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## 2022 CFA Program Level III Volume 5: Institutional Investors, Other Topics in Portfolio Management, and Cases

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Congratulations on your decision to enter the Chartered Financial Analyst (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities (competencies) it develops. Your commitment should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. CFA Program enrollment represents the first step toward a career-long commitment to professional education.

The CFA exam measures your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major CFA Program topic areas ([www.cfainstitute.org/programs/cfa/curriculum/cbok](http://www.cfainstitute.org/programs/cfa/curriculum/cbok));
- Topic area weights that indicate the relative exam weightings of the top-level topic areas ([www.cfainstitute.org/programs/cfa/curriculum](http://www.cfainstitute.org/programs/cfa/curriculum));
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- CFA Program curriculum that candidates receive upon exam registration.

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, features of the curriculum, and tips for designing an effective personal study program.

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# BACKGROUND ON THE CBOK

CFA Program is grounded in the practice of the investment profession. CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the competencies that are relevant to the profession, beginning with the Global Body of Investment Knowledge (GBIK®). Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback about the GBIK. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

The CFA Institute staff—in conjunction with the Education Advisory Committee and Curriculum Level Advisors, who consist of practicing CFA charterholders—designs the CFA Program curriculum in order to deliver the CBOK to candidates. The exams, also written by CFA charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into six topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected. It is then divided into one or more study sessions. These study sessions should form the basic structure of your reading and preparation. Each study session includes a statement of its structure and objective and is further divided into assigned readings. An outline illustrating the organization of these study sessions can be found at the front of each volume of the curriculum.

The readings are commissioned by CFA Institute and written by content experts, including investment professionals and university professors. Each reading includes LOS and the core material to be studied, often a combination of text, exhibits, and in-text examples and questions. End of Reading Questions (EORQs) followed by solutions help you understand and master the material. The LOS indicate what you should be able to accomplish after

studying the material. The LOS, the core material, and the EORQs are dependent on each other, with the core material and EORQs providing context for understanding the scope of the LOS and enabling you to apply a principle or concept in a variety of scenarios.

*The entire readings, including the EORQs, are the basis for all exam questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK.*

You should use the LOS to guide and focus your study because each exam question is based on one or more LOS and the core material and practice problems associated with the LOS. As a candidate, you are responsible for the entirety of the required material in a study session.

We encourage you to review the information about the LOS on our website ([www.cfainstitute.org/programs/cfa/curriculum/study-sessions](http://www.cfainstitute.org/programs/cfa/curriculum/study-sessions)), including the descriptions of LOS “command words” on the candidate resources page at [www.cfainstitute.org](http://www.cfainstitute.org).

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## FEATURES OF THE CURRICULUM

### End of Reading Questions/Solutions

*All End of Reading Questions (EORQs) as well as their solutions are part of the curriculum and are required material for the exam.* In addition to the in-text examples and questions, these EORQs help demonstrate practical applications and reinforce your understanding of the concepts presented. Some of these EORQs are adapted from past CFA exams and/or may serve as a basis for exam questions.

### Glossary

For your convenience, each volume includes a comprehensive Glossary. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the Glossary.

Note that the digital curriculum that is included in your exam registration fee is searchable for key words, including Glossary terms.

### LOS Self-Check



We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

## Source Material

The CFA Institute curriculum cites textbooks, journal articles, and other publications that provide additional context or information about topics covered in the readings. As a candidate, you are not responsible for familiarity with the original source materials cited in the curriculum.

Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written or updated but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*<sup>®</sup>, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and several Nobel laureates have contributed articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this, and other, CFA Institute practice-oriented publications through the Research & Analysis webpage ([www.cfainstitute.org/en/research](http://www.cfainstitute.org/en/research)).

## Errata

The curriculum development process is rigorous and includes multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, there are times when we must make corrections. Curriculum errata are periodically updated and posted

by exam level and test date online ([www.cfainstitute.org/en/programs/submit-errata](http://www.cfainstitute.org/en/programs/submit-errata)). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

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## DESIGNING YOUR PERSONAL STUDY PROGRAM

### Create a Schedule

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all assigned readings and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skills, and abilities described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will probably spend more time on some study sessions than on others.

You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

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## CFA INSTITUTE LEARNING ECOSYSTEM (LES)

As you prepare for your exam, we will email you important exam updates, testing policies, and study tips. Be sure to read these carefully.

Your exam registration fee includes access to the CFA Program Learning Ecosystem (LES). This digital learning platform provides access, even offline, to all of the readings and End of Reading Questions found in the print curriculum organized as a series of shorter online

lessons with associated EORQs. This tool is your one-stop location for all study materials, including practice questions and mock exams.

The LES provides the following supplemental study tools:

## **Structured and Adaptive Study Plans**

The LES offers two ways to plan your study through the curriculum. The first is a structured plan that allows you to move through the material in the way that you feel best suits your learning. The second is an adaptive study plan based on the results of an assessment test that uses actual practice questions.

Regardless of your chosen study path, the LES tracks your level of proficiency in each topic area and presents you with a dashboard of where you stand in terms of proficiency so that you can allocate your study time efficiently.

## **Flashcards and Game Center**

The LES offers all the Glossary terms as Flashcards and tracks correct and incorrect answers. Flashcards can be filtered both by curriculum topic area and by action taken—for example, answered correctly, unanswered, and so on. These Flashcards provide a flexible way to study Glossary item definitions.

The Game Center provides several engaging ways to interact with the Flashcards in a game context. Each game tests your knowledge of the Glossary terms a in different way. Your results are scored and presented, along with a summary of candidates with high scores on the game, on your Dashboard.

## **Discussion Board**

The Discussion Board within the LES provides a way for you to interact with other candidates as you pursue your study plan. Discussions can happen at the level of individual lessons to raise questions about material in those lessons that you or other candidates can clarify or comment on. Discussions can also be posted at the level of topics or in the initial Welcome section to connect with other candidates in your area.

## **Practice Question Bank**

The LES offers access to a question bank of hundreds of practice questions that are in addition to the End of Reading Questions. These practice questions, only available on the LES, are intended to help you assess your mastery of individual topic areas as you progress through your studies. After each practice question, you will receive immediate feedback

noting the correct response and indicating the relevant assigned reading so you can identify areas of weakness for further study.

## Mock Exams

The LES also includes access to three-hour Mock Exams that simulate the morning and afternoon sessions of the actual CFA exam. These Mock Exams are intended to be taken after you complete your study of the full curriculum and take practice questions so you can test your understanding of the curriculum and your readiness for the exam. If you take these Mock Exams within the LES, you will receive feedback afterward that notes the correct responses and indicates the relevant assigned readings so you can assess areas of weakness for further study. We recommend that you take Mock Exams during the final stages of your preparation for the actual CFA exam. For more information on the Mock Exams, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## PREP PROVIDERS

You may choose to seek study support outside CFA Institute in the form of exam prep providers. After your CFA Program enrollment, you may receive numerous solicitations for exam prep courses and review materials. When considering a prep course, make sure the provider is committed to following the CFA Institute guidelines and high standards in its offerings.

Remember, however, that there are no shortcuts to success on the CFA exams; reading and studying the CFA Program curriculum *is* the key to success on the exam. The CFA Program exams reference only the CFA Institute assigned curriculum; no prep course or review course materials are consulted or referenced.

### SUMMARY

Every question on the CFA exam is based on the content contained in the required readings and on one or more LOS. Frequently, an exam question is based on a specific example highlighted within a reading or on a specific practice problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the exam.

2. All questions, problems, and their solutions are part of the curriculum and are required study material for the exam. These questions are found at the end of the readings in the print versions of the curriculum. In the LES, these questions appear directly after the lesson with which they are associated. The LES provides immediate feedback on your answers and tracks your performance on these questions throughout your study.
3. We strongly encourage you to use the CFA Program Learning Ecosystem. In addition to providing access to all the curriculum material, including EORQs, in the form of shorter, focused lessons, the LES offers structured and adaptive study planning, a Discussion Board to communicate with other candidates, Flashcards, a Game Center for study activities, a test bank of practice questions, and online Mock Exams. Other supplemental study tools, such as eBook and PDF versions of the print curriculum, and additional candidate resources are available at [www.cfainstitute.org](http://www.cfainstitute.org).
4. Using the study planner, create a schedule and commit sufficient study time to cover the study sessions. You should also plan to review the materials, answer practice questions, and take Mock Exams.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

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## FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and investment professional comments and feedback as we work to improve the curriculum, supplemental study tools, and candidate resources.

Please send any comments or feedback to [info@cfainstitute.org](mailto:info@cfainstitute.org). You can be assured that we will review your suggestions carefully. Ongoing improvements in the curriculum will help you prepare for success on the upcoming exams and for a lifetime of learning as a serious investment professional.



# Portfolio Management

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## STUDY SESSIONS

<b>Study Session 1</b>	Behavioral Finance
<b>Study Session 2</b>	Capital Market Expectations
<b>Study Session 3</b>	Asset Allocation and Related Decisions in Portfolio Management
<b>Study Session 4</b>	Derivatives and Currency Management
<b>Study Session 5</b>	Fixed-Income Portfolio Management (1)
<b>Study Session 6</b>	Fixed-Income Portfolio Management (2)
<b>Study Session 7</b>	Equity Portfolio Management (1)
<b>Study Session 8</b>	Equity Portfolio Management (2)
<b>Study Session 9</b>	Alternative Investments Portfolio Management
<b>Study Session 10</b>	Private Wealth Management (1)
<b>Study Session 11</b>	Private Wealth Management (2)
<b>Study Session 12</b>	Portfolio Management for Institutional Investors
<b>Study Session 13</b>	Trading, Performance Evaluation, and Manager Selection
<b>Study Session 14</b>	Cases in Portfolio Management and Risk Management

This volume includes Study Sessions 1–3.

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## TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; and evaluate portfolio performance.



# Study Session 1

## Behavioral Finance

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Behavioral finance is introduced in the first study session on portfolio management because all market participants, regardless of expertise or experience, may be subject to behavioral biases. Behavioral finance provides insight into how emotional biases and cognitive errors may influence individuals' perceptions and investment decisions. As a consequence, knowledge of behavioral biases may help in understanding client goals, in constructing investment portfolios, and in identifying inconsistencies in investment decision making. Behavioral finance also provides insights into issues such as market anomalies. The readings propose that integration of behavioral and traditional finance may lead to a better outcome than either approach used in isolation.

## READING ASSIGNMENTS

**Reading 1** The Behavioral Biases of Individuals  
by Michael M. Pompian, CFA

**Reading 2** Behavioral Finance and Investment Processes  
by Michael M. Pompian, CFA, Colin McLean, MBA, FIA, FSIP, and Alistair Byrne, PhD, CFA

**Note:** The readings in this study session use widely recognized terminology. Nevertheless, readers should be aware that writers on behavioral finance vary in their choice of terminology.

# Reading 1

## The Behavioral Biases of Individuals

by Michael M. Pompian, CFA

*Michael M. Pompian, CFA, is at Sunpointe Investments (USA)*

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### LEARNING OUTCOMES

The candidate should be able to:

- a. compare and contrast cognitive errors and emotional biases;
- b. discuss commonly recognized behavioral biases and their implications for financial decision making;
- c. identify and evaluate an individual's behavioral biases;

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### 1. INTRODUCTION AND CATEGORIZATIONS OF BEHAVIORAL BIASES

- a. compare and contrast cognitive errors and emotional biases;

Much of traditional economic and financial theory is based on the assumptions that individuals act rationally and consider all available information in the decision-making process and that markets are efficient. Behavioral finance challenges these assumptions and explores how individuals and markets actually behave. To differentiate the study of individual investor behavior from the study of collective market behavior, the subject of behavioral finance can be classified as **Behavioral Finance Micro** (BFMI) and **Behavioral Finance Macro** (BFMA).

BFMI examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance. BFMA detects and describes market anomalies that distinguish markets from the efficient markets of traditional finance. In this reading, we focus on BFMI and the behavioral biases that individuals may exhibit when making financial decisions. BFMI attempts to observe and explain how individuals make financial decisions. This approach is in contrast to traditional theories of financial decision making that describe how people *should* make decisions under uncertainty.

Many prominent researchers have demonstrated that when people are faced with complex decision-making situations that demand substantial time and effort, they have difficulty devising completely rational approaches to developing and analyzing various courses of action. Facing uncertainty and an abundance of information to process, individuals may not systematically describe problems, record necessary data, or synthesize information to create rules for making decisions. Instead, individuals may follow a more subjective, suboptimal path of reasoning to determine a course of action consistent with their basic judgments and preferences.

A decision maker may have neither the time nor the ability to arrive at a perfectly optimal decision. Individuals strive to make good decisions by simplifying the choices available, using a subset of the information available, and discarding some possible alternatives to choose among a smaller number. They are content to accept a solution that is “good enough” rather than attempting to find the optimal answer. In doing so, they may unintentionally bias the decision-making process. These biases may lead to irrational behaviors and decisions.

By understanding behavioral biases, investment professionals may be able to improve economic outcomes. This may entail identifying behavioral biases they themselves exhibit or behavioral biases of others, including clients. Once a behavioral bias has been identified, it may be possible to either moderate the bias or adapt to the bias so that the resulting financial decisions more closely match the rational financial decisions assumed by traditional finance. Knowledge of and integration of behavioral and traditional finance may lead to superior results.

Section 2 describes and broadly characterizes behavioral biases. Sections 3–6 discuss specific behavioral biases within two broad categories: cognitive errors and emotional biases. The discussion will include a description of the bias, potential consequences of the bias, detection of the bias, and guidance on moderating the effects of the bias. A summary and practice problems conclude the reading.

## **1.1. Categorizations of Behavioral Biases**

Dictionary definitions of bias include the following: a statistical sampling or testing error caused by systematically favoring some outcomes over others; a preference or an inclination,

especially one that inhibits impartial judgment; an inclination or prejudice in favor of a particular viewpoint; an inclination of temperament or outlook, especially a personal and sometimes unreasoned judgment. In the context of this reading, we are considering biases that result in irrational financial decisions caused by faulty cognitive reasoning or reasoning influenced by feelings. The first dictionary definition of bias is consistent with faulty cognitive reasoning; the other three definitions are more consistent with reasoning influenced by feelings or emotions.

The simple categorization of distinguishing between biases based on faulty cognitive reasoning (**cognitive errors**) and those based on reasoning influenced by feelings or emotions (**emotional biases**) is used in this reading. Although researchers in the field of psychology have developed many different classifications and identifying factors to categorize and better understand biases, it is possible to see how each of these fit within the two categories. For example, psychologists' factors include cognitive information-processing shortcuts or heuristics, memory errors, emotional and/or motivational factors, and such social influences as family upbringing or societal culture. The first two are cognitive; the last two are emotional. Some biases identified by psychologists are understood in relation to human needs, such as those identified by Maslow (e.g., physiological, safety, social, esteem, and self-actualizing). In satisfying these needs, people will generally attempt to avoid pain and seek pleasure. The avoidance of pain can be as subtle as avoiding acknowledging mistakes in order to maintain a positive self-image. The biases that help to avoid pain and produce pleasure may be classified as emotional. Other biases found by psychologists are attributed to the particular way the brain perceives, forms memories, and makes judgments; the inability to do complex mathematical calculations, such as updating probabilities; and the processing and filtering of information. These can be classified as cognitive.

In summary, cognitive errors stem from basic statistical, information-processing, or memory errors; cognitive errors may be considered the result of faulty reasoning. Emotional biases stem from impulse or intuition; emotional biases may be considered to result from reasoning influenced by feelings. Behavioral biases, regardless of their source, may cause decisions to deviate from the assumed rational decisions of traditional finance.

## 1.2. Differences between Cognitive Errors and Emotional Biases

In this reading, behavioral biases are classified as either cognitive errors or emotional biases. This distinction is not only simple and easily understood, but it also provides a useful framework for understanding how effectively biases can be corrected for. If we think of decision making as occurring along a spectrum from the totally rational decision making of traditional finance to purely emotional decision making, cognitive errors are basic statistical, information-processing, or memory errors that cause the decision to deviate from the rational

decisions of traditional finance. Emotional biases arise spontaneously as a result of attitudes and feelings that can cause the decision to deviate from the rational decisions of traditional finance.

Cognitive errors are more easily corrected than emotional biases. Individuals are better able to adapt their behaviors or modify their processes if the source of the bias is logically identifiable, even if not completely understood. For instance, an individual may not understand the complex mathematical process to update probabilities but may comprehend that the process initially used was incorrect. Cognitive errors can also be thought of as “blind spots” or distortions in the human mind. Cognitive errors do not result from emotional or intellectual predispositions toward certain judgments, but rather from subconscious mental procedures for processing information. Because cognitive errors stem from faulty reasoning, better information, education, and advice can often correct for them. Thus, most cognitive biases can be “moderated”—to moderate the impact of a bias is to recognize it and attempt to reduce or even eliminate it within the individual.

Because emotional biases stem from impulse or intuition—especially personal and sometimes unreasoned judgments—they are less easily corrected. It is generally agreed that an emotion is a mental state that arises spontaneously rather than through conscious effort. Emotions are related to feelings, perceptions, or beliefs about elements, objects, or relations between them and can be a function of reality or the imagination. In the world of investing, emotions can cause investors to make suboptimal decisions. Emotions may be undesired to the individual feeling them; he or she may wish to control them but often cannot. Thus, it may only be possible to recognize an emotional bias and “adapt” to it. When a bias is adapted to, it is accepted and decisions are made that recognize and adjust for it (rather than making an attempt to reduce or eliminate it).

The cognitive–emotional distinction will help us determine when and how to adjust for behavioral biases in financial decision making. However, it should be noted that specific biases may have some common aspects and that a specific bias may seem to have both cognitive and emotional aspects. Researchers in financial decision making have identified numerous specific behavioral biases. This reading will not attempt to discuss all identified biases. Rather, this reading will discuss some of the more publicized and recognized biases within the cognitive–emotional framework. This framework will be useful in developing an awareness of biases, their implications, and ways of moderating their impact or adapting to them. The intent is not to develop a list of biases to be memorized but rather to create an awareness of biases so that financial decisions and resulting economic outcomes are potentially improved.

In Sections 3–6, specific behavioral biases will be discussed. Cognitive errors will be discussed in Sections 3 and 4 and emotional biases in Sections 5 and 6. For each bias we will 1) describe the bias, including evidence supporting the existence of the bias; 2) describe the consequences of the bias; and 3) offer guidance on detecting and overcoming the bias. We will limit our focus to gauging the presence or absence—not the magnitude—of each bias

discussed. That is, we will not try to measure how strongly the bias is exhibited, but rather we will describe the behavioral bias, its potential consequences, and the detection of and correction for the behavioral bias. In detecting a bias, we will identify statements or thought processes that may be indicative of the bias. Diagnostic tests of varying degrees of complexity are available to detect biases but are beyond the scope of this reading.

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## 2. COGNITIVE ERRORS: BELIEF PERSEVERANCE BIASES: CONSERVATION BIAS AND CONFIRMATION BIAS

- b. discuss commonly recognized behavioral biases and their implications for financial decision making;

We will now review nine specific cognitive errors, their implications for financial decision making, and suggestions for correcting for them. We classify cognitive errors into two categories. The first category contains “belief perseverance” biases. In general, belief perseverance is the tendency to cling to one’s previously held beliefs irrationally or illogically. The belief continues to be held and justified by committing statistical, information-processing, or memory errors. A second category of cognitive error has to do with “processing errors,” describing how information may be processed and used illogically or irrationally in financial decision making.

The belief perseverance biases discussed are conservatism, confirmation, representativeness, illusion of control, and hindsight. The processing errors discussed are anchoring and adjustment, mental accounting, framing, and availability.

In this reading, the individuals of interest are “financial market participants” (“FMPs”) engaged in financial decision making. These include both individual investors and financial services professionals.

### 2.1. Belief Perseverance Biases

Belief perseverance biases are closely related to the psychological concept of **cognitive dissonance**. Cognitive dissonance is the mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions. To resolve this dissonance,

people may notice only information of interest (selective exposure), ignore or modify information that conflicts with existing cognitions (selective perception), or remember and consider only information that confirms existing cognitions (selective retention). Aspects of these behaviors are contained in the biases categorized as belief perseverance.

### 2.1.1. *Conservatism Bias*

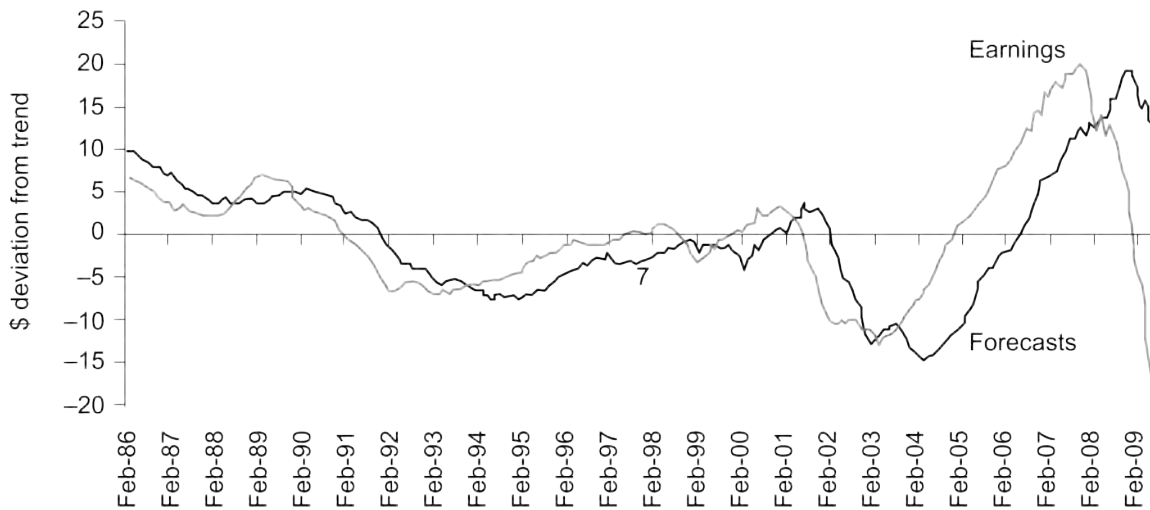
**Conservatism bias** is a belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information. This bias has aspects of both statistical and information-processing errors. Academic studies have demonstrated that conservatism causes individuals to overweight initial beliefs about probabilities and outcomes and under-react to new information; they fail to modify their beliefs and actions to the extent rationally justified by the new information. In Bayesian terms, they tend to overweight the probability of the event without the new information (the base rates) and underweight the new information, resulting in revised beliefs about probabilities and outcomes that demonstrate an underreaction to the new information. As a result of conservatism bias, FMPs may underreact to or fail to act on new information and continue to maintain beliefs close to those based on previous estimates and information.

#### EXAMPLE 1

### Conservatism in Action

Montier (2002) writes, “The stock market has a tendency to underreact to fundamental information—be it dividend omissions, initiations or an earnings report.” When discussing the behavior of security analysts, Montier (2010) explains, “[[Exhibit 1](#)] was constructed by de-trending operating earnings and the analyst forecasts of those earning so that the chart plots deviations from trend in dollars-per-share terms. It clearly shows that analysts lag reality. They only change their mind when there is irrefutable proof they were wrong, and then they only change their minds very slowly... In many ways, 2008 was a case study in financial conservatism. The recession that was engulfing all the major economies was eerily like watching a slow motion train wreck... The analysts seemed to be able to grasp this, and went away to cut their numbers. Of course, the first thing they did was talk to their companies... [which] unsurprisingly said that the recession wouldn’t affect them (even the cyclically exposed ones). After hearing this, the analysts came back to us and said, ‘We can’t cut our numbers!’” Discuss Montier’s analysis in the context of biases of individuals.

#### Exhibit 1. Analysts Lag Reality



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## Solution:

In relating conservatism to security analysts, Montier provides clear evidence of the conservatism bias in action: The analysts maintain their forecasts even when presented with new information. The behavior observed in security analysts can logically be extended to individual investors who are likely to engage in similar behavior when managing their own investment portfolios.

## Consequences of Conservatism Bias

As a result of conservatism bias, FMPs may do the following:

- Maintain or be slow to update a view or a forecast, even when presented with new information. For example, if an investor purchases a security of a pharmaceutical company based on the belief that the company is about to receive regulatory approval for a new drug, and then the company announces that it is experiencing problems getting the approval, the investor may cling to his initial valuation of the company and fail to respond or respond slowly to the new information. As a result, the investor may hold the security longer than a rational decision maker would.
- Opt to maintain a prior belief rather than deal with the mental stress of updating beliefs given complex data. This behavior relates to an underlying difficulty in processing new information. For example, if an investor purchases a security based on the belief that the company is entering a period of significant earnings growth, and then the company announces its growth rate may appear lower than expected because of a number of



difficult-to-interpret accounting changes, the investor may maintain the prior belief rather than attempt to decipher the fundamental impact, if any, reflected in the accounting changes. As a result, the investor may hold the security longer than a rational decision maker would.

## **Detection of and Guidance for Overcoming Conservatism Bias**

The effect of conservatism bias may be corrected for or reduced by properly analyzing and weighting new information. The first step is to be aware that a bias exists. If FMPs find themselves ignoring new information or not adequately processing new information on the basis that the information is not relevant, is difficult to understand, or would not change beliefs, a conservatism bias may exist.

The effort involved in processing new information and updating beliefs is termed **cognitive cost**. The higher the cognitive cost, the less likely information will be processed and beliefs updated. Information that is abstract and statistical is cognitively costly, and it thus receives less weighting. As a result, the base rate is overweighted. Information that is cognitively inexpensive (easily processed) may receive a higher weighting. As a result, individuals may overreact to information that is easily processed and may even underweight base rates. The costly processing idea can explain base rate overweighting and underweighting.

When new information is presented, the FMP should ask such questions as, “How does this information change my forecast?” or “What impact does this information have on my forecast?” Specifically, FMPs should react decisively to new information and avoid retaining old forecasts by disregarding new information. This reaction does not imply action before analysis. FMPs should conduct careful analysis incorporating the new information and then respond appropriately. When an appropriate course of action becomes clear, even if it deviates from the course of action based on previous information and beliefs, it should be implemented without hesitation.

When investors are ignoring information because it is difficult to interpret or understand, they should seek advice from a professional who can either explain how to interpret the data or can explain the action implications of the data to the satisfaction of the investor. Otherwise, investors may fail to make appropriate financial decisions. Inappropriate decisions may include making or failing to make investments because they are poorly understood.

### **2.1.2. Confirmation Bias**

**Confirmation bias** is a belief perseverance bias in which people tend to look for and notice what confirms their beliefs, and to ignore or undervalue what contradicts their beliefs. This behavior has aspects of selective exposure, perception, and retention and may be thought of

as a selection bias. It is an all too natural response to cognitive dissonance and reflects an ability to convince ourselves of what we want to believe by giving more weight to evidence that supports our beliefs and to ignore or modify evidence that conflicts with our beliefs.

Numerous studies have demonstrated that people generally place excessive weight on confirmatory information; that is, they place greater weight on information that supports their beliefs. Information is considered positive if it supports their beliefs and negative if it fails to support or refutes their beliefs. Positive information is thought to carry greater weight because it involves less cognitive cost for the individual. Analysts can be guilty of confirmation bias when they set up their analysis or frame their data in ways that tend to confirm their hypotheses. They compound the problem by proceeding in ways that avoid dealing with data that would contradict their hypotheses.

All FMPs—whether individual investors, analysts, investment advisers, or fund managers—may, after making an investment decision, tend to notice and consider information in a manner consistent with resolving cognitive dissonance. They may notice and consider only confirmatory information and ignore or modify contradictory information. Most experienced private wealth advisers have dealt with a client who conducts some research and insists on adding a particular investment to his portfolio. Unfortunately, the client may have failed to consider how the investment fits in his portfolio, as well as evidence of its fundamental value. This type of client may insist on continuing to hold the investment, even when the adviser recommends otherwise, because the client's follow-up research seeks only information that confirms his belief that the investment is still a good value. The confirmation bias is not limited to individual investors; all FMPs should be wary of the potential confirmation biases within themselves.

## **Consequences of Confirmation Bias**

In the investment world, confirmation bias is exhibited repeatedly. As a result of confirmation bias, FMPs may do the following:

- Consider only the positive information about an existing investment and ignore any negative information about the investment.
- Develop screening criteria and ignore information that either refutes the validity of the screening criteria or supports other screening criteria. As a result, some good investments that do not meet the screening criteria may be ignored; conversely, some bad investments that do meet the screening criteria may be made.
- Under-diversify portfolios, leading to excessive exposure to risk. FMPs may become convinced of the value of a single company and its stock. They ignore negative news about the company and its stock, and they gather and process only information confirming that the company is a good investment. They build a large position and

eventually own a poorly diversified portfolio.

- Hold a disproportionate amount of their investment assets in their employing company's stock because they believe in their company and are convinced of its favorable prospects. Favorable information is cited, and unfavorable information is ignored. If the employee was to acknowledge unfavorable information, the associated mental discomfort might make work very difficult for the employee.

## Detection of and Guidance for Overcoming Confirmation Bias

The effect of confirmation bias may be corrected for or reduced by actively seeking out information that challenges your beliefs. The conscious effort to gather and process negative information (information that challenges a belief), as well as positive information, provides more complete information on which to base a decision. Even well-informed decisions can lead to unfavorable results; however, making the extra effort to gather complete information, positive and negative, will likely result in better decisions.

Another useful step is to get corroborating support for an investment decision. For example, if investment selections are based on criteria confirming an existing belief, such as stocks breaking through their 52-week highs, it is usually advisable to obtain supporting information (e.g., fundamental research on the company, industry or sector information) to assure that a good investment is being made. Accepting an investment idea unquestioningly and confirming it through purchases is not a proven investment strategy. Additional research is highly recommended.

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## 3. COGNITIVE ERRORS: BELIEF PERSEVERANCE BIASES – REPRESENTATIVENESS

- b. discuss commonly recognized behavioral biases and their implications for financial decision making;

**Representativeness bias** is a belief perseverance bias in which people tend to classify new information based on past experiences and classifications. They believe their classifications are appropriate and place undue weight on them. This bias occurs because people attempting to derive meaning from their experiences tend to classify objects and thoughts into personalized categories. When confronted with new information, they use those

categories even if the new information does not necessarily fit. They rely on a “best fit” approximation to determine which category should provide a frame of reference from which to understand the new information.

Although this perceptual framework provides an expedient tool for processing new information, it may lead to statistical and information-processing errors. The new information superficially resembles or is *representative* of familiar elements already classified, but in reality it can be very different. In these instances, the classification reflex deceives people, producing an incorrect understanding that often persists and biases all future thinking about the information. *Base-rate neglect* and *sample-size neglect* are two types of representativeness bias that apply to FMPs. In Bayesian terms, FMPs tend to underweight the base rates and overweight the new information—resulting in revised beliefs about probabilities and outcomes that demonstrate an overreaction to the new information.

### 3.1. Base-Rate Neglect

In **base-rate neglect**, the base rate or probability of the categorization is not adequately considered. For example, an FMP attempting to determine the potential success of an investment in Company ABC might use a familiar, easy to understand classification scheme and categorize Company ABC as a “growth stock.” This classification is based on some information about ABC that is consistent with the FMP’s beliefs about growth companies, but it ignores the base probability that a company is a growth company. The FMP draws conclusions about ABC’s risks and rewards based on that categorization. FMPs often follow this erroneous path because it is an easy alternative to the diligent research actually required when evaluating investments. To rephrase this error, some FMPs rely on *stereotypes* when making investment decisions without adequately incorporating the base probability of the stereotype occurring.

### 3.2. Sample-Size Neglect

A second type of representativeness bias is **sample-size neglect**. In sample-size neglect, FMPs incorrectly assume that small sample sizes are *representative* of populations (or “real” data). Some researchers call this phenomenon the “law of small numbers.” This bias reflects erroneous beliefs about the laws of probability; they mistakenly believe that a small sample is representative of or similar in characteristics to the population. When people do not initially comprehend a trend or pattern reflected in a series of data, they may make assumptions relying on only a few data points. Individuals prone to sample-size neglect are quick to treat properties reflected in small samples as properties that accurately describe large pools of data. They overweight the information in the small sample.

## EXAMPLE 2

### Representativeness

APM Company is a large, 50-year old auto parts manufacturer having some business difficulties. It has previously been classified as a value stock. Jacques Verte is evaluating the future prospects of the company. Over the 50-year life of APM, there have been few failures of large auto parts manufacturers even given periods of difficulty. There have been a number of recent headlines about auto parts manufacturers having business and financial difficulty and potentially going out of business. He is considering two possibilities:

- A.** APM will solve its difficulties, the company's performance will revert to the mean, and the stock will again be a value stock.
  - B.** APM will go out of business, and the stock will become valueless.
- 1.** Is Scenario A or B more likely? Explain why.
  - 2.** If Verte is subject to representativeness bias, is he more likely to classify APM into A or B? Explain why.

#### Solution to 1:

Scenario A. It is more likely that APM will solve its difficulties, the company's performance will revert to the mean, and the stock will again be a value stock. The base rate, based on 50 years of data, is that more auto parts companies revert to the mean rather than go out of business.

#### Solution to 2:

Verte is likely to classify APM as B, predicting that it will go out of business because he read some headlines about other auto parts manufacturers going out of business. Verte, in classifying APM as likely to go out of business, may be guilty of both base-rate neglect and sample-size neglect. He has potentially ignored the base-rate information that far more auto parts manufacturers revert to the mean rather than go out of business, and he has assumed that the small sample of failing auto parts manufacturers is representative of all auto parts manufacturers.

### 3.3. Consequences of Representativeness Bias

A wide variety of FMP behaviors indicate susceptibility to the premise of the representativeness bias: FMPs often overweight new information and small samples because they view the information or sample as representative of the population as a whole. As a result of representativeness bias, FMPs may do the following:

- Adopt a view or a forecast based almost exclusively on new information or a small sample. For example, when evaluating investment managers, FMPs may place undue emphasis on high returns during a one-, two-, or three-year period, ignoring the base probability of such a return occurring. As a result, the investor may hire an investment manager without adequately considering the likelihood of such returns continuing. This situation may also result in high investment manager turnover as the investor changes investment managers based on short-term results.
- Update beliefs using simple classifications rather than deal with the mental stress of updating beliefs given complex data. This issue relates to an underlying difficulty (cognitive cost) in properly processing new information. For example, if an investor purchases a security based on the belief that the company is entering a period of significant earnings growth, and then the company announces that its growth rate may appear lower than expected because of a number of difficult-to-interpret accounting changes, the investor may simply reclassify the stock rather than attempt to decipher the fundamental impact, if any, reflected in the accounting changes. As a result, the investor may sell the security when fundamentals would not justify such a decision.

### 3.4. Detection of and Guidance on Overcoming Representativeness Bias

In both base-rate neglect and sample size neglect, investors ignore the laws of probability to satisfy their need for patterns. FMPs need to be aware of statistical mistakes they may be making and constantly ask themselves if they are overlooking the reality of the investment situation being considered.

For example, an FMP might conclude that a mutual fund manager possesses remarkable skill based on performance over a short time period, such as one, two, or three years. However, over a short time period, a manager's track record may benefit as much from luck as from skill. Several studies demonstrate this concept.

DALBAR's *Quantitative Analysis of Investor Behavior* has demonstrated that investors tend to buy into a fund immediately following rapid price appreciation. These investors seem to categorize the funds as good investments based on this recent information. These periods

tend to precede a subsequent decline in the fund's performance. Then, when prices fall, FMPs sell their holdings and search for the next hot fund. Thus, we can conclude that the additional costs of moving in and out of funds and lack of performance persistence will generally result in returns lower than those expected by investors. Moving in and out of investments based on categorizations that place undue reliance on recent performance and new information is likely to result in excessive trading and inferior performance results.

Prudent methods for identifying appropriate long-term investments exist. Use an asset allocation strategy to increase the likelihood of better long-term portfolio returns. Invest in a diversified portfolio to meet financial goals, and stick with it. The following questions should help FMPs avoid the futility of chasing returns and also help them select appropriate investments.

1. How does the fund under consideration perform relative to similarly sized and similarly styled funds?
2. What is the tenure of the managers and advisers at the fund?
3. Are the managers well-known and/or highly regarded?
4. Has the fund consistently pursued its strategy, or has its style drifted during different market conditions?

To counteract the effects of the representativeness bias when considering returns, many practitioners use what has become known as the “periodic table of investment returns,” as shown in [Exhibit 2](#).

## **Exhibit 2. Sample of a Periodic Table of Investment Returns**



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Highest Return	MSCI Em Mkts 32.59%	MSCI Em Mkts 39.78%	Barclays Agg Fx Inc 5.24%	MSCI Em Mkts 79.02%	Russell 2000 26.85%	NCREIF Property 14.26%	MSCI Mkts 18.63%	Russell 2000 38.82%	S&P 500 13.69%	NCREIF Property 13.33%
	MSCI EAFE 26.34%	Cambridge Private Eq. 17.69%	Barclays US TIPS -2.35%	Barclays Corp HY 58.21%	Cambridge Private Eq. 19.42%	Barclays US TIPS 13.56%	MSCI EAFE 17.32%	S&P 500 32.39%	Cambridge Private Eq. 12.81%	S&P 500 1.38%
	Cambridge Private Eq. 25.40%	NCREIF Property 15.85%	NCREIF Property -6.46%	MSCI EAFE 31.78%	MSCI Em Mkts 19.20%	Cambridge Private Eq. 10.99%	Russell 2000 16.35%	MSCI EAFE 22.78%	NCREIF Property 11.82%	Barclays Agg Fx Inc 0.55%
	Russell 2000 18.37%	CS Hedge Fund 12.56%	CS Hedge Fund -19.07%	Russell 2000 27.17%	Bloomberg Commodity 16.67%	Barclays Agg Fx Inc 7.84%	S&P 500 16.00%	Cambridge Private Eq. 22.28%	Diversified 6.10%	Diversified -0.50%
	NCREIF Property 16.59%	Barclays US TIPS 11.63%	Cambridge Private Eq. -22.37%	S&P 500 26.47%	Barclays Corp HY 15.12%	Barclays Corp HY 4.98%	Barclays Corp HY 15.81%	Diversified 14.70%	Barclays Agg Fx Inc 5.97%	CS Hedge Fund -0.71%
	S&P 500 15.79%	MSCI EAFE 11.17%	Diversified -25.10%	Diversified 20.20%	S&P 500 15.06%	S&P 500 2.11%	Cambridge Private Eq. 13.27%	NCREIF Property 10.98%	Russell 2000 4.89%	MSCI EAFE -0.81%
	CS Hedge Fund 13.86%	Bloomberg Commodity 11.08%	Barclays Corp HY -26.16%	Bloomberg Commodity 18.72%	NCREIF Property 13.11%	Diversified 1.10%	Diversified 12.60%	CS Hedge Fund 9.73%	CS Hedge Fund 4.13%	Barclays US TIPS -1.44%
	Diversified* 13.20%	Diversified 8.00%	Russell 2000 -33.79%	CS Hedge Fund 18.57%	Diversified 12.90%	CS Hedge Fund -2.52%	NCREIF Property 10.54%	Barclays Corp HY 7.44%	Barclays US TIPS 3.64%	Russell 2000 -4.41%
	Barclays Corp HY 11.85%	Barclays Agg Fx Inc 6.97%	Bloomberg Commodity -36.61%	Cambridge Private Eq. 13.98%	CS Hedge Fund 10.95%	Russell 2000 -4.18%	CS Hedge Fund 7.67%	Barclays Agg Fx Inc -2.02%	Barclays Corp HY 2.45%	Barclays Corp HY -4.47%
	Barclays Agg Fx Inc 4.33%	S&P 500 5.49%	S&P 500 -37.00%	Barclays US TIPS 11.41%	MSCI EAFE 7.75%	MSCI EAFE -12.14%	Barclays US TIPS 6.98%	MSCI Em Mkts -2.27%	MSCI Em Mkts -1.82%	MSCI Em Mkts -14.60%
	Barclays US TIPS 0.41%	Barclays Corp HY 1.87%	MSCI EAFE -43.38%	Barclays Agg Fx Inc 5.93%	Barclays Agg Fx Inc 6.54%	Bloomberg Commodity -13.37%	Barclays Agg Fx Inc 4.21%	Barclays US TIPS -8.61%	MSCI EAFE -4.90%	Bloomberg Commodity -24.70%
Lowest Return	Bloomberg Commodity -2.71%	Russell 2000 -1.57%	MSCI Em Mkts -53.18%	NCREIF Property -16.86%	Barclays US TIPS 6.31%	MSCI Em Mkts -18.17%	Bloomberg Commodity -1.14%	Bloomberg Commodity -9.58%	Bloomberg Commodity -17.04%	

\* “Diversified” is the median return of the funds in Callan Associates’ mid-sized defined-benefit fund universe.

Source: Callan Associates

Exhibit 2 shows that asset class returns are highly variable. Many FMPs fail to heed the advice offered by the chart—namely, that it is nearly impossible to accurately predict which asset class will be the best performer from one year to the next. Thus, diversification is prudent (note how the diversified portfolio consistently appears near the center of each column). Practitioners would be wise to present this chart when establishing asset allocations with new clients to emphasize the advantages of diversification over return chasing.

When FMPs sense that base-rate or sample-size neglect may be a problem, they should ask the following question: “What is the probability that X (the investment under consideration) belongs to Group A (the group it resembles or is considered representative of) versus Group B (the group it is statistically more likely to belong to)?” This question, or a similar question, will help FMPs think through whether they are failing to consider base-rate probabilities or neglecting the law of small numbers and thus inaccurately assessing a particular situation. It may be necessary to do more research to determine if a statistical error has indeed been made. In the end, this process should improve investment decisions.



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## 4. COGNITIVE ERRORS: BELIEF PERSEVERANCE BIASES - ILLUSION OF CONTROL BIAS AND HINDSIGHT BIAS

- b. discuss commonly recognized behavioral biases and their implications for financial decision making;

### 4.1. Illusion of control bias

**Illusion of control bias** is a bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of control bias has been defined as the “expectancy of a personal success probability inappropriately higher than the objective probability would warrant.” Many researchers have uncovered situations where people perceived themselves as possessing more control than they did, inferred causal connections where none existed, or displayed surprisingly great certainty in their predictions for the outcomes of chance events.

#### *Consequences of Illusion of Control*

As a result of illusion of control bias, FMPs may do the following:

- Trade more than is prudent. Researchers have found that traders, especially online traders, believe that they have “control” over the outcomes of their investments. This view leads to excessive trading, which may lead to lower realized returns than a strategy where securities are held longer and traded less frequently.
- Lead investors to inadequately diversify portfolios. Researchers have found that some investors prefer to invest in companies that they may feel they have some control over, like the companies they work for, leading them to hold concentrated positions. In fact, most investors have almost no control over the companies they work for. If the company performs poorly, the investor may experience both the loss of employment and investment losses.

#### *Detection of and Guidelines for Overcoming Illusion of Control Bias*

There are some useful guidelines to help investors detect and overcome illusion of control bias. The first and most basic idea is that investors need to recognize that successful investing is a probabilistic activity. The first step on the road to understanding illusion of control bias is to be aware that global capitalism is highly complex, and even the most powerful investors have little control over the outcomes of the investments they make.

Second, it is advisable to seek contrary viewpoints. As you contemplate a new investment, take a moment to ponder any considerations that might weigh against the trade. Ask yourself: Why am I making this investment? Is this investment part of an overall plan? What are the downside risks? What might go wrong? When will I sell? These important questions can help you logically evaluate an investment decision before implementation.

Finally, it is critical to keep records. Once you have decided to move forward with an investment, an effective way to prevent illusions of control is to maintain records of your transactions, including reminders outlining the rationale behind each trade. Write down some of the important features of each investment that you make, and emphasize those attributes that you have determined to be in favor of the investment's success.

Rationally, we know that returns on long-term investments are not impacted by the short-term beliefs, emotions, and impulses that often surround financial transactions. Success, or the lack thereof, is usually a result of such uncontrollable factors as corporate performance or general economic conditions. During periods of market turmoil, it can be difficult to keep this fact in mind. One of the best ways to prevent your biases from affecting your decisions is to keep the rational side of your brain as engaged as possible. Investing success is ultimately achieved by those who can conquer the daily psychological challenges and maintain a long-term perspective.

## 4.2. Hindsight Bias

**Hindsight bias** is a bias with selective perception and retention aspects. People may see past events as having been predictable and reasonable to expect. This behavior is based on the obvious fact that outcomes that did occur are more readily evident than outcomes that did not occur. Also, people tend to remember their own predictions of the future as more accurate than they actually were because they are biased by the knowledge of what has actually happened. To alleviate the discomfort associated with the unexpected, people tend to view things that have already happened as being relatively inevitable and predictable. This view is often caused by the reconstructive nature of memory. When people look back, they do not have perfect memory; they tend to “fill in the gaps” with what they prefer to believe. In doing so, people may prevent themselves from learning from the past.

In hindsight, poorly reasoned decisions with positive results may be described as brilliant tactical moves, and poor results of well-reasoned decisions may be described as avoidable

mistakes.

## ***Consequences of Hindsight Bias***

As a result of hindsight bias, FMPs may do the following:

- Overestimate the degree to which they predicted an investment outcome, thus giving them a false sense of confidence. For example, when an investment appreciates for unforeseen reasons, FMPs may rewrite their own memories to reflect those reasons. The hindsight bias may cause FMPs to take on excessive risk, leading to future investment mistakes.
- Cause FMPs to unfairly assess money manager or security performance. Based on their ability to look back at what has taken place in securities markets, performance is compared against what has happened as opposed to expectations. For example, a given manager may have followed his or her strategy faithfully, and possibly even ranked near the top of the relevant peer group, but the investment results may be disappointing compared to another segment of the market or the market as a whole.

## ***Detection of and Guidelines for Overcoming Hindsight Bias***

Once understood, hindsight bias should be recognizable. FMPs need to be aware of the possibility of hindsight bias and ask such questions as, “Am I re-writing history or being honest with myself about the mistakes I made?” Achieving success with investments requires investors to recognize and come to terms with mistakes. This approach is contrary to human nature. However, understanding how markets work and why investments go wrong is critical to achieving investment success.

To guard against hindsight bias, FMPs need to carefully record and examine their investment decisions, both good and bad, to avoid repeating past investment mistakes. In addition, FMPs should constantly remind themselves that markets move in cycles and that good managers stay true to their strategies through good times and bad. Expectations must be managed; there will inevitably be periods when even good managers underperform the broader market. Education is critical here. It is important that all investment managers be evaluated relative to appropriate benchmarks and peer groups.

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## **5. COGNITIVE ERRORS: INFORMATION**

# PROCESSING BIASES

- b. discuss commonly recognized behavioral biases and their implications for financial decision making;

The second category of cognitive errors includes information-processing errors or biases. Information-processing biases result in information being processed and used illogically or irrationally. As opposed to belief perseverance biases, these are less related to errors of memory or in assigning and updating probabilities and more to do with how information is processed.

## 5.1. Anchoring and Adjustment Bias

**Anchoring and adjustment bias** is an information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities. When required to estimate a value with unknown magnitude, people generally begin by envisioning some initial default number—an “anchor”—which they then adjust up or down to reflect subsequent information and analysis. Regardless of how the initial anchor was chosen, people tend to adjust their anchors insufficiently and produce end approximations that are, consequently, biased. This bias is closely related to the conservatism bias. In the conservatism bias, people overweight past information compared to new information. In anchoring and adjustment, people place undue weight on the anchor. People anchor and adjust because they are generally better at estimating relative comparisons than absolute figures.

For example, FMPs exhibiting this bias are often influenced by purchase “points,” or arbitrary price levels or price indexes, and tend to cling to these numbers when facing questions like, “Should I buy or sell this security?” or “Is the market overvalued or undervalued right now?” This approach is especially prevalent when the introduction of new information regarding the security further complicates the situation. Rational investors treat these new pieces of information objectively, and they do not reflect upon purchase prices or target prices in deciding how to act. Investors with an anchoring and adjustment bias, however, perceive new information through a warped lens. They place undue emphasis on statistically arbitrary, psychologically determined anchor points. Decision making therefore deviates from neo-classically prescribed “rational” norms.

### *Consequences of Anchoring and Adjustment Bias*

As a result of anchoring and adjustment bias, FMPs may stick too closely to their original estimates when new information is learned. For example, if the FMP originally estimates next year's earnings for a company as \$2.00 per share and the company experiences difficulties during the year, FMPs may not adequately adjust the \$2.00 estimate given the difficulties. They remain "anchored" to the \$2.00 estimate. This mindset is not limited to downside adjustments; the same phenomenon occurs when companies have upside surprises. In another example, FMPs may become anchored to the "economic states" of countries or companies. In the 1980s, Japan was viewed as a model economy, and many FMPs believed it would remain dominant for decades. It took many FMPs a significant period to revise their beliefs about Japan when its growth slowed. FMPs can similarly anchor on beliefs about companies.

### ***Detection of and Guidelines for Overcoming Anchoring and Adjustment Bias***

The primary action FMPs can take is to consciously ask questions that may reveal an anchoring and adjustment bias. Examples of such questions include, "Am I holding onto this stock based on rational analysis, or am I trying to attain a price that I am anchored to, such as the purchase price or a high water mark?" and "Am I making this market or security forecast based on rational analysis, or am I anchored to last year's market levels or ending securities prices?"

It is important to remember that past prices, market levels, and reputation provide little information about an investment's future potential and thus should not influence buy-and-sell decisions to any great extent. This advice is particularly relevant when analyzing the recommendations of securities' analysts. FMPs should look at the basis for any recommendations to see whether they are anchored to previous estimates or based on an objective, rational view of changes in company fundamentals.

## **5.2. Mental Accounting Bias**

**Mental accounting bias** is an information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to. **Thaler (1980)** describes mental accounting as a process in which people code, categorize, and evaluate economic outcomes by grouping their assets into any number of non-fungible (non-interchangeable) mental accounts. This method contradicts rational economic thought because money is inherently fungible. Mental accounts are based on such arbitrary classifications as the source of the money (e.g., salary, bonus, inheritance, gambling) or the planned use of the money (e.g., leisure, necessities). According to traditional finance theory, FMPs should consider portfolios holistically in a risk/return

context.

## ***Consequences of Mental Accounting Bias***

A potentially serious problem that mental accounting creates is the placement of investments into discrete “buckets” without regard for the correlations among these assets. Statman (1999, 2008) contends that the difficulty individuals have in addressing the interaction of different investments leads investors to construct portfolios in a layered pyramid format and that behavioral portfolio theory is a goal-based theory. Each layer of the portfolio addresses a particular investment goal (such as money for retirement) that is independent of other investment goals (such as college funds). Investors may target such low-risk investments as cash and money market funds to preserve wealth, bonds and dividend-paying stocks to provide income, and such risky investments as emerging market stocks and initial public offerings (IPOs) in an attempt to get rich.

As a result of mental accounting bias, FMPs may do the following:

- Neglect opportunities to reduce risk by combining assets with low correlations. Inefficient investing may result from offsetting positions in the various layers and can lead to suboptimal aggregate portfolio performance.
- Irrationally distinguish between returns derived from income and those derived from capital appreciation. Although many people feel the need to preserve capital appreciation (principal), they focus on the idea of spending income that the principal generates. As a result, many FMPs chase income streams, unwittingly eroding principal in the process. Consider a high-yield or “junk” bond that pays a high dividend but can suffer significant loss of principal if the company issuing the bond experiences financial difficulties. Mental accounting can make such instruments appear tremendously appealing, but it is also possible that the original investment could shrink, ultimately reducing or even eliminating income payments.

## ***Detection of and Guidelines for Overcoming Mental Accounting Bias***

An effective way to detect and overcome mental accounting behavior that causes investors to place money in discrete investment “buckets” is to recognize the drawbacks of engaging in this behavior. The primary drawback is that correlations between investments are not considered when creating an overall portfolio. FMPs should go through the exercise of combining all of their assets onto one spreadsheet or other summary document to see the true asset allocation of various mental account holdings. This exercise often produces information that is surprising when seen as whole, such as higher cash balances than expected. Going through this process will show the suboptimal nature of the portfolio constructed using

mental accounting. The logical next step would be to create a portfolio strategy taking all assets into consideration.

With regard to the income versus total return issue, an effective way to manage the tendency of some FMPs to treat investment income and capital appreciation differently is to focus on total return. FMPs should learn the benefits of integrating the two sources of return, allocating sufficient assets to lower income investments to allow principal to continue to grow even after inflation.

## 5.3. Framing Bias

**Framing bias** is an information-processing bias in which a person answers a question differently based on the way in which it is asked (framed). How information is processed is dependent upon how the question is framed. In actual choice contexts, a decision maker has flexibility in how to think about a problem. A decision frame is the decision maker's subjective conception of the acts, outcomes, and contingencies associated with a particular choice. The frame that a decision maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision maker. It is often possible to frame a given decision problem in more than one way.

A framing effect results in a change of preferences between options as a function of the variation of frames, perhaps through variation of the formulation of the decision context. For example, a decision may be presented within a *gain* context (25 percent of the people with disease X given medicine Z will survive) or within a *loss* context (75 percent of the people with disease X will die even if given medicine Z). In the first presentation, people with disease X tend to adopt a positive outlook based on a gain frame of reference and are generally less likely to engage in risky behavior; they are risk-averse because they view themselves as having a potential to gain (survive in this case). In the second presentation, people with disease X tend to adopt a negative outlook based on a loss frame of reference; they may seek risk because they view themselves as having nothing to lose (likely to die in this case).

Narrow framing occurs when people evaluate the information to make a decision based on a *narrow frame* of reference. People lose sight of the big picture and focus on one or two specific points. For example, a consumer considering an automobile purchase might focus on style or design but overlook safety features, fuel economy, and reliability. FMPs may exhibit similar behaviors when choosing securities.

### EXAMPLE 3



# Effect of Framing

Decision-making frames are quite prevalent in the context of investor behavior. Risk tolerance questionnaires can demonstrate how framing bias may occur in practice and how FMPs should be aware of its effects.

Suppose an investor is to take a risk tolerance questionnaire for the purpose of determining which “risk category” he or she is in. The risk category will determine asset allocations and the appropriate types of investments. The following information is provided to each questionnaire taker:

Over a 10-year period, Portfolio ABC has averaged an annual return of 10 percent with an annual standard deviation of 16 percent. Assuming a normal return distribution, in a given year there is a 67 percent probability that the return will fall within one standard deviation of the mean, a 95 percent probability that the return will fall within two standard deviations of the mean, and a 99.7 percent probability that the return will fall within three standard deviations of the mean. Thus, there is a 67 percent chance that the return earned by Portfolio ABC will be between –6 percent and 26 percent, a 95 percent chance that the return will be between –22 percent and 42 percent, and a 99.7 percent chance that the return will be between –38 percent and 58 percent.

The following two questions focus on hypothetical Portfolio ABC, DEF, and XYZ. The risk and return for each portfolio is the same in each of the two questions, but the presentation of information differs. Will an investor choose the same portfolio or different portfolios when asked Question 1 compared to Question 2? Explain your answer.

1. Based on the chart below, which investment portfolio fits your risk tolerance and desire for long-term return?
  - A. Portfolio XYZ.
  - B. Portfolio DEF.
  - C. Portfolio ABC.

Portfolio	95% Probability Return Range	10-Year Average Return
XYZ	0.5% to 6.5%	3.5%
DEF	–18.0% to 30.0%	6.0%
ABC	–22.0% to 42.0%	10.0%



2. Based on the chart below, which investment portfolio fits your risk tolerance and desire for long-term return?
- A. Portfolio XYZ.
  - B. Portfolio DEF.
  - C. Portfolio ABC.

Portfolio	10-Year Average Return	Standard Deviation of Returns
XYZ	3.5%	1.5%
DEF	6.0%	12.0%
ABC	10.0%	16.0%

### Solution:

An investor may choose different portfolios when asked Question 1 compared to Question 2. Portfolio XYZ may appear more attractive in the first question, where two standard deviations are used to define the range of returns and show the risk, than in the second, where only the standard deviations are shown. Also in the second question, the returns are presented first and the measure of risk second. Thus, how questions are framed and the order in which questions are presented can have a significant impact on how they are answered. FMPs should be acutely aware of how framing can affect investment choices.

## Consequences of Framing Bias

FMPs' willingness to accept risk can be influenced by how situations are presented or framed. Similar to what we saw in the standard deviation example previously presented, a common framing problem occurs when investment questions are posed positively or negatively. For example, suppose Mrs. Ang has a choice of Portfolio A or Portfolio B, which are identical in terms of expected risk and return. Mrs. Ang is told that Portfolio A offers a 70 percent chance of attaining her financial goals, and Portfolio B offers a 30 percent chance of falling short of her financial goals. Mrs. Ang is likely to choose Portfolio A because of the positive way the question was framed.

As a result of framing bias, FMPs may do the following:

- Misidentify risk tolerances because of how questions about risk tolerance were framed; may become more risk-averse when presented with a gain frame of reference and more risk-seeking when presented with a loss frame of reference. This may result in suboptimal portfolios.
- Choose suboptimal investments, even with properly identified risk tolerances, based on how information about the specific investments is framed.
- Focus on short-term price fluctuations, which may result in excessive trading.

## ***Detection of and Guidelines for Overcoming Framing Bias***

Framing bias is detected by asking such questions as, “Is the decision the result of focusing on a net gain or net loss position?” As discussed above, an investor who has framed the decision as a potential net loss is more likely to select a riskier investment; however, if the decision is framed as a potential net gain, the investor is more likely to go with a less risky investment. When making decisions, FMPs should try to eliminate any reference to gains and losses already incurred; instead, they should focus on the future prospects of an investment.

Regarding susceptibility to the positive and negative presentation of information, investors should try to be as neutral and open-minded as possible when interpreting investment-related situations. This approach can eliminate biased responses, help FMPs create better portfolios, and give FMPs a better chance of meeting long-term financial objectives.

## **5.4. Availability Bias**

**Availability bias** is an information-processing bias in which people take a heuristic (sometimes called a rule of thumb or a mental shortcut) approach to estimating the probability of an outcome based on how easily the outcome comes to mind. Easily recalled outcomes are often perceived as being more likely than those that are harder to recall or understand. People often unconsciously assume that readily available thoughts, ideas, or images represent unbiased estimates of statistical probabilities. People decide the probability of an event by how easily they can recall a memory of the event. The basic problem is that there are biases in our memories. For instance, recent events are much more easily remembered and available.

There are various sources of availability bias. We will examine the four most applicable to FMPs: retrievability, categorization, narrow range of experience, and resonance. Each of these categories will be described, and then we will review examples of each as applied to

FMPs.

## **Retrievability**

If an answer or idea comes to mind more quickly than another answer or idea, the first answer or idea will likely be chosen as correct even if it is not the reality

## **Categorization**

When solving problems, people gather information from what they perceive as relevant search sets. Different problems require different search sets, which are often based on familiar categorizations. If it is difficult to come up with a search set, the estimated probability of an event may be biased.

## **Narrow Range of Experience**

This bias occurs when a person with a narrow range of experience uses too narrow a frame of reference based upon that experience when making an estimate. A CFA charterholder working for a hedge fund is likely to overestimate the proportion of CFA charterholders who work for hedge funds and to underestimate the proportion of CFA charterholders who work in other areas, such as private wealth management, because that is not within their frame of reference.

## **Resonance**

People are often biased by how closely a situation parallels their own personal situation.

Clearly, overlap exists between the sources of availability bias. For instance, a person's range of experience will affect his search sets, what information is retrieved, and what resonates with him. The critical aspect is not to be able to identify the specific source of bias, but rather to know the sources of bias in order to detect and overcome the availability bias. The questions to ask can be much more specific and helpful when based on the sources of availability bias rather than on the more general definition of availability bias.

## ***Consequences of Availability Bias***

FMPs' investment choices may be influenced by how easily information is recalled. As a result of availability bias, FMPs may do the following:

- Choose an investment, investment adviser, or mutual fund based on advertising rather than on a thorough analysis of the options. For instance, when asked to name potential

mutual fund companies to invest with, many people will name only the funds that do extensive advertising. In reality, many mutual fund companies do little or no advertising. The choice of mutual fund should be based on a variety of factors that make it a good fit given the investor's objectives and risk/return profile. Choices based on advertising are consistent with retrievability as a source of availability bias.

- Limit their investment opportunity set. This may be because they use familiar classification schemes. They may restrict investments to stocks and bonds of one country or may fail to consider alternative investments when appropriate.
- Fail to diversify. This may be because they make their choices based on a narrow range of experience. For example, an investor who works for a fast-growing company in a particular industry may overweight investments in that industry.
- Fail to achieve an appropriate asset allocation. This consequence may occur because they invest in companies that match their own personal likes and dislikes without properly taking into account risk and return.

## ***Detection of and Guidelines for Overcoming Availability Bias***

To overcome availability bias, investors need to develop an appropriate investment policy strategy, carefully research and analyze investment decisions before making them, and focus on long-term results. A disciplined approach will prevent the investor from overemphasizing the most recent financial events based on easy recall. It will also help establish suitable asset allocations based on return objectives, risk tolerances, and constraints. It should also help assure that the portfolio of investments is adequately diversified and not affected by the availability bias from any source. FMPs need to recognize that it is a human tendency to overemphasize the most recent financial events because of easy recall.

When selecting stocks, it is crucial to consider your availability bias. Such questions as, *“Did you hear about the stocks on Bloomberg, read about them in the Wall Street Journal, see them on CNBC, or receive a sell-side research report?”* and *“Am I buying or selling a group of investments because of some recent market event or trend without doing adequate analysis?”* focus on retrievability.

Such additional questions as, *“How did you decide which investments to consider? Did you choose investments based on your familiarity with the industry or country?”* and *“Did you choose your investments because you like the companies' products?”* help identify issues of categorization, narrow range of experience, and resonance as sources of availability bias.

It is also important to realize that humans generally disregard or forget about events that happened more than a few years ago. For example, if you were in a car accident last week, it would be natural for you to drive more cautiously than you normally would for a period of

time. However, as time passed, you would likely resume your normal driving behavior. Availability bias causes investors to *overreact* to market conditions, whether positive or negative. It is natural for people to be influenced by current events.

Another problem is that much of the information we receive is inaccurate, outdated, or confusing. The information may be based on opinions that are not based on sound analysis. Availability bias causes people to think that events that receive heavy media attention are more important than they may actually be. Many FMPs ignore the fact that they lack the training, experience, and objectivity to interpret the massive amount of investment information available.

## 5.5. Cognitive Errors: Conclusion

Cognitive errors are statistical, information-processing, or memory errors that result in faulty reasoning and analysis. The individual may be attempting to follow a rational decision-making process but fail to do so because of cognitive errors. For example, the person may fail to update probabilities correctly, properly weigh and consider information, or gather information. If these errors are drawn to the attention of an individual attempting to follow a rational decision-making process, he or she is likely to be receptive to correcting the errors.

Individuals are less likely to make cognitive errors if they remain vigilant to the possibility of their occurrence. A systematic process to describe problems and objectives; to gather, record, and synthesize information; to document decisions and the reasoning behind them; and to compare the actual outcomes with expected results will help reduce cognitive errors.

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## 6. EMOTIONAL BIASES: LOSS AVERSION

- b.** discuss commonly recognized behavioral biases and their implications for financial decision making;

We will now review six emotional biases, their implications for investment decision making, and suggestions for managing the effects of these biases. Although emotion has no single universally accepted definition, an emotion may be thought of as a mental state that arises spontaneously rather than through conscious effort. Emotions may be undesired to the individuals feeling them; although they may wish to control the emotion and their response to it, they often cannot. Emotional biases are harder to correct for than cognitive errors because they originate from impulse or intuition rather than conscious calculations. In the case of

emotional biases, it may only be possible to recognize the bias and adapt to it rather than correct for it.

Emotional biases can cause investors to make suboptimal decisions. Because emotions are rarely identified and recorded in the decision-making process—they have to do with how people feel rather than what and how they think—fewer emotional biases have been identified. The six emotional biases discussed are loss aversion, overconfidence, self-control, status quo, endowment, and regret aversion. In the discussion of each of these biases, some related biases may also be discussed.

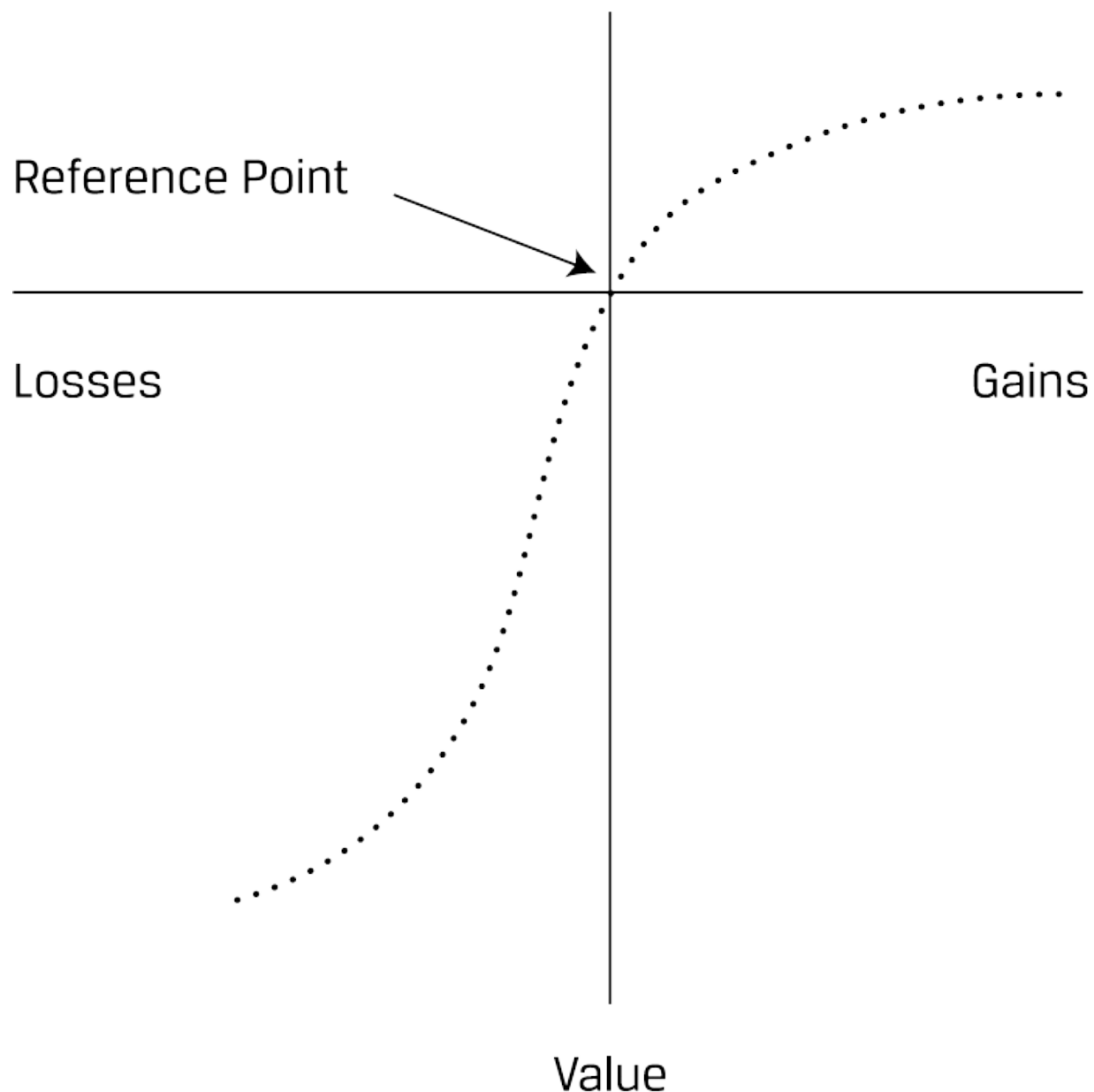
## 6.1. Loss-Aversion Bias

**Loss-aversion bias** was identified by Kahneman and Tversky (1979) while they were working on developing prospect theory. In prospect theory, loss-aversion bias is a bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains. A number of studies on loss aversion suggest that, psychologically, losses are significantly more powerful than gains. When comparing absolute values, the utility derived from a gain is much lower than the utility given up with an equivalent loss.

Rational FMPs should accept more risk to increase gains, not to mitigate losses. However, paradoxically, FMPs tend to accept more risk to avoid losses than to achieve gains. Loss aversion leads people to hold their losers even if an investment has little or no chance of going back up. Similarly, loss-aversion bias leads to risk avoidance when people evaluate a potential gain. Given the possibility of giving back gains already realized, FMPs lock in profits, thus limiting their upside profits.

Kahneman and Tversky describe loss-averse investor behavior as the evaluation of gains and losses based on a reference point. A value function that passes through this reference point is seen in [Exhibit 3](#). It is s-shaped and asymmetric, implying a greater impact of losses than of gains for the same variation in absolute value. This utility function implies risk-seeking behavior in the domain of losses (below the horizontal axis) and risk avoidance in the domain of gains (above the horizontal axis). An important concept embedded in this utility representation is what has been termed the *disposition effect*: the holding (not selling) of investments that have experienced losses (losers) too long, and the selling (not holding) of investments that have experienced gains (winners) too quickly. The resulting portfolio may be riskier than the optimal portfolio based on the risk/return objectives of the investor.

### Exhibit 3. Value Function of Loss Aversion



#### EXAMPLE 4

### Effect of Loss-Aversion Bias

Loss-aversion bias, executed in practice as the *disposition effect*, is observed often by wealth management practitioners. The classic case of this bias is when an investor opens the monthly account statement and scans the individual investments for winners and losers. Seeing that some investments have lost money and others have gained, discuss how the investor is likely to respond given a loss-aversion bias.

#### Sample Solution:

The investor is likely to respond by continuing to hold the losing investments. The idea of actually losing money is so painful that the first reaction is to hold the investment until it breaks even. The investor is acting based on emotions, not cognitive reasoning. In this case, if the investor did some research, he or she might learn that the company in question is experiencing difficulty and that holding the investment actually adds to the risk in the portfolio (hence the term risk-seeking in the domain of losses).

Conversely, the winners are making money. Loss-averse FMPs have a tendency to sell these investments and realize their gains to avoid any further risk. In this case, if the investor did some research, he or she might learn that the company in question actually improves the risk/return profile of the portfolio. By selling the investment, not only is the potential for future losses eliminated, but the potential for future gains is also eliminated. Combining the added risk of holding the losers with the elimination of potential gains from selling the winners may make investors' portfolios less efficient than portfolios based on fundamental analysis.

## ***Consequences of Loss Aversion***

As a result of loss-aversion bias, FMPs may do the following:

- Hold investments in a loss position longer than justified by fundamental analysis. FMPs hold losing investments in the hope that they will return to break even.
- Sell investments in a gain position earlier than justified by fundamental analysis. FMPs sell winning investments because they fear that their profit will erode.
- Limit the upside potential of a portfolio by selling winners and holding losers.
- Trade excessively as a result of selling winners. Excessive trading has been shown to lower investment returns.
- Hold riskier portfolios than is acceptable based on the risk/return objectives of the FMP. This is caused by the sale of investments that are winners and the retention of investments that are losers. FMPs may accept more risk in their portfolios than they would if they had based their decision on risk/return objectives and fundamental analysis.

Further, framing and loss-aversion biases may affect the FMP simultaneously, and is a potentially dangerous combination. When people have suffered losses, they may view risky alternatives as a source of opportunity; when people have gained, they may view choices involving additional risk as a threat. For example, an investor who has a net loss is more



likely than average to choose the riskier investment, while a net gainer is more likely to go with a less risky alternative. A caveat to this basic principle is that once money is made through a profitable trade, some investors may view the profit differently from other money and decide to engage in additional risky behavior with it. This is referred to as the “house money effect,” which is based on the willingness of gamblers to engage in increasingly risky gambles with previous winnings. The gamblers view themselves as risking someone else’s money; in the case of the gambler, it is the casino or house’s money they view as at risk.

### ***Special Application: Myopic Loss Aversion***

*Myopic loss aversion* serves as a possible explanation for the *equity premium puzzle*, a phenomenon that describes the anomalously higher historical real returns of stocks over government bonds. Myopic loss aversion combines aspects of time horizon-based framing, mental accounting, and loss-aversion biases. Investors presented with annual return data for stocks and bonds tend to adopt more conservative strategies (lower allocation to equities) than those presented with longer-term return data, such as 30-year compound returns. Investors place stocks and bonds into separate mental accounts rather than thinking of them together in a portfolio context; they seem to be more concerned with the potential for short-term losses than with planning for the relevant time horizon and focusing on long-term results. The argument is that investors evaluate their portfolios on an annual basis and as a result overemphasize short-term gains and losses and weigh losses more heavily than gains. The overemphasis on short-term losses results in a higher than theoretically justified equity risk premium.

The argument is that the price of financial assets reflects the preferences of FMPs who are both loss averse and myopic. To appreciate the effect of myopia on risk attitudes, consider an investor with the utility function shown in [Exhibit 3](#) above who must choose between a risky asset that pays an expected 7 percent per year with a standard deviation of 20 percent (like stocks) and a safe asset that pays a sure 1 percent per year. The attractiveness of the risky asset depends on the time horizon of the investor. An investor who is prepared to wait a long time before evaluating the outcome of the investment as a gain or a loss will find the risky asset more attractive than another investor (equally loss averse, but more myopic), who expects to evaluate the outcome soon. Furthermore, FMPs who differ in the frequency with which they evaluate outcomes will not derive the same utility from owning stocks. The probability of observing a loss is higher when the frequency of evaluation is high. If losses cause more mental anguish than equivalent gains cause pleasure, the experienced utility associated with owning stocks is lower for the more myopic investor. Over time, the myopic investor is expected to gravitate to a lower level of risk.

### ***Detection of and Guidelines for Overcoming Loss Aversion***

A disciplined approach to investment based on fundamental analysis is a good way to alleviate the impact of the loss-aversion bias. It is impossible to make experiencing losses any less painful emotionally but analyzing investments and realistically considering the probabilities of future losses and gains may help guide the FMP to a rational decision.

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## 7. EMOTIONAL BIASES: OVERCONFIDENCE & SELF CONTROL

- b. discuss commonly recognized behavioral biases and their implications for financial decision making;

### 7.1. Overconfidence Bias

**Overconfidence bias** is a bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities. This overconfidence may be the result of overestimating knowledge levels, abilities, and access to information. For example, people generally do a poor job of estimating probabilities; still, they believe they do it well because they believe that they are smarter and more informed than they actually are. This view is sometimes referred to as the *illusion of knowledge bias*. Overconfidence may be intensified when combined with *self-attribution bias*. Self-attribution bias is a bias in which people take credit for successes and assign responsibility for failures. In other words, success is attributed to the individual's skill, while failures are attributed to external factors. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Overconfidence bias has aspects of both cognitive and emotional errors but is classified as emotional because the bias is primarily the result of emotion. It is difficult to correct for because it is difficult for people to revise self-perceptions of their knowledge and abilities. The concept of overconfidence has been derived from a large number of psychological experiments and surveys in which subjects overestimate both their own predictive abilities as well as the precision of the information they have been given.

There are two basic types of overconfidence bias rooted in the illusion of knowledge: *prediction overconfidence* and *certainty overconfidence*. Both types have cognitive and emotional aspects; both types demonstrate faulty reasoning combined with “gut feel” and such emotional elements as hope. Hope frequently underpins the probabilities assumed when investment decisions are made in an overconfident state. When the FMP feels lucky and

bases probabilities on that luck rather than on the actual likelihood of an event, the resulting financial decision is likely to generate results less than those expected by the FMP.

Prediction overconfidence occurs when the confidence intervals that FMPs assign to their investment predictions are too narrow. For example, when estimating the future value of a stock, overconfident FMPs will incorporate far too little variation—using a narrower range of expected payoffs and a lower standard deviation of returns—than justified based on historical results and fundamental analysis. As a result of underestimating risks, particularly downside risks, FMPs may hold poorly diversified portfolios.

Certainty overconfidence occurs when the probabilities that FMPs assign to outcomes are too high because they are too certain of their judgments. This certainty is often an emotional response rather than a cognitive evaluation. For example, having decided that a company is a good investment, people may become blind to the prospect of a loss and predict high returns with virtual certainty. When the results are less than expected, the FMPs are surprised and disappointed. In response, they are likely to sell the investment and look for a replacement that they feel is certain to generate high returns. People susceptible to certainty overconfidence often trade too frequently.

Self-attribution bias is the tendency of individuals to ascribe their successes to innate personal traits, such as talent or foresight, while blaming failures on exogenous factors, such as bad luck. It can be broken down into two subsidiary biases: *self-enhancing* and *self-protecting*. Self-enhancing bias describes people's propensity to claim too much credit for their successes. Self-protecting bias describes the denial of personal responsibility for failures. The need for self-esteem affects the attribution of task outcomes; people protect themselves psychologically as they attempt to comprehend their successes and failures.

## ***Consequences of Overconfidence Bias***

As a result of overconfidence bias, FMPs may do the following:

- Underestimate risks and overestimate expected returns.
- Hold poorly diversified portfolios.
- Trade excessively.
- Experience lower returns than those of the market.

Many overconfident FMPs claim above-average aptitude for selecting stocks, with little supporting evidence. [Barber and Odean \(2001\)](#) found that after trading costs and before taxes, the average investor underperformed the market by approximately 2 percent per year.

Barber and Odean also found that the average subject's annual portfolio turnover was 80 percent (slightly less than the 84 percent averaged by mutual funds). The least active quintile of participants, with an average annual turnover of 1 percent, earned 17.5 percent annual returns, outperforming the 16.9 percent garnered by the S&P during this period. The most active 20 percent of FMPs averaged a *monthly* turnover of over 9 percent, but they realized pre-tax returns of only 10 percent annually. The authors of the study do, indeed, seem justified in labeling frequent trading as hazardous.

Many overconfident FMPs also believe they can pick mutual funds that will deliver superior future performance. The market-trailing performance of the average mutual fund is proof that most mutual fund clients also fail in this endeavor. Worse yet, FMPs tend to trade in and out of mutual funds at the worst possible times, chasing returns with poor results, as we learned in the previously referenced DALBAR study.

### ***Detection of and Guidelines for Overcoming Overconfidence Bias***

FMPs should review their trading records, identify the winners and losers, and calculate portfolio performance over at least two years. Investors with an unfounded belief in their own ability to identify good investments may recall winners and their results but underestimate the number and results of their losers. A conscious review process will force them to acknowledge their losers, because a review of trading activity will demonstrate not only the winners but also the losers. This review will also identify the amount of trading. When FMPs engage in too much trading, they should be advised to keep track of every investment trade and then calculate returns. This exercise will demonstrate the detrimental effects of excessive trading. Because overconfidence is also a cognitive error, more complete information can often help FMPs understand the error of their ways.

It is critical that investors be objective when making and evaluating investment decisions. There is an old Wall Street adage, "Don't confuse brains with a bull market," that warns about self-attribution. It is advisable to view the reasoning behind and the results of investments, winning and losing, as objectively as possible. Unfortunately, most people have difficulty being objective about their own behavior. This can lead to self-attribution and overconfidence biases and result in repeating the same mistakes: overtrading and chasing returns to the detriment of actual realized returns.

To stay objective, it is a good idea to perform post-investment analysis on both successful and unsuccessful investments. When did you make money? When did you lose money? Mentally separate your good money-making decisions from your bad ones. Then, review the beneficial decisions and try to discern what, exactly, you did correctly. Did you purchase an investment at a particularly advantageous time based on fundamentals, or did you luck out by timing a market upswing? Similarly, review the decisions that you categorized as poor. Did you make an investment aptly based on fundamentals and then make an error when it came

time to sell, or was the market going through a correction? When reviewing unprofitable decisions, look for patterns or common mistakes that perhaps you were unaware you were making. Note any such tendencies that you discover, and try to remain mindful of them by brainstorming a rule or reminder such as: “I will do X in the future” or “I will not do Y in the future.” Being conscious of these rules will help overcome any bad habits you may have acquired, and it can also reinforce your reliance on strategies that have served you well.

## 7.2. Self-Control Bias

**Self-control bias** is a bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline. There is an inherent conflict between short-term satisfaction and achievement of some long-term goals. Money is an area in which people are notorious for displaying a lack of self-control, but it is not the only one. Attitudes toward weight loss, smoking, and studying provide other examples. A person who is 100 pounds overweight is told by a doctor that weight loss is essential to long-term good health. Despite this knowledge, the individual may fail to cut back on food consumption. The short-term satisfaction of eating conflicts with the long-term goal of good health. Similarly, smokers may continue to smoke even though they are aware of the long-term health risks involved. People pursuing the CFA charter may fail to study sufficiently because of short-term competing demands on their time. Rational behavior would suggest that people would do whatever was necessary to achieve their long-term goals—whether to stay healthy or become a CFA charterholder—but it often does not happen.

When it comes to money, people may know they need to save for retirement, but they often have difficulty sacrificing present consumption because of a lack of self-control. The apparent lack of self-control may also be a function of hyperbolic discounting. Hyperbolic discounting is the human tendency to prefer small payoffs now compared to larger payoffs in the future. Sacrifices in the present require much greater payoffs in the future; otherwise, people will not be willing to make current sacrifices. People seem to have temporal short-sightedness or temporal myopia, focusing on the present and discounting the future. They spend today rather than save for tomorrow. This behavior can lead to high short-term utility and disastrous long-term utility.

### ***Consequences of Self-Control Bias***

As a result of self-control bias, FMPs may do the following:

- Save insufficiently for the future.

Upon realizing that their savings are insufficient, FMPs may do the following:

- Accept too much risk in their portfolios in an attempt to generate higher returns. In this attempt to make up for less than adequate savings, the capital base is put at risk.
- Cause asset allocation imbalance problems. For example, some FMPs prefer income-producing assets in order to have income to spend. This behavior can be hazardous to long-term wealth because income-producing assets may offer less total return potential, particularly when the income is not reinvested, which may inhibit a portfolio's ability to maintain spending power after inflation. Other FMPs may favor equities over bonds simply because they like to take risks. Asset allocations should be based upon a variety of factors, including level of risk tolerance, but they should not be entirely driven by risk tolerance.

### ***Detection of and Guidelines for Overcoming Self-Control Bias***

People have a strong desire to consume today, which can be counterproductive to attaining long-term financial goals. FMPs should ensure that a proper investment plan is in place and should have a personal budget. Investing without planning is like building without a blueprint. Planning is the key to attaining long-term financial goals; plans need to be in writing, so that they can be reviewed regularly. Failing to plan is planning to fail. FMPs need to maintain a proper balance in asset allocations to attain their long-term financial goals. Adhering to a saving plan and an appropriate asset allocation strategy are critical to long-term financial success.

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## **8. EMOTIONAL BIASES: STATUS QUO, ENDOWMENT, AND REGRET-AVERSION**

- b. discuss commonly recognized behavioral biases and their implications for financial decision making;

### **8.1. Status Quo Bias**

**Status quo bias** is an emotional bias in which people choose to do nothing (i.e., maintain the “status quo”) instead of making a change. People are generally more comfortable keeping things the same than with change and thus do not necessarily look for opportunities where change is beneficial. Given no apparent problem requiring a decision, the status quo is



maintained. Further, if given a situation where one choice is the default choice, people will frequently let that choice stand rather than opting out of it and making another choice. Thus, the process in presenting choices can influence decisions. For example, companies that enroll employees in defined contribution pension plans but give the employees the ability to opt out of the plan have a much higher participation rate than companies where employees have to opt in to the plan.

Status quo bias is often discussed in tandem with endowment and regret-aversion biases (described later) because the outcome of the biases, maintaining existing positions, may be similar. However, the reasons for maintaining the existing positions differ among the biases. In the status quo bias, the positions are maintained largely because of inertia rather than conscious choice. In the endowment and regret-aversion biases, the positions are maintained because of conscious, but possibly incorrect, choices. When endowment bias exists, ownership imbues an investment with intangible value beyond the true value to the holder. Endowment bias creates a preference for no change or the status quo. With regard to regret aversion, an FMP presented with two investment choices may opt for the status quo rather than potentially experience the regret of selling shares that then went up in price. When status quo, endowment, and regret-aversion biases are combined, people will tend to strongly prefer that things stay as they are, even at some personal cost.

## ***Consequences of Status Quo Bias***

As a result of status quo bias, FMPs may do the following:

- Unknowingly maintain portfolios with risk characteristics that are inappropriate for their circumstances.
- Fail to explore other opportunities.

## ***Detection of and Guidelines for Overcoming Status Quo Bias***

Status quo bias may be exceptionally strong and difficult to overcome. Education is essential. FMPs should quantify the risk-reducing and return-enhancing advantages of diversification and proper asset allocation. For example, with a concentrated stock position, showing what can happen to overall wealth levels if the stock collapses may persuade an FMP to diversify.

## **8.2. Endowment Bias**

**Endowment bias** is an emotional bias in which people value an asset more when they hold

rights to it than when they do not. Endowment bias is inconsistent with standard economic theory, which asserts that the price a person is *willing to pay* for a good should equal the price at which that person would be *willing to sell* the same good. However, psychologists have found that when asked, people tend to state minimum selling prices for a good that exceed maximum purchase prices that they are willing to pay for the same good. Effectively, ownership “endows” the asset with added value. Endowment bias can affect attitudes toward items owned for long periods of time or can occur immediately when an item is acquired. Endowment bias may apply to inherited or purchased securities.

FMPs may irrationally hold on to securities they already own, which is particularly true regarding their inherited investments. For example, a child or grandchild may hold an outsized inherited stock position because of an emotional attachment, despite the risk of a sizable loss if the stock stumbles. These investors are often resistant to selling even in the face of poor prospects. Again using the example of an inheritance, an FMP may hold an inherited municipal bond portfolio because of an emotional attachment, when a more aggressive asset mix may be more appropriate.

Many wealth management practitioners have encountered clients who are reluctant to sell securities bequeathed by previous generations. Often in these situations, investors cite feelings of disloyalty associated with the prospect of selling inherited securities, general uncertainty in determining the right choice, and concerns with tax issues. Although the latter may be a rational concern, the tax implications are most likely not being considered rationally. Sometimes the appropriate action may be to pay taxes and alter the investment portfolio.

## ***Consequences of Endowment Bias***

As is the case with status quo bias, endowment bias may lead FMPs to do the following:

- Fail to sell off certain assets and replace them with other assets.
- Maintain an inappropriate asset allocation. The portfolio may be inappropriate for investors’ levels of risk tolerance and financial goals.
- Continue to hold classes of assets with which they are familiar. FMPs may believe they understand the characteristics of the investments they already own and may be reluctant to purchase assets with which they have less experience. Familiarity adds to owners’ perceived value of a security.

## ***Detection of and Guidelines for Overcoming Endowment Bias***



Inherited securities are often the cause of endowment bias. In the case of inherited investments, an FMP should ask such a question as, “If an equivalent sum to the value of the investments inherited had been received in cash, how would you invest the cash?” Often, the answer is into a very different investment portfolio than the one inherited. It may also be useful to explore the deceased’s intent in owning the investment and bequeathing it. “Was the primary intent to leave the specific investment portfolio because it was perceived to be a suitable investment based on fundamental analysis, or was it to leave financial resources to benefit the heirs?” Heirs who affirm the latter conclusion are receptive to considering alternative asset allocations.

When financial goals are in jeopardy, emotional attachment must be moderated; it cannot be accepted and adapted to. Several good resources are available on “emotional intelligence.” FMPs should familiarize themselves with the topic so they can help themselves or their clients work through emotional attachment issues.

An effective way to address a desire for familiarity, when that desire contradicts good financial sense, is to review the historical performance and risk of the unfamiliar securities in question and contemplate the reasoning underlying the recommendation. Rather than replacing all familiar holdings with new, intimidating ones, start with a small purchase of the unfamiliar investments until a comfort level with them is achieved.

## 8.3. Regret-Aversion Bias

**Regret-aversion bias** is an emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly. Simply put, people try to avoid the pain of regret associated with bad decisions. This tendency is especially prevalent in investment decision making. Regret aversion can cause FMPs to hold onto positions too long. They are reluctant to sell because they fear that the position will increase in value and then they will regret having sold it.

Regret aversion can also keep FMPs out of a market that has recently generated sharp losses or gains. Having experienced losses, our instincts tell us that to continue investing is not prudent. Yet periods of depressed prices may present great buying opportunities. Regret aversion can persuade us to stay out of the stock market just when the time is right for investing. On the upside, fear of getting in at the high point can restrict new investments from taking place.

Regret bias can have two dimensions: actions that people take and actions that people *could have taken*. More formally, regret from an action taken is called an *error of commission*, whereas regret from an action not taken is called an *error of omission*. Regret may be distinguished from disappointment in that regret includes strong feelings of responsibility for the choice that has been made. Regret is more intense when the unfavorable outcomes are the

result of an error of commission versus an error of omission. Thus, no action becomes the preferred decision.

Regret aversion can initiate herding behavior by leading FMPs to avoid the pain of regret resulting from a poor investment decision, whether the loss comes from an investment that goes down or a “loss” resulting from a stock that went up that they did not own. It is not just the financial loss they regret; it is also the feeling of responsibility for the decision that gave rise to the loss. In order to avoid the burden of responsibility, regret aversion can encourage FMPs to invest in a similar fashion and in the same stocks as others. This herding behavior alleviates some of the burden of responsibility. As John Maynard [Keynes \(1936\)](#) writes “Worldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally.”

## ***Consequences of Regret-Aversion Bias***

As a result of regret-aversion bias, FMPs may do the following:

- Be too conservative in their investment choices as a result of poor outcomes on risky investments in the past. FMPs may wish to avoid the regret of making another bad investment and decide that low-risk instruments are better. This behavior can lead to long-term underperformance and potential failure to reach investment goals.
- Engage in herding behavior. FMPs may feel safer in popular investments in order to limit potential future regret. It seems safe to be with the crowd, and a reduction in potential emotional pain is perceived. Regret aversion may lead to preference for stocks of well-known companies even in the face of equal risk and return expectations. Choosing the stocks of less familiar companies is perceived as riskier and involves more personal responsibility and greater potential for regret.

## ***Detection of and Guidelines for Overcoming Regret-Aversion Bias***

In overcoming regret-aversion bias, education is essential. FMPs should quantify the risk-reducing and return-enhancing advantages of diversification and proper asset allocation. Regret aversion can cause some FMPs to invest too conservatively or too riskily depending on the current trends. With proper diversification, FMPs will accept the appropriate level of risk in their portfolios depending, of course, on return objectives. To prevent investments from being too conservative, FMPs must recognize that losses happen to everyone and keep in mind the long-term benefits of including risky assets in portfolios. Recognizing that bubbles happen and keeping in mind long-term objectives will prevent a client from making investments that are too risky. Efficient frontier research can be quite helpful as an educational tool. Investing too conservatively or too riskily can potentially inhibit the ability

to reach long-term financial goals.

## 8.4. Emotional Biases: Conclusion

Emotional biases stem from impulse, intuition, and feelings and may result in personal and unreasoned decisions. When possible, focusing on cognitive aspects of the biases may be more effective than trying to alter an emotional response. Also, educating about the investment decision-making process and portfolio theory can be helpful in moving the decision making from an emotional basis to a cognitive basis. When biases are emotional in nature, drawing these to the attention of an individual making the decision is unlikely to lead to positive outcomes; the individual is likely to become defensive rather than receptive to considering alternatives. Thinking of the appropriate questions to ask to potentially alter the decision-making process is likely to be most effective.

Such questions as, “If an equivalent sum to the value of the investments inherited had been received in cash, how would you invest the cash?” or “Was the primary intent to leave the specific investment portfolio because it was perceived to be a suitable investment based on fundamental analysis, or was it to leave financial resources to benefit the heirs?” are unlikely to elicit defensiveness. These types of questions are likely to open the way to a more rational investment approach.

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## SUMMARY

Behavioral biases potentially affect the behaviors and decisions of financial market participants. By understanding behavioral biases, financial market participants may be able to moderate or adapt to the biases and as a result improve upon economic outcomes. These biases may be categorized as either cognitive errors or emotional biases. The type of bias influences whether the impact of the bias is moderated or adapted to.

Among the points made in this reading are the following:

- Individuals do not necessarily act rationally and consider all available information in the decision-making process because they may be influenced by behavioral biases.
- Biases may lead to sub-optimal decisions.
- Behavioral biases may be categorized as either cognitive errors or emotional biases. A

single bias may, however, have aspects of both with one type of bias dominating.

- Cognitive errors stem from basic statistical, information-processing, or memory errors; cognitive errors typically result from faulty reasoning.
- Emotional biases stem from impulse or intuition; emotional biases tend to result from reasoning influenced by feelings.
- Cognitive errors are more easily corrected for because they stem from faulty reasoning rather than an emotional predisposition.
- Emotional biases are harder to correct for because they are based on feelings, which can be difficult to change.
- To adapt to a bias is to recognize and accept the bias and to adjust for the bias rather than to attempt to moderate the bias.
- To moderate a bias is to recognize the bias and to attempt to reduce or even eliminate the bias within the individual.
- Cognitive errors can be further classified into two categories: belief perseverance biases and information-processing biases.
- Belief perseverance errors reflect an inclination to maintain beliefs. The belief is maintained by committing statistical, information-processing, or memory errors. Belief perseverance biases are closely related to the psychological concept of cognitive dissonance.
- Belief perseverance biases include conservatism, confirmation, representativeness, illusion of control, and hindsight.
- Information-processing biases result in information being processed and used illogically or irrationally.
- Information-processing biases include anchoring and adjustment, mental accounting, framing, and availability.
- Emotional biases include loss aversion, overconfidence, self-control, status quo, endowment, and regret aversion.
- Understanding and detecting biases is the first step in overcoming the effect of biases on financial decisions. By understanding behavioral biases, financial market participants may be able to moderate or adapt to the biases and as a result improve upon economic outcomes.

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## PRACTICE PROBLEMS

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### The following information relates to Questions 1–4.

Luca Gerber recently became the chief investment officer for the mid-size private foundation in Switzerland. Prior to assuming this position, Gerber was a well-known health care industry analyst. The Ludwigs’ family fortune is based on entrepreneurship. Gerhard Ludwigs founded ABC Innovations (a





















# Reading 2

## Behavioral Finance and Investment Processes

by Michael M. Pompian, CFA, Colin McLean, MBA, FIA, FSIP, and Alistair Byrne, PhD, CFA

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** explain the uses and limitations of classifying investors into personality types;
- b.** discuss how behavioral factors affect adviser–client interactions;
- c.** discuss how behavioral factors influence portfolio construction;
- d.** explain how behavioral finance can be applied to the process of portfolio construction;
- e.** discuss how behavioral factors affect analyst forecasts and recommend remedial actions for analyst biases;
- f.** discuss how behavioral factors affect investment committee decision making and recommend techniques for mitigating their effects;
- g.** describe how behavioral biases of investors can lead to market characteristics that may not be explained by traditional finance.

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## 1. INTRODUCTION AND GENERAL

# DISCUSSION OF INVESTOR TYPES

- a. explain the uses and limitations of classifying investors into personality types;

Much of current economic and financial theory is based on the assumptions that individuals act rationally and consider all available information in the decision-making process.<sup>1</sup> Behavioral finance challenges these assumptions. The relaxing of these assumptions has implications at both the individual and market levels. It is important to note that, at the individual level, all market participants, whether they are less knowledgeable individual investors or experienced money managers, may act irrationally; in other words, all market participants may deviate from the behavior that is assumed in traditional financial theory. Some of these deviations have been identified and categorized as behavioral biases. In addition, individual behavioral biases may be reinforced in a group setting, which further complicates rational investment processes.

This reading focuses on understanding individual investor behavior and how it affects adviser–client relationships and portfolio construction, as well as on the analyst-, committee-, and market-level impact of behavioral biases. Sections 1 and 2 discuss how investors may be classified by type based on the biases and other behaviors they display and explains the uses and limitations of classifying investors into types. Section 3 discusses how behavioral factors affect adviser–client relationships. Section 4 examines the potential effects of behavioral biases on portfolio construction. Sections 5 and 6 discuss how behavioral biases affect the work of analysts, looking specifically at their forecasts, and explore remedial actions for analyst biases. Section 7 examines committee decision making and how behavioral biases may be amplified or mitigated in a group setting, and discusses steps to make committees more effective. Section 8 discusses how behavioral finance influences market behavior by examining market anomalies and observed market behavior. A summary and practice problems conclude the reading.

## 1.1. General Discussion of Investor Types

In recent decades, financial service professionals and researchers have been attempting to classify investors by their psychographic characteristics—in other words, by personality, values, attitudes, and interests—rather than classifying simply based on demographic characteristics. Psychographic classifications are particularly relevant with regard to individual strategy and risk tolerance. An investor’s background, past experiences, and attitudes can play a significant role in decisions made during the asset allocation process. If investors fitting specific psychographic profiles are more likely to exhibit specific investor biases, then practitioners can attempt to recognize the relevant behavioral tendencies before investment decisions are made. It is important to note that because psychology is involved,



no exact diagnosis can be made of any individual or situation. Although there are limitations to this type of analysis, if financial market participants can gain an understanding of their behavioral tendencies, the result is likely to be better investment outcomes.

We will now review two models of investor psychographics from the 1980s. One model was proposed in [Barnewall \(1987\)](#) and the other in [Bailard, Biehl, and Kaiser \(1986\)](#). We will then move to more recent models of investor behavior.

### **1.1.1. *Barnewall Two-Way Model***

One of the oldest and most prevalent psychographic investor models, based on the work of Marilyn MacGruder Barnewall and intended to help investment advisers interface with clients, distinguishes two relatively simple investor types: passive and active. Barnewall notes that “passive investors” are defined as those investors who have become wealthy passively—for example, by inheritance or by risking the capital of others rather than risking their own capital (managers who benefit when their companies do well are examples of the latter category). Passive investors have a greater need for security than they have tolerance for risk. Occupational groups that tend to have passive investors include corporate executives, lawyers with large regional firms, certified public accountants (CPAs) with large CPA companies, medical and dental non-surgeons, small business owners who inherited the business, politicians, bankers, and journalists. Further, the smaller the economic resources an investor has, the more likely the person is to be a passive investor. The lack of resources gives individuals a higher security need and a lower tolerance for risk.

“Active investors” are individuals who have been actively involved in wealth creation through investment, and they have risked their own capital in achieving their wealth objectives. Active investors have a higher tolerance for risk than they have need for security. Related to their high risk tolerance is the fact that active investors prefer to maintain control of their own investments. Their tolerance for risk is high because they believe in themselves. When active investors sense a loss of control, their risk tolerance drops quickly. They are involved in their own investments to the point that they gather tremendous amounts of information about the investments. By their involvement and control, they feel that they reduce risk to an acceptable level, which is often fallacious ([Barnewall 1987](#)).

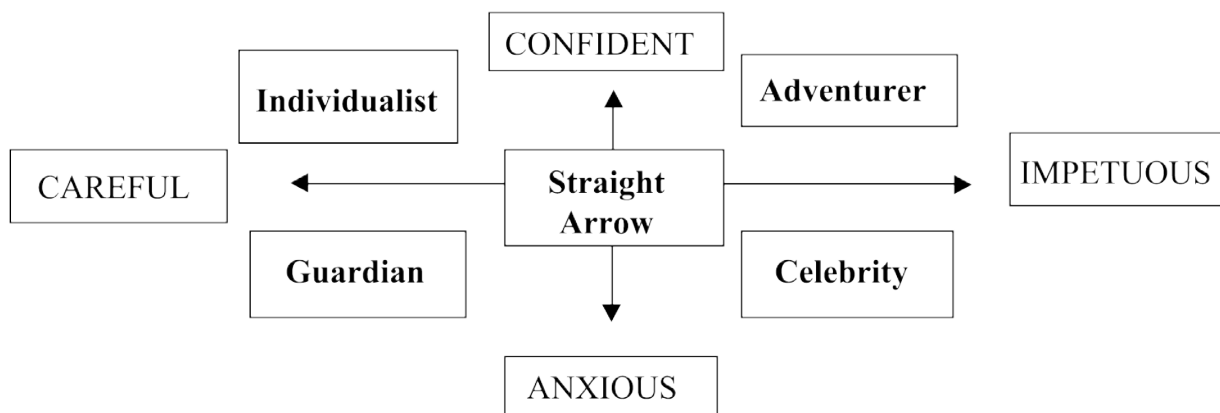
Barnewall’s work suggests that a simple, non-invasive overview of an investor’s personal history and career record could signal potential pitfalls to guard against in establishing an advisory relationship. Her analysis also indicates that a quick, biographic glance at a client could provide important context for portfolio design.

### **1.1.2. *Bailard, Biehl, and Kaiser Five-Way Model***

The Bailard, Biehl, and Kaiser (BB&K) model features some of the principles of the Barnewall model, but by classifying investor personalities along two axes—level of confidence and method of action—it introduces an additional dimension of analysis. [Bailard, Biehl, and Kaiser \(1986\)](#) provide a graphic representation of their model ([Exhibit 1](#)). [Kaiser \(1990\)](#) explains:

The first (aspect of personality) deals with how confidently the investor approaches life, regardless of whether it is his approach to his career, his health, or his money. These are important emotional choices, and they are dictated by how confident the investor is about some things or how much he tends to worry about them. The second element deals with whether the investor is methodical, careful, and analytical in his approach to life or whether he is emotional, intuitive, and impetuous. These two elements can be thought of as two “axes” of individual psychology; one axis is called the “confident–anxious” axis and the other is called the “careful–impetuous” axis.

### Exhibit 1. Bailard, Biehl, and Kaiser Model



[Exhibit 2](#) includes a synopsis of BB&K’s descriptions of each of the five investor personality types that the model generates ([Kaiser 1990](#)).

### Exhibit 2. BB&K Classifications

- The **Adventurer**: Adventurers may hold highly undiversified portfolios because they are confident and willing to take chances. Their confidence leads them to make their own decisions and makes them reluctant to take advice. This presents a challenge for an investment adviser.
- The **Celebrity**: Celebrities like to be the center of attention. They may hold

opinions about some things but to a certain extent recognize their limitations and may be willing to seek and take advice about investing.

- The **Individualist**: Individualists are independent and confident, which may be reflected in their choice of employment. They like to make their own decisions but only after careful analysis. They are pleasant to advise because they will listen and process information rationally.
  - The **Guardian**: Guardians are cautious and concerned about the future. As people age and approach retirement, they may become guardians. They are concerned about protecting their assets and may seek advice from those they perceive as being more knowledgeable than themselves.
  - The **Straight Arrow**: Straight arrows are sensible and secure. They fall near the center of the graph. They are willing to take on some risk in the expectation of earning a commensurate return.
- 

Although this model may be useful, it is possible that investors do not approach all parts of their life with equal confidence or care. It is important to focus on the approach to investing rather than placing undue focus on evidence from other aspects of their life. In addition, a limitation of all categorization schemes is that an individual's behavior patterns may change or lack consistency.

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## 2. NEW DEVELOPMENTS IN PSYCHOGRAPHIC MODELING: BEHAVIORAL INVESTOR TYPES

- a. explain the uses and limitations of classifying investors into personality types;

In recent years, there have been additional developments in the practical application of behavioral finance. [Pompian \(2008\)](#) identifies four behavioral investor types (BITs). The objective of this categorization scheme, similar to BB&K and Barnewall, is to help advisers and investors better understand investor behavior in an effort to make better investment decisions. However, the approach suggested by Pompian differs from some of the earlier approaches. This section will review the basics of developing investment plans that incorporate behavioral finance. It will build on key concepts in Pompian and Longo's article (2005) in the *Journal of Financial Planning*, and Pompian's book, *Behavioral Finance and*

*Wealth Management* (2006).

These early works outline a method of applying behavioral finance to private clients in a way that Pompian refers to as “bottom up.” This term means that for an adviser or investor to diagnose and treat behavioral biases, he or she must first test for all behavioral biases in the client. This testing is done to determine which biases a client has before being able to create an appropriate investment policy statement and a behaviorally modified asset allocation like those presented in the reading, “The Behavioral Biases of Individuals.” [Pompian and Longo \(2005\)](#) explain how to plot bias type and wealth level information on a chart to create a “best practical allocation” or “best behaviorally modified allocation” for the client. However, some advisers may find this bottom-up approach too time-consuming or complex.

[Pompian \(2008\)](#) introduces a behavioral alpha (BA) approach. It is a “top-down” approach to bias identification that may be simpler and more efficient than a bottom-up approach. The BA approach is essentially a shortcut that may more efficiently identify biases for the purpose of determining which type of bias dominates. Using the BA approach, advisers and investors can test for the behavioral biases they are likely to encounter based on the psychological profile of clients and consider how to correct for or adapt to the biases.

## 2.1. The Behavioral Alpha Process: A Top-Down Approach

### ***Step 1: Interview the client and identify active or passive traits and risk tolerance.***

Most advisers begin the planning process with a client interview, which consists mainly of a question-and-answer session intended to gain an understanding of the objectives, constraints, tolerance for accepting risk in the portfolio, and past investing practices of a client. Part of this process should also include the adviser determining whether a client is an *active* or *passive* investor, building on the work of [Barnewall \(1987\)](#). Through this process, the adviser is trying to determine whether the client has in the past (or does now) put his or her capital at risk to build wealth.<sup>2</sup> Understanding the characteristics of active and passive investors is important because they have tendencies toward different biases. Following is an example of a test created by [Pompian \(2008\)](#) to probe the risk tolerance and active/passive nature of a client. Predominantly “a” answers indicate higher risk tolerance and/or active investor traits, whereas “b” answers indicate lower risk tolerance and/or passive investor traits. Note that a traditional risk tolerance questionnaire is an appropriate way to evaluate the risk tolerance level of a client, but it may fail to address the active/passive nature of a client.

## **Test for Risk Tolerance and Active/Passive Traits**

1. Have you risked your own capital in the creation of your wealth?
  - A. Yes.
  - B. No.
2. Which is stronger: your tolerance for risk to build wealth or the desire to preserve wealth?
  - A. Tolerance for risk.
  - B. Preserve wealth.
3. Would you prefer to maintain control over your investments or prefer to delegate that responsibility to someone else?
  - A. Maintain control.
  - B. Delegate.
4. Do you have faith in your abilities as an investor?
  - A. Yes.
  - B. No.
5. If you had to pick one of two portfolios, which would it be?
  - A. 80 percent stocks/20 percent bonds.
  - B. 40 percent stocks/60 percent bonds.
6. Is your wealth goal intended to continue your current lifestyle, or are you motivated to build wealth at the expense of current lifestyle?
  - A. Build wealth.
  - B. Continue current lifestyle.
7. In your work and personal life, do you generally prefer to take initiative by seeking out what needs to be done and then doing it, or do you prefer to take direction?
  - A. Take initiative.

**B.** Take direction.

**8.** Are you capital preservation oriented or are you willing to put your capital at risk to build wealth?

**A.** Capital at risk.

**B.** Capital preservation oriented.

**9.** Do you believe in the concept of borrowing money to make money/operate a business or do you prefer to limit the amount of debt you owe?

**A.** Borrow money.

**B.** Limit debt.

## ***Step 2: Plot the investor on the active/passive and risk tolerance scale.***

Once the adviser has classified the investor as active or passive and determined risk tolerance, the next step is to begin the process of identifying which one of the four BITs, identified by [Pompian \(2008\)](#) and shown in [Exhibit 4](#), that the client falls into. The adviser's task at this point is to determine where the client falls on the risk scale in relation to how the client falls on the active/passive scale. The expectation is that active investors will rank medium to high on the risk tolerance scale whereas passive investors will rank medium to low on the risk scale. Naturally, this division will not always be the case. If there is an unexpected outcome, then the adviser should defer to the risk tolerance as the guiding factor in determining which biases to test for (see next section for more details on bias testing). Without further analysis, the expected relationship between risk and active/passive responses is shown in [Exhibit 3](#).

### **Exhibit 3. Risk Tolerance and Active/Passive Scale**

General Type:	PASSIVE			ACTIVE		
Risk Tolerance:	Low	Medium			High	

## ***Step 3: Test for behavioral biases.***

The last step in the process is to confirm the expectation that the client has certain behavioral biases associated and consistent with a specific BIT. [Exhibit 4](#) provides an overview of the characteristics of each BIT, and [Exhibit 5](#) illustrates the entire diagnostic process. An expanded description of each BIT and advice for dealing with each BIT follows [Exhibit 5](#).

#### Exhibit 4. Biases Associated with Each Behavioral Investor Type

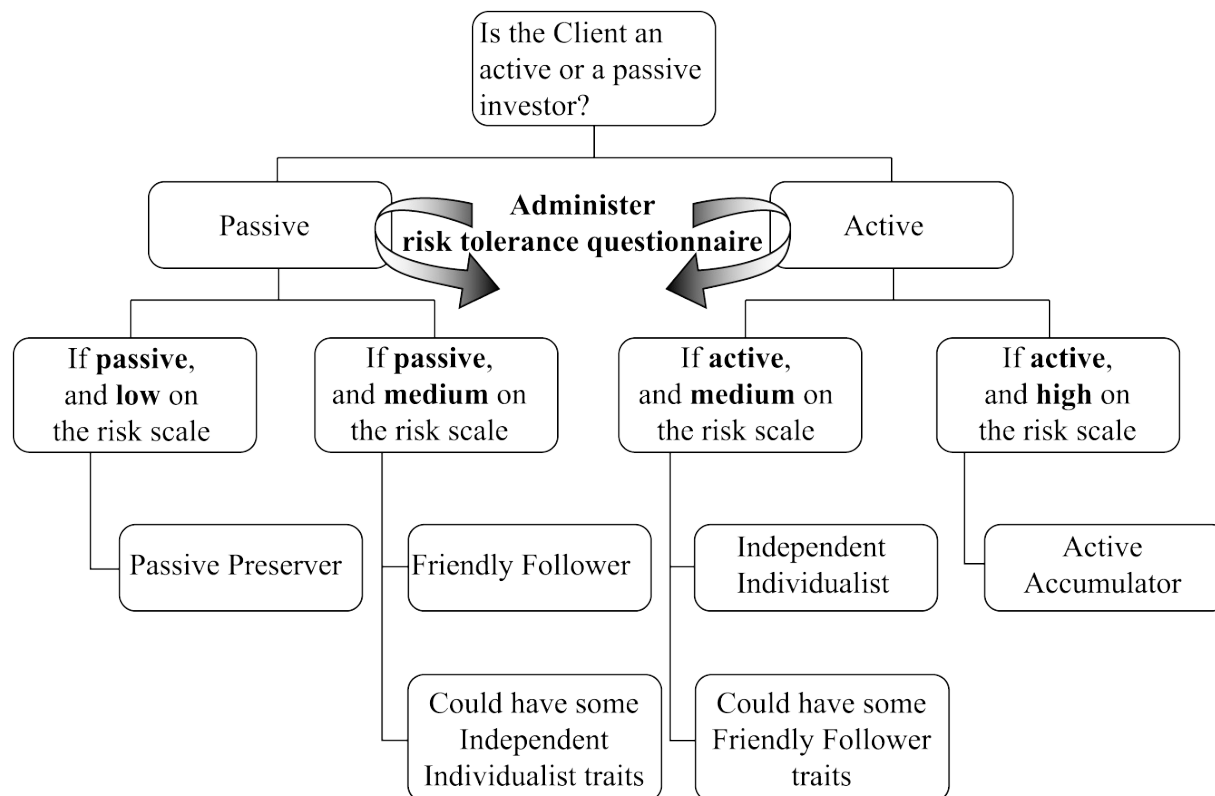
General Type	PASSIVE		ACTIVE	
Risk Tolerance	Low ←──			

One of the key observations from [Exhibit 4](#) is that at either end of the passive/active scale are clients who are susceptible to *emotional* biases and in the middle are clients affected mainly by *cognitive* biases or errors.<sup>3</sup> This division makes intuitive sense when the investor types are considered. Passive Preservers are conservative investors with low risk tolerance. They have a high need for security, they are highly emotional about losing money, and they become uneasy during times of stress or change. Similarly, aggressive investors with a high risk tolerance, called Active Accumulators, are also emotionally charged. They typically suffer from a high level of overconfidence and have an illusion of control; they mistakenly believe they can control the outcomes of their investments to a greater extent than they can. In between these two extremes are the Friendly Followers and the Independent Individualists who suffer mainly from cognitive biases and need education and information to make better decisions. Importantly, clients who are emotional about their investing need to be advised differently from those who make mainly cognitive errors. When advising emotionally biased investors, advisers should focus on explaining how the investment program being created affects such issues as financial security, retirement, or future generations rather than focusing on such quantitative details as standard deviations and Sharpe ratios. Quantitative measures work better with cognitively biased investors.

## Step 4: Classify investor into a behavioral investor type.

Once the adviser finds that the client has certain behavioral biases associated and consistent with a specific behavioral investor type, he or she will classify the client into the appropriate BIT. [Exhibit 5](#) demonstrates the process of classifying investors into a BIT. For example if an investor is passive, the risk tolerance questionnaire reveals a low risk tolerance, and the investor has biases associated with a *Passive Preserver* as shown in [Exhibit 4](#), the investor is then classified as a PP. Note that investors may exhibit some traits similar to the BITs shown beside them in [Exhibit 5](#). Judgment is required in determining which classification best fits an investor.

**Exhibit 5. The Behavioral Investor Type Diagnostic Process**



### Passive Preserver (PP)

*Basic type: Passive*

*Risk tolerance level: Low*

*Primary biases: Emotional*



Passive Preservers, as the name implies, are investors who place a great deal of emphasis on financial security and preserving wealth rather than taking risks to grow wealth. Many have gained wealth through inheritance or by receiving high compensation at work. Because they have gained wealth without risking their own capital, PPs may not be financially sophisticated. Some PPs are “worriers”; they obsess over short-term performance and are slow to make investment decisions because they are not comfortable with change. This behavior is consistent with the way they have approached their professional lives, being careful not to take excessive risks. Many PPs are focused on taking care of their family members and future generations, especially funding life-enhancing experiences such as education and home buying. Because the focus is on family and security, PP biases tend to be emotional rather than cognitive. This BIT becomes more common as investors’ age and wealth level increase. The emotional biases most common to PPs are endowment, loss aversion, status quo, and regret aversion. They may also exhibit cognitive errors, such as anchoring and adjustment and mental accounting.

### **Advising Passive Preservers:**

Passive Preservers may be difficult to advise because they are driven mainly by emotion. Although this characterization is true, PPs still need good financial advice. Advisers should take the time to consider the implications of the behavioral biases of their PP clients. PPs are more receptive to “big picture” advice that does not dwell on such details as standard deviations and Sharpe ratios. Because PPs are emotionally biased, providing excessive cognitive detail will lose their attention. Advisers should focus on what the money will accomplish, such as family legacy goals, education, and so on. PPs need to be persuaded about the soundness of their adviser’s general philosophy first, and then, as trust is gained, PPs will respond to advice and take action. After a period of time, Passive Preservers are likely to become an adviser’s best clients because they value greatly the adviser’s professional expertise and objectivity in helping make the right investment decisions.

### **Friendly Follower (FF)**

*Basic type: Passive*

*Risk tolerance level: Low to medium*

*Primary biases: Cognitive*

Friendly Followers are passive investors with a low to medium risk tolerance who tend to follow leads from their friends, colleagues, or advisers when making investment decisions. They often want to be in the latest, most popular investments without regard to current market conditions or the suitability of the investment to the FFs long-term goals. One of the key challenges in working with FFs is that they often *overestimate their risk tolerance*. Advisers need to be careful not to suggest too many “hot” ideas—FFs will likely want to

invest in all of them because they may regret it if others make money and they do not. FFs generally comply with professional advice when they get it, and they educate themselves financially. At times, however, FFs can be difficult because they do not enjoy or have an aptitude for the investment process. Biases of FFs tend to be cognitive. Their decisions typically are influenced by availability, hindsight, and framing biases. Resolution of cognitive dissonance is an important factor to FFs. Regret aversion, as it relates to herding behavior, is an emotional bias with a significant impact.

## **Advising Friendly Followers:**

Friendly Followers may be difficult to advise because they often overestimate their risk tolerance. Risky trend-following behavior occurs in part because FFs often convince themselves that they “knew it all along” when an investment works out well, which increases future risk-taking behavior. Advisers need to handle FFs with care because they are likely to say yes to advice that makes sense to them without adequately considering the risk involved. Advisers need to guide them to take a hard look at behavioral tendencies that contribute to overestimating risk tolerance. Because FF biases are mainly cognitive, education on the benefits of portfolio diversification is usually the best course of action. Advisers should challenge FF clients to be introspective and provide data-backed support for recommendations. Offering education in clear, unambiguous ways is helpful so that FFs have the opportunity to understand the implications of investment choices. If advisers take the time, this steady, educational approach will generate greater client loyalty and adherence to long-term investment plans from Friendly Followers.

## **Independent Individualist (II)**

*Basic type: Active*

*Risk tolerance: Medium to high*

*Primary Biases: Cognitive*

An Independent Individualist is an active investor with medium to high risk tolerance who is strong-willed and an independent thinker. IIs are self-assured and “trust their gut” when making decisions; however, when they do research on their own, they may be susceptible to acting on information that is available to them rather than getting corroboration from other sources. Sometimes advisers find that an II client made an investment without consulting anyone. This situation can be problematic; because of their independent mindset, these clients maintain the opinion they had when they made the investment, even when market conditions change. They enjoy investing and are comfortable taking risks, but often resist following a financial plan. Of all behavioral investor types, IIs are the most likely to be contrarian, which can benefit them. II biases are typically cognitive. Conservatism, availability, confirmation, and representativeness biases are common to IIs. Overconfidence

and self-attribution biases are the emotional biases that IIs sometimes exhibit.

### **Advising Independent Individualists:**

Independent Individualists may be difficult clients to advise because of their independent mindset, but they are usually willing to listen to sound advice when it is presented in a way that respects their intelligence. IIs have faith in themselves and their decisions, but may be unaware of their tendency to take a contrarian position. As with Friendly Followers, education is essential to changing their behavior because their biases are predominantly cognitive. A good approach is to have regular educational discussions during client meetings. In this way, the adviser does not point out unique or recent failures, but rather educates regularly and can incorporate concepts that he or she feels are appropriate for the Independent Individualist client.

### **Active Accumulator**

*Basic type: Active*

*Risk tolerance: High*

*Primary Biases: Emotional*

The Active Accumulator is the most aggressive behavioral investor type. These clients are entrepreneurial and often the first generation to create wealth; and they are even more strong-willed and confident than Independent Individualists. At high wealth levels, AAs often have controlled the outcomes of non-investment activities and believe they can do the same with investing. This behavior can lead to overconfidence in investing activities. AAs often have high portfolio turnover rates, which normally is a drag on investment performance. AAs are quick decision makers but may chase higher risk investments that their friends or associates are suggesting. If successful, they enjoy the excitement of making a good investment. Some AAs do not accept or follow basic investment principles such as diversification and asset allocation. They are often “hands on,” wanting to be heavily involved in the investment decision-making process. AA biases are typically overconfidence, self-control, and illusion of control. As a result of these biases, they may be overly optimistic about their investment choices.

### **Advising Active Accumulators:**

Active Accumulators may be the most difficult clients to advise. They like to control, or at least get deeply involved in, the details of investment decision making. They tend to be emotional and display overconfidence, which often manifests itself as optimism. They are convinced that their investments will do well, even if that optimistic attitude is irrational.

Some AAs need to be monitored for excessive spending, because they may lack self-control. This spending can inhibit performance of a long-term portfolio. The best approach to dealing with these clients is to take control of the situation. If advisers let the AA client dictate the terms of the advisory engagement, the client's emotionally oriented decision making will dominate and the result will likely be an unhappy client and an unhappy adviser. Advisers need to prove to the client that they have the ability to make wise, objective, and long-term decisions and can communicate these results in an effective way. Advisers who take control are more likely to have Active Accumulator clients listen to and accept their advice.

## 2.2. Limitations of Classifying Investors into Various Types

The challenge that all financial market participants face is that behavior patterns are not consistently demonstrated. An individual may normally behave one way but at times may behave in an unexpected manner. Different and irrational behaviors are exhibited at random times, usually during periods of financial market or personal stress. Because of inconsistencies in behavior, financial decision making is not always predictable or expectations of financial decision making are not always reliable. Therefore, it is important for readers to understand that whatever system is used to classify or otherwise understand individual investor behavior, there will be limitations to its effectiveness. The limitations of behavioral models include the following:

1. *Individuals may exhibit both cognitive errors and emotional biases.* Unfortunately, the same individual may exhibit both cognitive errors and emotional biases. Either may result in behavior that appears irrational. It may be possible to determine whether cognitive errors or emotional biases dominate, which is the heart of creating a behaviorally modified portfolio, but most people experience both faulty reasoning and feelings. Therefore, it may not be appropriate in most cases to classify a person as either an emotionally biased person or a cognitively biased person.
2. *Individuals may exhibit characteristics of multiple investor types.* Each behavioral investor type has unique characteristics. Unfortunately, people may engage in behaviors that are representative of multiple types. Therefore, users of investor classification models should not look for people to fit neatly into one "box" or type.
3. *Individuals will likely go through behavioral changes as they age.* As people age their behaviors may change. The most widely recognized example is that as people age their tolerance for risk (i.e., losses) generally decreases. They may become more emotional about their investing as well. It is important for BIT users to recognize this limitation and keep a close watch for changes in behavior as their clients age or experience changes in responsibilities or circumstances.

4. *Individuals are likely to require unique treatment even if they are classified as the same investor type because human behavior is so complex.* Even if two people fit the profile of a certain BIT, it is unlikely that one would treat those two people exactly the same. For example, one Passive Preserver may be more emotional or less risk tolerant than another. The classifications should not be taken as absolutes.
5. *Individuals act irrationally at different times and without predictability.* Life would be easier if we knew exactly when we or our clients would act irrationally. Because we do not, it is important to recognize that placing people into classifications may be more challenging at certain points, for example, during periods of market or personal stress compared with times of relative calm or even personal exuberance.

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### 3. HOW BEHAVIORAL FACTORS AFFECT ADVISER-CLIENT RELATIONS

- a. explain the uses and limitations of classifying investors into personality types;
- b. discuss how behavioral factors affect adviser–client interactions;

As behavioral finance gains credibility and acceptance by the investment community, advisers and investors are increasingly likely to include behavioral considerations in a client's investment policy statement (IPS). By adding behavioral factors to the IPS, a number of benefits can be realized. There is no doubt that an understanding of investor psychology will generate insights that benefit the advisory relationship. The key result of a behavioral finance–enhanced relationship will be a portfolio to which the adviser and client can comfortably adhere while fulfilling the client's long-term goals. This result has obvious advantages: advantages that suggest behavioral finance will continue to play an increasingly influential role in portfolio structure.

However, because behavioral finance is a relatively new concept as applied to individual investors, investment advisers may be reluctant to accept its validity. Moreover, advisers may not feel comfortable asking their clients psychological or behavioral questions to ascertain biases, especially at the beginning of the relationship. This reluctance should not deter an adviser from considering behavioral factors. Inclusion of behavioral finance considerations in the client–adviser relationship will likely result in a more satisfactory relationship and in investment decisions that are closer to those of traditional finance while being easier for the client to accept and adhere to.

Wealth management practitioners have different ways of measuring the success of an advisory relationship, but few would dispute that every successful relationship shares a few fundamental characteristics, including the following as outlined by [Pompian \(2006\)](#):

1. The adviser understands the client's financial goals and characteristics. These are considered when developing the investment policy statement.
2. The adviser maintains a systematic (consistent) approach to advising the client.
3. The adviser invests as the client expects. Results are communicated on a regular basis and in an effective manner that takes into account the client's characteristics.
4. The relationship benefits both client and adviser.

Behavioral finance can enhance these areas as shown in the following sections.

### **3.1. Formulating Financial Goals**

Experienced financial advisers know that defining financial goals is critical to creating an investment program appropriate for the client. To best define financial goals, it is helpful to understand the psychology and emotions involved in the decisions underlying the goals. Behavioral finance helps advisers discern why investors set the goals they do. Such insights equip the adviser to deepen the bond with the client, thus producing a better relationship and a better investment outcome.

### **3.2. Maintaining a Consistent Approach**

Most successful advisers maintain a consistent approach to delivering wealth management services. Incorporating behavioral finance can become part of that discipline without requiring large-scale changes in the adviser's methods. Behavioral finance can also add professionalism and structure to the relationship, allowing advisers to better understand the client before delivering any investment advice. Clients will appreciate this step, and it will make the relationship more successful.

### **3.3. Investing as the Client Expects**

Addressing client expectations is essential to a successful relationship; in many unfortunate instances, the adviser does not deliver on the client's expectations because the adviser does

not understand them. Perhaps no other aspect of the advisory relationship could benefit more from behavioral finance. Behavioral finance provides a context in which the adviser can “take a step back” and attempt to explore the motivations of the client. With a more thorough understanding of the client’s expectations, the adviser is better equipped to help satisfy them.

### **3.4. Ensuring Mutual Benefits**

Measures resulting in happier, more satisfied clients will also improve the adviser’s practice and work life. Incorporating insights from behavioral finance into the advisory relationship will enhance that relationship and its results. Those in the individual investor advisory business should be aware that factors other than investment results may be considered when clients seek new advisers. Practitioners may lose clients because clients do not feel as though their advisers understand them and/or their financial objectives. Likewise, practitioners may gain clients because clients feel as though their advisers understand them and/or their financial objectives. The primary benefit that behavioral finance offers is the ability to develop a stronger bond between clients and advisers. By “getting inside the head” of the client and developing a comprehensive grasp of his motives and fears, the adviser can help the client better understand why a portfolio is designed the way it is and why it is an appropriate portfolio for him or her, regardless of what happens day-to-day in the markets.

### **3.5. Limitations of Traditional Risk Tolerance Questionnaires**

Today, a dizzying variety of sources supply financial advice. To standardize processes, financial services firms often administer, and require their advisers to administer, risk tolerance questionnaires to clients and prospects prior to drafting any asset allocation. In the absence of any other diagnostic analysis, this methodology is certainly helpful and can generate important information. However, it is important to recognize the limitations of risk tolerance questionnaires. Aside from ignoring behavioral issues, an aspect we will examine shortly, risk tolerance questionnaires can also generate dramatically different results when administered repeatedly to the same individual, but with slight variations. Such imprecision arises primarily from variations in wording. Additionally, many risk tolerance questionnaires are administered once, and may not be revisited despite the fact that an IPS should be reviewed at least annually to measure not only a client’s ability to take risk but also their willingness to take risk. Risk tolerance can vary as a result of changing life stages or events so it is critical to re-evaluate it periodically. Another critical drawback of risk tolerance questionnaires is that many advisers interpret their results too literally. For example, some clients might indicate that the maximum loss they would be willing to tolerate in a single year would equal 20 percent of their total assets. Does that mean that an ideal portfolio would

place such a client in a position to lose 20 percent? No! Advisers should set portfolio parameters that preclude a client from incurring the maximum specified tolerable loss in any given period. For these reasons, risk tolerance questionnaires provide only broad guidelines for asset allocation, and should be used in concert with other behavioral assessment tools.

From the behavioral finance perspective, risk tolerance questionnaires may work better as a diagnostic tool for institutional investors compared with individual investors. This difference is because institutional investors are familiar with mean–variance optimization and think about risk. For them, risk analysis is a cognitive process. Individual investors are more likely to have feelings about risk, and for them risk analysis is an emotional process. Thus, risk tolerance questionnaires may fail emotionally biased individuals. An asset allocation generated and executed based on mean–variance optimization may result in a scenario in which a client demands, in response to short-term market fluctuations and to the detriment of the investment plan, that his or her asset allocation be changed. Moving repeatedly in and out of an allocation can have serious long-term negative consequences. Behavioral biases should be identified before the allocation is executed, so that such problems can be avoided. By doing so, the IPS that includes behavioral factors may result in decisions that the investor can adhere to. The IPS can be re-evaluated on a regular basis and updated for changes in the investor’s circumstances and risk tolerance.

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## 4. HOW BEHAVIORAL FACTORS AFFECT PORTFOLIO CONSTRUCTION

- c. discuss how behavioral factors influence portfolio construction;
- d. explain how behavioral finance can be applied to the process of portfolio construction;

Behavioral biases may affect how investors construct portfolios from the securities available to them. One way to consider this issue is to analyze the actual portfolios investors construct and compare them with the portfolios implied by traditional portfolio theory. Some useful evidence on the portfolio selection decisions of individual investors comes from defined-contribution (DC) pension plans. In particular, investment decisions in US 401(k) plans have been investigated in a number of studies.<sup>4</sup>

### 4.1. Inertia and Default



Consistent with the status quo bias,<sup>5</sup> a key finding is that most DC plan participants show inertia and tend not to change their asset allocations through time, even though it might be assumed that their tolerance for risk and other circumstances would be changing. For example, [Samuelson and Zeckhauser \(1988\)](#) and more recently [Ameriks and Zeldes \(2000\)](#) find the majority of investors in their samples made zero fund switches during the sample period in spite of there being no transaction costs associated with altering allocations among funds.<sup>6</sup>

There is also substantial evidence that shows inertia leads plan participants to stick with default options in terms of contribution rates and investment funds. In many cases, the default funds will be cash or money market funds, which are arguably too conservative for long-term savings, with low risk but also low rates of return (for example, see [Madrian and Shea 2001](#)).

Some companies have introduced “autopilot” strategies to counteract the inertia that plan participants frequently exhibit. For example, target date funds automatically switch from risky assets to fixed-income assets as the plan participant nears the intended retirement date. The participant does not need to take any action to achieve the reduction in risk. Although target date funds can be helpful in countering investor inertia, the potential disadvantage is that they are a “one size fits all” solution that may not match the needs of specific investors.

## EXAMPLE 1

### Target Date Fund Glide Path

Target date funds are designed to deal with investor inertia. As the investor approaches the intended retirement date, the fund manager reduces the proportion of risky assets in the fund. The reduction in risky assets is because plan participants close to retirement have little time to recover losses or make adjustments to their circumstances if their risky investments incur losses. Investors with longer to retirement are typically more able to bear investment risk.

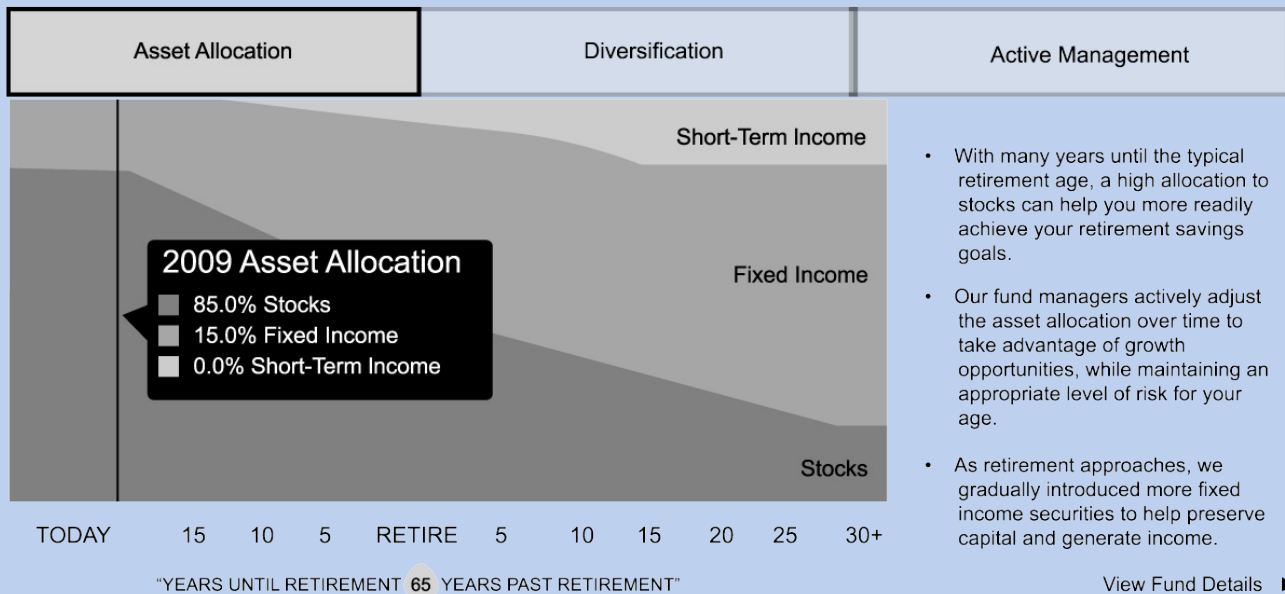
Although investors could do this kind of risk management for themselves, in practice many would not get around to making the allocation changes. The target date fund manager provides an autopilot solution for them. The diagram below shows the asset allocation “glide path” that T Rowe Price suggests for a 45-year-old investor. As shown, the allocation to stocks will decline (glide down) over time, whereas the allocation to fixed income and short-term income will increase. Similar programs are offered by other investment management companies.

Discuss factors that might make this one-size-fits-all solution inappropriate.

Select your age to find a fund:

45

Based on your age, we suggest the Retirement 2030 Fund



## Solution:

The entire investment portfolio of the investor should always be considered. Where tax treatment differs among types of returns or assets, assets that are expected to generate higher taxable returns may be held in tax-deferred retirement funds. An investor with significant amounts invested in non-retirement funds might prefer to tax shelter some assets in their retirement funds.

An investor with significant wealth and no children may be willing to take more risk. They may be less loss- and risk-averse than another investor of the same age with less wealth and parental responsibilities.

An investor with a preference for active portfolio management might prefer to have different allocations to asset classes based on his or her expectations and market conditions. For example, if interest levels are historically low, the investor might prefer to invest in stocks anticipating that interest rates will rise and the fixed-income portion will decline in value.

These are some of the factors that might be discussed.

Source: [www.troweprice.com](http://www.troweprice.com).

## 4.2. Naïve Diversification

When DC plan members do make active fund choices, some of the decisions appear to be the result of behavioral biases. For example, there is evidence of investors using simple heuristics to allocate among available funds and of framing bias. [Benartzi and Thaler \(2001\)](#) cite evidence of plan participants using a “1/n” naïve diversification strategy—dividing contributions equally among available funds irrespective of the underlying composition of the funds. In one experiment conducted by Benartzi and Thaler, one group of subjects is given the choice between a stock (equities) fund and a bond fund and a second group of subjects is given a choice between a stock fund and a balanced (50 percent stock, 50 percent bond) fund. The average asset allocation to equities is higher for the second group because in each group, the mode is to allocate assets evenly between the two funds available for selection. The use of a heuristic and framing bias appear to have impacted the choices. In a real life example studied by Benartzi and Thaler, by comparing allocations of a plan with five stock funds and one bond fund and a second plan with one stock fund and four bond funds, they find average equity allocation is very different. In the first plan, the average equity allocation is 75 percent, and in the second plan, the average equity allocation is only 34 percent. This example demonstrates the impact of framing bias.

Not all researchers support the idea that investors follow a 1/n strategy. [Huberman and Jiang \(2006\)](#) counter that most participants choose between three and five funds, and that the number chosen is not sensitive to the number of funds on offer (n). However, they do find evidence of participants following a *conditional* 1/n strategy, by allocating equally among their chosen subset of funds. In other words, once they have selected their funds, they allocate the invested amount equally among the chosen funds.

Regret may play a role in explaining naïve diversification strategies. [Benartzi and Thaler \(2007\)](#) cite an interview with Harry Markowitz in which he notes that he selected a 50/50 allocation between stocks and bonds in his TIAA-CREF retirement account. He states that his intention was to minimize future regret from one asset class beating the other, an essentially behavioral explanation, and perhaps an emotional one.

## 4.3. Company Stock: Investing in the Familiar

A very graphic example of potentially inappropriate portfolio construction approaches in DC plans comes in the form of high levels of investment in the stock of the sponsoring company. Many US 401(k) plans offer the employer’s stock as an investment option and many also make employer matching contributions in employer stock, in some cases with restrictions on subsequent sale.

[Benartzi \(2001\)](#) notes that one-third of 401(k) assets are invested in participants’ own

employer's stock, and in some plans the proportion is more than 90 percent. In many cases, the account balances are comprised in significant part by the employees' *discretionary* allocations. Vanguard (2006) notes that although only 12 percent of plans offer employer's stock as a choice, these are larger plans. As a result, 43 percent of participants have employer's stock as a choice and one-fifth of all participants have more than 20 percent of their account balance in employer's stock. Fifteen percent of participants have more than 80 percent of their account balance in their employer's stock. Balances in employer's stock remain high despite such high profile disasters as WorldCom and Enron.<sup>7</sup>

Explanations given for investment in employer's stock include the following:

- *Familiarity and overconfidence effects:* Employees underestimate risk because of familiarity with the employing company and overconfidence in their estimates of the company's performance. A John Hancock (2003) survey shows investors assigning an average risk score of 3.1 to company stock, in comparison with 3.6 for domestic stock funds and 4.1 for global stock funds. Huberman (2001) argues this enthusiasm for own company investment springs from the same familiarity bias that leads to home bias in geographic allocations. The familiarity bias also led US investors to invest more in their local phone company than in other telephone companies. It could be that employees do have an informational advantage that justifies their high holdings in their employer's stock, but evidence on returns (e.g., Benartzi 2001) casts doubt on this view and points to overconfidence as an explanation.
- *Naïve extrapolation of past returns:* Plan participants at companies whose stock has done well in the past may expect this performance to continue and hence wish to hold company stock in their account. Benartzi (2001) sorts companies into quintiles based on 10-year past performance of the employing company's stock. Employees at the worst-performing companies on average allocate 10 percent of contributions to company stock; for the best-performing companies, the figure is 40 percent. Subsequent stock performance does not validate this difference in allocation.
- *Framing and status quo effect of matching contributions:* Benartzi (2001) shows that employees who can choose where the employer match is invested allocate 18 percent of their own funds to employer's stock. Where the match is in employer's stock, employees allocate 29 percent of their own contributions. Employees may be taking the company's decision to contribute stock to their plan as *implicit advice*.
- *Loyalty effects:* Employees may be willing to hold employer's stock to assist the company, as they perceive it. For example, employees may be encouraged to hold employer's stock as assistance in a takeover defense. Companies with high levels of employee stock holdings may be harder to take over.
- *Financial incentives:* Employees might rationally invest in employer's stock when there

are financial incentives for them to do so. These could include being able to purchase stock at a discount to market price, or beneficial tax treatment. Although these explanations are possibilities, most studies show substantial holdings of employer's stock exist in the absence of such incentives. However, this finding may be the result of inertia and employees continuing to hold employer's stock once any restrictions on selling have lapsed.

## 4.4. Excessive Trading

The evidence of participant inertia in DC plans is in contrast to evidence of individuals with retail investment accounts. Investors with retail accounts appear to be more active traders. [Barber and Odean \(1999\)](#) summarize evidence from their studies of investors with discount brokerage accounts. The main findings are that investors trade too much—damaging returns—and tend to sell winners and hold on to losers—the disposition effect.

A winning position, in which current price is above the purchase price, is 1.5 times more likely to be sold in any month than a corresponding losing position. This behavior may be driven by fear of regret. Winners sold subsequently outperform the losers that remain in the portfolio. Excessive trading appears to be driven by overconfidence. Overconfident investors may falsely think that they have the knowledge and insight to make profitable trades, and trade actively to benefit from these insights. The researchers' initial expectation that frequent traders would be worse off because of their transaction costs is not confirmed; in fact, the outcome was even worse than expected in that stocks sold do better than stocks bought by about 3.5 percent over the following 12 months. The frequent traders not only had higher transaction costs because of excessive trading but also experienced opportunity losses because of the disposition effect. Performance is negatively related to turnover levels. Young males are found to trade the most and earn the lowest net returns.

The difference between the findings on trading in the discount brokerage and the 401(k) pension plan accounts may stem from self-selection of individuals (keen traders) into brokerage accounts and the differing levels of investment choice (i.e., choice is generally restricted in 401(k) plans).

## 4.5. Home Bias

Portfolio diversification represents another dimension in which investors must make a choice. Plan participants can diversify internationally as well as across asset classes. A large body of literature exists showing that many investors maintain a high proportion—often 80 percent or more—of their investments in securities listed in their own country (for example,

see [French and Poterba 1991](#); [Kang and Stulz 1997](#)). There have been attempts to offer rational explanations for this feature, for example, as a result of information costs. However, there are also behavioral explanations, such as availability, confirmation, illusion of control, endowment, and status quo biases. Familiarity with a country may lead investors to own high concentrations of domestic assets. This choice is closely related to the idea that a similar type of familiarity could lead investors to own excessive amounts of employer stock.

## 4.6. Behavioral Portfolio Theory

Shefrin and Statman have published a number of articles on behavioral portfolio theory (e.g., [Shefrin and Statman 2000](#); [Statman 1999, 2004](#)). The theory is intended to reflect how investors actually form portfolios rather than how traditional theory suggests they should. Shefrin and Statman argue that portfolios, affected by behavioral biases, are formed as layered pyramids in which each layer is aligned with an objective. As a result of a mental accounting bias in which people treat one sum of money differently from another sum based on which mental account the money is assigned to, investments are allocated to discrete layers without regard for the correlations among these investments. For example, a base layer of low risk assets may be intended as “protection from poverty,” whereas a higher layer of risky assets represents “hopes for riches.” Behavioral investors do not consider the correlation between the layers in the way that modern portfolio theory would suggest they should. Clients can have several layers or mental accounts in their portfolios. The layered approach can explain observed features, such as undiversified stock portfolios (hopes for riches), and the reluctance of investors to invest in foreign stocks despite the seemingly obvious diversification benefits. This latter feature reflects failure to consider the diversification benefits of stocks with a low correlation with the domestic portfolio. The failure to consider diversification benefits is an implication of the mental accounting bias.

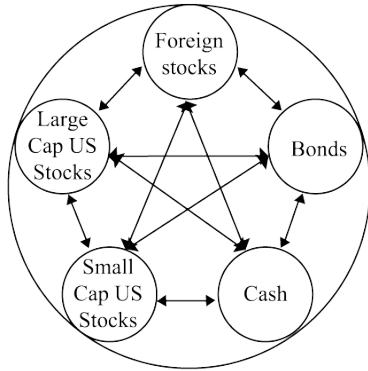
An important point to note is that investors do not have a single attitude toward risk. They have multiple attitudes toward risk depending on which part of their wealth is being considered. Hence, in a behavioral context it might make sense for investors to say they are prepared to take a lot of risk with some of their money, even though such a statement makes little sense in a conventional mean–variance portfolio theory framework.

Advisers and portfolio managers constructing an investment policy statement for or with a client may wish to consider behavioral portfolio theory. For example, they can clarify which mental accounts the client has and what attitude toward risk prevails for each one. [Exhibit 6](#) compares the structure of a mean–variance portfolio and a behavioral portfolio ([Statman 1999](#)).



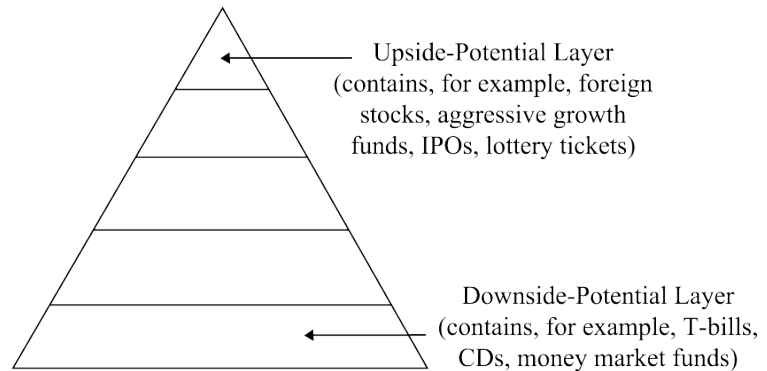
### *Mean–Variance Portfolio*

Mean–variance portfolios are constructed as a whole, and only the expected return and the variance of the entire portfolio matter. Covariance between assets is crucial in determination of the variance of the portfolio.



### *Behavioral Portfolio*

Behavioral portfolios are constructed not as a whole but layer by layer, where each layer is associated with a goal and is filled with securities that correspond to that goal. Covariance between assets is overlooked.



Source: Statman (1999).

## 5. BEHAVIORAL FINANCE AND ANALYST FORECASTS AND OVERCONFIDENCE IN FORECASTING SKILLS

- e. discuss how behavioral factors affect analyst forecasts and recommend remedial actions for analyst biases;

Sections 1–4 focus on understanding individual investor behavior and how it affects the adviser–client relationship and portfolio construction. Sections 5–8 focus on how behavioral factors impact security analysts, investment committees, and markets.

Studies have shown that experts in many fields persistently make forecasting errors arising from their behavioral biases. Investment analysts are subject to these biases, and need to be aware of the potential for biases to compromise their professional judgment. When qualified, analysts possess a range of techniques to research companies and securities, yet their superior skills surprisingly place them at greater risk of some types of error. One key issue for all experts is recognizing the occasions when they lack the information or insight to make a good professional judgment. Even possessing good analytical skills, investment professionals' judgment can be limited by human failings and the environment in which they operate. Judgment can be improved if an individual understands the limits to his or her

knowledge.

The biases that can adversely impact analysis are not confined to analysts' behavior. The way in which information is presented in company management presentations, reports, and accounts can reflect human biases in corporate executives. To achieve good forecasts or decisions, analysts need to be alert to the potential impact of biases.

Section 5.1 describes the effect of *behavioral biases* on analysts and their work. *Cognitive errors* or failures of reasoning create the potential for errors of judgment, and include memory- and probability-based errors. *Emotional biases* are biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition. *Cognitive dissonance* arises when new information conflicts with previously held beliefs or cognitions. To resolve the dissonance, people may notice only information of interest, may ignore or modify information that conflicts with existing beliefs, may remember and consider only information that confirms existing beliefs, and/or may modify beliefs. The work of analysts, which includes research, judgment, forecasts, decisions, and conclusions, may be affected by behavioral biases and cognitive dissonance. In other words, analysts are not immune to behavioral biases and exhibiting irrational behavior.

## 5.1. Overconfidence in Forecasting Skills

*Overconfidence* is a key behavioral bias relevant to investment analysts. Overconfidence bias is a bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities. This overconfidence may be the result of overestimating knowledge levels, abilities, and access to information. For example, people generally do a poor job of estimating probabilities but believe they do it well because they believe that they are smarter and more informed than they actually are. This behavior is sometimes referred to as the *illusion of knowledge bias*. Overconfidence may be intensified when combined with *self-attribution bias*. Self-attribution bias is a bias in which people take credit for successes and assign responsibility for failures. In other words, success is attributed to the individual's skill whereas failures are attributed to external factors. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Analysts frequently show excessive confidence on the likely correctness of their forecasts. Studies have identified that 90 percent *confidence intervals* for forecasts, which should leave only 10 percent error rates, turn out to be wrong as much as 40 percent of the time ([Russo and Schoemaker 1992](#)). The actual error rate is the result of a calibration issue about how sure an expert is about his or her judgment.

Overconfidence can be the result of placing too much emphasis on specific characteristics of a company or what is being examined and neglecting to fully consider the impact of the



economic environment and other information. Studies have suggested individuals are more confident when making contrarian predictions that counter the consensus. That is, overconfidence can arise when forecasting what others do not expect or predict (Dunning, Griffin, Milojkovic, and Ross 1990). Overconfidence has been shown to be particularly evident for strategists, rather than for individual stock or industry analysts. Stock analysts are typically more confident about earnings forecasts than target prices.

A key bias linked to overconfidence is the illusion of knowledge. Analysts believe that by acquiring information, they can know more than others and obtain an edge. In other words, information will result in analysts being more knowledgeable and thus more accurate in their forecasts compared with others. As a result, they may collect too much information. Although forecasting is driven by information, additional data that is not adding material content tends not to increase the accuracy of a forecast, but instead reinforces an analyst's confidence in that forecast.

Additional information may contribute to the cognitive bias of representativeness, in which analysts judge the probability of a forecast being correct by considering how much the outcome resembles overall available data (Kahneman, Slovic, and Tversky 1982 and more recently, Shefrin 2007). Typically, this simplification combines probabilities incorrectly. Additional information or detail may appear to conform to the overall scenario being forecast, even if it is largely irrelevant, and so add to confidence in the forecast. The **availability bias** is a cognitive bias that involves individuals giving undue weight to more accessible, readily recalled information. Availability and representativeness can each encourage overreaction to rare events.

Attempting to collect more information can also contribute to the cognitive bias of **illusion of control**, which is a tendency of analysts to try to control what cannot be controlled. Inherently, uncertain outcomes relating to business or the economy cannot have all forecasting risk removed. Risk in a model and the modeling process cannot be eliminated by an excess of information. The illusion of control can lead to analysts forecasting complex patterns of business performance or stock price behavior, or being confident about unlikely combinations of short- and long-term recommendations, price targets, and earnings forecasts.

Overconfidence and the illusion of control can be encouraged by *complex models*. Many analytical problems will require modeling and extensive use of data. More complex models usually fit a particular data set better but prove less robust in a range of different environments. The data set used may be more relevant to a particular economic or business environment or may be influenced by some outlying or atypical observations. Mathematical rigor and spurious precision of models can conceal underlying weaknesses in the models and assumptions. Analysts should avoid modeling that overly focuses on a single set of historical data, which risks optimization on that data set rather than achieving robustness of modeling. Robustness reflects a model's ability to perform well out of sample.

Even when analysts are not managing portfolios of securities, **self-attribution bias** can adversely influence their analyses and contribute to overconfidence in their forecasts. Self-attribution bias is a bias in which people take personal credit for successes and attribute failures to external factors outside the individual's control. Self-attribution bias may reflect a desire to preserve self-esteem while people protect themselves psychologically as they attempt to comprehend successes and failures. Self-attribution bias may be evident in *skewed forecasts*, in which the confidence interval is not symmetric around a central forecast. People may appear to exhibit self-attribution bias as a result of misdirected financial incentives. In this case, it is not true self-attribution bias but a deliberate attempt to gain credit for successes and assign responsibility for failures for financial as opposed to psychological reasons.

Experts often use other self-esteem or ego defense mechanisms, such as **hindsight bias**. Hindsight bias is also called the “I knew it all along” effect. Forecasts are evaluated with hindsight, and that additional knowledge can be combined with a human tendency to see past events as having been predictable. Also, people tend to remember their own predictions of the future as more accurate than they actually are because they are biased by the knowledge of what has actually happened. Hindsight bias is more prevalent when forecasts are ambiguous. Individuals tend to misinterpret past data, which can lead to overconfidence and insufficient adjustment in future forecasts. Hindsight bias can make analysts blind to future risks or the full breadth of the range of outcomes.

Hindsight bias can involve both cognitive and emotional bias. It is a result of the process of integrating new information with prior beliefs. A source of error in calibrating earlier forecasts typically arises from selective recall, in which individuals remember showing greater foresight than proved to be the case. Typically, an outcome is viewed as more likely, in the sense of being capable of being repeated, once it has occurred than is expected before that.

## EXAMPLE 2

### Analyst Case Study

Based on a company's sales and earnings per share growth over the past 10 years, an analyst has concluded that its high rate of growth will continue in the future. Before the report is completed, the analyst reads in a newspaper that the company's chief executive has made an apparently very profitable personal investment in another unrelated business. The analyst believes that this profitable outcome is evidence of the chief executive's entrepreneurism and dynamism, and that it is additional confirmation of the analyst's assessment of the company in the report. Supported by the additional information, the analyst now feels more confident with the forecasted growth rates and in fact increases the average forecasted earnings growth rate and decreases the dispersion of the forecasted growth rates. He includes the additional information about

the chief executive in the report.

Discuss flaws in the analyst's approach and possible biases of the analyst.

### **Solution:**

The value of the additional information is difficult to quantify, and it may not have been collected systematically. The analyst may not have looked as rigorously for evidence of how representative the successful investment was among the chief executive's total portfolio of personal investments; other investments might have shown poor returns but received less publicity. Newspaper coverage can be selective. Thus, the new information might reflect *availability bias*. The chief executive may even have been motivated to diversify his investments by concern about the outlook for the company's stock. The analyst's judgment might have been adversely affected by *overconfidence*, with faulty reasoning contributing to the issue. Further, the analyst might have seen the additional information as being *representative* of a mental picture of the characteristics of a growth business.

#### **5.1.1. Remedial Actions for Overconfidence and Related Biases**

Dealing with overconfidence is difficult, but *prompt and accurate feedback* combined with a *structure that rewards accuracy* can help analysts to re-evaluate their processes and self-calibrate. Most people calibrate better and reduce overconfidence if they know that the result of their forecast will be known and reflected to them very quickly.

Effective methods of providing incentives need not necessarily be in the form of financial reward. Good motivation can also be achieved if an individual is directly accountable for accuracy to supervisors or clients. An appreciation of stock market history and economic cycles, as well as rigorous self-appraisal, can help improve future forecasts and correct confidence intervals given by analysts. Where resources and organizational structure permit, *appraisal by colleagues, superiors, or systems* can also help calibrate forecasts and control overconfidence.

*Well-structured feedback* can also reduce hindsight bias. An analyst should document a decision or forecast and the reasons for that judgment. A written record helps make the later evaluation more objective. Documenting the reasons for the judgment not only allows the accuracy to be assessed later, but also why it was right or wrong. The data used should be recorded to allow subsequent assessment. Unambiguous forecasts are less vulnerable to hindsight bias. Where possible, numbers should be included, and it can be helpful to document any consensus or base rates that exist, to compare with the analyst's judgment and

for later assessment purposes.

To address hindsight bias and other biases, analysts should make the conclusion as explicit as possible, although this documenting should not be confused with showing greater confidence or adding extraneous detail. What is required is sufficient detail to allow subsequent evaluation of its accuracy. In subsequently evaluating a forecast after the outcome is known, the record of the prediction can be assessed by reviewing the data, assumptions, and model. Feedback or a systematic review process can assist future accuracy and help control overconfidence and reduce hindsight bias.

Some outcomes or sources of forecasting error can be overlooked. Analysts should be thorough in their search for unconsidered outcomes that might have been missed initially and attempt to evaluate those. One method that can help reduce overconfidence is for an analyst to be required to provide at least one counterargument in the report. If the documentation of the research includes one good reason why the conclusion might turn out to be wrong, forecasting accuracy can be improved and confidence be better calibrated. When listing evidence for and against a conclusion, it is the evidence against that does the most good in countering overconfidence.

To counter the risk of inaccuracy and excess confidence based on specific characteristics of the subject of the analysis, analysts should consider whether the sample size is too small. Ensuring that a search process includes only *comparable data* is also helpful to reducing overconfidence. Additional data that cannot be analyzed in the same way as the comparable data set are more likely to add to confidence than accuracy, via the bias of illusion of knowledge.

Bayes' formula is a mathematical rule that explains how existing probability beliefs should be changed given new information. In other words, Bayes' formula expects people to update old beliefs in a certain manner when given new information. Bayes' formula is essentially an application of conditional probabilities.<sup>8</sup> Ideally, analysts should incorporate additional information with a Bayesian approach to calculate probabilities, recognize underlying base rates, and link probabilities conditionally.

Using Bayes' formula, the initial position (prior probability) typically matters less, and more importance can be given to a sequence of useful evidence. Because the starting assumptions are typically less important than collecting and incorporating new information, Bayes' formula can be a useful tool for analysis, reducing the risk of behavioral biases in incorporating new information.

However, base rates—the underlying averages or background frequencies—should be recognized if the data is available. Indeed, in some cases the base rates can be clear and powerful. In some investment analyses the base rate of likely outcomes may be statistically significant, but there is much less information that allows discrimination between investments. For example, there may be insufficient data to determine accurately stock betas

in a model. The analysis may be more robust if calculated assuming all the stock betas are equal to 1 (the overall average or base rate).

In [Example 3](#), the correlations and similarity of previous performance between stocks, which can be high within some sectors, demonstrate the difficulty of discriminating between stocks in the short term. Against this background—where it seems quite likely that short-term performance of the two stocks will be similar—achieving a successful recommendation requires a higher hurdle in terms of further evidence and quality of analysis.

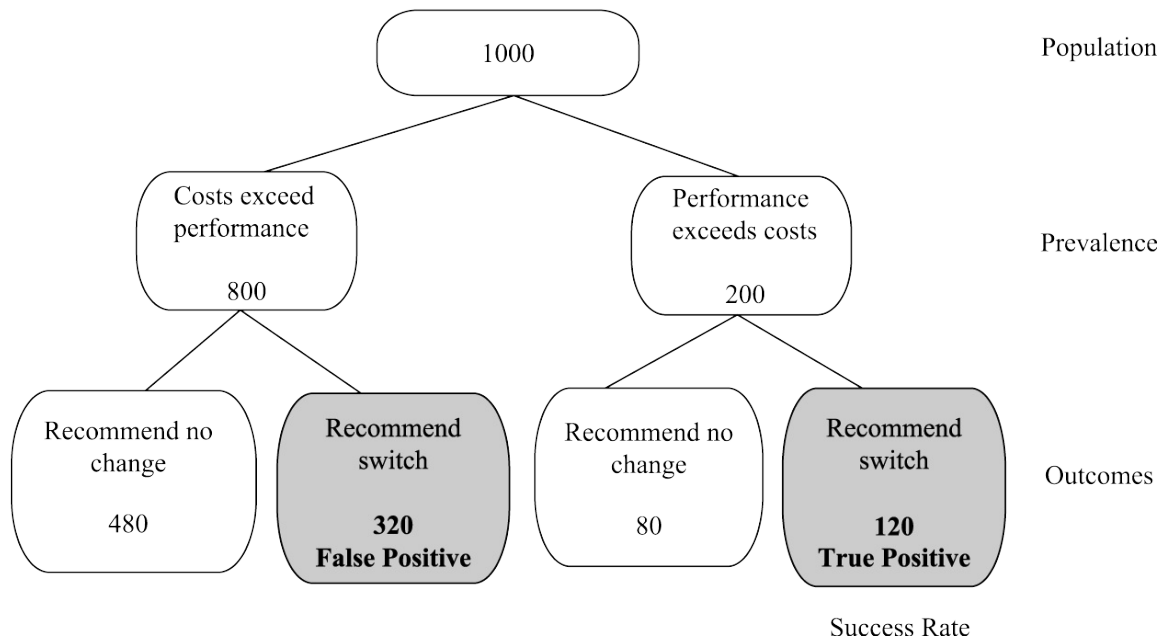
### EXAMPLE 3

## Analyst Recommendation and Base Rate Case Study

The chief investment officer (CIO) of an investment institution is presented with research by an analyst on his team. The analyst is recommending a switch from the stock of one major integrated oil company, XYZ plc, into another major integrated oil company, ABC plc. Over the previous three years, the stock prices of the two companies had a correlation of 88 percent. On the basis of this high correlation and also the fact that over the period the performance of the two stocks had diverged little, the CIO concludes that the probability of switching costs exceeding the difference in prospective returns over the next 12 months is 80 percent (base rate or prior probability). The CIO estimates the cost of the switch at 4 percent because tax costs are involved. The analyst's judgment is correct 60 percent of the time, in line with the average for the team. How should the CIO evaluate the analyst's recommendation?

### Solution:

#### Exhibit 7. Bayes' Formula Demonstrated Using Natural Frequencies



The information in [Exhibit 7](#) is summarized in [Exhibit 8](#).

### Exhibit 8

	Switching Is Worthwhile	Switching Is Not Worthwhile	Total
Analyst recommends a switch	120	320	440
Analyst recommends no change	80	480	560
Total	200	800	1000

$P(A)$  = Probability switching is worthwhile =  $1 - 0.8 = 0.2$  (given), or  $200/1000 = 0.2$

$P(B)$  = Probability analyst recommends a switch =  $440/1000 = 0.44$

$P(B|A)$  = Probability analyst recommends a switch given switching is worthwhile =  $0.6$  (given), or  $120/200 = 0.6$

If a population of 1000 outcomes is used, on average in 800 ( $= 0.8 \times 1000$ ) outcomes there will be less than 4 percent annualized difference between the stocks. On the other

200 ( $= 0.2 \times 1000$ ) outcomes, it would be worth switching.

The analyst's 60 percent rate of being correct means on average that he can be expected to identify correctly 120 ( $= 0.6 \times 200$ ) of the useful switching opportunities. But his 40 percent failure rate means that he will not predict the remaining 80 ( $= 0.4 \times 200$ ) outcomes when switching would prove right (false negatives).

Of the 800 outcomes in which switching would not be worthwhile, the analyst will correctly recognize 480 of the outcomes ( $= 0.6 \times 800$ ). But he will wrongly predict a switch on the remaining 320 outcomes in which there is no meaningful difference between the stocks (false positives).

Exhibit 8 indicates that the analyst will make 440 calls to switch ( $= 120 + 320$ ), of which just 120 can be expected to be correct. The analyst's expected success ratio in calling a profitable switch between two closely correlated stocks is 27 percent ( $= 120/440$ ) or calculated using Bayes' formula:  $P(A|B) = [P(B|A)/P(B)]P(A) = [(0.6)/(0.44) \times 0.2] = 1.36 \times 0.2 = 0.27$

The CIO would need more information about time frames and predicted magnitude of performance difference between the stocks before making a decision. However, in these circumstances, the base rate—the similar prior performance of the two stocks—is hard to beat. (Switching costs and the possibility that some outcomes represent an unexpected outperformance of XYZ may even add to the risks.) Where a base rate or prior is very strong, a decision counter to the base rate can only be made with a strong proven ability to discriminate.

Remedial actions include giving prompt, well-structured, and accurate feedback; developing explicit and unambiguous conclusions; having a systematic review process and a structure that rewards accuracy; conducting regular appraisals by colleagues and superiors; providing counterarguments; and documenting comparable data.

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## 6. INFLUENCE OF COMPANY'S MANAGEMENT ON ANALYSIS AND ANALYST BIASES IN CONDUCTING RESEARCH

- e. discuss how behavioral factors affect analyst forecasts and recommend remedial actions



for analyst biases;

The information that is presented by company management and the way the information is presented can affect external analysts. Analysts should remember that company management is also susceptible to behavioral biases.

**Framing, anchoring and adjustment**, and availability are important cognitive biases. Framing is a cognitive bias in which the same problem is assessed differently depending on how information or a question is presented. Humans assume that the frame or context is providing additional information when it may not be. It can involve anchoring, in which some information is given undue importance in decision making. Anchoring means that the framework for interpreting and analyzing the available information can be influenced disproportionately by an initial, default position or “anchor.” This anchor can be chosen in a variety of ways. For example, it may be based on initial information, prominent and vivid data, or recent data. Adjustments from the anchor tend to insufficiently incorporate new information. Availability is a cognitive bias that involves individuals giving undue weight to more accessible, readily recalled information.

For example, a management presentation describing specific successes or selecting favorable comparisons for business performance could anchor an analyst’s view of the business results as successful. Subsequent less favorable metrics or explanations might not be given the appropriate consideration or weight. Typically, management presentations and annual reports begin with a summary of results and achievements. Analysts should recognize the risk of this information being given undue importance in the analysis relative to the analyst’s own ratios and metrics.

The extent to which company management can be excessively optimistic is shown in [Exhibit 9](#), which analyzes the report of a bank that subsequently moved into significant loss. Analysts reviewing a company report that lacks balance in the language need to consider the potential for their favorable initial impression of reporting language to adversely affect an objective analysis of numbers, via the influence of framing bias.

### Exhibit 9. Framing Bias

Consider this text analysis of the chairman’s statement and business review in the 2007 annual report of a major European bank published in 2008, a few months before the bank was rescued by the government.

Occurrences of:	
Negative words	Positive words



Disappoint/disappointed	0	Good	55
Bad/badly	0	Excellent	12
Poor	0	Success/successful	35
Weaker/weakening	7	Improvement	23
Slowdown	6	Strong/stronger/strongly	78

*Source: Royal Bank of Scotland plc, Annual Report and Accounts 2007, SVM Analysis.*

Analysts should also recognize the possibility of a self-attribution bias in company executives that arises from the impact of incentive compensation on company reporting. Incentive compensation for both company management and for analysts can be too large, creating errors of reasoning and judgment because of preoccupation with specific factors. Company management and analysts can be influenced by optimism. This optimism may be influenced by overconfidence and illusion of control biases. As a result, there is a systematic tendency to overestimate the likelihood of favorable outcomes, and underestimate the likelihood of negative events ([Lench and Ditto 2008](#)). Optimism can be evident in company reporting.

Framing and setting expectations may be influenced by companies presenting recalculated earnings. This recalculation may happen if management believes earnings are temporarily or artificially depressed; typically, the recalculation does not comply with generally agreed accounting practice presentation. Usually, the recalculated earnings are more favorable and given greater prominence in company reporting. Because these adjustments can affect valuation, apparent growth rates, and the smoothness of earnings progression (earnings quality), analysts need to consider whether the adjustment is unreasonably influencing their perception of the business in terms of profitability, growth, or riskiness.

## 6.1. Remedial Actions for Influence of Company's Management on Analysis

Analysts can best deal with cognitive biases in the interpretation of information by maintaining a disciplined and systematic approach. Focusing on metrics and comparable data, rather than what is descriptive or unverifiable, can assist forecast accuracy and consistency of approach across research. Calibration of likely accuracy can be improved by framing the issue appropriately, gathering information, and recognizing underlying base rates.

## 6.2. Analyst Biases in Conducting Research

Although cognitive biases may be the most significant behavioral problem for analysts, there is usually also an emotional component to judgment. Emotional responses are a significant factor in the real-time processing of financial information. Emotional perception of information is not necessarily rational; emotions can improve or disrupt decision making. However, even before an analysis is complete, the model or judgment can only be as good as the data used. The search process for information is an important element of successful analysis, and the optimal stopping point in that search may not be clear. It is possible to collect too much information.

Specific biases can be more prevalent in company analysis. Collecting too much unstructured information may not only lead to illusions of knowledge and control, contributing to overconfidence, but can also expose analysts to the risk of representativeness. Additional information can feed representativeness.

More detail collected from companies can feed confidence. An indicator that a conclusion has been driven by extraneous detail may be that the conclusion is presented as a *story*. A story involves explaining evidence with a story or scenario that fits, and then making a decision that matches the specific scenario. A story may not be based on a thorough analysis but can be compelling because of how it is presented.

**Confirmation bias**, a cognitive bias, is the tendency for people to misread evidence as additional support for an initial hypothesis. Confirmation bias is a form of resolving cognitive dissonance that describes the tendency to search for, or interpret, information in a way that confirms the analyst's prior beliefs. The additional information may not be analyzed in a rigorous way, but it can nevertheless appear to make the judgment or forecast more likely by sharing some of its general characteristics. An example is when probabilities of independent events are combined inappropriately, such as additively or some variation of adding, to support a belief. This example highlights the conjunction fallacy. The probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone. In fact, the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

The **gamblers' fallacy**, a misunderstanding of probabilities in which people wrongly project reversal to a long-term mean, is a related cognitive bias (Shefrin 2007). Investment professionals, and strategists in particular, can suffer from this cognitive bias. It reflects a faulty understanding about the behavior of random events, expecting reversals to occur more frequently than actually happens. With the gamblers' fallacy, the analyst is expecting a pattern that has diverged from the long-term average to reverse within a specific period of time. Another fallacy, common to gamblers and many others, is the hot hand fallacy. People affected by this fallacy wrongly project continuation of a recent trend. Both of these fallacies demonstrate a lack of understanding of statistical independence.

Similar to endowment bias, assets may be endowed with additional value based on an emotional response to them. Analysts can associate financially sound companies with good or safe characteristics, although the external economic environment or high stock price for the company can make it risky. This view can also reflect a confirmation bias. Analysts may look for and notice what confirms their beliefs, and ignore or undervalue what contradicts their beliefs. Studies have suggested that analysts have biases favoring growth over value. Earnings growth records themselves can be seen as representative of a growth business, and naively extrapolated. The tendency of analysts to recommend high-growth and low-yield stocks typically reflects a failure to incorporate the base rate or effect of the environment in which a company operates. This situation may reflect a **representativeness bias**.

## EXAMPLE 4

### Investment Manager Case Study

It is August. An investment manager has just signed a charitable organization (charity) as a new client. The charity currently holds primarily cash and liquid assets. The directors of the charity would like to move some money not required to fund short- or medium-term activities of the charity into stocks. They expect stocks to earn higher returns than the returns of the assets currently held. They have asked the investment manager to advise them on the timing of entry into the stock market.

The manager advises them that she expects stock to rise over the next 12 months but advises deferring investment in stocks for a month or two. She thinks stocks will decline in the near future because each month for the last six months stocks have risen more than the average monthly increase for the last 25 years. She anticipates a correction that will reduce the increase to the long-term average. She suggests waiting to enter the market until after the anticipated correction.

She states that the probability of a market fall in any September is 0.55 and that the probability of a market increase over a 12-month period is 0.7. She uses these probabilities to support her advice to defer investment for a month or two.

Assume that the probabilities are correct and that the events are independent. What behavioral biases might be evident with this advice? How might the investment manager address these?

#### **Solution:**

The expectation of a market reversal—a fall coming after a rising trend—could reflect the gamblers' fallacy. The investment manager is expecting the stocks that have diverged from the long-term average to reverse within a specific period of time. She has

not done a thorough analysis but has instead told a compelling story. She may be susceptible to a representativeness bias, in which analysts judge the probability of a forecast being correct by considering how much the outcome resembles overall available data. Frequently, this simplification combines probabilities incorrectly. Additional information or detail may appear to conform to the overall scenario being forecast, even if it is largely irrelevant, and so add to confidence in the forecast. Further, the manager may be anchoring incorrectly on the long-run average. If she believes in a further gain in the stock market, then phased investment over a period of weeks or months may reduce the impact of volatility on timing investment on any single day or month.

Combining this event—a stock market fall in September—with an expectation of a rise in subsequent months to support the manager’s belief inappropriately combines probabilities and reflects the **conjunction fallacy**. The probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone. The probability of a market fall in September is 0.55, the probability of a market rise over the subsequent 12 months is 0.7, and the two events are independent. Therefore, the probability of the two events occurring in the outlined scenario is just 0.385 ( $= 0.55 \times 0.7$ ). This probability is lower than the probability of either individual event. However, the investment manager and the client may suffer from a confirmation bias that makes the additional detail appear supportive of her belief. The information is not being analyzed in a rigorous way. Essentially, the proposal to the client is a sequence of apparently connected events (a story). The added detail in actuality suggests that the assumed scenario is less likely than she asserts, but offers misleading vividness and detail that is being misinterpreted.

## 6.3. Remedial Actions for Analyst Biases in Conducting Research

Given the errors and overconfidence in forecasts, analysts should focus on more objective data such as trailing earnings. However, even reported earnings may be affected by operating and accounting choices made by management. In making forecasts, analysts should *evaluate previous forecasts* and be wary of anchoring and adjustment.

Emotional biases are difficult to deal with and can impact the search process, thereby compromising any subsequent analysis. The solution is to *collect information in a systematic way* and, where possible, use metrics and ratios that allow comparability—comparability in both analysis with previous calculations and also, where possible, benchmarked against current similar calculations. Information should be questioned and assessed relative to its

context. It is important when gathering information to use a *systematic approach* with prepared questions. Information should be gathered before analysis is done and a conclusion has been made. In conducting analysis, CFA Institute members and candidates are expected to comply with Standard V of the *Standards of Practice Handbook*.

An analyst should attempt to *assign probabilities*, particularly to underlying base rates of prevalence. It is a human failing to assume that some outcomes are either impossible or certain. Once base rates or events are assessed with other than 0 or 100 percent likelihood, a Bayesian approach to combining evidence will force the conclusion away from unlikely scenarios.

Analysts need to *consider the search process*, the limits of information, and the context of the information. A *structured process* for information gathering and processing can help analysts deal with search biases. A search process should involve *seeking contrary facts and opinions*. Online data gathering or news services can be set to provide information that avoids some search biases. Without structure in the search for information, it is possible for analysts simply to collect more confirmatory evidence while overlooking contradictory information. Clear unambiguous forecasts can help address this shortcoming; confirmatory bias may be greater with complex forecasts that can be easier to appear to confirm.

Having a structured search process and a clear way of *incorporating evidence sequentially*, either as decision rules (trees) or using Bayes' formula, can encourage much faster adaptation of forecasts. *Prompt feedback* not only allows re-evaluation but also helps analysts to gain knowledge and experience that can be drawn on in the future, either consciously or unconsciously (intuitively).

Identifying faulty searches or stories (an excess of representative but less relevant information) is difficult. However, experts' arguments should include some contrary evidence. In a report or forecast, this evidence may be introduced by the use of such words as "however" rather than words that simply reinforce a belief or conclusion, such as "moreover." Vivid and specific illustration in support of an argument may indicate representativeness and availability biases, whereas many good analysts' reports will admit to some abstract unknowns and admit some contrary evidence.

Although analysts should *document* their decision making to assist later evaluation, some of the documentation may be best done once the analysis is complete. Studies suggest that the process of providing explanations can diminish an expert's ability to draw on his or her intuition. Stories can also overwrite nuances and actual knowledge, and they may represent less creative solutions. The amount of knowledge that can be conveyed in a written or spoken answer is small compared with the store of knowledge and decision rules stored in one's head. Spoken and written language can encourage linear thinking, whereas actual decision making is a more complex weighting of different unconnected factors. The nuances of judgment can be hard to verbalize.

Remedial actions include using consistent data, evaluating previous forecasts, taking a systematic and structured approach, assigning probabilities, seeking contrary facts and opinions, incorporating evidence sequentially, having prompt feedback, and documenting the process.

## “Superforecasting”

To combat biases, one must take a disciplined approach to decision making. A quantitative process often comes to mind—letting the emotionless computer drive the analysis, via the use of statistics or simulation. However, a program is only as robust as the programmers who wrote it. Human creativity, as outlined in *Superforecasting* (Tetlock and Gardner, 2015), and the qualitative route can be just as effective in achieving high-quality decisions. “Machines may get better at ‘mimicking human meaning,’ and thereby better at predicting human behavior, but ‘there’s a difference between *mimicking* and... *originating meaning*.’ (p. 22).” Human beings still have the edge in terms of lateral thinking but to do so requires focus and commitment. Ultimately, pairing humans and computers, thus building on each other’s strengths and mitigating each other’s weaknesses, may offer the most robust long-term investment system.

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## 7. HOW BEHAVIORAL FACTORS AFFECT COMMITTEE DECISION MAKING

- f. discuss how behavioral factors affect investment committee decision making and recommend techniques for mitigating their effects;

Many investment decisions are made by groups or committees rather than by individuals acting alone. Examples include analyst stock recommendations that need to be approved by research committees and the asset allocation and fund manager selection decisions of a pension plan made by a board of trustees or some other group of fiduciaries. Often, the motivation for using a group decision is the idea that “two heads are better than one.” More formally, the application to a task of a number of individuals, each with different skills and experiences, can be expected to allow for more effective decision making.

Individual decision making is affected by behavioral biases, and a variety of behavioral biases are relevant to investment decisions made by individuals whether they are private or professional investors. Individuals can be overconfident in their information and their ability to forecast earnings or pick winning investments. They can be anchored by irrelevant values, such as past stock prices, or too conservative in updating beliefs in the face of new information, such as earnings forecasts. They can be loss averse and reluctant to close out a position at a loss, even if on an objective basis the future prospects of the investment have deteriorated. As we consider investment committee decision making, we need to evaluate the implications of these individual biases for group decision making. The group process may mitigate a bias or it may exacerbate it. We also need to consider whether the group decision-making process creates additional biases.

Analysts will often work with research teams, and the group environment can have an impact on their own research. Although this arrangement can set standards for good professional work, and provide a cultural and analytical framework for that work, individuals are subject to biases that can compromise their research.

**Social proof** is a bias in which individuals are biased to follow the beliefs of a group. Analysts may wrongly favor the judgment or endorsement of others, often without being fully aware that they are doing so. This behavior can adversely affect analytical work. For example, a buy-side analyst's investment view might be influenced by his or her team's investment position.

Groups may also amplify individual behavioral biases. The process of reaching a consensus will usually narrow the range of views. If a group-decision process does not encourage private information held by individual analysts to be shared fully with others before a decision is made, the decision may fail to combine the collective wisdom of the group. Group judgments are potentially better than individual ones, but biases mean that the group may not perform optimally. Typically, a group will have more confidence in its decisions after discussion that leads to an overconfidence bias.

## 7.1. Investment Committee Dynamics

All of the biases present in individuals can be present in investment committee decisions. A group environment may increase them. [Wood \(2006\)](#) cites an example in which his investment recommendation to a committee of a purchase of Ford Motor Company shares was rejected because of the chair's own poor experience with the company's products. Other committee members immediately supported and reinforced the chair's view despite it being based on weak anecdotal evidence:

... the rest of the committee chimed in to support the chair's verdict. Any disagreement



with people in power is reflected by the Japanese proverb, “the nail that sticks up gets hammered down.” Prior experience with group behavior teaches most members to preserve consensus or face the consequences. (p. 30)

There is little evidence in this instance of two heads being better than one. In essence, the committee merely acted to support the judgment of one head, the chair. In general, decision makers are most likely to learn to control harmful behavioral biases in situations where the decision makers have repeated attempts at the decision and there is good quality feedback on prior outcomes. It follows that investment committee decision making should be improved by carefully analyzing and learning from past decisions. [Wood \(2006\)](#) argues that this rarely happens, and changing committee membership is particularly unhelpful in this regard:

Committees notoriously do not learn from experience. Feedback is a learning mechanism, but feedback from most decisions, when available, is often slow and generally inaccurate. Committees rarely keep track of decisions well enough or long enough to identify systematic biases that creep into their deliberations. Without feedback, people struggle to understand what works and what does not. (p. 32)

## **7.2. Techniques for Structuring and Operating Committees to Address Behavioral Factors**

We might ask why the logic of “two heads are better than one” often fails to apply in committees in practice. [Wood \(2006\)](#) makes an important distinction between crowds and committees. A crowd is a random collection of individuals. For example, in the TV game show “Who Wants to Be a Millionaire?” contestants can opt to ask the studio audience to help identify the correct multiple choice answer to a question. The majority opinion of the audience (a crowd) has been correct 91 percent of the time ([Surowieki 2004](#)). Most investment committees fall well short of a 91 percent hit rate.

The main difference is that crowds are diverse, with individuals having varied backgrounds and experiences. Furthermore, in situations like asking the audience, members of the crowd give their own best opinion without consulting, and thus potentially avoid being influenced by other crowd members. In contrast, committees are often made up of individuals with similar backgrounds who are likely to approach decisions in a similar way. Committee decisions are discussed and debated, and as a result, individuals may moderate their own views to fit in with the consensus or may feel pressure to agree with views expressed by powerful individuals on the committee. It follows that committee decision making is likely to be enhanced when a committee is made up of members from diverse backgrounds who are independent enough to express and support their own views rather than falling into line with the views of others. However, assembling and managing such diverse and opinionated committees is likely to be challenging.



The chair of a committee has an important role in ensuring the effectiveness of the committee's decision making. As noted earlier, this responsibility includes assembling a diverse group of individuals with relevant skills and experiences and creating a culture in which members can express dissenting views. The chair is also responsible for ensuring that the committee sticks to the agenda and making sure a clear decision is reached after the various opinions have been heard. The chair should actively encourage alternative opinions so that all perspectives are covered. In turn, committee members have a responsibility to actively contribute their own information and knowledge and not simply fall into line with the consensus for the sake of harmony.

Teams that are diverse in skills, experience, and culture may be less prone to social proof bias. Different perspectives and contrary views are more likely to emerge in a diverse group. Ensuring professional respect between all members of the group and maintaining analysts' self-esteem can help each member contribute to group judgment, even if the views expressed are contrary to group norms. An individual expressing strong contrarian views within the group can help in avoiding too quick of a move to consensus before all the evidence is discussed. The risk of suppressed privately held information by individuals can be reduced if a group leader collects some of the individual views in advance of a discussion.

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## 8. HOW BEHAVIORAL FINANCE INFLUENCES MARKET BEHAVIOR

- g. describe how behavioral biases of investors can lead to market characteristics that may not be explained by traditional finance.

Much of the day-to-day work of investment professionals will be within the framework of efficient markets. This framework provides a useful set of tools for investment analysis, portfolio management, and risk management. Over time, academic papers have broadened the understanding of market efficiency. However, this understanding still does not explain some persistent market patterns. Behavioral finance does offer some explanation of these exceptions to market efficiency, and this reading focuses on the biases that contribute to these anomalies. Investment professionals should view an understanding of these biases as complementary to their knowledge of market efficiency, thus allowing a greater range of stock market and investor behavior to be explained.

### 8.1. Defining Market Anomalies

Efficient markets should not deliver abnormal returns. Research has identified puzzles or persistent features of market behavior that appear to contradict the efficient markets hypothesis. On closer examination, not all necessarily contradict the hypothesis. Note that the hypothesis does not rule out small abnormal returns if transaction costs and expenses are taken into account. Closed-end fund discounts, for example, do not offer a profitable strategy to trade when transaction costs are allowed.

**Anomalies** (apparent deviations from the efficient market hypothesis) are persistent abnormal returns that differ from zero and are predictable after calculating what constitutes normal returns relative to the risk in the asset pricing model used. Anomalous behavior can be indicative of shortcomings in the asset pricing model. When high returns persist on a particular claim unrelated to a specific factor in valuation, it might simply be a compensation for risk, not genuinely anomalous. Fama (1998) states that if a reasonable claimant for estimating abnormal returns causes an anomaly to disappear, then the anomaly is an illusion. He includes in this category apparently low initial returns on public offerings (called the “IPO puzzle”) and the positive abnormal returns 12 months after a stock split.

Some apparent anomalies may be explained by the small samples used, biases in selection or survivorship, or data mining that overanalyzes data and finds spurious correlations as relevant. The magnitude of any over- or under-reaction is critically on the choice of benchmark, which can make it hard to interpret. One with data mining is that the anomaly may not persist out of sample. The Super Bowl indicator,<sup>9</sup> a spurious correlation, correctly “predicted” the direction of three US market indexes 27 out of 30 times. But it then indicated the opposite direction in the following row, delivering an accurate result in just 7 out of the next 13 years. If the correlation between the outcome of a sporting event and stock market performance is not explained, it is not surprising that the Super Bowl indicator has turned out to be a poor predictor.

Also, from time to time, markets can present *temporary disequilibrium* features that may survive for a period of years but ultimately disappear. A market anomaly, which draws attention to the pattern, can start the arbitrage behavior. For example, the small company January effect, part of which does not appear persistent once appropriate adjustment for risk is made. The January effect involving lower stock market returns on Mondays, appears to have been observed in the United States and United Kingdom. However, the market anomalies discussed here are behavior that has been identified and analyzed in a number of markets and at different time periods. The patterns have been documented in many studies and broadly similar conclusions.

Some of these market features may be attributed to rational behavior.







































































# Study Session 2

## Capital Market Expectations

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A necessary task in the investment management process is to formulate capital market expectations. These forecasts of risk and return for various asset classes form the basis for constructing portfolios that maximize expected return for given levels of risk.

This study session examines the process of setting capital market expectations and covers major tools of economic analysis. A central theme of both readings is that a disciplined approach to setting expectations will be rewarded. After outlining a framework for developing expectations and reviewing potential pitfalls, the first reading focuses on the use of macroeconomic analysis in setting expectations. The second reading in this session builds on that foundation to examine setting expectations for specific asset classes—fixed income, equities, real estate, and currencies.

## READING ASSIGNMENTS

- Reading 3** Capital Market Expectations, Part I: Framework and Macro Considerations  
by Christopher D. Piros, PhD, CFA
- Reading 4** Capital Market Expectations, Part II: Forecasting Asset Class Returns  
by Christopher D. Piros, PhD, CFA

# Reading 3

## Capital Market Expectations, Part 1: Framework and Macro Considerations

by Christopher D. Piros, PhD, CFA

*Christopher D. Piros, PhD, CFA (USA).*

Parts of this reading have been adapted from a former Capital Market Expectations reading authored by John P. Calverley, Alan M. Meder, CPA, CFA, Brian D. Singer, CFA, and Renato Staub, PhD

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss the role of, and a framework for, capital market expectations in the portfolio management process;
- b.** discuss challenges in developing capital market forecasts;
- c.** explain how exogenous shocks may affect economic growth trends;
- d.** discuss the application of economic growth trend analysis to the formulation of capital market expectations;
- e.** compare major approaches to economic forecasting;
- f.** discuss how business cycles affect short- and long-term expectations;
- g.** explain the relationship of inflation to the business cycle and the implications of inflation for cash, bonds, equity, and real estate returns;
- h.** discuss the effects of monetary and fiscal policy on business cycles;
- i.** interpret the shape of the yield curve as an economic predictor and discuss the relationship between the yield curve and fiscal and monetary policy;

- j. identify and interpret macroeconomic, interest rate, and exchange rate linkages between economies.

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# 1. INTRODUCTION & FRAMEWORK FOR DEVELOPING CAPITAL MARKET EXPECTATIONS

- a. discuss the role of, and a framework for, capital market expectations in the portfolio management process;

A noted investment authority has written that the “fundamental law of investing is the uncertainty of the future.”<sup>1</sup> Investors have no choice but to forecast elements of the future because nearly all investment decisions look toward it. Specifically, investment decisions incorporate the decision maker’s expectations concerning factors and events believed to affect investment values. The decision maker integrates these views into expectations about the risk and return prospects of individual assets and groups of assets.

This reading’s focus is **capital market expectations** (CME): expectations concerning the risk and return prospects of asset classes, however broadly or narrowly the investor defines those asset classes. Capital market expectations are an essential input to formulating a strategic asset allocation. For example, if an investor’s investment policy statement specifies and defines eight permissible asset classes, the investor will need to have formulated long-term expectations concerning each of those asset classes. The investor may also act on short-term expectations. Insights into capital markets gleaned during CME setting should also help in formulating the expectations concerning individual assets that are needed in security selection and valuation.

This is the first of two readings on capital market expectations. A central theme of both readings is that a disciplined approach to setting expectations will be rewarded. With that in mind, Sections 1 and 2 of this reading present a general framework for developing capital market expectations and alert the reader to the range of problems and pitfalls that await investors and analysts in this arena. Sections 3–11 focus on the use of macroeconomic analysis in setting expectations. The second of the two CME readings builds on this foundation to address setting expectations for specific asset classes: equities, fixed income, real estate, and currencies. Various analytical tools are reviewed as needed throughout both readings.

## 1.1. Framework and Challenges

In this section, we provide a guide to collecting, organizing, combining, and interpreting investment information. After outlining the process, we turn to a discussion of typical problems and challenges to formulating the most informed judgments possible.

Before laying out the framework, we must be clear about what it needs to accomplish. The ultimate objective is to develop a set of projections with which to make informed investment decisions, specifically asset allocation decisions. As obvious as this goal may seem, it has important implications.

Asset allocation is the primary determinant of long-run portfolio performance.<sup>2</sup> The projections underlying these decisions are among the most important determinants of whether investors achieve their long-term goals. It thus follows that it is vital to get the long-run *level* of returns (approximately) right. Until the late 1990s, it was standard practice for institutional investors to extrapolate historical return data into forecasts. At the height of the technology bubble,<sup>3</sup> this practice led many to project double-digit portfolio returns into the indefinite future. Such inflated projections allowed institutions to underfund their obligations and/or set unrealistic goals, many of which have had to be scaled back. Since that time, most institutions have adopted explicitly forward-looking methods of the type(s) discussed in our two CME readings, and return projections have declined sharply. Indeed, as of the beginning of 2018, consensus rate of return projections seemed to imply that US private foundations, which must distribute at least 5% of assets annually, could struggle to prudently generate long-run returns sufficient to cover their required distributions, their expenses, and inflation. To reiterate, projecting a realistic overall level of returns has to be a top priority.

As appealing as it is to think we could project asset returns with precision, that idea is unrealistic. Even the most sophisticated methods are likely to be subject to frustratingly large forecast errors over relevant horizons. We should, of course, seek to limit our forecast errors. We should not, however, put undue emphasis on the precision of projections for individual asset classes. Far more important objectives are to ensure internal consistency across asset classes (**cross-sectional consistency**) and over various time horizons (**intertemporal consistency**). This emphasis stems once again from the primary use of the projections—asset allocation decisions. Inconsistency across asset classes is likely to result in portfolios with poor risk–return characteristics over any horizon, whereas intertemporal inconsistency is likely to distort the connection between portfolio decisions and investment horizon.

Our discussion adopts the perspective of an analyst or team responsible for developing projections to be used by the firm’s investment professionals in advising and/or managing portfolios for its clients. As the setting of explicit capital market expectations has become both more common and more sophisticated, many asset managers have adopted this centralized approach, enabling them to leverage the requisite expertise and deliver more consistent advice to all their clients.

### 1.1.1. A Framework for Developing Capital Market Expectations

The following is a framework for a disciplined approach to setting CME.

1. *Specify the set of expectations needed, including the time horizon(s) to which they apply.* This step requires the analyst to formulate an explicit list of the asset classes and investment horizon(s) for which projections are needed.
2. *Research the historical record.* Most forecasts have some connection to the past. For many markets, the historical record contains useful information on the asset's investment characteristics, suggesting at least some possible ranges for future results. Beyond the raw historical facts, the analyst should seek to identify and understand the factors that affect asset class returns.
3. *Specify the method(s) and/or model(s) to be used and their information requirements.* The analyst or team responsible for developing CME should be explicit about the method(s) and/or model(s) that will be used and should be able to justify the selection.
4. *Determine the best sources for information needs.* The analyst or team must identify those sources that provide the most accurate and timely information tailored to their needs.
5. *Interpret the current investment environment using the selected data and methods, applying experience and judgment.* Care should be taken to apply a common set of assumptions, compatible methodologies, and consistent judgments in order to ensure mutually consistent projections across asset classes and over time horizons.
6. *Provide the set of expectations needed, documenting conclusions.* The projections should be accompanied by the reasoning and assumptions behind them.
7. *Monitor actual outcomes and compare them with expectations, providing feedback to improve the expectations-setting process.* The most effective practice is likely to synchronize this step with the expectations-setting process, monitoring and reviewing outcomes on the same cycle as the projections are updated, although several cycles may be required to validate conclusions.

The first step in the CME framework requires the analyst to define the universe of asset classes for which she will develop expectations. The universe should include all of the asset classes that will typically be accorded a distinct allocation in client portfolios. To put it another way, the universe needs to reflect the key dimensions of decision making in the firm's investment process. On the other hand, the universe should be as small as possible because even pared down to minimum needs, the expectations-setting process can be quite challenging.

Steps 2 and 3 in the process involve understanding the historical performance of the asset classes and researching their return drivers. The information that needs to be collected mirrors considerations that defined the universe of assets in step 1. The more granular the classification of assets, the more granular the breakdown of information will need to be to support the investment process. Except in the simplest of cases, the analyst will need to slice the data in multiple dimensions. Among these are the following:

- Geography: global, regional, domestic versus non-domestic, economic blocs (e.g., the European Union), individual countries;
- Major asset classes: equity, fixed-income, real assets;
- Sub-asset classes:
  - Equities: styles, sizes, sectors, industries;
  - Fixed income: maturities, credit quality, securitization, fixed versus floating, nominal or inflation-protected;
  - Real assets: real estate, commodities, timber.

How each analyst approaches this task depends on the hierarchy of decisions in their investment process. One firm may prioritize segmenting the global equity market by Global Industry Classification Standard (GIC) sector, with geographic distinctions accorded secondary consideration, while another firm prioritizes decisions with respect to geography considering sector breakdowns as secondary.<sup>4</sup>

In Step 3, the analyst needs to be sensitive to the fact that both the effectiveness of forecasting approaches and relationships among variables are related to the investor's time horizon. As an example, a discounted cash flow approach to setting equity market expectations is usually considered to be most appropriate to long-range forecasting. If forecasts are also to be made for shorter, finite horizons, intertemporal consistency dictates that the method used for those projections must be calibrated so that its projections converge to the long-range forecast as the horizon extends.

Executing the fourth step—determining the best information sources—requires researching the quality of alternative data sources and striving to fully understand the data. Using flawed or misunderstood data is a recipe for faulty analysis. Furthermore, analysts should be alert to new, superior data sources. Large, commercially available databases and reputable financial publications are likely the best avenue for obtaining widely disseminated information covering the broad spectrum of asset classes and geographies. Trade publications, academic studies, government and central bank reports, corporate filings, and broker/dealer and third-party research often provide more specialized information. Appropriate data frequencies must be selected. Daily series are of more use for setting shorter-term expectations. Monthly,

quarterly, or annual data series are useful for setting longer-term CME.

The first four steps lay the foundation for the heart of the process: the fifth and sixth steps. Monitoring and interpreting the economic and market environment and assessing the implications for relevant investments are activities the analyst should be doing every day. In essence, step five could be labelled “implement your investment/research process” and step six could be labelled “at designated times, synthesize, document, and defend your views.” Perhaps what most distinguishes these steps from the day-to-day investment process is that the analyst must make simultaneous projections for all asset classes and all designated, concrete horizons.

Finally, in step 7 we use experience to improve the expectations-setting process. We measure our previously formed expectations against actual results to assess the level of accuracy the process is delivering. Generally, good forecasts are:

- unbiased, objective, and well researched;
- efficient, in the sense of minimizing the size of forecast errors; and
- internally consistent, both cross-sectionally and intertemporally.

Although it is important to monitor outcomes for ways in which our forecasting process can be improved, our ability to assess the accuracy of our forecasts may be severely limited. A standard rule of thumb in statistics is that we need at least 30 observations to meaningfully test a hypothesis. Quantitative evaluation of forecast errors in real time may be of limited value in refining a process that is already reasonably well constructed (i.e., not subject to obvious gross errors). Hence, the most valuable part of the feedback loop will often be qualitative and judgmental.

## EXAMPLE 1

### Capital Market Expectations Setting: Information Requirements

Consider two investment strategists charged with developing capital market expectations for their firms, John Pearson and Michael Wu. Pearson works for a bank trust department that runs US balanced separately managed accounts (SMAs) for high-net-worth individuals. These accounts’ mandates restrict investments to US equities, US investment-grade fixed-income instruments, and prime US money market instruments. The investment objective is long-term capital growth and income. In contrast, Wu works for a large Hong Kong SAR-based, internationally focused asset manager that uses the following types of assets within its investment process:



Equities	Fixed Income	Alternative Investments
Asian equities	Eurozone sovereign	Eastern European
Eurozone	US government	venture capital
US large-cap		New Zealand timber
US small-cap		US commercial real
Canadian large-cap		estate

Wu's firm runs SMAs with generally long-term time horizons and global tactical asset allocation (GTAA) programs. Compare and contrast the information and knowledge requirements of Pearson and Wu.

### Guideline answer:

Pearson's in-depth information requirements relate to US equity and fixed-income markets. By contrast, Wu's information requirements relate not only to US and non-US equity and fixed-income markets but also to three alternative investment types with non-public markets, located on three different continents. Wu has a more urgent need to be current on political, social, economic, and trading-oriented operational details worldwide than Pearson. Given their respective investment time horizons, Pearson's focus is on the long term whereas Wu needs to focus not only on the long term but also on near-term disequilibria among markets (for GTAA decisions). One challenge that Pearson has in US fixed-income markets that Wu does not face is the need to cover corporate and municipal as well as government debt securities. Nevertheless, Wu's overall information and knowledge requirements are clearly more demanding than Pearson's.

## 2. CHALLENGES IN FORECASTING

- b. discuss challenges in developing capital market forecasts;

A range of problems can frustrate analysts' expectations-setting efforts. Expectations reflecting faulty analysis or assumptions may cause a portfolio manager to construct a portfolio that is inappropriate for the client. At the least, the portfolio manager may incur the

costs of changing portfolio composition without any offsetting benefits. The following sections provide guidance on points that warrant special caution. The discussion focuses on problems in the use of data and on analyst mistakes and biases.

## 2.1. Limitations of Economic Data

The analyst needs to understand the definition, construction, timeliness, and accuracy of any data used, including any biases. The time lag with which economic data are collected, processed, and disseminated can impede their use because data that are not timely may be of little value in assessing current conditions. Some economic data may be reported with a lag as short as one week, whereas other important data may be reported with a lag of more than a quarter. The International Monetary Fund sometimes reports data for developing economies with a lag of two years or more. Older data increase the uncertainty concerning the current state of the economy with respect to that variable.

Furthermore, one or more official revisions to initial data values are common. Sometimes these revisions are substantial, which may give rise to significantly different inferences. Often only the most recent data point is revised. Other series are subject to periodic “benchmark revisions” that simultaneously revise all or a portion of the historical data series. In either case—routine updating of the most recent release or benchmark revision—the analyst must be aware that using revised data as if it were known at the time to which it applies often suggests strong historical relationships that are unreliable for forecasting.

Definitions and calculation methods change too. For example, the US Bureau of Labor Statistics (BLS) made significant changes to the Consumer Price Index for All Urban Consumers (CPI-U) in 1983 (treatment of owner-occupied housing) and again in 1991 (regression-based product quality adjustments). Analysts should also be aware that suppliers of economic and financial indexes periodically **re-base** these indexes, meaning that the specific period used as the base of the index is changed. Analysts should take care to avoid inadvertently mixing data relating to different base periods.

## 2.2. Data Measurement Errors and Biases

Analysts need to be aware of possible biases and/or errors in data series, including the following:

- **Transcription errors.** These are errors in gathering and recording data.
- **Survivorship bias.** This bias arises when a data series reflects only entities that survived to the end of the period. Without correction, statistics from such data can be

misleading. Data on alternative assets such as hedge funds are notorious for survivorship bias.

- **Appraisal (smoothed) data.** For certain assets without liquid public markets, notably but not only real estate, appraisal data are used in lieu of transaction data. Appraised values tend to be less volatile than market-determined values. As a result, measured volatilities are biased downward and correlations with other assets tend to be understated.

## 2.3. The Limitations of Historical Estimates

Although history is often a helpful guide, the past should not be extrapolated uncritically. There are two primary issues with respect to using historical data. First, the data may not be representative of the future period for which an analyst needs to forecast. Second, even if the data are representative of the future, statistics calculated from that data may be poor estimates of the desired metrics. Both of these issues can be addressed to some extent by imposing structure (that is, a model) on how data is presumed to have been generated in the past and how it is expected to be generated in the future.

Changes in technological, political, legal, and regulatory environments; disruptions such as wars and other calamities; and changes in policy stances can all alter risk–return relationships. Such shifts are known as changes in **regime** (the governing set of relationships) and give rise to the statistical problem of **nonstationarity** (meaning, informally, that different parts of a data series reflect different underlying statistical properties). Statistical tools are available to help identify and model such changes or turning points.

A practical approach for an analyst to decide whether to use the whole of a long data series or only part of it involves answering two questions.

1. Is there any reason to believe that the entirety of the sample period is no longer relevant? In other words, has there been a fundamental regime change (such as political, economic, market, or asset class structure) during the sample period?
2. Do the data support the hypothesis that such a change has occurred?

If the answer to both questions is yes, the analyst should use only that part of the time series that appears relevant to the present. Alternatively, he may apply statistical techniques that account for regime changes in the past data as well as the possibility of subsequent regime changes. [Exhibit 1](#) illustrates examples of changes in regime.

## Exhibit 1. Regimes and the Relevance of Historical Bond Returns

In the 1970s, oil price shocks combined with accommodative monetary policy by the US Federal Reserve fueled sharply rising inflation. In 1980, the Fed abruptly shifted to an aggressively tight stance. After the initial shock of sharply higher interest rates, US bond yields trended downward for roughly 35 years as the Fed kept downward pressure on inflation. Throughout the 1980s and 1990s, the Fed eased monetary policy in the aftermath of the technology bubble. Then, switching to an extraordinarily expansionary policy in the midst of the 2008–2009 global financial crisis, the Fed reduced its policy rate to 0% in December 2008.

Subsequently, it aggressively bought Treasury bonds and mortgage-backed securities. The Fed finally raised its policy rate target in December 2015. In October 2017, it stopped rolling over maturing bonds, allowing its balance sheet to shrink, albeit very slowly. It can be argued that bond returns from the 1970s through 2015 reflect at least three distinct regimes: the inflationary 1970s with accommodative Fed policy, the 1980–2008 period of disinflationary policy and secularly falling yields, and the unprecedented 2009–2015 period of zero interest rates and explosive liquidity provision. As of mid-2018, nominal interest rates were still negative in some developed markets, and major central banks including the Fed were aiming to “normalize” policy over the next few years. There is ample reason to believe that future bond returns will reflect a regime like none before.

In general, the analyst should use the longest data history for which there is reasonable assurance of stationarity. This guideline follows from the fact that sample statistics from a longer history are more precise than those with fewer observations. Although it is tempting to assume that using higher-frequency data (e.g., monthly rather than annual observations) will also provide more-precise estimates, this assumption is not necessarily true. Although higher-frequency data improve the precision of sample variances, covariances, and correlations, they do *not* improve the precision of the sample mean.

When many variables are considered, a large number of observations may be a statistical necessity. For example, to calculate a sample covariance matrix, the number of observations must exceed the number of variables (assets). Otherwise, some asset combinations (i.e., portfolios) will spuriously appear to have zero volatility. This problem arises frequently in investment analysis, and a remedy is available. Covariance matrices are routinely estimated even for huge numbers of assets by assuming that returns are driven by a smaller set of common factors plus uncorrelated asset-specific components.

As the frequency of observations increases, the likelihood increases that data may be asynchronous (i.e., not simultaneous or concurrent in time) across variables. This means that

data points for different variables may not reflect exactly the same period even though they are labeled as if they do. For example, daily data from different countries are typically asynchronous because of time zone differences. Asynchronicity can be a significant problem for daily, and perhaps even weekly data, because it distorts measured correlations and induces lead–lag relationships that might not exist if the data were measured synchronously. Lower-frequency data (e.g., monthly or quarterly) are less susceptible to asynchrony, although it can still arise. For example, two series that are released and labeled as monthly could reflect data collected at different times of the month.

As a final note on historical data, some care should be taken with respect to whether data are normally distributed. Historical asset returns, in particular, routinely exhibit skewness and “fat tails,” which cause them to fail formal tests of normality. The cost in terms of analytical complexity of accounting for non-normality, however, can be quite high. As a practical matter, the added complexity is often not worth the cost.<sup>5</sup>

## 2.4. Ex Post Risk Can Be a Biased Measure of Ex Ante Risk

In interpreting historical prices and returns over a given sample period, the analyst needs to evaluate whether asset prices reflected the possibility of a very negative event that did not materialize during the period. This phenomenon is often referred to as the “peso problem.” Looking backward, we are likely to underestimate *ex ante* risk and overestimate *ex ante* anticipated returns. The key point is that high *ex post* returns that reflect fears of adverse events that did not materialize provide a poor estimate of *ex ante* expected returns.

### The 1970s Peso Devaluation

In the mid-1970s, the Mexican peso was pegged to the US dollar, but peso-denominated interest rates were persistently well above corresponding dollar rates because investors feared the Mexican government would devalue the peso. In 1976, the peso was indeed devalued by nearly 50%, but data from before that event would suggest that holding the peso was a high expected return, low risk strategy.

The opposite situation is also a problem, especially for risk measures that consider only the subset of worst-case outcomes (e.g., value at risk, or VaR). If our data series includes even one observation of a rare event, we may substantially overstate the likelihood of such events

happening in the future. Within a finite sample, the observed frequency of this bad outcome will far exceed its true probability. As a simple example, there were 21 trading days in July 2018. On 26 July, the price of Facebook stock closed down 19%. Based on this sample, the (interpolated) daily 5% VaR on Facebook stock is 17.3%. That is, an investor in Facebook shares would expect to lose at least 17.3% once every 20 days.

## 2.5. Biases in Analysts' Methods

Analysts naturally search for relationships that will help in developing better capital market expectations. Among the preventable biases that the analyst may introduce are the following:

- **Data-mining bias** arises from repeatedly searching a dataset until a statistically significant pattern emerges. It is almost inevitable that some relationship will appear. Such patterns cannot be expected to have predictive value. Lack of an explicit economic rationale for a variable's usefulness is a warning sign of a data-mining problem: no story, no future.<sup>6</sup> Of course, the analyst must be wary of inventing the story after discovering the relationship and bear in mind that correlation does not imply causation.
- **Time-period bias** relates to results that are period specific. Research findings often turn out to be sensitive to the selection of specific starting and/or ending dates.

### Small Cap Outperformance and Time-Period Bias

Evidence suggesting that small-cap stocks outperform large-cap stocks over time (the so-called small firm effect) is very sensitive to the choice of sample period. From 1926 through 1974, US small-cap stocks outperformed large caps by 0.43% per year, but if we skip the Great Depression and start in 1932, the differential becomes 3.49% per year. Similarly, small caps outperformed by 3.46% per year from 1975 through 2016 but by only 0.09% per year from 1984 through 2016. In the nine years from 1975 through 1983, small caps outperformed by 16.85% per year!<sup>7</sup>

How might analysts avoid using an irrelevant variable in a forecasting model? The analyst should scrutinize the variable selection process for data-mining bias and be able to provide an economic rationale for the variable's usefulness in a forecasting model. A further practical

check is to examine the forecasting relationship out of sample (i.e., on data that was not used to estimate the relationship).

## 2.6. The Failure to Account for Conditioning Information

The discussion of regimes introduced the notion that assets' risk and return characteristics vary with the economic and market environment. That fact explains why economic analysis is important in expectation setting. The analyst should not ignore relevant information or analysis in formulating expectations. Unconditional forecasts, which dilute this information by averaging over environments, can lead to misperception of prospective risk and return.

[Exhibit 2](#) illustrates how an analyst may use conditioning information.

### Exhibit 2. Incorporating Conditioning Information

Noah Sota uses the CAPM to set capital market expectations. He estimates that one asset class has a beta of 0.8 in economic expansions and 1.2 in recessions. The expected return on the market is 12% in an expansion and 4% in a recession. The risk-free rate is assumed to be constant at 2%. Expansion and recession are equally likely. Sota aims to calculate the unconditional expected return for the asset class.

The conditional expected returns on the asset are  $10\% = 2\% + 0.8 \times (12\% - 2\%)$  in an expansion and  $4.4\% = 2\% + 1.2 \times (4\% - 2\%)$  in a recession. Weighting by the probabilities of expansion and recession, the unconditional expected return is  $7.2\% = [(0.5 \times 10\%) + (0.5 \times 4.4\%)]$ .

### EXAMPLE 2

## Ignoring Conditioning Information

Following on from the scenario in [Exhibit 2](#), one of Noah Sota's colleagues suggests an alternative approach to calculate the unconditional expected return for the asset class. His method is to calculate the unconditional beta to be used in the CAPM formula,  $1.0 = (0.5 \times 0.8) + (0.5 \times 1.2)$ . He then works out the unconditional expected return on the market portfolio,  $8\% = (0.5 \times 12\%) + (0.5 \times 4\%)$ . Finally, using the unconditional beta and the unconditional market return, he calculates the unconditional expected return on the asset class as  $8.0\% = 2.0\% + 1.0 \times (8\% - 2\%)$ .



Explain why the alternative approach is right or wrong.

### Guideline answer

The approach suggested by Sota's colleague is wrong. It ignores the fact that the market excess return and the asset's beta vary with the business cycle. The expected return of 8% calculated this way would overestimate the (unconditional) expected return on this asset class. Such a return forecast would ignore the fact that the beta differs for expansion (0.8) and recession (1.2).

## 2.7. Misinterpretation of Correlations

When a variable  $A$  is found to be significantly correlated with another variable  $B$ , there are at least four possible explanations: (1)  $A$  predicts  $B$ , (2)  $B$  predicts  $A$ , (3) a third variable  $C$  predicts both  $A$  and  $B$ , or (4) the relationship is spurious. The observed correlation alone does not allow us to distinguish among these situations. Consequently, correlation relationships should not be used in a predictive model without investigating the underlying linkages.

Although apparently significant correlations can be spurious, it is also true that lack of a strong correlation can be misleading. A negligible measured correlation may reflect a strong but *nonlinear* relationship. Analysts should explore this possibility if they have a solid reason for believing a relationship exists.

## 2.8. Psychological Biases

The behavioral finance literature documents a long and growing list of psychological biases that can affect investment decisions. Only a few of the more prominent ones that could undermine the analyst's ability to make accurate and unbiased forecasts are outlined here. Furthermore, note that the literature contains various names and definitions of behavioral biases, which are not necessarily mutually exclusive.

- **Anchoring bias** is the tendency to give disproportionate weight to the first information received or first number envisioned, which is then adjusted. Such adjustment is often insufficient, and approximations are consequently biased. Analysts can try to avoid anchoring bias by consciously attempting to avoid premature conclusions.
- **Status quo bias** reflects the tendency for forecasts to perpetuate recent observations—



that is, to avoid making changes and preserve the status quo, and/or to accept a default option. This bias may reflect greater pain from errors of commission (making a change) than from errors of omission (doing nothing). Status quo bias can be mitigated by disciplined effort to avoid “anchoring” on the status quo.

- **Confirmation bias** is the tendency to seek and overweight evidence or information that confirms one’s existing or preferred beliefs and to discount evidence that contradicts those beliefs. This bias can be mitigated by examining all evidence with equal rigor and/or debating with a knowledgeable person capable of arguing against one’s own views.
- **Overconfidence bias** is unwarranted confidence in one’s own intuitive reasoning, judgment, knowledge, and/or ability. This bias may lead an analyst to overestimate the accuracy of her forecasts and/or fail to consider a sufficiently broad range of possible outcomes or scenarios. Analysts may not only fail to fully account for uncertainty about which they are aware (sometimes described as “known unknowns”) but they also are very likely to ignore the possibility of uncertainties about which they are not even aware (sometimes described as “unknown unknowns”).
- **Prudence bias** reflects the tendency to temper forecasts so that they do not appear extreme or the tendency to be overly cautious in forecasting. In decision-making contexts, one may be too cautious when making decisions that could damage one’s career or reputation. This bias can be mitigated by conscious effort to identify plausible scenarios that would give rise to more extreme outcomes and to give greater weight to such scenarios in the forecast.
- **Availability bias** is the tendency to be overly influenced by events that have left a strong impression and/or for which it is easy to recall an example. Recent events may likewise be overemphasized. The effect of this bias can be mitigated by attempting to base conclusions on objective evidence and analytical procedures.

### EXAMPLE 3

## Biases in Forecasting and Decision Making

Cynthia Casey is a London-based investment adviser with a clientele of ultra-high-net-worth individuals in the UK, the US, and the EU. Within the equity portion of her portfolios, she rarely deviates significantly from the country weightings of the MSCI World Index, even though more often than not she tilts the allocation in the right direction. Hence, she can claim a good tactical track record despite having added little value in terms of return through tactical allocation. Because most investors have an implicit “home bias,” her European clients tend to view their portfolios as significantly

overweight the US (nearly 50% of the World index) and are happy because the US market outperformed the MSCI World ex-US Index by about 4% per year over the 10 years ending September 2018. Conversely, her US clients are unhappy because Casey persistently projected US outperformance but maintained what they instinctively perceive as a significant underweight in the United States. Citing year-to-date performance as of 28 September 2018—US up 9%, World ex-US down 1%, with 10 of 15 European markets down in local currencies—Casey’s US clients are pressuring her to aggressively increase allocations to US equities. Although experience has taught her to be wary of chasing a strong market, Casey vividly remembers losing clients in the late 1990s because she doubted that the explosive rally in technology stocks would be sustained. With that in mind, she has looked for and found a rationale for a bullish view on US stocks—very robust year-to-date earnings growth.

What psychological biases are Casey and her clients exhibiting?

### Guideline answer

Casey’s clients are implicitly anchoring their expectations on the performance of their respective domestic markets. In pressing Casey to increase the allocation to US stocks based on recent outperformance, her US clients are clearly projecting continuation of the trend, a status quo bias. Casey herself is exhibiting several biases. Prudence bias is apparent in the fact that she has a good record of projecting the correct direction of relative performance among markets but has not translated that into reallocations large enough to add meaningful value. We cannot assess whether that bias affects the magnitude of her forecasts, the extent to which she responds to the opportunities, or both. Losing clients when she doubted the sustainability of the late 1990s technology rally made a very strong impression on Casey, so much so that she has apparently convinced herself to look for a reason to believe the recent relative performance trends will persist. This is indicative of availability bias. Searching for evidence to support a favored view (continued strength of the US market) is a clear sign of confirmation bias, whereas finding support for that view in the recent strength of earnings growth reflects status quo bias.

## 2.9. Model Uncertainty

The analyst usually encounters at least three kinds of uncertainty in conducting an analysis. **Model uncertainty** pertains to whether a selected model is structurally and/or conceptually correct. **Parameter uncertainty** arises because a quantitative model’s parameters are invariably estimated with error. **Input uncertainty** concerns whether the inputs are correct.

Any or all of these may give rise to erroneous forecasts and/or cause the unwary analyst to overestimate the accuracy and reliability of his forecasts.

The effects of parameter uncertainty can be mitigated through due attention to estimation errors. Input uncertainty arises primarily from the need to proxy for an unobservable variable such as “the market portfolio” in the CAPM. Whether or not this is a serious issue depends on the context. It is a problem if the analyst wants to test the validity of the underlying theory or identify “anomalies” relative to the model. It is less of an issue if the analyst is merely focused on useful empirical relationships rather than proof of concept/theory. Model uncertainty is potentially the most serious issue because the wrong model may lead an analyst to fundamentally flawed conclusions.

Our discussion of the limitations of historical data touched on a model that led many investors far astray in the late 1990s. Up to that point, the implicit model used by many, if not most, institutional investors for setting long-term equity expectations was, “The *ex ante* expected return is, was, and always will be a constant number  $\mu$ , and the best estimate of that number is the mean over the longest sample available.” As the market soared in the late 1990s, the historical estimate of  $\mu$  rose steadily, leading investors to shift more heavily into equities, which fueled further price appreciation and more reallocation toward equities, and so on, until the technology bubble burst. Ironically, belief in the sanctity of historical estimates coincided with the diametrically opposed notion that the “new economy” made historical economic and market relationships obsolete. There seemed to be no limits to growth or to valuations, at least in some segments of the market. But, of course, there were. This description of the technology bubble illustrates the breakdown of a particular forecasting model. It is not a literal description of anyone’s thought process. For various reasons, however—competitive pressures, status quo/availability/prudence biases—many investors acted *as if* they were following the model.

Another flawed model unraveled during the global financial crisis of 2007–2009. One component of that model was the notion that housing price declines are geographically isolated events: There was no risk of a nationwide housing slump. A second component involved “originate to sell” loan pipelines: businesses that made loans with the intention of immediately selling them to investors and therefore had very little incentive to vet loan quality. A third component was the notion that the macro risk of an ever-growing supply of increasingly poor-quality mortgages could be diversified away by progressive layers of securitization. End investors were implicitly sold the notion that the securities were low risk because numerous computer simulations showed that the “micro” risk of individual loans was well diversified. The macro risk of a housing crisis, however, was not reflected in prices and yields—until, of course, the model proved to be flawed. The scenario highlighted here provides another illustration of a particular model breaking down. In this case, it was a flawed model of risk and diversification, and its breakdown was one of many aspects of the financial crisis.

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## 3. ECONOMIC AND MARKET ANALYSIS: THE ROLE OF ECONOMIC ANALYSIS AND ANALYSIS OF ECONOMIC GROWTH: EXOGENOUS SHOCKS TO GROWTH

- c. explain how exogenous shocks may affect economic growth trends;

The previous section outlined various pitfalls in forecasting. Each of these is important. Yet they pale in comparison to a fundamental mistake: losing sight of the fact that investment outcomes are inherently linked to the economy. The technology bubble and the global financial crisis offer two extreme illustrations of the consequences of falling into this trap. Less dramatic, but still consequential, instances of this mistake regularly contribute to the differential investment performance that separates “winners” and “losers.” The remainder of this reading is dedicated to effective incorporation of economic and market analysis into capital market expectations.

### 3.1. The Role of Economic Analysis

History has shown that there is a direct yet variable relationship among actual realized asset returns, expectations for future asset returns, and economic activity. Analysts need to be familiar with the historical relationships that empirical research has uncovered concerning the direction, strength, and lead–lag relationships between economic variables and capital market returns.

The analyst who understands which economic variables may be most relevant to the current economic environment has a competitive advantage, as does the analyst who can discern or forecast changes in acceleration and deceleration of a trend.

Economic output has both cyclical and trend growth components. Trend growth is of obvious relevance for setting long-term return expectations for asset classes such as equities. Cyclical variation affects variables such as corporate profits and interest rates, which are directly related to asset class returns and risk. In the following sections, we address trend growth, business cycles, the role of monetary and fiscal policies, and international interactions.

### 3.2. Analysis of Economic Growth

The economic growth trend is the long-term average growth path of GDP around which the economy experiences semi-regular business cycles. The analyst needs to understand and analyze both the trend and the cycles. Though each could exist without the other, they are related.

It might seem that trends are inherently easier to forecast than cycles. After all, trends are about long-term averages, whereas cycles are about shorter-term movements and turning points. The assumption that trends are easier to forecast would be true if trend growth rates were constant. But trend growth rates do change, which is what makes forecasting them relevant for investment analysis. Some changes are fairly easy to forecast because they are driven by slowly evolving and easily observable factors such as demographics. Trend changes that arise from significant “exogenous shocks” to underlying economic and/or market relationships are not only impossible to foresee but also difficult to identify, assess, and quantify until the change is well-established and retrospectively revealed in the data. Virtually by definition, the effect of truly exogenous shocks on the level and/or growth rate of the economy will not have been built into asset prices in advance—although the risk of such events will likely have been reflected in prices to some degree.

### **3.2.1. Exogenous Shocks to Growth**

Shocks arise from various sources. Some are purely domestic. Others are transmitted from other parts of the globe. Some are negative for potential growth, while others enhance it. Significant shocks typically arise from the following:

- **Policy changes.** Elements of pro-growth government policies include sound fiscal policy, minimal intrusion on the private sector, encouraging competition within the private sector, support for infrastructure and human capital development, and sound tax policies. Any significant, unexpected change in these policies that is likely to persist will change the expected trend rate of growth. The overhaul of US business taxes at the end of 2017, although not entirely unexpected, was intended to be a pro-growth change in policy. On the other hand, standard economic arguments indicate that erecting trade barriers will diminish trend growth.
- **New products and technologies.** Creation and assimilation of new products, markets, and technologies enhances potential growth. Consider the printing press, steam engine, telegraph and telephone, railroad, automobile, airplane, transistor, random-access memory (RAM), integrated circuits, internet, wireless communication (radio, TV, smartphone), rockets, and satellites, to name just a few.
- **Geopolitics.** Geopolitical conflict has the potential to reduce growth by diverting resources to less economically productive uses (e.g., accumulating and maintaining weapons, discouraging beneficial trade). The fall of the Berlin wall, which triggered

German reunification and a “peace dividend” for governments as they cut defense spending, was a growth-enhancing geopolitical shock. Interestingly, geopolitical tensions (e.g., the space race) can also spur innovation that results in growth-enhancing technologies.

- **Natural disasters.** Natural disasters destroy productive capacity. In the short run, a disaster is likely to reduce growth, but it may actually enhance long-run growth if old capacity is replaced with more efficient facilities.
- **Natural resources/critical inputs.** Discovery of new natural resources or of new ways to recover them (e.g., fracking) can be expected to enhance potential growth, directly via production of those resources and indirectly by reducing the cost of production for other products. Conversely, sustained reduction in the supply of important resources diminishes growth (e.g., the OPEC oil shock in 1973).
- **Financial crises.** The financial system allows the economy to channel resources to their most efficient use. Financial crises arise when market participants lose confidence in others’ ability (or willingness) to meet their obligations and cease to provide funding—first to specific counterparties and then more broadly as potential losses cascade through the system. As discussed in [Exhibit 3](#), a financial crisis may affect both the level of output and the trend growth rate.

### Exhibit 3. Trend Growth after a Financial Crisis

An extensive study of growth and debt dynamics in the wake of the 2007–2009 global financial crisis identified three types of crises:

- Type 1: A persistent (permanent, one-time) decline in the level of output, but the subsequent trend rate of growth is unchanged.
- Type 2: No persistent decline in the level of output, but the subsequent trend rate of growth is reduced.
- Type 3: Both a persistent decline in the level of output and a reduction in the subsequent trend rate of growth.

The Eurozone experienced a sharp, apparently permanent drop in output after the global financial crisis, and subsequent growth was markedly lower than before the crisis, suggesting a Type 3 crisis.

The Eurozone’s stagnant growth may be traced to structural problems in conjunction with policy missteps. Structural issues included rigid labor markets, a relatively rapid aging of the population, legal and regulatory barriers, cultural

differences among countries, use of a common currency in dissimilar economies, and lack of a unified fiscal policy. In terms of policy response, the European Central Bank was slow to cut rates, was slow to expand its balance sheet, and failed to sustain that expansion. Insolvent banks were allowed to remain operational, thwarting deleveraging of the financial system. In part as the result of a lack of fiscal integration that would have facilitated cross-country transfers, several countries were forced to adopt drastic budget cuts that magnified the impact on their particular economies, the differential impact across countries, and the consequences of structural impediments.

*Note:* See Luigi Butiglione, Philip R. Lane, Lucrezia Reichlin, and Vincent Reinhart, “Deleveraging? What Deleveraging?”, September 2014, International Center for Monetary and Banking Studies.

It should be clear that any of the shocks listed would likely constitute a “regime change” as discussed earlier.

#### EXAMPLE 4

## Impact of Exogenous Shocks on Trend Growth

Philippe Leblanc, an analyst focusing on economic forecasting, recently read about a discovery by scientists at a major university that may allow the efficiency of solar panels to double every two to three years, a result similar to Moore’s Law with respect to computer chips. In further reading, he found new research at Tsinghua University that may rapidly increase the distance over which electricity can be transmitted.

What implications should Leblanc draw with regard to growth trends if either, or both, of these developments come to fruition? What government policy changes might offset the impact?

### Guideline answer:

Either of these developments would be expected to increase trend growth. They would be especially powerful together. Rapid increases in solar panel efficiency would drive down the cost of energy over time, especially in areas with long days and intense sunlight. The closer to the equator, the larger the potential effect. The developments would also make it increasingly possible to bring large-scale power production to remote areas, thereby expanding the range and scale of economically viable businesses in those areas. Extending the range of electrical transmission would allow moving



lower-cost energy (regardless of how it is generated) to where it is most efficiently used. A variety of government actions could undermine the pro-growth nature of these developments; for example, tariffs on solar panels, restrictions on electrical transmission lines, subsidies to support less efficient energy sources, failure to protect intellectual property rights, or prohibition on transfer of technology.

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## 4. APPLYING GROWTH ANALYSIS TO CAPITAL MARKET EXPECTATIONS

- d. discuss the application of economic growth trend analysis to the formulation of capital market expectations;

The expected trend rate of economic growth is a key consideration in a variety of contexts. First, it is an important input to discounted cash flow models of expected return. The trend growth rate imposes discipline on forecasts of fundamental metrics such as earnings because these must be kept consistent with aggregate long-run growth at the trend rate. Second, a country with a higher trend rate of growth may offer equity investors a particularly good return if that growth has not already been priced into the market. Third, a higher trend rate of growth in the economy allows actual growth to be faster before accelerating inflation becomes a significant concern. This fact is especially important in projecting the likely path of monetary policy and bond yields. Fourth, theory implies, and empirical evidence confirms, that the average level of real government bond yields is linked to the trend growth rate. Faster trend growth implies higher average real yields.

Most countries have had periods of faster and slower trend growth during their development. Emerging countries often experience rapid growth as they catch up with the leading industrial countries, but the more developed they become, the more likely it is that their growth will slow.

### 4.1. A Decomposition of GDP Growth and Its Use in Forecasting

The simplest way to analyze an economy's aggregate trend growth is to split it into the



following components:

- growth from labor inputs, consisting of
  - growth in potential labor force size and
  - growth in actual labor force participation, plus
- growth from labor productivity, consisting of
  - growth from increasing capital inputs and
  - growth in total factor productivity.

Labor input encompasses both the number of workers and the average number of hours they work. Growth in the potential labor force size is driven by demographics such as the population's age distribution, net migration, and workplace norms such as the length of the work week. All of these factors tend to change slowly, making growth in the potential labor force relatively predictable. Trends in net migration and workplace norms, however, may change abruptly in response to sudden structural changes, such as changes in government policies.

Labor force participation primarily reflects labor versus leisure decisions by workers. All else the same, we should expect labor force participation to decline (or at least grow more slowly) as a country becomes more affluent. On the other hand, rising real wages tend to attract workers back into the labor force. Social norms and government policies also play a large role.

Growth in labor productivity comes from investment in additional capital per worker ("capital deepening") and from increases in **total factor productivity** (TFP), which is often taken to be synonymous with technological improvement.<sup>8</sup> Government policy (e.g., regulations) can also influence TFP. In historical analyses, TFP is often measured as a "residual"—that is, output growth that is not accounted for by the other factors.

The trend rate of growth in mature, developed markets is generally fairly stable. As a result, extrapolating past trends in the components outlined in the foregoing can be expected to provide a reasonable initial estimate of the future growth trend. This forecast should then be adjusted to reflect observable information indicating how future patterns are likely to differ from past patterns. This same approach can be applied to less developed markets. It must be recognized, however, that these economies are likely to be undergoing rapid structural changes that may require the analyst to make more significant adjustments relative to past trends.

## 4.2. Anchoring Asset Returns to Trend Growth

Both theory and empirical evidence indicate that the average level of real (nominal) default-free bond yields is linked to the trend rate of real (nominal) growth.<sup>9</sup> To put it another way, bond yields will be pulled toward this level over time. Thus, the trend rate of growth provides an important anchor for estimating bond returns over horizons long enough for this reversion to prevail over cyclical and short-term forces. Intertemporal consistency demands that this anchor be factored into forecasts even for shorter horizons.

The trend growth rate also provides an anchor for long-run equity appreciation.<sup>10</sup> We can express the aggregate market value of equity,  $V^e$ , as the product of three factors: the level of nominal GDP, the share of profits in the economy,  $S^k$  (earnings/GDP), and the P/E ratio ( $PE$ ).

$$V_t^e = \text{GDP}_t \times S_t^k \times PE_t$$

It is clear that over long periods, capital's share of income cannot continually increase or decrease. The same is true for the P/E multiple applied to earnings. As a result, in the long run, the growth rate of the total value of equity in an economy is linked to the growth rate of GDP. Over finite horizons, the way in which the share of capital and the P/E multiple are expected to change will also affect the forecast of the total value of equity, as well as its corresponding growth rate over that period.

This argument applies to the capital appreciation component of equity returns. It does not supply a way to estimate the other component: the dividend yield. An estimate for the dividend yield (annual dividends/market value) can be obtained by noting that the dividend yield equals the dividend payout ratio (dividends/profit) divided by the profit multiple (market value/profit). The analyst may set any two of these three ratios and infer the third.

### EXAMPLE 5

## Long-Run Equity Returns and Economic Growth

In January 2000, Alena Bjornsdottir, CFA, was updating her firm's projections for US equity returns. The firm had always used the historical average return with little adjustment. Bjornsdottir was aware that historical averages are subject to large sampling errors and was especially concerned about this fact because of the sequence of very high returns in the late 1990s. She decided to examine whether US equity returns since World War II had been consistent with economic growth. For the period 1946–1999, the continuously compounded (i.e., logarithmic) return was 12.18% per annum, which reflected the following components:

Real GDP Growth	Inflation	EPS/GDP (Chg)	P/E (Chg)	Dividend Yield
3.14%	4.12%	0.00%	0.95%	3.97%

## Questions

1. What conclusion was Bjornsdottir likely have drawn from this analysis?
2. If she believed that in the long run that the US labor input would grow by 0.9% per annum and labor productivity by 1.5%, that inflation would be 2.1%, that the dividend yield would be 2.25%, and that there would be no further growth in P/E, what is likely to have been her baseline projection for continuously compounded long-term US equity returns?
3. In light of her analysis, how might she have adjusted her baseline projection?

## Guideline answers

1. Bjornsdottir is likely have concluded that the post-war stock return exceeded what would have been consistent with growth of the economy. In particular, the rising P/E added 0.95% of “extra” return per year for 54 years, adding 51.3% ( $= 54 \times 0.95\%$ ) to the cumulative, continuously compounded return and leaving the market 67% ( $\exp[51.3\%] = 1.67$ ) above “fair value.”
2. Her baseline projection is likely to have been  $6.75\% = 0.9\% + 1.5\% + 2.1\% + 2.25\%$ .
3. She is likely to have adjusted her projection downward to some degree to reflect the likelihood that the effect of the P/E would decline toward zero over time. Assuming, for example, that this would occur over 30 years would imply reducing the baseline projection by  $1.71\% = (51.3\%/30)$  per year.

*Note:* The P/E impact was actually eliminated by the end of 2005. Had Bjornsdottir anticipated such a rapid correction, she would have needed to reduce her projection by  $10.26\% = 51.3\%/5$  per year to  $-3.51\% = 6.75\% - 10.26\%$ .

Studies have shown that countries with higher economic growth rates do not reliably generate higher equity market returns.<sup>11</sup> A partial explanation is likely to be that the higher growth rate was already reflected in market prices. The sources of growth may be a second factor. Stock market returns ultimately reflect the rate of return on invested capital. If the capital stock is growing rapidly, the rate of return on invested capital may be driven down.

Both of these explanations are consistent with the arguments outlined earlier. High growth need not translate one-for-one into higher return unless it can be expected to continue forever. Declining return on investment essentially means that either GDP growth slows or profits decline as a share of GDP, or both. And, of course, valuation multiples do matter.

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## 5. APPROACHES TO ECONOMIC FORECASTING

- e. compare major approaches to economic forecasting;

Whereas the trend growth rate is a long-term average and reflects only the supply side of the economy, most macroeconomic forecasting focuses on short- to intermediate-term fluctuations around the trend—that is, the business cycle. These fluctuations are usually ascribed primarily to shifts in aggregate demand, although shifts in the short-term aggregate supply curve also play a role.

Before discussing the business cycle, we outline the main approaches available for tracking and projecting these movements. There are at least three distinct approaches:

- Econometric models: the most formal and mathematical.
- Indicators: variables that lead, lag, or coincide with turns in the economy.
- Checklists: subjective integration of the answers to relevant questions.

These approaches are not mutually exclusive. Indeed, thorough analysis is likely to incorporate elements of all three.

### 5.1. Econometric Modeling

**Econometrics** is the application of statistical methods to model relationships among economic variables. **Structural models** specify functional relationships among variables based on economic theory. The functional form and parameters of these models are derived from the underlying theory. **Reduced-form models** have a looser connection to theory. As the name suggests, some such models are simply more-compact representations of underlying structural models. At the other end of the spectrum are models that are essentially

data driven, with only a heuristic rationale for selection of variables and/or functional forms.

Econometric models vary from small models with a handful of equations to large, complex models with hundreds of equations. They are all used in essentially the same way, however. The estimated system of equations is used to forecast the future values of economic variables, with the forecaster supplying values for the exogenous variables. For example, such a model may require the forecaster to enter exchange rates, interest rates, commodity prices, and/or policy variables. The model then uses the estimated past relationships to forecast the future. It is important to consider that the forecaster's future values for the exogenous variables are themselves subject to estimation error. This fact will increase the variability of potential forecast errors of the endogenous variables beyond what results from errors in the estimated parameter values. The analyst should examine a realistic range of values for the exogenous variables to assess the forecast's sensitivity to these inputs.

Econometric models are widely regarded as very useful for simulating the effects of changes in key variables. The great merit of the econometric approach is that it constrains the forecaster to a certain degree of consistency and also challenges the modeler to reassess prior views based on what the model concludes. It does have important limitations, however. Econometric models require the user to find adequate measures for the real-world activities and relationships to be modeled. These measures may be unavailable. Variables may also be measured with error. Relationships among the variables may change over time because of changes in economic structure and/or because the model may have been based on faulty assumptions as to how the world works. As a result, the econometric model may be misspecified. In practice, therefore, skillful econometric modelers monitor the model's recent forecasts for signs of systematic errors. Persistent forecast errors should ideally lead to a complete overhaul of the model. In practice, however, a more pragmatic approach is often adopted: Past forecast errors are incorporated into the model as an additional explanatory variable.

## 5.2. Economic Indicators

**Economic indicators** are economic statistics published by official agencies and/or private organizations. These indicators contain information on an economy's recent past activity or its current or future position in the business cycle. Lagging economic indicators and coincident indicators reflect recent past and current economic activity, respectively. A **leading economic indicator** (LEI) moves ahead of the business cycle by a fairly consistent time interval. Most analysts focus primarily on leading indicators because they purport to provide information about upcoming changes in economic activity, inflation, interest rates, and security prices.

Leading indicator-based analysis is the simplest forecasting approach to use because it

requires following only a limited number of statistics. It also has the advantage of not requiring the analyst to make assumptions about the path of exogenous variables. Analysts use both individual LEIs and composite LEIs, reflecting a collection of economic data releases combined to give an overall reading. The OECD composite LEI for each country or region is based on five to nine variables such as share prices, manufacturing metrics, inflation, interest rates, and monetary data that exhibit cyclical fluctuations similar to GDP, with peaks and troughs occurring six to nine months earlier with reasonable consistency. Individual LEIs can also be combined into a so-called **diffusion index**, which measures how many indicators are pointing up and how many down. For example, if 7 out of 10 are pointing upward, then the odds are that the economy is accelerating.

One of the drawbacks of the (composite) leading indicator methodology is that the entire history may be revised each month. As a result, the most recently published historical indicator series will almost certainly appear to have fit past business cycles (i.e., GDP) better than it actually did in real time. This distortion is known as “look ahead” bias. Correspondingly, the LEI may be less reliable in predicting the current/next cycle than history suggests.

Business cycle indicators have been published for decades. A new methodology for tracking the business cycle, known generically as “nowcasting,” emerged in the United States in the wake of the global financial crisis. The best-known of these forecasts, the Federal Reserve Bank of Atlanta’s “GDPNow,” was first published on 1 May 2014 for the second quarter of that year. The objective is to forecast GDP for the current quarter (which will not be released until after quarter-end) based on data as it is released throughout the quarter. To do this, the Atlanta Fed attempts to use the same methodology and data as will be used by the Bureau of Economic Analysis (BEA) to estimate GDP, replacing data that has not yet been released with forecasts based on the data already observed. As the quarter progresses, more of the actual data will have been observed, and GDPNow should, at least on average, converge to what will be released by the BEA.

## BEA releases of estimates

The BEA releases a sequence of three GDP estimates for each quarter. The first, labeled the “advance” estimate, is released four weeks after the end of the quarter and tends to have the greatest market impact. The “preliminary” estimate is released a month later, and the “final” estimate comes at the end of the following quarter. The Atlanta Fed’s GDPNow is actually a forecast of the BEA’s advance estimate, not of the final GDP release.

It remains to be seen how useful nowcasting will be for investment analysts. It has a couple of clear advantages: It is updated in real time, and it is focused directly on a variable of primary interest (GDP and its components). Nowcasting is not designed to be predictive of anything beyond the end of the current quarter, however. In addition, it tends to be very volatile until a significant portion of the data for the quarter has been observed, at which point it may have lost some of its usefulness as a guide for investment decisions.

### 5.3. Checklist Approach

Formally or informally, many forecasters consider a whole range of economic data to assess the economy’s future position. Checklist assessments are straightforward but time-consuming because they require continually monitoring the widest possible range of data. The data may then be extrapolated into forecasts via objective statistical methods, such as time-series analysis, or via more subjective or judgmental means. An analyst may then assess whether the measures are in an equilibrium state or nearer to an extreme reading.

The subjectivity of the checklist approach is perhaps its main weakness. The checklist’s strength is its flexibility. It allows the forecaster to quickly take into account changes in economic structure by changing the variables or the weights assigned to variables within the analysis.

### 5.4. Economic Forecasting Approaches: Summary of Strengths and Weaknesses

Exhibit 4 summarizes the advantages and disadvantages of forecasting using econometric models, leading indicators, and checklists.

**Exhibit 4. Economic Forecasting Approaches: Strengths and Weaknesses**

Strengths	Weaknesses
<b>Econometric Models Approach</b>	
<ul style="list-style-type: none"><li>Models can be quite robust, with many factors included to approximate reality.</li></ul>	<ul style="list-style-type: none"><li>Complex and time-consuming to formulate.</li><li>Data inputs not easy to forecast.</li><li>Relationships not static. Model may be</li></ul>

- New data may be collected and consistently used within models to quickly generate output.
- Delivers quantitative estimates of impact of changes in exogenous variables.
- Imposes discipline/consistency on analysis.
- mis-specified.
- May give false sense of precision.
- Rarely forecasts turning points well.

### **Leading Indicator–Based Approach**

- Usually intuitive and simple in construction.
- Focuses primarily on identifying turning points.
- May be available from third parties. Easy to track.
- History subject to frequent revision.
  - “Current” data not reliable as input for historical analysis.
  - Overfitted in-sample. Likely overstates forecast accuracy.
- Can provide false signals.
- May provide little more than binary (no/yes) directional guidance.

### **Checklist Approach**

- Limited complexity.
- Flexible.
  - Structural changes easily incorporated.
  - Items easily added/dropped.
  - Can draw on any information, from
- Subjective. Arbitrary. Judgmental.
- Time-consuming.
- Manual process limits depth of analysis. No clear mechanism for combining disparate information.
- Imposes no consistency of analysis across items or at different points in time. May allow use of biased and/or inconsistent views, theories, assumptions.



any source, as desired.

- Breadth: Can include virtually any topics, perspectives, theories, and assumptions.
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## EXAMPLE 6

### Approaches to Forecasting

Sara Izek and Adam Berke are members of the asset allocation committee at Cycle Point Advisors, which emphasizes the business cycle within its tactical asset allocation process. Berke has developed a time series model of the business cycle that uses a published LEI series as a key input. He presents forecasts based on the model at each asset allocation meeting. Izek is eclectic in her approach, preferring to sample research from a wide variety of sources each month and then focus on whatever perspectives and results seem most interesting. She usually brings a stack of charts she has copied to the asset allocation meeting.

#### Questions:

1. Which of the main forecasting approaches (or combination of approaches) best describe(s) each analyst's own practice?
2. What strength(s) are likely to have appealed to each analyst?
3. What weaknesses might each analyst be overlooking?

#### Guideline answers:

1. Berke uses the econometric modeling approach in conjunction with the LEI approach. Izek's practice is essentially a checklist approach.
2. Berke is probably attracted to the quantitative output provided by a model, the consistency and discipline it imposes on the process, and the ability to generate explicit forecasts. He may have included the LEI in the model because it is designed to capture cyclical turning points or simply because doing so improves

the model's statistical fit of the model.

Izek is probably drawn to the flexibility of the checklist approach with respect to what is included/excluded and how to evaluate the information.

3. Berke may be overlooking potential mis-specification of his model, which is apt to make his forecasts systematically inaccurate (i.e., biased). He may also be failing to recognize the likely magnitude of the forecast errors that will be present even if the model is unbiased (i.e., overestimating the precision of the forecasts). By using the historical LEI series as an input to the model, he may be incorporating look-ahead bias into the model.

Izek is likely overlooking the subjective, judgmental, and idiosyncratic nature of her approach. Her practice of basing her “checklist” on what seems most interesting in other analysts’ current research makes her process especially vulnerable to inconsistency and cognitive biases.

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## 6. BUSINESS CYCLE ANALYSIS, PHASES OF THE BUSINESS CYCLE AND MARKET EXPECTATIONS AND THE BUSINESS CYCLE

- f. discuss how business cycles affect short- and long-term expectations;

The trend rate of economic growth provides a vital anchor for setting very long-run investment expectations, which in turn provide a starting point for developing projections over short- to intermediate-term horizons. Virtually by definition, deviations from trend wash out in the long run, making information about the current economic and market environment of limited value over very long horizons. Over short to intermediate horizons, however, such information can be very important. From a macroeconomic perspective, the most useful such information typically pertains to fluctuations associated with the **business cycle**.

It is useful to think of fluctuations in economic activity as a superposition of many cycles varying in frequency from very short (days) to very long (decades), each with stochastic amplitude. The business cycle is not a specific, well-defined cycle. It is the result of many intermediate frequency cycles that jointly generate most of the variation in aggregate economic activity (i.e., GDP) around the trend. This fact explains why historical business

cycles have varied in both duration and intensity—each was a different realization of a range of underlying stochastic cycles. It also helps to explain why it is difficult to project turning points in real time.

## Business cycle peaks and troughs

The best-known record of business cycle peaks and troughs is published for the United States by the National Bureau of Economic research (NBER). According to NBER, the United States has experienced 66 complete business cycles since 1854, averaging 56 months from peak to peak. The longest cycle was 128 months, the shortest only 17 months. Fifty percent of the cycles lasted between 38 and 69 months. On average, the cycle's contraction phase (peak to trough) lasted 17 months, whereas the expansion phase (trough to peak) lasted 39 months.

At a fundamental level, the business cycle arises in response to the interaction of uncertainty, expectational errors, and rigidities that prevent instantaneous adjustment to unexpected events. It reflects decisions that

- a. are made based on imperfect information and/or analysis with the expectation of future benefits,
- b. require significant current resources and/or time to implement, and
- c. are difficult and/or costly to reverse.

Such decisions are, broadly defined, investment decisions. Much of the uncertainty that sustains the cycle is endogenous to the system. Competitors, suppliers, employers, creditors, customers, and policymakers do not behave as expected. Prices and quantities adjust more or less than expected. Other sources of uncertainty are more exogenous. Technological breakthroughs threaten to disrupt whole industries and/or create new ones. Fracking, gene sequencing, e-commerce, “big data,” digital advertising, cybersecurity, 3-D printing, the internet of things, and driverless cars are among those now playing out. Weather patterns affect agriculture, construction, and transportation. Natural disasters devastate local economies. Political and geopolitical shifts favor some entities and disadvantage others. And, of course, shocks in one part of the global economy are often transmitted to other parts of the world through trade relations, financial markets, and the prices of goods and services.

Numerous variables can be used to monitor the business cycle. Among them are GDP growth, industrial production (IP), employment/unemployment, purchasing managers

indexes, orders for durable goods, the output gap (the difference between GDP estimated as if the economy were on its trend growth path and the actual value of GDP), and the leading indicator indexes discussed earlier.

## 6.1. Phases of The Business Cycle

There are various ways to delineate phases of the business cycle. The most obvious is to divide it into two primary segments (the expansion and the contraction) with two key turning points at which growth changes sign (the peak and the trough). These two periods are fairly easy to identify, at least in retrospect. Subdividing the cycle more finely is more ambiguous, even in retrospect, because it requires identifying more nuanced changes such as acceleration or deceleration of growth without a change in direction. Nonetheless, it is useful to divide the cycle into several phases distinguished through both economic and financial market characteristics. For the purpose of setting expectations for capital markets, we use five phases of the business cycle here: initial recovery, early expansion, late expansion, slowdown, and contraction. The first four occur within the overall expansion.

1. **Initial recovery.** This period is usually a short phase of a few months beginning at the trough of the cycle in which the economy picks up, business confidence rises, stimulative policies are still in place, the negative output gap is large, and inflation is typically decelerating. Recovery is often supported by an upturn in spending on housing and consumer durables.

*Capital market effects:* Short-term rates and government bond yields are low. Bond yields may continue to decline in anticipation of further disinflation but are likely to be bottoming. Stock markets may rise briskly as fears of a longer recession (or even a depression) dissipate. Cyclical assets—and riskier assets, such as small stocks, higher-yield corporate bonds, and emerging market equities and bonds—attract investors and typically perform well.

2. **Early expansion.** The economy is gaining some momentum, unemployment starts to fall but the output gap remains negative, consumers borrow and spend, and businesses step up production and investment. Profits typically rise rapidly. Demand for housing and consumer durables is strong.

*Capital market effects:* Short rates are moving up as the central bank starts to withdraw stimulus put in place during the recession. Longer-maturity bond yields are likely to be stable or rising slightly. The yield curve is flattening. Stocks trend upward.

3. **Late expansion.** The output gap has closed, and the economy is increasingly in danger of overheating. A boom mentality prevails. Unemployment is low, profits are strong, both wages and inflation are rising, and capacity pressures boost investment spending.

Debt coverage ratios may deteriorate as balance sheets expand and interest rates rise. The central bank may aim for a “soft landing” while fiscal balances improve.

*Capital market effects:* Interest rates are typically rising as monetary policy becomes restrictive. Bond yields are usually rising, more slowly than short rates, so the yield curve continues to flatten. Private sector borrowing puts pressure on credit markets. Stock markets often rise but may be volatile as nervous investors endeavor to detect signs of looming deceleration. Cyclical assets may underperform while inflation hedges such as commodities outperform.

- 4. Slowdown.** The economy is slowing and approaching the eventual peak, usually in response to rising interest rates, fewer viable investment projects, and accumulated debt. It is especially vulnerable to a shock at this juncture. Business confidence wavers. Inflation often continues to rise as firms raise prices in an attempt to stay ahead of rising costs imposed by other firms doing the same.

*Capital market effects:* Short-term interest rates are high, perhaps still rising, but likely to peak. Government bond yields top out at the first clear sign of a slowing economy and may then decline sharply. The yield curve may invert, especially if the central bank continues to exert upward pressure on short rates. Credit spreads, especially for weaker credits generally widen. The stock market may fall, with interest-sensitive stocks such as utilities and “quality” stocks with stable earnings performing best.

- 5. Contraction.** Recessions typically last 12 to 18 months. Investment spending, broadly defined, typically leads the contraction. Firms cut production sharply. Once the recession is confirmed, the central bank eases monetary policy. Profits drop sharply. Tightening credit magnifies downward pressure on the economy. Recessions are often punctuated by major bankruptcies, incidents of uncovered fraud, exposure of aggressive accounting practices, or a financial crisis. Unemployment can rise quickly, impairing household financial positions.

*Capital market effects:* Short-term interest rates drop during this phase, as do bond yields. The yield curve steepens substantially. The stock market declines in the earlier stages of the contraction but usually starts to rise in the later stages, well before the recovery emerges. Credit spreads typically widen and remain elevated until signs of a trough emerge and it becomes apparent that firms will be able to roll over near-term debt maturities.

## 6.2. Market Expectations and the Business Cycle

This description of a typical business cycle may suggest that forming capital market expectations for short and intermediate horizons should be relatively straightforward. If an

investor can identify the current phase of the cycle and correctly predict when the next phase will begin, is it not easy to make money? Unfortunately, it is not that simple.

First, the phases of the business cycle vary in length and amplitude. Recessions can be steep, and downturns (such as in the 1930s and in 2007–2009) can be frightening. On the other hand, recessions also can be short lived, with only a small decline in output and only a modest rise in unemployment. Sometimes, the weakest phase of the cycle does not even involve a recession but merely a period of slower economic growth or a “growth recession.” Similarly, expansions vary in length and intensity.

Second, it is not always easy to distinguish between cyclical forces and secular forces acting on the economy and the markets. The prolonged recovery following the 2007–2009 global financial crisis is a prime example. Interest rates and inflation went far lower and remained extraordinarily low far longer than virtually anyone would have predicted based on a purely cyclical view.

Third, although the connection between the real economy and capital market returns is strong, it is subject to substantial uncertainty. Capital market prices reflect a composite of investors’ expectations and attitudes toward risk with respect to all future horizons. How, when, and by how much the markets respond to the business cycle are as uncertain as the cycle itself—perhaps more so.

What does all of this variation and uncertainty imply for setting capital market projections? First, as with virtually any investment information, business cycle analysis generates a noisy signal with respect to prospective opportunities. Second, the signal is likely to be most reliable (a higher “signal-to-noise” ratio), and hence most valuable, over horizons within the range of likely expansion and contraction phases—perhaps one to three years. Returns over substantially shorter horizons are likely to be driven primarily by market reactions to more transitory developments, undermining the cycle’s predictive value. On the other hand, as the forecast horizon extends beyond this range, it becomes increasingly likely that one or more turning points will occur within the horizon, implying returns that increasingly reflect averaging over the cycle.

## EXAMPLE 7

### Cycles, Horizons, and Expectations

Lee Kim uses a statistical model that divides the business cycle into two “regimes”: expansion and contraction. The expected (continuously compounded) return on equities is +2% per month during expansions and –2% per month during contractions. Consistent with NBER’s historical record (see earlier sidebar), the probabilities of transitioning between regimes imply that expansions last 39 months on average,

whereas contractions average 20 months. Correspondingly, over the long run, the economy expands roughly two-thirds of the time and contracts one-third of the time. Hence, the long-term expected equity return is  $0.67\% = [(2\% \times 2/3) + (-2\% \times 1/3)]$  per month, or 8% per year. Kim's model indicates that the economy recently transitioned into contraction. For the upcoming asset allocation committee meeting, he will prepare equity return forecasts for horizons of 3 months, 1 year, 5 years, and 10 years.

Explain how you would expect the choice of time horizon to affect Kim's projections.

### **Guideline answer**

The longer the horizon, the more likely that one or more transitions will occur between contraction and expansion; more generally, the more likely it is that the horizon spans more than one business cycle phase or even more than one full cycle. As a result, the longer the horizon, the more Kim's forecast should reflect averaging over periods of expansion and contraction and the closer it will be to the "information-less" average of 8% per year.

Over the next three months, it is highly likely that the economy will remain in contraction, so Kim's forecast for that period should be very close to  $-2\%$  per month [cumulatively  $-6\%$ ]. Because contractions last 20 months on average in the model, Kim's forecast for a one-year horizon should reflect only a modestly higher probability of having transitioned to expansion at some point within the period. So, his forecast might be  $-18\%$  (an average of  $-1.5\%$  per month) instead of  $-24\%$  ( $-2\%$  per month). Over a five-year horizon, it is very likely that the economy will have spent time in both contraction and expansion. As a result, Kim's forecast will put significant weight on each phase. Because the economy starts in contraction (i.e., the starting point is not random), the weight on that phase will probably be somewhat higher than its long-term frequency of  $1/3$ , say  $0.40$ . This assumption implies a forecast of  $4.8\%$  per year  $[= 12 \times [(0.6 \times 2\%) + (0.4 \times -2\%)]]$ . Over a 10-year horizon, the frequency of expansion and contraction months is likely to be very close to the 2-to-1 long-run ratio. So, Kim's forecast should be very close to 8% per year.

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## **7. INFLATION AND DEFLATION: TRENDS AND RELATIONS TO THE BUSINESS CYCLE**



- g. explain the relationship of inflation to the business cycle and the implications of inflation for cash, bonds, equity, and real estate returns;

Until the early 20th century, the money supply was largely dictated by the supply of specie—gold and/or silver used in coins and to back bank deposits. Periods of both inflation and deflation were common. Today, currencies are backed by the credibility of governments and central banks rather than specie, and people expect the prices of goods and services to trend upward. Persistent deflation is rare. Expectation of an upward trend in prices reflects recognition of an asymmetry in a central bank's so-called "reaction function." It is generally accepted that a central bank's policy tools are more effective in slowing economic activity than in accelerating sluggish activity. Hence, central banks may tend to be more aggressive in combating downward pressure on demand than in reining in strong demand. In addition, it is widely believed that outright deflation damages the economy because it undermines:

- debt-financed investments. Servicing and repayment of nominally fixed debt becomes more onerous as nominal income flows and the nominal value of real assets both decline; and
- the power of central banks. In a deflationary environment, interest rates fall to levels close to (or even below) zero. When interest rates are already very low, the central bank has less leeway to stimulate the economy by lowering interest rates.

In contrast, moderate inflation is generally considered to impose only modest costs on the economy. Both the differential effectiveness of policy and the differential costs of inflation versus deflation suggest that central banks will, implicitly or explicitly, target positive inflation, and investors set their expectations accordingly. The result is that asset prices in general and bond yields in particular generally build in compensation for a positive average inflation rate.

Inflation is procyclical, accelerating in the later stages of the business cycle when the output gap has closed and decelerating when, during a recession or the early years afterward, there is a large output gap, which puts downward pressure on wages and prices. If the central bank's target is credible, the average rate of inflation over the cycle should be near the target.

Because the cyclical pattern of inflation is well known, inflation expectations will also be procyclical. It is important, however, to differentiate inflation expectations by horizon. Very long-term inflation expectations should be virtually unaffected by cyclical fluctuations provided investors maintain confidence in the central bank's target. Short horizon expectations will tend to have about the same amplitude as actual inflation. Inflation, and therefore inflation expectations, over intermediate horizons will be a blend of the different phases of the current and subsequent cycles. Hence, the amplitude of expectations will decline with horizon—again, provided investors do not lose confidence in the central bank's target.



The pattern just described implies a “horizon structure” of inflation expectations that is countercyclical—upward sloping at the trough of the business cycle and inverted at the peak. Because inflation expectations are an important component of bond yields, this countercyclical pattern is one of the reasons that the yield curve’s slope is countercyclical.<sup>12</sup>

To assess the effect of inflation on asset classes, we must consider both the cash flows and the discount rates. We consider “cash,” nominal bonds, stocks, and real estate.

- *Cash:* In this context, cash is taken to mean short-term interest-bearing instruments, not currency or zero-interest deposits. As long as short-term interest rates adjust with expected inflation, cash is essentially a zero-duration, inflation-protected asset that earns a floating real rate. Inflation above or below expectation contributes to temporary fluctuations in the realized real return. Because central banks aim to stabilize actual and expected inflation, they tend to make the real rate on cash procyclical around a long-term level consistent with their target inflation rate. Hence, cash is relatively attractive (unattractive) in a rising (declining) rate environment. Deflation may make cash particularly attractive if a zero-lower-bound is binding on the nominal interest rate. Otherwise deflation is simply a component of the required short-term real rate.
- *Bonds:* Because the cash flows are fixed in nominal terms, the effect of inflation is transmitted solely through the discount rates (i.e., the yield curve). Rising (falling) inflation induces capital losses (gains) as the expected inflation component of yields rises (falls). If inflation remains within the expected cyclical range, shorter-term yields rise/fall more than longer yields but have less price impact as a result of shorter duration. If, however, inflation moves out of the expected range, longer-term yields may rise/fall more sharply as investors reassess the likelihood of a change in the long-run average level of inflation. Persistent deflation benefits the highest-quality bonds because it increases the purchasing power of the cash flows, but it is likely to impair the creditworthiness of lower-quality debt.
- *Stocks:* As long as inflation stays within the expected cyclical range, there should be little effect on stocks because both expected future cash flows (earnings and dividends) and associated discount rates rise/fall in line with the horizon structure of inflation expectations. Signs that inflation is moving out of the expected range, however, indicate a potential threat. Unexpectedly high and/or rapidly rising inflation could mean that the central bank needs to act to slow the economy, whereas very low and/or falling inflation (possibly deflation) threatens a recession and a decline in asset prices. Within the stock market, higher inflation benefits firms that are able to pass along rising costs, whereas deflation is especially detrimental for asset-intensive, commodity-producing, and/or highly leveraged firms.
- *Real estate:* Short- to intermediate-term nominal cash flows are generally dictated by existing leases, with the speed of adjustment depending on the type of real estate asset held. As long as inflation remains within the expected range, renewal of leases will

likely generate rental income rising with expected inflation, accompanied by stable asset values. Higher-than-expected inflation is likely to coincide with high demand for real estate, expectations that rental income will rise even faster than general inflation, and rising property values. The impact may be quite idiosyncratic, however, depending on the length of leases, the existing supply of similar properties, and the likelihood of new supply hitting the market when leases come up for renewal. On the other hand, unexpectedly low inflation (or deflation) will put downward pressure on expected rental income and property values, especially for less-than-prime properties, which may have to cut rents sharply to avoid rising vacancies.

## EXAMPLE 8

### Inflation

Kesia Jabari believes the quantitative easing undertaken by major central banks in the wake of the global financial crisis is finally about to induce a surge in inflation. She believes that without extraordinary policy actions from the central banks, the inflation rate will ultimately rise to the upper end of central banks' tolerance ranges at the peak of the current business cycle.

Assuming Jabari is correct, discuss the likely implications for floating-rate instruments ("cash"), bonds, stocks, and real estate if:

- a. the market shares Jabari's view, or
- b. once inflation begins to rise, the market doubts that the central banks will be able to contain it.

### Guideline answer

- a. If the market agrees with Jabari, then the relationship of inflation and the asset classes to the business cycle should be fairly normal. Short-term rates and bond yields will rise with inflation expectations. The yield curve should flatten because long-term inflation expectations should remain well anchored. Floating-rate instruments (cash) will be relatively attractive, and intermediate maturities ("the belly of the curve") will be the most vulnerable. In general, the rise in inflation should not have much independent impact on stocks or real estate because both cash flows and discount rates will be expected to rise. Firms with pricing power and real estate with relatively short lease-renewal cycles are set to perform best.
- b. If the market doubts that central banks can contain inflation within previously perceived tolerances, then long-run inflation expectations will rise and the yield

curve may steepen rather than flatten, at least initially. Floating-rate instruments will still be relatively attractive, but now it is the longest maturities that will be the most vulnerable. Stocks are likely to suffer because the market expects central banks to be aggressive in fighting inflation. Real estate with long-term leases and little long-term, fixed-rate debt will suffer. Real estate with substantial long-term, fixed-rate debt should do relatively well, especially high-quality properties with little new supply nearby, which are likely to avoid significant vacancies even in a recession.

In the interest of completeness, we should note a caveat before leaving the topic of inflation. The preceding discussion implicitly assumes that the short-run aggregate supply curve is upward sloping and that the business cycle is primarily driven by fluctuations in aggregate demand. Together, these assumptions imply that inflation is pro-cyclical. Although globalization may have reduced the sensitivity of domestic prices to domestic output, it seems unlikely that domestic output/growth no longer matters. Thus, the aggregate supply curve may be *flatter* but is unlikely to be *flat*. With regard to what drives the cycle, if aggregate supply shocks predominate, then inflation will tend to be *countercyclical*, reflecting alternating periods of “stagflation” and disinflationary boom. The 1970s oil crisis is a prime example. This pattern is more likely to be the exception rather than the rule, however.

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## 8. ANALYSIS OF MONETARY AND FISCAL POLICIES

**h.** discuss the effects of monetary and fiscal policy on business cycles;

Actual and anticipated actions by monetary and fiscal authorities affect the decisions and actions of all other participants in the economy and the markets. As a result, it is somewhat difficult to isolate their role(s) from our broader discussion. Indeed, the foregoing sections have made numerous references to these policies. Nonetheless it is worthwhile to focus directly on these policies from the perspective of setting capital market expectations.

Monetary policy is often used as a mechanism for intervention in the business cycle. Indeed, this use is inherent in the mandates of most central banks to maintain price stability and/or growth consistent with the economy’s potential. Each central bank interprets its mandate somewhat differently, sets its own operational objectives and guidelines, and selects its own

mix of the tools (e.g., policy rates and liquidity provision) at its disposal. The common theme is that central banks virtually always aim to moderate the cyclical behavior of growth and inflation, in both directions. Thus, monetary policy aims to be countercyclical. The impact of monetary policy, however, is famously subject to “long and variable lags,” as well as substantial uncertainty. As a result, a central bank’s ability to fine-tune the economy is limited, and there is always risk that policy measures will exacerbate rather than moderate the business cycle. This risk is greatest at the top of the cycle, when the central bank may overestimate the economy’s momentum and/or underestimate the effects of restrictive policies. In such situations, monetary policy may trigger a contraction that it cannot immediately counteract. In contrast, expansionary monetary policy rarely, if ever, suffices to turn a contraction into a strong recovery. This asymmetry is captured in a classic analogy: Expansionary policy is like “pushing” on a string, whereas restrictive policy is like “pulling” on a string.

Fiscal policy (government spending and taxation) can also be used to counteract cyclical fluctuations in the economy. Aside from extreme situations, however—such as the Great Depression of the 1930s and recovery from the 2007–2009 global financial crisis—fiscal policy typically addresses objectives other than regulating short-term growth, for at least two main reasons. First, in all but the most authoritarian regimes, the fiscal decision-making process is too lengthy to make timely adjustments to aggregate spending and taxation aimed at short-term objectives. Second, frequent changes of a meaningful magnitude would be disruptive to the ongoing process of providing and funding government services.

Notwithstanding these considerations, fiscal policy often does play a role in mitigating cyclical fluctuations. Progressive tax regimes imply that the effective tax rate on the private sector is pro-cyclical—rising as the economy expands and falling as the economy contracts. Similarly, means-based transfer payments vary inversely with the economy, helping to mitigate fluctuations in disposable income for the most vulnerable households. The effect of these so-called automatic stabilizers should not be overlooked in setting expectations for the economy and the markets.

From the perspective of an investment analyst focused on establishing expectations for broad asset classes, having a handle on monetary policy is mission-critical with respect to cyclical patterns. Under normal conditions, fiscal adjustments are important but likely to be secondary considerations. The reverse is likely with respect to assessing the long run. Of course, if a major change in fiscal stance is contemplated or has been implemented, the impact warrants significant attention with respect to all horizons. The major overhaul of the US tax code at the end of 2017 is a good example of these points. It almost certainly provided a short-term stimulus, especially with respect to capital expenditures. But it was not a short-term policy adjustment. It was the most significant change to the tax code in decades, a major structural change that may affect the path of both the economy and the markets for many years.

## 8.1. Monetary Policy

Central banks can, and do, carry out their mandates somewhat differently. In general, they seek to mitigate extremes in inflation and/or growth via countercyclical policy measures. As a generic illustration of how this might work, we briefly review the **Taylor rule**. In the current context, it can be viewed as a tool for assessing a central bank's stance and a guide to predicting how that stance is likely to evolve.

In essence, the Taylor rule links a central bank's target short-term nominal interest rate to the expected growth rate of the economy and inflation, relative to trend growth and the central bank's inflation target.

$$i^* = r_{\text{neutral}} + \pi_e + 0.5(Y_e - Y_{\text{trend}}) + 0.5(\pi_e - \pi_{\text{target}})$$

Where

$i^*$  = target nominal policy rate

$r_{\text{neutral}}$  = real policy rate that would be targeted if growth is expected to be at trend and inflation on target

$\pi_e, \pi_{\text{target}}$  = respectively, the expected and target inflation rates

$Y_e, Y_{\text{trend}}$  = respectively, the expected and trend real GDP growth rates

The rule can be re-expressed in terms of the real, inflation-adjusted target rate by moving the expected inflation rate to the left-hand side of the equation.

$$i^* - \pi_e = r_{\text{neutral}} + 0.5(Y_e - Y_{\text{trend}}) + 0.5(\pi_e - \pi_{\text{target}})$$

From this rearrangement, we see that the real, inflation-adjusted policy rate deviates from neutral by one-half the amount by which growth and inflation deviate from their respective targets. As an example, suppose the neutral real policy rate is 2.25%, the target inflation rate is 2%, and trend growth is estimated to be 2.5%. If growth is expected to be 3.5% and inflation is expected to be 3%, the Taylor rule would call for a 6.25% nominal policy rate:

$$2.25\% + 3\% + 0.5(3.5\% - 2.5\%) + 0.5(3.0\% - 2.0\%) = 6.25\%$$

With expected inflation at 3%, this calculation corresponds to a 3.25% real policy rate.

Even if a central bank were to set its policy rate according to the Taylor rule, there could still be substantial judgment left in the process. None of the inputs to the rule are objectively observable. To make the rule operational, policymakers and their staffs have to specify how

the requisite expectations will be generated, and by whom. Whose expectations are to be used? What is the appropriate neutral real policy rate? Over which expectations apply? Models could be developed to answer all the questions, but there would be judgments to be made in doing so. The upshot for the instructor is that monetary policy cannot be reduced to a simple equation. The Taylor Rule, or its customized variant, provides a good framework for analyzing the effects of monetary policy, but the analyst must pay careful attention to the assumptions of the central bank. This is why, for example, the investment community watches for any word in the Federal Reserve's post-meeting statements and speeches for any hint of a change in the Fed's own interpretation of the environment.

## EXAMPLE 9

### Policies and the Business Cycle

Albert Grant, CFA, is an institutional portfolio strategist at Camford Capital Management. During a period of trend growth, inflation at the central bank's target, and a tight monetary policy, the economy has been hit by a substantial deflationary shock.

#### Questions

1. How are monetary and fiscal policies likely to respond to the shock?

Camford's economics department estimates that growth is now 1% and inflation is 2% below the central bank's target. Camford's chief economist (CIO) has asked Grant to put together a projection of the likely paths of growth, inflation, and short-term rates over the next five years.

2. If Grant believes the central bank will respond in accordance with the Taylor Rule, what other information will he need in order to project the paths of growth, inflation, and short-term rates over the next five years?
3. What pattern should Grant expect for growth, inflation, and short-term rates if the central bank does *not* respond to the shock?
4. Assuming the central bank does respond and that its reaction function is approximated by the Taylor Rule, how will this alter Grant's projections of the paths of growth, inflation, and short-term rates over the next five years?

#### Guideline answers

1. A countercyclical response can be expected from both monetary and fiscal policies. Assuming the central bank uses a policy rate target as its



















































































# Reading 4

## Capital Market Expectations, Part 2: Forecasting Asset Class Returns

by Christopher D. Piros, PhD, CFA

*Christopher D. Piros, PhD, CFA (USA).*

Parts of this reading have been adapted from a former Capital Market Expectations reading authored by John P. Calverley, Alan M. Meder, CPA, CFA, Brian D. Singer, CFA, and Renato Staub, PhD.

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss approaches to setting expectations for fixed-income returns;
  - b.** discuss risks faced by investors in emerging market fixed-income securities and the country risk analysis techniques used to evaluate emerging market economies;
  - c.** discuss approaches to setting expectations for equity investment market returns;
  - d.** discuss risks faced by investors in emerging market equity securities;
  - e.** explain how economic and competitive factors can affect expectations for real estate investment markets and sector returns;
  - f.** discuss major approaches to forecasting exchange rates;
  - g.** discuss methods of forecasting volatility;
  - h.** recommend and justify changes in the component weights of a global investment portfolio based on trends and expected changes in macroeconomic factors.
-

# 1. INTRODUCTION

This is the second of two readings focusing on capital market expectations. A central theme of both readings is that a disciplined approach to setting expectations will be rewarded. After outlining a framework for developing expectations and reviewing potential pitfalls, the first reading focused on the use of macroeconomic analysis in setting expectations. This reading builds on that foundation and examines setting expectations for specific asset classes—fixed income, equities, real estate, and currencies. Estimation of variance–covariance matrices is covered as well.

The reading begins with an overview of the techniques frequently used to develop capital market expectations. The discussion of specific asset classes begins with fixed income in Sections 3 and 4, followed by equities, real estate, and currencies in Sections 5–7. Estimation of variance–covariance structures is addressed in Section 8. Section 9 illustrates the use of macroeconomic analysis to develop and justify adjustments to a global portfolio.

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## 2. OVERVIEW OF TOOLS AND APPROACHES

This section provides a brief overview of the main concepts, approaches, and tools used in professional forecasting of capital market returns. Whereas subsequent sections focus on specific asset classes, the emphasis here is on the commonality of techniques.

### 2.1. The Nature of the Problem

Few investment practitioners are likely to question the notion that investment opportunities change in systematic, but imperfectly predictable, ways over time. Yet the ramifications of that fact are often not explicitly recognized. Forecasting returns is not simply a matter of estimating constant, but unknown, parameters—for example, expected returns, variances, and correlations. Time horizons matter. The previous reading highlighted two aspects of this issue: the need to ensure intertemporal consistency and the relative usefulness of specific information (e.g., the business cycle) over short, intermediate, and long horizons. The choice among forecasting techniques is effectively a choice of the information on which forecasts will be based (in statistical terms, the information on which the forecast is “conditioned”) and how that information will be incorporated into the forecasts. The fact that opportunities change over time should, at least in principle, affect strategic investment decisions and how

positions respond to changing forecasts.<sup>1</sup>

Although investment opportunities are not constant, virtually all forecasting techniques rely on notions of central tendency, toward which opportunities tend to revert over time. This fact means that although asset prices, risk premiums, volatilities, valuation ratios, and other metrics may exhibit momentum, persistence, and clustering in the short run, over sufficiently long horizons, they tend to converge to levels consistent with economic and financial fundamentals.

What are we trying to forecast? In principle, we are interested in the whole probability distribution of future returns. In practice, however, forecasting expected return is by far the most important consideration, both because it is the dominant driver of most investment decisions and because it is generally more difficult to forecast within practical tolerances than such risk metrics as volatility. Hence, the primary focus here is on expected return. In terms of risk metrics, we limit our attention to variances and covariances.

## **2.2. Approaches to Forecasting**

At a very high level, there are essentially three approaches to forecasting: (1) formal tools, (2) surveys, and (3) judgment. Formal tools are established research methods amenable to precise definition and independent replication of results. Surveys involve asking a group of experts for their opinions. Judgment can be described as a qualitative synthesis of information derived from various sources and filtered through the lens of experience.

Surveys are probably most useful as a way to gauge consensus views, which can serve as inputs into formal tools and the analyst's own judgment. Judgment is always important. There is ample scope for applying judgment—in particular, economic and psychological insight—to improve forecasts and numbers, including those produced by elaborate quantitative models. In using survey results and applying their own judgment, analysts must be wary of the psychological traps discussed in the Capital Market Expectations Part 1 reading. Beyond these brief observations, however, there is not much new to be said about surveys and judgment.

The formal forecasting tools most commonly used in forecasting capital market returns fall into three broad categories: statistical methods, discounted cash flow models, and risk premium models. The distinctions among these methods will become clear as they are discussed and applied throughout the reading.

### **2.2.1. Statistical Methods**

All the formal tools involve data and statistical analysis to some degree. Methods that are primarily, if not exclusively, statistical impose relatively little structure on the data. As a result, the forecasts inherit the statistical properties of the data with limited, if any, regard for economic or financial reasoning. Three types of statistical methods will be covered in this reading. The first approach is to use well-known sample statistics, such as sample means, variances, and correlations, to describe the distribution of future returns. This is undoubtedly the clearest example of simply taking the data at face value. Unfortunately, sampling error makes some of these statistics—in particular, the sample mean—very imprecise. The second approach, **shrinkage estimation**, involves taking a weighted average of two estimates of the same parameter—one based on historical sample data and the other based on some other source or information, such as the analyst’s “prior” knowledge. This “two-estimates-are-better-than-one” approach has the desirable property of reducing forecast errors relative to simple sample statistics. The third method, **time-series estimation**, involves forecasting a variable on the basis of lagged values of the variable being forecast and often lagged values of other selected variables. These models have the benefit of explicitly incorporating dynamics into the forecasting process. However, since they are reduced-form models, they may summarize the historical data well without providing much insight into the underlying drivers of the forecasts.

### **2.2.2. Discounted Cash Flow**

Discounted cash flow (DCF) models express the idea that an asset’s value is the present value of its expected cash flows. They are a basic method for establishing the intrinsic value of an asset on the basis of fundamentals and its fair required rate of return. Conversely, they are used to estimate the required rate of return implied by the asset’s current price.

### **2.2.3. Risk Premium Models**

The risk premium approach expresses the expected return on a risky asset as the sum of the risk-free rate of interest and one or more risk premiums that compensate investors for the asset’s exposure to sources of *priced risk* (risk for which investors demand compensation). There are three main methods for modeling risk premiums: (1) an equilibrium model, such as the CAPM, (2) a factor model, and (3) building blocks. Each of these methods was discussed in earlier readings. Equilibrium models and factor models both impose a structure on how returns are assumed to be generated. Hence, they can be used to generate estimates of (1) expected returns and (2) variances and covariances.

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## 3. FORECASTING FIXED INCOME RETURNS

- a. discuss approaches to setting expectations for fixed-income returns;

There are three main ways to approach forecasting fixed-income returns. The first is discounted cash flow. This method is really the only one that is precise enough to use in support of trades involving individual fixed-income securities. This type of “micro” analysis will not be discussed in detail here since it is covered extensively elsewhere in CFA Program curriculum readings that focus on fixed income. DCF concepts are also useful in forecasting the more aggregated performance needed to support asset allocation decisions. The second approach is the risk premium approach, which is often applied to fixed income, in part because fixed-income premiums are among the building blocks used to estimate expected returns on riskier asset classes, such as equities. The third approach is to include fixed-income asset classes in an equilibrium model. Doing so has the advantage of imposing consistency across asset classes and is especially useful as a first step in applying the Black–Litterman framework, which will be discussed in a later reading.

### 3.1. Applying DCF to Fixed Income

Fixed income is really all about discounted cash flow. This stems from the facts that almost all fixed-income securities have finite maturities and that the (promised) cash flows are known, governed by explicit rules, or can be modeled with a reasonably high degree of accuracy (e.g., mortgage-backed security prepayments). Using modern arbitrage-free models, we can value virtually any fixed-income instrument. The most straightforward and, undoubtedly, most precise way to forecast fixed-income returns is to explicitly value the securities on the basis of the assumed evolution of the critical inputs to the valuation model—for example, the spot yield curve, the term structure of volatilities, and prepayment speeds. A whole distribution of returns can be generated by doing this for a variety of scenarios. As noted previously, this is essentially the only option if we need the “micro” precision of accounting for rolling down the yield curve, changes in the shape of the yield curve, changes in rate volatilities, or changes in the sensitivity of contingent cash flows. But for many purposes—for example, asset allocation—we usually do not need such granularity.

Yield to maturity (YTM)—the single discount rate that equates the present value of a bond’s cash flows to its market price—is by far the most commonly quoted metric of valuation and, implicitly, of expected return for bonds. For bond portfolios, the YTM is usually calculated as if it were simply an average of the individual bonds’ YTM, which is not exactly accurate but is a reasonable approximation.<sup>2</sup> Forecasting bond returns would be very easy if we could simply equate yield to maturity with expected return. It is not that simple, but YTM does

provide a reasonable and readily available first approximation.

Assuming cash flows are received in full and on time, there are two main reasons why realized return may not equal the initial yield to maturity. First, if the investment horizon is shorter than the amount of time until the bond's maturity, any change in interest rate (i.e., the bond's YTM) will generate a capital gain or loss at the horizon. Second, the cash flows may be reinvested at rates above or below the initial YTM. The longer the horizon, the more sensitive the realized return will be to reinvestment rates. These two issues work in opposite directions: Rising (falling) rates induce capital losses (gains) but increase (decrease) reinvestment income. If the investment horizon equals the (Macaulay) duration of the bond or portfolio, the capital gain/loss and reinvestment effects will roughly offset, leaving the realized return close to the original YTM. This relationship is exact if (a) the yield curve is flat and (b) the change in rates occurs immediately in a single step. In practice, the relationship is only an approximation. Nonetheless, it provides an important insight: *Over horizons shorter than the duration, the capital gain/loss impact will tend to dominate such that rising (declining) rates imply lower (higher) return, whereas over horizons longer than the duration, the reinvestment impact will tend to dominate such that rising (declining) rates imply higher (lower) return.*

Note that the timing of rate changes matters. It will not have much effect, if any, on the capital gain/loss component because that ultimately depends on the beginning and ending values of the bond or portfolio. But it does affect the reinvestment return. The longer the horizon, the more it matters. Hence, for long-term forecasts, we should break the forecast horizon into subperiods corresponding to when we expect the largest rate changes to occur.

## EXAMPLE 1

### Forecasting Return Based on Yield to Maturity

Jesper Bloch works for Discrete Asset Management (DAM) in Zurich. Many of the firm's more risk-averse clients invest in a currency-hedged global government bond strategy that uses cash flows to purchase new issues and seasoned bonds all along the yield curve to maintain a roughly constant maturity and duration profile. The yield to maturity of the portfolio is 3.25% (compounded annually), and the modified duration is 4.84. DAM's chief investment officer believes global government yields are likely to rise by 200 bps over the next two years as central banks remove extraordinarily accommodative policies and inflation surges. Bloch has been asked to project approximate returns for this strategy over horizons of two, five, and seven years. What conclusions is Bloch likely to draw?



## Solution:

If yields were not expected to change, the return would be very close to the yield to maturity (3.25%) over each horizon. The Macaulay duration is 5.0 ( $= 4.84 \times 1.0325$ ), so if the yield change occurred immediately, the capital gain/loss and reinvestment impacts on return would roughly balance over five years. Ignoring convexity (which is not given), the capital loss at the end of two years will be approximately 9.68% ( $= 4.84 \times 2\%$ ). Assuming yields rise linearly over the initial two-year period, the higher reinvestment rates will boost the cumulative return by approximately 1.0% over two years, so the annual return over two years will be approximately  $-1.09\%$  [ $= 3.25 + (-9.68 + 1.0)/2$ ]. Reinvesting for three more years at the 2.0% higher rate adds another 6.0% to the cumulative return, so the five-year annual return would be approximately 2.71% [ $= 3.25 + (-9.68 + 1.0 + 6.0)/5$ ]. With an additional two years of reinvestment income, the seven-year annual return would be about 3.44% [ $= 3.25 + (-9.68 + 1.0 + 6.0 + 4.0)/7$ ]. As expected, the capital loss dominated the return over two years, and higher reinvestment rates dominated over seven years. The gradual nature of the yield increase extended the horizon over which the capital gain/loss and reinvestment effects would balance beyond the initial five-year Macaulay duration.

We have extended the DCF approach beyond simply finding the discount rates implied by current market prices (e.g., YTM), which might be considered the “pure” DCF approach. For other asset classes (e.g., equities), the connection between discount rates and valuations/returns is vague because there is so much uncertainty with respect to the cash flows. For these asset classes, discounted cash flow is essentially a conceptual framework rather than a precise valuation model. In contrast, in fixed income there is a tight connection between discount rates, valuations, and returns. We are, therefore, able to refine the “pure” DCF forecast by incorporating projections of how rates will evolve over the investment horizon. Doing so is particularly useful in formulating short-term forecasts.

## 3.2. The Building Block Approach to Fixed-Income Returns

The building block approach forms an estimate of expected return in terms of required compensation for specific types of risk. The required return for fixed-income asset classes has four components: the one-period default-free rate, the term premium, the credit premium, and the liquidity premium. As the names indicate, the premiums reflect compensation for interest rate risk, duration risk, credit risk, and illiquidity, respectively. Only one of the four components—the short-term default-free rate—is (potentially) observable. For example, the

term premium and the credit premium are implicitly embedded in yield spreads, but they are not *equal* to observed yield spreads. Next, we will consider each of these components and summarize applicable empirical regularities.

### **3.2.1. The Short-term Default-free Rate**

In principle, the short-term default-free rate is the rate on the highest-quality, most liquid instrument with a maturity that matches the forecast horizon. In practice, it is usually taken to be a government zero-coupon bill at a maturity that is issued frequently—say, every three months. This rate is virtually always tied closely to the central bank’s policy rate and, therefore, mirrors the cyclical dynamics of monetary policy. Secular movements are closely tied to expected inflation levels.

Under normal circumstances, the observed rate is a reasonable base on which to build expected returns for risky assets. In extreme circumstances, however, it may be necessary to adopt a normalized rate. For example, when policy rates or short-term government rates are negative, using the observed rate without adjustment may unduly reduce the required/expected return estimate for risky instruments. An alternative to normalizing the short rate in this circumstance would be to raise the estimate of one or more of the risk premiums on the basis of the notion that the observed negative short rate reflects an elevated willingness to pay for safety or, conversely, elevated required compensation for risk.

Forecast horizons substantially longer than the maturity of the standard short-term instrument call for a different type of adjustment. There are essentially two approaches. The first is to use the yield on a longer zero-coupon bond with a maturity that matches the horizon. In theory, that is the right thing to do. It does, however, call into question the role of the term premium since the longer-term rate will already incorporate the term premium. The second approach is to replace today’s observed short-term rate with an estimate of the return that would be generated by rolling the short-term instrument over the forecast horizon; that is, take account of the likely path of short-term rates. This approach does not change the interpretation of the term premium. In addition to helping establish the baseline return to which risk premiums will be added, explicitly projecting the path of short-term rates may help in estimating the term premium.

In many markets, there are futures contracts for short-term instruments. The rates implied by these contracts are frequently interpreted as the market’s expected path of short-term rates. As such, they provide an excellent starting point for analysts in formulating their own projections. Some central banks—for example, the US Federal Reserve Board—publish projections of future policy rates that can also serve as a guide for analysts. Quantitative models, such as the Taylor rule, provide another tool.<sup>3</sup>

### 3.2.2. The Term Premium

The default-free spot rate curve reflects the expected path of short-term rates and the required term premiums for each maturity. It is tempting to think that given a projected path of short-term rates, we can easily deduce the term premiums from the spot curve. We can, of course, derive a set of forward rates in the usual way and subtract the projected short-term rate for each future period. Doing so would give an implied sequence of period-by-period premiums. This may be a useful exercise, but it will not give us what we really want—the expected returns for bonds of different maturities over our forecast horizon. The implication is that although the yield curve contains the information we want and may be useful in forecasting returns, we cannot derive the term premium directly from the curve itself.

A vast amount of academic research has been devoted over many decades to addressing three fundamental questions: Do term premiums exist? If so, are they constant? And if they exist, how are they related to maturity? The evidence indicates that term premiums are positive and increase with maturity, are roughly proportional to duration, and vary over time. The first of these properties implies that term premiums are important. The second allows the analyst to be pragmatic, focusing on a single term premium, which is then scaled by duration. The third property implies that basing estimates on current information is essential.

[Ilmanen \(2012\)](#) argued that there are four main drivers of the term premium for nominal bonds.

- *Level-dependent inflation uncertainty:* Inflation is arguably the main driver of long-run variation in both nominal yields and the term premium. Higher (lower) levels of inflation tend to coincide with greater (less) inflation uncertainty. Hence, nominal yields rise (fall) with inflation because of changes in both expected inflation and the inflation risk component of the term premium.
- *Ability to hedge recession risk:* In theory, assets earn a low (or negative) risk premium if they tend to perform well when the economy is weak. When growth and inflation are primarily driven by aggregate demand, nominal bond returns tend to be negatively correlated with growth and a relatively low term premium is warranted. Conversely, when growth and inflation are primarily driven by aggregate supply, nominal bond returns tend to be positively correlated with growth, necessitating a higher term premium.
- *Supply and demand:* The relative outstanding supply of short-maturity and long-maturity default-free bonds influences the slope of the yield curve.<sup>4</sup> This phenomenon is largely attributable to the term premium since the maturity structure of outstanding debt should have little impact on the expected future path of short-term rates.<sup>5</sup>
- *Cyclical effects:* The slope of the yield curve varies substantially over the business

cycle: It is steep around the trough of the cycle and flat or even inverted around the peak. Much of this movement reflects changes in the expected path of short-term rates. However, it also reflects countercyclical changes in the term premium.

Although the slope of the yield curve is useful information on which to base forecasts of the term premium, other indicators work as well or better. [Exhibit 1](#) shows correlations with subsequent excess bond returns (7- to 10-year Treasury bond return minus 3-month Treasury bill return) over 1-quarter, 1-year, and 5-year horizons for eight indicators. The indicators are listed in descending order of the (absolute value of the) correlation with one-year returns. The first four are derived from the bond market. The *ex ante* real yield has the strongest relationship over each horizon. Next on the list are the two most complex indicators. The Cochrane and Piazzesi curve factor is a composite measure capturing both the slope and the curvature of the yield curve.<sup>6</sup> The Kim and Wright premium is derived from a three-factor term structure model.<sup>7</sup> The slope of the yield curve is next on the list. Note that it has the weakest relationship over the five-year horizon. The supply indicator—the share of debt with maturity greater than 10 years—has a particularly strong relationship over the longest horizon. Since this variable tends to change gradually over time, it is not surprising that it is more closely related to long-run average returns than it is to shorter-term returns. The three cyclical proxies—the corporate profit-to-GDP ratio, business confidence, and the unemployment rate—are at the bottom of the list since they had the weakest correlation with return over the next year.

### Exhibit 1. Correlations with Future Excess Bond Returns, 1962–2009

Current Indicator	Return Horizon		
	1 Quarter	1 Year	5 Years
<i>Ex ante</i> real yield	0.28	0.48	0.69
Cochrane and Piazzesi curve factor	0.24	0.44	0.32
Kim and Wright model premium*	0.25	0.43	0.34
Yield curve slope (10 year – 3 month)	0.21	0.34	0.06
Share of debt > 10 years	0.13	0.28	0.66
Corporate profit/GDP	–0.13	–0.25	–0.52
ISM business confidence	–0.10	–0.20	–0.30
Unemployment rate	0.11	0.18	0.24

\* Kim and Wright model results are for 1990–2009.

Source: Ilmanen (2012, Exhibit 3.14).

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### 3.2.3. The Credit Premium

The credit premium is the additional expected return demanded for bearing the risk of default losses—importantly, in addition to compensation for the *expected* level of losses. Both expected default losses and the credit premium are embedded in credit spreads. They cannot be recovered from those spreads unless we impose some structure (i.e., a model) on default-free rates, default probabilities, and recovery rates. The two main types of models—structural credit models and reduced-form credit models—are described in detail in other readings.<sup>8</sup> In the following discussion, we will focus on the empirical behavior of the credit premium.

An analysis of 150 years of defaults among US non-financial corporate bonds showed that the severity of default losses accounted for only about half of the 1.53% average yield spread.<sup>9</sup> Hence, holders of corporate bonds did, on average, earn a credit premium to bear the risk of default. However, the pattern of actual defaults suggests the premium was earned very unevenly over time. In particular, high and low default rates tended to persist, causing clusters of high and low annual default rates and resultant losses. The study found that the previous year's default rate, stock market return, stock market volatility, and GDP growth rate were predictive of the subsequent year's default rate. However, the aggregate credit spread was not predictive of subsequent defaults. Contemporaneous financial market variables—stock returns, stock volatility, and the riskless rate—were significant in explaining the credit spread, but neither GDP growth nor changes in the default rate helped explain the credit spread. This finding suggests that credit spreads were driven primarily by the credit risk premium and financial market conditions and only secondarily by fundamental changes in the expected level of default losses. Thus, credit spreads do contain information relevant to predicting the credit premium.

[Ilmanen \(2012\)](#) hypothesized that credit spreads and the credit premiums embedded in them are driven by different factors, depending on credit quality. Default rates on top-quality (AAA and AA) bonds are extremely low, so very little of the spread/premium is due to the likelihood of actual default in the absence of a change in credit quality. Instead, the main driver is “downgrade bias”—the fact that a deterioration in credit quality (resulting in a rating downgrade) is much more likely than an improvement in credit quality (leading to an upgrade) and that downgrades induce larger spread changes than upgrades do.<sup>10</sup> Bonds rated A and BBB have moderate default rates. They still do not have a high likelihood of actual default losses, but their prospects are more sensitive to cyclical forces and their spreads/premiums vary more (countercyclically) over the cycle. Default losses are of utmost concern for below-investment-grade bonds. Defaults tend to cluster in times when the economy is in recession. In addition, the default rate and the severity of losses in default tend to rise and fall together. These characteristics imply big losses at the worst times, necessitating substantial compensation for this risk. Not too surprisingly, high-yield

spreads/premiums tend to rise ahead of realized default rates.

**Exhibit 2** shows three variables that have tended to predict excess returns (over T-bills) for an index of US investment-grade corporate bonds over the next quarter and the next year. Not surprisingly, a high corporate option-adjusted spread is bullish for corporate bond performance because it indicates a large cushion against credit losses—that is, a higher credit premium. A steep Treasury curve is also bullish because, as mentioned earlier, it tends to correspond to the trough of the business cycle when default rates begin to decline. Combining these insights with those from **Exhibit 1**, the implication is that a steep yield curve predicts both a high term premium and a high credit premium. Higher implied volatility in the equity market was also bullish for corporates, most likely reflecting risk-averse pricing—that is, high risk premiums—across all markets.

### **Exhibit 2. Correlations with US Investment-Grade Corporate Excess Returns, 1990–2009**

<b>Current Indicator</b>	<b>Return Horizon</b>	
	<b>1 Quarter</b>	<b>1 Year</b>
Corporate option-adjusted spread	0.25	0.46
VIX implied equity volatility	0.28	0.39
Yield curve slope (10 year – 2 year)	0.20	0.27

Source: Ilmanen (2012, Exhibit 4.15).

How are credit premiums related to maturity? Aside from situations of imminent default, there is greater risk of default losses the longer one must wait for payment. We might, therefore, expect that longer-maturity corporate bonds would offer higher credit risk premiums. The historical evidence suggests that this has not been the case. Credit premiums tend to be especially generous at the short end of the curve. This may be due to “event risk,” in the sense that a default, no matter how unlikely, could still cause a huge proportional loss but there is no way that the bond will pay more than the issuer promised. It may also be due, in part, to illiquidity since many short-maturity bonds are old issues that rarely trade as they gradually approach maturity. As a result, many portfolio managers use a strategy known as a “credit barbell” in which they concentrate credit exposure at short maturities and take interest rate/duration risk via long-maturity government bonds.



### 3.2.4. The Liquidity Premium

Relatively few bond issues trade actively for more than a few weeks after issuance. Secondary market trading occurs primarily in the most recently issued sovereign bonds, current coupon mortgage-backed securities, and a few of the largest high-quality corporate bonds. The liquidity of other bonds largely depends on the willingness of dealers to hold them in inventory long enough to find a buyer. In general, liquidity tends to be better for bonds that are (a) priced near par/reflective of current market levels, (b) relatively new, (c) from a relatively large issue, (d) from a well-known/frequent issuer, (e) standard/simple in structure, and (f) high quality. These factors tend to reduce the dealer's risk in holding the bond and increase the likelihood of finding a buyer quickly.

As a baseline estimate of the “pure” liquidity premium in a particular market, the analyst can look to the yield spread between fixed-rate, option-free bonds from the highest-quality issuer (virtually always the sovereign) and the next highest-quality large issuer of similar bonds (often a government agency or quasi-agency). Adjustments should then be made for the factors listed previously. In general, the impact of each factor is likely to increase disproportionately as one moves away from baseline attributes. For example, each step lower in credit quality is likely to have a bigger impact on liquidity than that of the preceding step.

#### EXAMPLE 2

### Fixed-Income Building Blocks

Salimah Rahman works for SMECo, a Middle Eastern sovereign wealth fund. Each year, the fund's staff updates its projected returns for the following year on the basis of developments in the preceding year. The fund uses the building block approach in making its fixed-income projections. Rahman has been assigned the task of revising the key building block components for a major European bond market. The following table shows last year's values:

Description		Value
Risk-free rate	3-month government bill	3.50%
Term premium	5-year duration	0.50%
Credit premium	Baa/BBB corporate	0.90%
Liquidity premium	Government-guaranteed agency	0.15%

Although inflation rose modestly, the central bank cut its policy rate by 50 bps in

response to weakening growth. Aggregate corporate profits have remained solid, and after a modest correction, the stock market finished higher for the year. However, defaults on leveraged loans were unexpectedly high this year, and confidence surveys weakened again recently. Equity option volatility spiked mid-year but ended the year somewhat lower. The interest rate futures curve has flattened but remains upward sloping. The 10-year government yield declined only a few basis points, while the yield on comparable government agency bonds remained unchanged and corporate spreads—both nominal and option adjusted—widened.

Indicate the developments that are likely to cause Rahman to increase/decrease each of the key building blocks relative to last year.

### **Guideline answer:**

Based on the reduction in policy rates and the flattening of the interest rate futures curve, Rahman is virtually certain to reduce the short-term rate component. Steepening of the yield curve (10-year yield barely responded to the 50 bp rate cut) indicates an increase in both the term premium and the credit premium. Declining confidence also suggests a higher term premium. Widening of credit spreads is also indicative of a higher credit premium. However, the increase in loan defaults suggests that credit losses are likely to be higher next year as well, since defaults tend to cluster. All else the same, this reduces the expected return on corporate bonds/loans. Hence, the credit premium should increase less than would otherwise be implied by the steeper yield curve and wider credit spreads. Modest widening of the government agency spread indicates an increase in the liquidity premium. The resilience of the equity market and the decline in equity option volatility suggest that investors are not demanding a general increase in risk premiums.

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## **4. RISKS IN EMERGING MARKET BONDS**

- b.** discuss risks faced by investors in emerging market fixed-income securities and the country risk analysis techniques used to evaluate emerging market economies;

Emerging market debt was once nearly synonymous with crisis. The Latin American debt crisis of the 1980s involved bank loans but essentially triggered development of a market for emerging market bonds. In the early 1990s, the Mexican crisis occurred. In the late 1990s,



there was the Asian crisis, followed by the Russian crisis, which contributed to the turmoil that sank the giant hedge fund Long-Term Capital Management. There have been other, more isolated, events, such as Argentina's forced restructuring of its debt, but the emerging market bond market has grown, deepened, and matured. What started with only a few government issuers borrowing in hard currencies (from their perspective foreign, but widely used, currencies) has grown into a market in which corporations as well as governments issue in their local currencies and in hard currencies. The discussion here applies not just to emerging markets but also to what are known as "frontier" markets (when they are treated separately or as a subset of emerging markets).

Investing in emerging market debt involves all the same risks as investing in developed country debt, such as interest rate movements, currency movements, and potential defaults. In addition, it poses risks that are, although not entirely absent, less significant in developed markets. These risks fall roughly into two categories: (1) economic and (2) political and legal. A slightly different breakdown would be "ability to pay" and "willingness to pay."

Before discussing these country risks, note that some countries that are labeled as emerging markets may in fact be healthy, prosperous economies with strong fundamentals. Likewise, the political and legal issues discussed in this section may or may not apply to any particular country. Furthermore, these risks will, in general, apply in varying degrees across countries. Emerging markets are widely recognized as a very heterogeneous group. It is up to the analyst to assess which considerations are relevant to a particular investment decision.

## **4.1. Economic Risks/Ability to Pay**

Emerging market economies as a whole have characteristics that make them potentially more vulnerable to distress and hence less likely to be able to pay their debts on time or in full, such as the following:

- Greater concentration of wealth and income; less diverse tax base
- Greater dependence on specific industries, especially cyclical industries, such as commodities and agriculture; low potential for pricing power in world markets
- Restrictions on trade, capital flows, and currency conversion
- Poor fiscal controls and monetary discipline
- Less educated and less skilled work force; poor or limited physical infrastructure; lower level of industrialization and technological sophistication
- Reliance on foreign borrowing, often in hard currencies not their own

- Small/less sophisticated financial markets and institutions
- Susceptibility to capital flight; perceived vulnerability contributing to actual vulnerability

Although history is at best an imperfect guide to the future, the analyst should examine a country's track record on critical issues. Have there been crises in the past? If so, how were they handled/resolved? Has the sovereign defaulted? Is there restructured debt? How have authorities responded to fiscal challenges? Is there inflation or currency instability?

The analyst should, of course, examine the health of the macroeconomy in some detail. A few indicative guidelines can be helpful. If there is one ratio that is most closely watched, it is the ratio of the fiscal deficit to GDP. Most emerging countries have deficits and perpetually struggle to reduce them. A persistent ratio above 40% is likely a cause for concern. A debt-to-GDP ratio exceeding 70%–80%, perhaps of only mild concern for a developed market, is a sign of vulnerability for an emerging market. A persistent annual real growth rate less than 4% suggests that an emerging market is catching up with more advanced economies only slowly, if at all, and per capita income might even be falling—a potential source of political stress. Persistent current account deficits greater than 4% of GDP probably indicate lack of competitiveness. Foreign debt greater than 50% of GDP or greater than 200% of current account receipts is also a sign of danger. Finally, foreign exchange reserves less than 100% of short-term debt is risky, whereas a ratio greater than 200% is ample. It must be emphasized that the numbers given here are merely suggestive of levels that may indicate a need for further scrutiny.

When all else fails, a country may need to call on external support mechanisms. Hence, the analyst should consider whether the country has access to support from the International Monetary Fund (IMF), the World Bank, or other international agencies.

## 4.2. Political and Legal Risks/Willingness to Pay

Investors in emerging market debt may be unable to enforce their claims or recover their investments. Weak property rights laws and weak enforcement of contract laws are clearly of concern in this regard. Inability to enforce seniority structures within private sector claims is one important example. The principle of sovereign immunity makes it very difficult to force a sovereign borrower to pay its debts. Confiscation of property, nationalization of companies, and corruption are also relevant hazards. Coalition governments may also pose political instability problems. Meanwhile, the imposition of capital controls or restrictions on currency conversion may make it difficult, or even impossible, to repatriate capital.

As with economic risks, history may provide some guidance with respect to the severity of political and legal risks. The following are some pertinent questions: Is there a history of

nationalization, expropriation, or other violations of property rights? How have international disputes been resolved and under which legal jurisdiction? Has the integrity of the judicial system and process been questioned? Are political institutions stable? Are they recognized as legitimate and subject to reasonable checks and balances? Has the transfer of power been peaceful, orderly, and lawful? Does the political process give rise to fragile coalitions that collapse whenever events strain the initial compromises with respect to policy?

### EXAMPLE 3

## Emerging Market Bonds

Belvia has big aspirations. Although still a poor country, it has been growing rapidly, averaging 6% real and 10% nominal growth for the last five years. At the beginning of this period of growth, a centrist coalition gained a narrow majority over the authoritarian, fiscally irresponsible, anti-investor, anti-business party that had been in power for decades. The government has removed the old barriers to trade, including the signing of a regional free-trade agreement, and removed capital controls. Much of its growth has been fueled by investment in its dominant industry—natural resources—financed by debt and foreign direct investment flows. These policies have been popular with the business community, as has the relaxation of regulations affecting key constituencies. Meanwhile, to ensure that prosperity flows rapidly to the people, the government has allowed redistributive social payments to grow even faster than GDP, resulting in a large and rising fiscal deficit (5% of GDP this year, projected to be 7% in two years). The current account deficit is 8% of GDP. Despite the large current account deficit, the local currency has appreciated significantly since it was allowed to float two years ago. The government has just announced that it will issue a large 10-year local currency bond under Belvian law—the first issue of its kind in many years.

Despite a very strong relationship with the bank marketing the bond, Peter Valt has decided not to invest in it. When pressed for his reasoning, what risks is he likely to identify?

### Solution:

There are several significant risks and warning signs. Coalition governments are often unstable, and the most likely alternative would appear to be a return to the previously dominant party that lacks fiscal discipline. That regime is likely to undo the recent pro-growth policies and might even disavow the debt, including this new bond. The bond will be governed by Belvian law, which, combined with the principle of sovereign immunity, will make it very difficult for foreigners to enforce their claims. In addition, the relaxation of regulations affecting key constituencies hints strongly at corruption and possibly at payoffs within the current regime. With respect to the economy, fiscal

discipline remains poor, there is heavy reliance on a single industry, and the current account deficit is almost certainly unsustainable (e.g., over the 10-year life of this bond). In addition, the currency is very likely to be overvalued, which will both make it very difficult to broaden global competitiveness beyond natural resources and increase the investor's risk of substantial currency losses.

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## 5. FORECASTING EQUITY RETURNS

- c. discuss approaches to setting expectations for equity investment market returns;
- d. discuss risks faced by investors in emerging market equity securities;

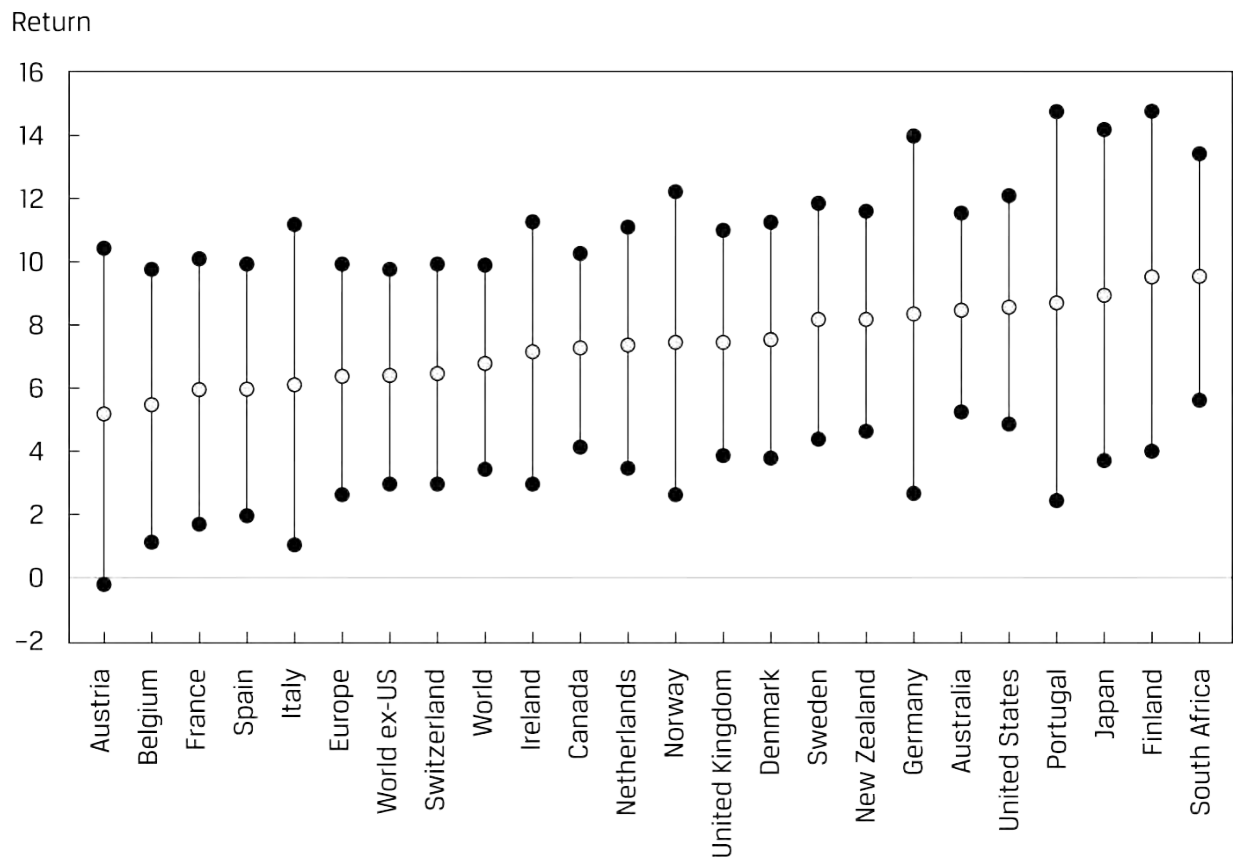
The task of forecasting equity market returns is often the central focus of setting capital market expectations. In this section, we discuss applying each of the major methodologies to equities.

### 5.1. Historical Statistics Approach to Equity Returns

The *Credit Suisse Global Investment Returns Yearbook 2018*<sup>11</sup> updated the seminal work of [Dimson, Marsh, and Staunton \(2002\)](#) to include asset returns in 21 countries for the 118-year period of 1900–2017. [Exhibit 3](#) shows the mean real return for each market portfolio centered within a 95% confidence interval. Results are also shown for a world portfolio, a world ex-US portfolio, and Europe. The portfolios are ordered from left to right on the basis of the mean return.

The means range from a low of 5.0% for Austria to a high of 9.4% in South Africa. Note that both of these values lie within the confidence interval for every country. From a statistical perspective, there is really no difference among these markets in terms of mean real return. This illustrates the fact that sample averages, even derived from seemingly long histories, are very imprecise estimates unless the volatility of the data is small relative to the mean. Clearly that is not the case for equity returns. Nonetheless, sample means are frequently cited without regard to the quality of information they convey.

### Exhibit 3. Historical Mean Returns with Confidence Intervals by Country, 1900–2017



Source: Dimson, Marsh, and Staunton (2018, Chapter 1, Table 1. Real, local currency percent returns).

As indicated in Section 2, shrinkage estimators can often provide more reliable estimates by combining the sample mean with a second estimate of the mean return. However, the application of a common shrinkage estimator confirms that there is no basis for believing that the true expected returns for the countries in [Exhibit 3](#) are different.

## 5.2. DCF Approach to Equity Returns

Analysts have frequently used the Gordon (constant) growth model form of the dividend discount model, solved for the required rate of return, to formulate the long-term expected return of equity markets. Although this model is quite simple, it has a big advantage over using historical stock returns to project future returns. The vast majority of the “noise” in historical stock returns comes from fluctuations in the price-to-earnings ratio (P/E) and the ratio of earnings to GDP. Since the amount of earnings appears in the numerator of one ratio and the denominator of the other, the impact of these ratios tends to cancel out over time,

leaving the relationship between equity market appreciation and GDP growth much more stable. And GDP growth itself, especially the real growth component, is much less volatile and hence relatively predictable.<sup>12</sup> As an illustration, [Exhibit 4](#) shows historical volatilities (defined as the standard deviation of percentage changes) for the S&P 500 Index return, P/E, the earnings-to-GDP ratio, real US GDP growth, and inflation for 1946–2016. The Gordon growth model allows us to take advantage of this relative stability by linking long-term equity appreciation to a more stable foundation—economic growth.

#### Exhibit 4. Historical Comparison of Standard Deviations in the United States, 1946–2016

S&P 500	P/E	Earnings/GDP	Real GDP Growth	Inflation
16.1	28.5	28.9	3.0	3.2

*Note:* Standard deviation of % changes

In the United States and other major markets, share repurchases have become an important way for companies to distribute cash to shareholders. [Grinold and Kroner \(2002\)](#) provided a restatement of the Gordon growth model that takes explicit account of repurchases. Their model also provides a means for analysts to incorporate expectations of valuation levels through the familiar price-to-earnings ratio. The **Grinold–Kroner model**<sup>13</sup> is

#### Equation (1)

$$E(R_e) \approx \frac{D}{P} + (\% \Delta E - \% \Delta S) + \% \Delta P/E,$$

where  $E(R_e)$  is the expected equity return,  $D/P$  is the dividend yield,  $\% \Delta E$  is the expected percentage change in total earnings,  $\% \Delta S$  is the expected percentage change in shares outstanding, and  $\% \Delta P/E$  is the expected percentage change in the price-to-earnings ratio. The term in parentheses,  $(\% \Delta E - \% \Delta S)$ , is the growth rate of earnings per share. Net share repurchases ( $\% \Delta S < 0$ ) imply that earnings per share grows faster than total earnings.

With a minor rearrangement of the equation, the expected return can be divided into three components:

- Expected cash flow (“income”) return:  $D/P - \% \Delta S$
- Expected nominal earnings growth return:  $\% \Delta E$

- Expected repricing return:  $\% \Delta P/E$

The expected nominal earnings growth return and the expected repricing return constitute the expected capital gains.

In principle, the Grinold–Kroner model assumes an infinite horizon. In practice, the analyst typically needs to make projections for finite horizons, perhaps several horizons. In applying the model, the analyst needs to be aware of the implications of constant growth rate assumptions over different horizons. Failure to tailor growth rates to the horizon can easily lead to implausible results. As an example, suppose the P/E is currently 16.0 and the analyst believes that it will revert to a level of 20 and be stable thereafter. The P/E growth rates for various horizons that are consistent with this view are 4.56% for 5 years, 2.26% for 10 years, 0.75% for 30 years, and an arbitrarily small positive number for a truly long-term horizon. Treating, say, the 2.26% 10-year number as if it is appropriate for the “long run” would imply an ever-rising P/E rather than convergence to a plausible long-run valuation. The only very long-run assumptions that are consistent with economically plausible relationships are  $\% \Delta E = \text{Nominal GDP growth}$ ,  $\% \Delta S = 0$ , and  $\% \Delta P/E = 0$ . The longer the (finite) horizon, the less the analyst’s projection should deviate from these values.

#### EXAMPLE 4

## Forecasting the Equity Return Using the Grinold–Kroner Model

Cynthia Casey uses the Grinold–Kroner model in forecasting developed market equity returns. Casey makes the following forecasts:

- a 2.25% dividend yield on Canadian equities, based on the S&P/TSE Composite Index;
  - a 1% rate of net share repurchases for Canadian equities;
  - a long-term corporate earnings growth rate of 6% per year, based on a 1 percentage point (pp) premium for corporate earnings growth over her expected Canadian (nominal) GDP growth rate of 5%; and
  - an expansion rate for P/E multiples of 0.25% per year.
1. Based on the information given, what expected rate of return on Canadian equities is implied by Casey’s assumptions?
  2. Are Casey’s assumptions plausible for the long run and for a 10-year horizon?



## Solution to 1:

The expected rate of return on Canadian equities based on Casey's assumptions would be 9.5%, calculated as

$$E(R_e) \approx 2.25\% + [6.0\% - (-1.0\%)] + 0.25\% = 9.5\%.$$

## Solution to 2:

Casey's assumptions are not plausible for the very long run. The assumption that earnings will grow 1% faster than GDP implies one of two things: either an ever-rising ratio of economy-wide earnings to GDP or the earnings accruing to businesses not included in the index (e.g., private firms) continually shrinking relative to GDP. Neither is likely to persist indefinitely. Similarly, perpetual share repurchases would eventually eliminate all shares, whereas a perpetually rising P/E would lead to an arbitrarily high price per Canadian dollar of earnings per share. Based on Casey's economic growth forecast, a more reasonable long-run expected return would be  $7.25\% = 2.25\% + 5.0\%$ .

Casey's assumptions are plausible for a 10-year horizon. Over 10 years, the ratio of earnings to GDP would rise by roughly  $10.5\% = (1.01)^{10} - 1$ , shares outstanding would shrink by roughly  $9.6\% = 1 - (0.99)^{10}$ , and the P/E would rise by about  $2.5\% = (1.0025)^{10} - 1$ .

Most of the inputs to the Grinold–Kroner model are fairly readily available. Economic growth forecasts can easily be found in investment research publications, reports from such agencies as the IMF, the World Bank, and the OECD, and likely from the analyst firm's own economists. Data on the rate of share repurchases are less straightforward but are likely to be tracked by sell-side firms and occasionally mentioned in research publications. The big question is how to gauge valuation of the market in order to project changes in the P/E.

The fundamental valuation metrics used in practice typically take the form of a ratio of price to some fundamental flow variable—such as earnings, cash flow, or sales—with seemingly endless variations in how the measures are defined and calculated. Whatever the metric, the implicit assumption is that it has a well-defined long-run mean value to which it will revert. In statistical terms, it is a stationary random variable. Extensive empirical evidence indicates that these valuation measures are poor predictors of short-term performance. Over multi-year horizons, however, there is a reasonably strong tendency for extreme values to be corrected. Thus, these metrics do provide guidance for projecting intermediate-term movements in valuation.

Gauging what is or is not an extreme value is complicated by the fact that all the fundamental



flow variables as well as stock prices are heavily influenced by the business cycle. One method of dealing with this issue is to “cyclically adjust” the valuation measure. The most widely known metric is the cyclically adjusted P/E (CAPE). For this measure, the current price level is divided by the average level of earnings for the last 10 years (adjusted for inflation), rather than by the most current earnings. The idea is to average away cyclical variation in earnings and provide a more reliable base against which to assess the current market price.

## 5.3. Risk Premium Approaches to Equity Returns

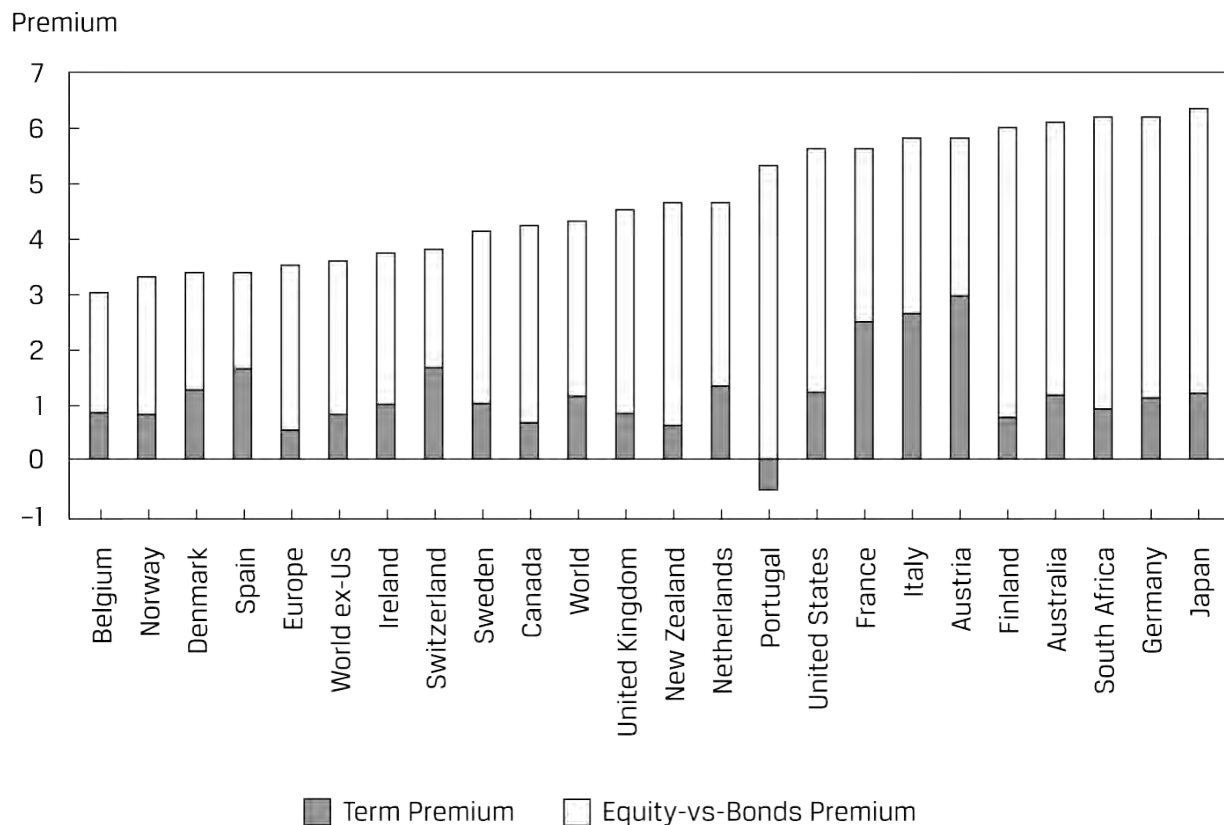
The Grinold–Kroner model and similar models are sometimes said to reflect the “supply” of equity returns since they outline the sources of return. In contrast, risk premiums reflect “demand” for returns.

### 5.3.1. *Defining and Forecasting the Equity Premium*

The term “equity premium” is most frequently used to describe the amount by which the expected return on equities exceeds the riskless rate (“equity versus bills”). However, the same term is sometimes used to refer to the amount by which the expected return on equities exceeds the expected return on default-free bonds (“equity versus bonds”). From the discussion of fixed-income building blocks in Sections 3 and 4, we know that the difference between these two definitions is the term premium built into the expected return on default-free bonds. The equity-versus-bonds premium reflects an incremental/building block approach to developing expected equity returns, whereas the equity-versus-bills premium reflects a single composite premium for the risk of equity investment.

**Exhibit 5** shows historical averages for both of these equity premium concepts by country for the period 1900–2017.<sup>14</sup> For each country, the bottom portion of the column is the realized term premium (i.e., bonds minus bills) and the top segment is the realized equity-versus-bonds premium. The whole column represents the equity-versus-bills premium. The equity-versus-bills premiums range from 3.0% to 6.3%, the equity-versus-bonds premiums range from 1.8% to 5.2%, and the term premiums range from –0.6% to 2.9%.

#### **Exhibit 5. Historical Equity Premiums by Country, 1900–2017**



Notes: Germany excludes 1922–1923. Austria excludes 1921–1922. Returns are shown in percentages.

Source: [Dimson et al. \(2018, Chapter 2, Tables 8 and 9\)](#).

As with the mean equity returns in [Exhibit 3](#), these historical premiums are subject to substantial estimation error. Statistically, there is no meaningful difference among them. Thus, the long-run cross section of returns/premiums provides virtually no reliable information with which to differentiate among countries.

Since equity returns are much more volatile than returns on either bills or bonds, forecasting either definition of the equity premium is just as difficult as projecting the absolute level of equity returns. That is, simply shifting to focus on risk premiums provides little, if any, specific insight with which to improve forecasts. The analyst must, therefore, use the other modes of analysis discussed here to forecast equity returns/premiums.

### 5.3.2. An Equilibrium Approach

There are various global/international extensions of the familiar capital asset pricing model (CAPM). We will discuss a version proposed by [Singer and Terhaar \(1997\)](#) that is intended to capture the impact of incomplete integration of global markets.

The Singer–Terhaar model is actually a combination of two underlying CAPM models. The

first assumes that all global markets and asset classes are fully integrated. The full integration assumption allows the use of a single global market portfolio to determine equity-versus-bills risk premiums for all assets. The second underlying CAPM assumes complete segmentation of markets such that each asset class in each country is priced without regard to any other country/asset class. For example, the markets for German equities and German bonds are completely segmented. Clearly, this is a very extreme assumption.

Recall the basic CAPM pricing relationship:

**Equation (2)**

$$RP_i = \beta_{i,M} RP_M,$$

where  $RP_i = [E(R_i) - R_F]$  is the risk premium on the  $i$ th asset,  $RP_M$  is the risk premium on the market portfolio,  $R_F$  is the risk-free rate, and  $\beta_{i,M}$ —asset  $i$ 's sensitivity to the market portfolio—is given by

**Equation (3)**

$$\beta_{i,M} = \frac{\text{Cov}(R_i, R_M)}{\text{Var}(R_M)} = \rho_{i,M} \left( \frac{\sigma_i}{\sigma_M} \right).$$

Standard deviations are denoted by  $\sigma$ , and  $\rho$  denotes correlation.

Under the assumption of full integration, every asset is priced relative to the global capitalization-weighted market portfolio. Using Equations 2 and 3 and denoting the global market portfolio by “GM,” the first component of the Singer–Terhaar model is

**Equation (4)**

$$RP_i^G = \beta_{i,GM} RP_{GM} = \rho_{i,GM} \sigma_i \left( \frac{RP_{GM}}{\sigma_{GM}} \right).$$

A superscript “G” has been added on the asset's risk premium to indicate that it reflects the global equilibrium. The term in parentheses on the far right is the Sharpe ratio for the global market portfolio, the risk premium per unit of global market risk.

Now consider the case of completely segmented markets. In this case, the risk premium for each asset will be determined in isolation without regard to other markets or opportunities for diversification. The risk premium will be whatever is required to induce investors with access to that market/asset to hold the existing supply. In terms of the CAPM framework, this implies treating each asset as its own “market portfolio.” Formally, we can simply set  $\beta$  equal to 1 and  $\rho$  equal to 1 in the previous equations since each asset is perfectly correlated with

itself. Using a superscript “S” to denote the segmented market equilibrium and replacing the global market portfolio with asset  $i$  itself in Equation 4, the segmented market equilibrium risk premium for asset  $i$  is

**Equation (5)**

$$RP_i^S = 1 \times RP_i^S = 1 \times \sigma_i \left( \frac{RP_i^S}{\sigma_i} \right).$$

This is the second component of the Singer–Terhaar model. Note that the first equality in Equation 5 is an identity; it conveys no information. It reflects the fact that in a completely segmented market, the required risk premium could take any value. The second equality is more useful because it breaks the risk premium into two parts: the risk of the asset ( $\sigma_i$ ) and the Sharpe ratio (i.e., compensation per unit of risk) in the segmented market.<sup>15</sup>

The final Singer–Terhaar risk premium estimate for asset  $i$  is a weighted average of the two component estimates

**Equation (6)**

$$RP_i = \phi RP_i^G + (1 - \phi) RP_i^S.$$

To implement the model, the analyst must supply values for the Sharpe ratios in the globally integrated market and the asset’s segmented market; the degree to which the asset is globally integrated, denoted by  $\phi$ ; the asset’s volatility; and the asset’s  $\beta$  with respect to the global market portfolio. A pragmatic approach to specifying the Sharpe ratios for each asset under complete segmentation is to assume that compensation for non-diversifiable risk (i.e., “market risk”) is the same in every market. That is, assume all the Sharpe ratios equal the global Sharpe ratio.

In practice, the analyst must make a judgment about the degree of integration/segmentation—that is, the value of  $\phi$  in the Singer–Terhaar model. With that in mind, some representative values that can serve as starting points for refinement can be helpful. Developed market equities and bonds are highly integrated, so a range of 0.75–0.90 would be reasonable for  $\phi$ . Emerging markets are noticeably less integrated, especially during stressful periods, and there are likely to be greater differences among these markets, so a range of 0.50–0.75 would be reasonable for emerging market equities and bonds. Real estate market integration is increasing but remains far behind developed market financial assets, perhaps on par with emerging market stocks and bonds overall. In general, relative real estate market integration is likely to reflect the relative integration of the associated financial markets. Commodities for which there are actively traded, high-volume futures contracts should be on the higher end of the integration scale.

To illustrate the Singer–Terhaar model, suppose that an investor has developed the following projections for German shares and bonds.

	German Shares	German Bonds
Volatility ( $\sigma_i$ )	17.0%	7.0%
Correlation with global market ( $\rho_{i,M}$ )	0.70	0.50
Degree of integration ( $\phi$ )	0.85	0.85
Segmented market Sharpe ratio ( $RP_i^S / \sigma_i$ )	0.35	0.25

The risk-free rate is 3.0%, and the investor's estimate of the global Sharpe ratio is 0.30. Note that the investor expects compensation for undiversifiable risk to be higher in the German stock market and lower in the German bond market under full segmentation. The following are the fully integrated risk premiums for each of the assets (from Equation 4):

Equities:  $0.70 \times 17.0\% \times 0.30 = 3.57\%$ .

Bonds:  $0.50 \times 7.0\% \times 0.30 = 1.05\%$ .

The following are the fully segmented risk premiums (from Equation 5):

Equities:  $17.0\% \times 0.35 = 5.95\%$ .

Bonds:  $7.0\% \times 0.25 = 1.75\%$ .

Based on 85% integration ( $\phi = 0.85$ ), the final risk estimates (from Equation 6) would be as follows:

Equities:  $(0.85 \times 3.57\%) + (1 - 0.85) \times 5.95\% = 3.93\%$ .

Bonds:  $(0.85 \times 1.05\%) + (1 - 0.85) \times 1.75\% = 1.16\%$ .

Adding in the risk-free rate, the expected returns for German shares and bonds would be 6.93% and 4.16%, respectively.

Virtually all equilibrium models implicitly assume perfectly liquid markets. Thus, the analyst should assess the actual liquidity of each asset class and add appropriate liquidity premiums. Although market segmentation and market liquidity are conceptually distinct, in practice they are likely to be related. Highly integrated markets are likely to be relatively liquid, and illiquidity is one reason that a market may remain segmented.

## EXAMPLE 5

## Using the Singer–Terhaar Model

Stacy Adkins believes the equity market in one of the emerging markets that she models has become more fully integrated with the global market. As a result, she expects it to be more highly correlated with the global market. However, she thinks its overall volatility will decline. Her old and new estimates are as follows:

	Previous Data	New Data
Volatility ( $\sigma_i$ )	22.0%	18.0%
Correlation with global market ( $\rho_{i,M}$ )	0.50	0.70
Degree of integration ( $\varphi$ )	0.55	0.75
Sharpe ratio (global and segmented markets)	0.30	0.30

If she uses the Singer–Terhaar model, what will the net impact of these changes be on her risk premium estimate for this market?

### Solution:

The segmented market risk premium will decline from 6.6% (calculated as  $22.0\% \times 0.30 = 6.6\%$ ) to 5.4% ( $= 18\% \times 0.30$ ). The fully integrated risk premium will increase from 3.30% ( $= 0.50 \times 22.0\% \times 0.30$ ) to 3.78% ( $= 0.70 \times 18.0\% \times 0.30$ ). The weighted average premium will decline from 4.79% [ $= (0.55 \times 3.30\%) + (0.45 \times 6.60\%)$ ] to 4.19% [ $= (0.75 \times 3.78\%) + (0.25 \times 5.40\%)$ ], so the net effect is a decline of 60 bps.

## 5.4. Risks in Emerging Market Equities

Most of the issues underlying the risks of emerging market (and “frontier market” if they are classified as such) bonds also present risks for emerging market equities: more fragile economies, less stable political and policy frameworks, and weaker legal protections. However, the risks take somewhat different forms because of the different nature of equity and debt claims. Again, note that emerging markets are a very heterogeneous group. The political, legal, and economic issues that are often associated with emerging markets may not, in fact, apply to a particular market or country being analyzed.

There has been a debate about the relative importance of “country” versus “industry” risk

factors in global equity markets for over 40 years. The empirical evidence has been summarized quite accurately as “vast and contradictory.”<sup>16</sup> Both matter, but on the whole, country effects still tend to be more important than (global) industry effects. This is particularly true for emerging markets. Emerging markets are generally less fully integrated into the global economy and the global markets. Hence, local economic and market factors exert greater influence on risk and return in these markets than in developed markets.

Political, legal, and regulatory weaknesses—in the form of weak standards and/or weak enforcement—affect emerging market equity investors in various ways. The standards of corporate governance may allow interested parties to manipulate the capital structure of companies and to misuse business assets. Accounting standards may allow management and other insiders to hide or misstate important information. Weak disclosure rules may also impede transparency and favor insiders. Inadequate property rights laws, lack of enforcement, and weak checks and balances on governmental actions may permit seizure of property, nationalization of companies, and prejudicial and unpredictable regulatory actions.

Whereas the emerging market debt investor needs to focus on ability and willingness to pay specific obligations, emerging market equity investors need to focus on the many ways that the value of their ownership claims might be expropriated by the government, corporate insiders, or dominant shareholders.

## EXAMPLE 6

### Emerging Market Equity Risks

Bill Dwight has been discussing investment opportunities in Belvia with his colleague, Peter Valt (see [Example 3](#)). He is aware that Valt declined to buy the recently issued government bond, but he believes the country’s equities may be attractive. He notes the rapid growth, substantial investment spending, free trade agreement, deregulation, and strong capital inflows as factors favoring a strong equity market. In addition, solid global growth has been boosting demand for Belvia’s natural resources. Roughly half of the public equity market is represented by companies in the natural resources sector. The other half is a reasonably diversified mix of other industries. Many of these firms remain closely held, having floated a minority stake on the local exchange in the last few years. Listed firms are required to have published two years of financial statements conforming to standards set by the Belvia Public Accounting Board, which is made up of the heads of the three largest domestic accounting firms. With the help of a local broker, Dwight has identified a diversified basket of stocks that he intends to buy.

Discuss the risks Dwight might be overlooking.

**Guideline answer:**

Dwight might be overlooking several risks. He is almost certainly underestimating the vulnerability of the local economy and the vulnerability of the equity market to local developments. The economy's rapid growth is being driven by a large and growing fiscal deficit, in particular, rapidly rising redistributive social payments, and investment spending financed by foreign capital. Appreciation of the currency has made industries other than natural resources less competitive, so the free trade agreement provides little support for the economy. When the government is forced to tighten fiscal policy or capital flows shrink, the domestic economy is likely to be hit hard. Political risk is also a concern. A return to the prior regime is likely to result in a less pro-growth, less business-friendly environment, which would most likely result in attempts by foreign investors to repatriate their capital. Dwight should also have serious concerns about corporate governance, given that most listed companies are closely held, with dominant shareholders posing expropriation risk. He should also be concerned about transparency (e.g., limited history available) and accounting standards (local standards set by the auditing firms themselves).

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## 6. FORECASTING REAL ESTATE RETURNS

- e. explain how economic and competitive factors can affect expectations for real estate investment markets and sector returns;

Real estate is inherently quite different from equities, bonds, and cash. It is a physical asset rather than a financial asset. It is heterogeneous, indivisible, and immobile. It is a factor of production, like capital equipment and labor, and as such, it directly produces a return in the form of services. Its services can be sold but can be used/consumed only in one location. Owning and operating real estate involves operating and maintenance costs. All these factors contribute to making real estate illiquid and costly to transfer. The characteristics just described apply to direct investment in real estate (raw land, which does not produce income, is an exception). We will address the investment characteristics of equity REITs versus direct real estate, but unless otherwise stated, the focus is on directly held, unlevered, income-producing real estate.

### 6.1. Historical Real Estate Returns



The heterogeneity, indivisibility, immobility, and illiquidity of real estate pose a severe problem for historical analysis. Properties trade infrequently, so there is virtually no chance of getting a sequence of simultaneous, periodic (say, quarterly) transaction prices for a cross section of properties. Real estate owners/investors must rely heavily on appraisals, rather than transactions, in valuing properties. Owing to infrequent transactions and the heterogeneity of properties, these appraisals tend to reflect slowly moving averages of past market conditions. As a result, returns calculated from appraisals represent weighted averages of (unobservable) “true” returns—returns that would have been observed if there had been transaction prices—in previous periods. This averaging does not, in general, bias the mean return. It does, however, significantly distort estimates of volatility and correlations. The published return series is too smooth; that is, the usual sample volatility substantially understates the true volatility of returns. Meanwhile, by disguising the timing of response to market information, the smoothing tends to understate the strength of contemporaneous correlation with other market variables and spuriously induce a lead/lag structure of correlations.

In order to undertake any meaningful analysis of real estate as an asset class, the analyst must first deal with this data issue. It has become standard to “unsmooth” appraisal-based returns using a time-series model. Such techniques, which also apply to private equity funds, private debt funds, and hedge funds, are briefly described in a later section.

## 6.2. Real Estate Cycles

Real estate is subject to cycles that both drive and are driven by the business cycle. Real estate is a major factor of production in the economy. Virtually every business requires it. Every household consumes “housing services.” Demand for the services provided by real estate rises and falls with the pace of economic activity. The supply of real estate is vast but essentially fixed at any point in time.<sup>17</sup> As a result, there is a strong cyclical pattern to property values, rents, and occupancy rates. The extent to which this pattern is observable depends on the type of real estate. As emphasized previously, changes in property values are obscured by the appraisal process, although indications can be gleaned from transactions as they occur. The extent to which actual rents and occupancy rates fully reflect the balance of supply and demand depends primarily on the type of property and the quality of the property. High-quality properties with long leases will tend to have little turnover, so fluctuations in actual rents and occupancy rates are likely to be relatively small. In contrast, demand for low-quality properties is likely to be more sensitive to the economy, leading to more substantial swings in occupancy and possibly rents as well. Properties with short leases will see rents adjust more completely to current supply/demand imbalances. Room rates and occupancy at low-quality hotels will tend to be the most volatile.

Fluctuations in the balance of supply and demand set up a classic boom–bust cycle in real

estate. First, the boom: Perceptions of rising demand, property values, lease rates, and occupancy induce development of new properties. This investment spending helps drive and/or sustain economic activity, which, in turn, reinforces the perceived profitability of building new capacity. Then, the bust: Inevitably, optimistic projections lead to overbuilding and declining property values, lease rates, and occupancy. Since property has a very long life and is immobile, leases are typically for multiple years and staggered across tenants. In addition, since moving is costly for tenants, it may take many months or years for the excess supply to be absorbed.

A study by Clayton, Fabozzi, Gilberto, Gordon, Hudson-Wilson, Hughes, Liang, MacKinnon, and Mansour (2011) suggested that the US commercial real estate crash following the global financial crisis was the first to have been driven by the capital markets rather than by a boom–bust cycle in real estate fundamentals.<sup>18</sup> The catalyst was not overbuilding, Clayton et al. argued, but rather excess leverage and investment in more speculative types of properties. Consistent with that hypothesis, both the collapse in property prices and the subsequent recovery were unusually rapid. The authors attributed the accelerated response to underlying conditions to appraisers responding more vigorously to signals from the REIT and commercial mortgage-backed security markets. It remains to be seen whether this phenomenon will persist in less extreme circumstances.

## 6.3. Capitalization Rates

The capitalization (cap) rate, defined as net operating income (NOI) in the current period divided by the property value, is the standard valuation metric for commercial real estate. It is analogous to the earnings yield (E/P) for equities. It is not, strictly speaking, a cash flow yield because a portion of operating income may be reinvested in the property.<sup>19</sup> As with equities, an estimate of the long-run expected/required rate of return can be derived from this ratio by assuming a constant growth rate for NOI—that is, by applying the Gordon growth model.

### Equation (7)

$$E(R_{re}) = \text{Cap rate} + \text{NOI growth rate}.$$

The long-run, steady-state NOI growth rate for commercial real estate as a whole should be reasonably close to the growth rate of GDP. The observation that over a 30-year period UK nominal rental income grew about 6.5% per annum, roughly 2.5% in real terms,<sup>20</sup> is consistent with this relationship.

Over finite horizons, it is appropriate to adjust this equation to reflect the anticipated rate of change in the cap rate.

## Equation (8)

$$E(R_{re}) = \text{Cap rate} + \text{NOI growth rate} - \% \Delta \text{Cap rate}.$$

This equation is analogous to the Grinold–Kroner model for equities, except there is no term for share buybacks. The growth rate of NOI could, of course, be split into a real component and inflation.

**Exhibit 6** shows private market cap rates as of March 2018 for US commercial properties differentiated by type, location, and quality. The rates range from 4.7% for offices in gateway cities, such as New York City, to 9.5% for skilled nursing (i.e., 24-hour old-age care) properties. There is a clear pattern of high cap rates for riskier property types (hotels versus apartments, skilled nursing facilities versus medical offices), lower-quality properties (low-productivity versus high-productivity malls), and less attractive locations (offices in secondary versus gateway cities).

### Exhibit 6. Cap Rates (%) as of March 2018

Property Type	Average	Higher Risk	Lower Risk
Hotels	7.2	Limited Service 7.7	Full Service 7.1
Health Care	6.6	Skilled Nursing 9.5	Medical Office 5.7
Retail Malls	5.6	Low Productivity 8.8	High Productivity 5.0
Industrial	5.4		
Office	5.2	Secondary Cities 6.6	Gateway Cities 4.7
Apartments	4.8		

Source: CenterSquare Investment Management (2018). Gateway cities include Boston, Chicago, Los Angeles, New York City, San Francisco, and Washington, DC.

Retail properties provide a good example of the impact of competition on real estate. Brick-and-mortar stores have been under increasing competitive pressure from online retailers, such as Amazon. The pressure is especially intense for lower-productivity (less profitable) locations. As a result, cap rates for high- and low-productivity malls began to diverge even before the global financial crisis. In 2006, the difference in cap rates was 1.2 percentage points; by 2018, it was 3.2 percentage points.<sup>21</sup>

Cap rates reflect long-term discount rates. As such, we should expect them to rise and fall

with the general level of long-term interest rates, which tends to make them pro-cyclical. However, they are also sensitive to credit spreads and the availability of credit. [Peyton \(2009\)](#) found that the spread between cap rates and the 10-year Treasury yield is positively related to the option-adjusted spread on three- to five-year B-rated corporate bonds and negatively related to ratios of household and non-financial-sector debt to GDP. The countercyclical nature of credit spreads mitigates the cyclicity of cap rates. The debt ratios are effectively proxies for the availability of debt financing for leveraged investment in real estate. Since real estate transactions typically involve substantial leverage, greater availability of debt financing is likely to translate into a lower required liquidity premium component of expected real estate returns. Not surprisingly, higher vacancy rates induce higher cap rates.

## 6.4. The Risk Premium Perspective on Real Estate Expected Return

As a very long-lived asset, real estate is quite sensitive to the level of long-term rates; that is, it has a high effective duration. Indeed, this is often the one and only characteristic mentioned in broad assessments of the likely performance of real estate as an asset class. Hence, real estate must earn a significant term premium. Income-earning properties are exposed to the credit risk of the tenants. In essence, a fixed-term lease with a stable stream of payments is like a corporate bond issued by the tenant secured with physical assets. The landlord must, therefore, demand a credit premium commensurate with what his or her average tenant would have to pay to issue such debt. Real estate must also earn a significant equity risk premium (relative to corporate debt) since the owner bears the full brunt of fluctuations in property values as well as uncertainty with respect to rent growth, lease rollover/termination, and vacancies. The most volatile component of return arises, of course, from changes in property values. As noted previously, these values are strongly pro-cyclical, which implies the need for a significant equity risk premium. Combining the bond-like components (term premium plus credit premium) with a stock-like component implies a risk premium somewhere between those of corporate bonds and equities.

Liquidity is an especially important risk for direct real estate ownership. There are two main ways to view illiquidity. For publicly traded equities and bonds, the question is not whether one can sell the security quickly but, rather, at what price. For real estate, however, it may be better to think of illiquidity as a total inability to sell the asset except at randomly spaced points in time. From this perspective, the degree of liquidity depends on the average frequency of these trading opportunities. By adopting this perspective, one can ask how large the liquidity premium must be to induce investors to hold an asset with a given level of liquidity. [Ang, Papanikolaou, and Westerfield \(2014\)](#) analyzed this question. Their results suggest liquidity premiums on the order of 0.60% for quarterly average liquidity, 0.90% for annual liquidity, and 2%, 4%, and 6% for liquidity on average every 2, 5, and 10

years, respectively.<sup>22</sup> All things considered, a liquidity premium of 2%–4% would seem reasonable for commercial real estate.

## 6.5. Real Estate in Equilibrium

Real estate can be incorporated into an equilibrium framework (such as the Singer–Terhaar model). Indeed, doing so might be deemed a necessity given the importance of real estate in global wealth. There are, however, a few important considerations. First, the impact of smoothing must have been removed from the risk/return data and metrics used for real estate. Otherwise, inclusion of real estate will distort the results for all asset classes. Second, it is important to recognize the implicit assumption of fully liquid assets in equilibrium models. Adjusting the equilibrium for illiquidity—that is, adding a liquidity premium—is especially important for real estate and other private assets. Third, although real estate investors increasingly venture outside their home markets, real estate is still location specific and may, therefore, be more closely related to local, as opposed to global, economic/market factors than are financial claims.

## 6.6. Public vs. Private Real Estate

Many institutional investors and some ultra-wealthy individuals are able to assemble diversified portfolios of direct real estate holdings. Investors with smaller portfolios must typically choose between limited, undiversified direct real estate holdings or obtaining real estate exposure through financial instruments, such as REIT shares. Assessing whether these alternatives—direct real estate and REITs—have similar investment characteristics is difficult because of return smoothing, heterogeneity of properties, and variations in leverage.

A careful analysis of this issue requires (1) transaction-based returns for unlevered direct real estate holdings, (2) firm-by-firm deleveraging of REIT returns based on their individual balance sheets over time, and (3) carefully constructing direct real estate and REIT portfolios with matching property characteristics. [Exhibit 7](#) shows the results of such an analysis.

**Exhibit 7. Direct Real Estate vs. REITs: Four Property Types, 1994–2012**

Mean Return (%)			Standard Deviation (%)		
Direct	REITs		Direct	REITs	
Real			Real		
Estate	Unlevered	Levered	Estate	Unlevered	Levered

Aggregate	8.80	9.29		11.09	9.71	
Apartment	9.49	9.08	11.77	11.42	9.50	20.69
Office	8.43	9.37	10.49	10.97	10.58	23.78
Industrial	9.00	9.02	9.57	11.14	11.65	23.46
Retail	8.96	9.90	12.04	11.54	10.03	23.73

Source: Ling and Naranjo (2015, Table 1).

Deleveraging the REITs substantially reduces both their mean returns and their volatilities. The volatilities are roughly cut in half. Clearly, the deleveraged REIT returns are much more similar to the direct real estate returns than are the levered REIT returns. In the aggregate, REITs outperformed direct real estate by 49 bps per year with lower volatility. Looking at specific property types, REITs had higher returns and lower volatility in two categories—office and retail. Industrial REITs had essentially the same return as directly owned industrial properties but with higher volatility. Apartment REITs lagged the direct market but with significantly lower volatility.

**Exhibit 7** certainly shows some interesting differences. The pattern of unlevered REIT returns by property type is not the same as for direct real estate. Retail REITs had the highest return, and industrial REITs had the lowest. Among directly owned properties, apartments had the highest return and offices the lowest. A similar mismatch appears with respect to volatilities.

Overall, this study tends to support the general conclusion reached by most comparisons: Public and private commercial real estate are different. The extent of the difference is less clear. It does appear that once we account for differences in leverage, REIT investors are not sacrificing performance to obtain the liquidity afforded by publicly traded shares. Perhaps REIT investors are able to capture a significant portion of the liquidity risk premium garnered by direct investors (because the REIT is a direct investor) as well as benefit from professional management.

What about the diversification benefits of real estate as an asset class? REITs are traded securities, and that fact shows up in their much higher short-term correlation with equities. In contrast, direct real estate is often touted as a good diversifier based on the notion that it is not very highly correlated with equities. As noted previously, the smoothed nature of most published real estate returns is a major contributor to the appearance of low correlation with financial assets, including with REITs. Once that is corrected, however, the correlation is higher, even over reasonably short horizons, such as a quarter or a year. Importantly, REITs are more highly correlated with direct real estate and less highly correlated with equities over multi-year horizons.<sup>23</sup> Thus, although REITs tend to act like “stocks” in the short run, they

act like “real estate” in the longer run. From a strategic asset allocation perspective, REITs and direct real estate are more comparable than conventional metrics suggest.

## 6.7. Long-Term Housing Returns

[Savills World Research \(2016\)](#) estimated that residential real estate accounts for 75% of the total value of developed properties globally. Most individuals’ homes are their primary, perhaps only, real estate investment. A relatively new database provides a global perspective on the long-term performance of residential real estate (housing), equities, and bonds.<sup>24</sup> The database covers 145 years (1870–2015) and 16 countries.

[Jordà, Knoll, Kuvshinov, Schularick, and Taylor \(2017\)](#) found that residential real estate was the best performing asset class over the entire sample period, with a higher real return and much lower volatility than equities. However, performance characteristics differed before and after World War II:

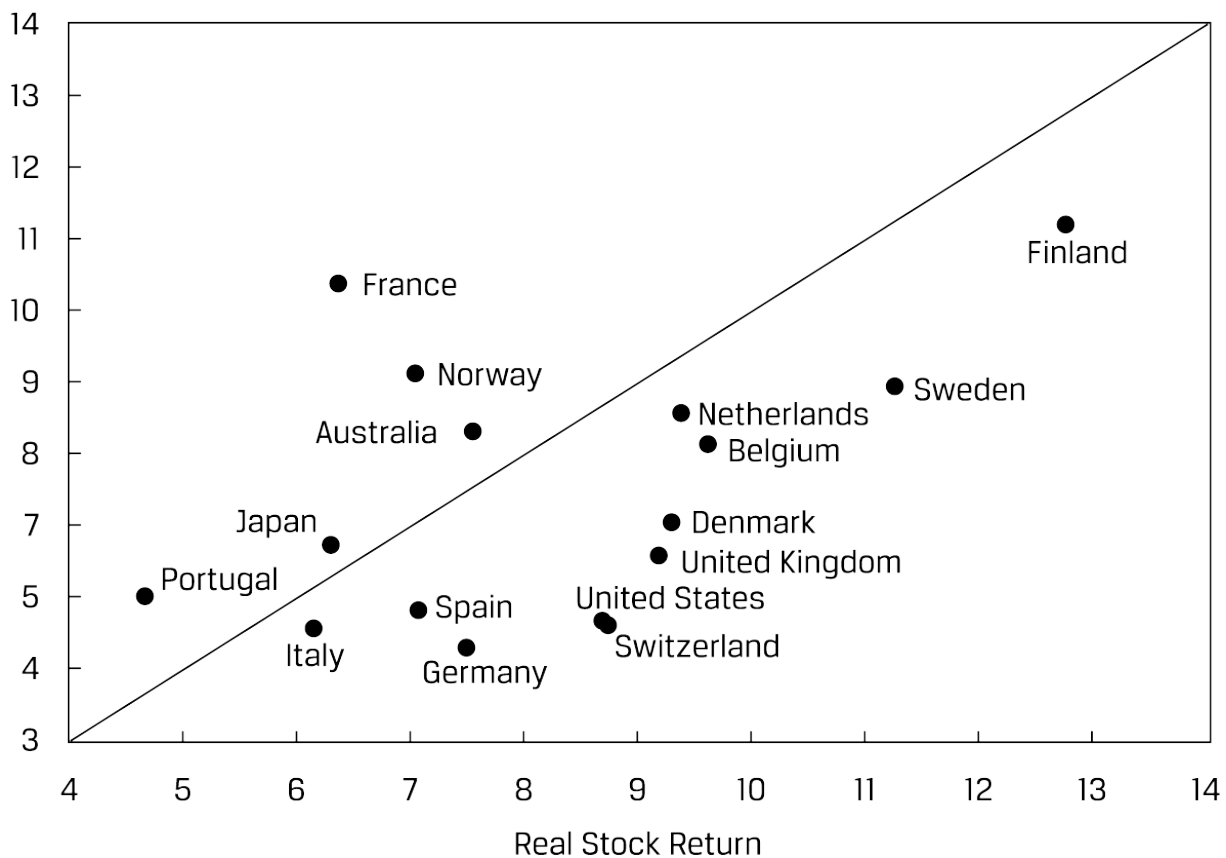
- Residential real estate had a higher (lower) real return than equities before (after) World War II.
- Residential real estate had a higher real return than equities in every country except Switzerland, the United Kingdom, and the United States over 1950–1980 but a lower return than equities in every country for 1980–2015.
- Residential real estate and equities had similar patterns—that is, a strong correlation—prior to the war but a low correlation after the war.
- Equity returns became increasingly correlated across countries after the war, but residential real estate returns are essentially uncorrelated across countries.

[Exhibit 8](#) shows the real returns for equities and residential real estate in each country since 1950.

### **Exhibit 8. Real Equity and Housing Returns by Country, 1950–2015**



## Real Housing Return



Note: Annual percentage returns are shown.

Source: Jordà et al. (2017).

## EXAMPLE 7

# Assessing Real Estate Investments

Tammi Sinclair, an analyst at a large retirement fund, recently attended investor presentations by three private real estate firms looking to fund new projects. Office Growth Partners specializes in building and owning low-cost, standardized office space for firms seeking to place sales representatives in the most rapidly growing small population areas across the region. Mega-Box Properties builds and owns large, custom-designed distribution facilities for multinational makers of brand-name products. The facilities are strategically located near major global transportation hubs. Exclusive Elegance Inc. develops and then manages some of the world's most luxurious, sought-after residential buildings in prime locations. It never breaks ground on a new property until at least 85% of the units have been sold and, to date, has never failed to sell out before construction is complete.



Identify important characteristics of each business that Sinclair will need to consider in establishing a required rate of return for each potential investment.

### **Guideline answer:**

Office Growth Partners (OGP) is likely to be a very high-risk investment. It essentially chases hot markets, it builds generic office space, and its typical tenants (opportunistic sales forces) are apt to opt out as soon as the market cools. All these aspects suggest that its business is very exposed to a boom-and-bust cycle. It is likely to end up owning properties with persistently high vacancy rates and high turnover. Hence, Sinclair will likely require a rather high expected return on an investment in OGP.

Mega-Box's business should be fairly stable. The distribution centers are strategically located and designed to meet the needs of the tenant, which suggests long-term leases and low turnover will benefit both Mega-Box and the tenant firms. The average credit quality of the tenants—multinational makers of brand-name products—is likely to be solid and disciplined by the public bond and loan markets. All things considered, Sinclair should probably require a significantly lower expected return on an investment in Mega-Box than in OGP.

Exclusive Elegance appears to be even lower risk. First, it deals only in the very highest-quality, most sought-after properties in prime locations. These should be relatively immune to cyclical fluctuations. Second, it does not retain ownership of the properties, so it does not bear the equity/ownership risks. Third, it is fairly conservative in the riskiest portion of its business—developing new properties. However, Sinclair will need to investigate its record with respect to completing development projects within budget, maintaining properties, and delivering top-quality service to residents.

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## **7. FORECASTING EXCHANGE RATES**

- f. discuss major approaches to forecasting exchange rates;

Forecasting exchange rates is generally acknowledged to be especially difficult—so difficult that many asset managers either passively accept the impact of currency movements on their portfolio returns or routinely hedge out the currency exposure even if doing so is costly.

To get a sense for why exchange rates are so difficult to forecast, it is useful to distinguish

between “money” and the currency in which it is denominated. Like equities and bonds, money is an asset denominated in a currency. Currencies are the units of account in which the prices of everything else—goods, services, real assets, financial assets, liabilities, flows, and balances—are quoted. An exchange rate movement changes the values of everything denominated in one currency relative to everything denominated in every other currency. That is a very powerful force. It works in the other direction as well. Anything that affects quantities, prices, or values within one currency relative to those in another will exert some degree of pressure on exchange rates. Perhaps even more importantly, anything that changes *expectations* of prices, quantities, or values within any currency can change expectations about the future path of currencies, causing an immediate reaction in exchange rates as people adjust their exposures.

Of course, currencies are not abstract accounting ledgers. They are inherently tied to governments, financial systems, legal systems, and geographies. The laws, regulations, customs, and conventions within and between these systems also influence exchange rates, especially when exchange rates are used as instruments or targets of policy. The consequence of all these aspects is that there is very little firm ground on which to stand for analysts trying to forecast exchange rates. The best we can hope to do is to identify the forces that are likely to be exerting the most powerful influences and assess their relative strength. On a related note, it is not possible to identify mutually exclusive approaches to exchange rate forecasting that are each complete enough to stand alone. Hence, the perspectives discussed in this section should be viewed as complementary rather than as alternatives.

## **7.1. Focus on Goods and Services, Trade, and the Current Account**

There are three primary ways in which trade in goods and services can influence the exchange rate. The first is directly through flows. The second is through quasi-arbitrage of prices. The third is through competitiveness and sustainability.

### **7.1.1. Trade Flows**

Trade flows do not, in general, exert a significant impact on contemporaneous exchange rate movements, provided they can be financed. Although gross trade flows may be large, net flows (exports minus imports) are typically much smaller relative to the economy and relative to actual and potential financial flows. If trade-related flows through the foreign exchange market become large relative to financing/investment flows, it is likely that a crisis is emerging.

### 7.1.2. Purchasing Power Parity

Purchasing power parity (PPP) is based on the notion that the prices of goods and services should change at the same rate regardless of currency denomination.<sup>25</sup> Thus, *the expected percentage change in the exchange rate should be equal to the difference in expected inflation rates*. If we define the *real exchange rate* as the ratio of price levels converted to a common currency, then PPP says that *the expected change in the real exchange rate should be zero*.

The mechanism underlying PPP is a quasi-arbitrage. Free and competitive trade should force alignment of the prices of similar products after conversion to a common currency. This is a very powerful force. It works, but it is slow and incomplete. As a result, the evidence indicates that PPP is a poor predictor of exchange rates over short to intermediate horizons but is a better guide to currency movements over progressively longer multi-year horizons.<sup>26</sup>

There are numerous reasons for deviations from PPP. The starting point matters. Relative PPP implicitly assumes that prices and exchange rates are already well aligned. If not, it will take time before the PPP relationship re-emerges. Not all goods are traded, and virtually every country imposes some trade barriers. PPP completely ignores the impact of capital flows, which often exert much more acute pressure on exchange rates over significant periods of time. Finally, economic developments may necessitate changes in the country's terms of trade; that is, contrary to PPP, the real exchange rate may need to change over time.

The impact of relative purchasing power on exchange rates tends to be most evident when inflation differentials are large, persistent, and driven primarily by monetary conditions. Under these conditions, PPP may describe exchange rate movements reasonably well over all but the shortest horizons. Indeed, the well-known “monetary approach” to exchange rates essentially boils down to two assumptions: (1) PPP holds, and (2) inflation is determined by the money supply.

### 7.1.3. Competitiveness and Sustainability of the Current Account

It is axiomatic that in the absence of capital flows prices, quantities, and exchange rates would have to adjust so that trade is always balanced. Since the prices of goods and services, production levels, and spending decisions tend to adjust only gradually, the onus of adjustment would fall primarily on exchange rates. Allowing for capital flows mitigates this pressure on exchange rates. The fact remains, however, that imposition of restrictions on capital flows will increase the sensitivity of exchange rates to the trade balance or, more generally, the current account balance.<sup>27</sup> This is not usually a major consideration for large, developed economies with sophisticated financial markets but can be important in small or developing economies.

Aside from the issue of restrictions on capital mobility, the extent to which the current account balance influences the exchange rate depends primarily on whether it is likely to be persistent and, if so, whether it can be sustained. These issues, in turn, depend mainly on the size of the imbalance and its source. Small current account balances—say, less than 2% of GDP—are likely to be sustainable for many years and hence would exert little influence on exchange rates. Similarly, larger imbalances that are expected to be transitory may not generate a significant, lasting impact on currencies.

The current account balance equals the difference between national saving and investment.<sup>28</sup> A current account surplus indicates that household saving plus business profits and the government surplus/deficit exceeds domestic investment spending. A current account deficit reflects the opposite. A current account deficit that reflects strong, profitable investment spending is more likely to be sustainable than a deficit reflecting high household spending (low saving), low business profits, or substantial government deficits because it is likely to attract the required capital inflow for as long as attractive investment opportunities persist. A large current account surplus may not be very sustainable either because it poses a sustainability problem for deficit countries or because the surplus country becomes unwilling to maintain such a high level of aggregate saving.

Whether an imbalance is likely to persist in the absence of terms-of-trade adjustments largely depends on whether the imbalance is structural. Structural imbalances arise from (1) persistent fiscal imbalances; (2) preferences, demographics, and institutional characteristics affecting saving decisions; (3) abundance or lack of important resources; (4) availability/absence of profitable investment opportunities associated with growth, capital deepening, and innovation; and, of course, (5) the prevailing terms of trade. Temporary imbalances mainly arise from business cycles (at home and abroad) and associated policy actions.

If a change in the (nominal) exchange rate is to bring about a necessary change in the current account balance, it will have to induce changes in spending patterns, consumption/saving decisions, and production/investment decisions. These adjustments typically occur slowly and are often resisted by decision makers who hope they can be avoided. Rapid adjustment of the exchange rate may also be resisted because people only gradually adjust their expectations of its ultimate level. Hence, both the exchange rate and current account adjustments are likely to be gradual.

## 7.2. Focus on Capital Flows

Since the current account and the capital account must always balance and the drivers of the current account tend to adjust only gradually, virtually all of the short-term adjustment and much of the intermediate-term adjustment must occur in the capital account. Asset prices,

interest rates, and exchange rates are all part of the equilibrating mechanism. Since a change in the exchange rate simultaneously affects the relative values of all assets denominated in different currencies, we should expect significant pressure to be exerted on the exchange rate whenever an adjustment of capital flows is required.

### 7.2.1. Implications of Capital Mobility

Capital seeks the highest risk-adjusted expected return. The investments available in each currency can be viewed as a portfolio. Designating one as domestic ( $d$ ) and one as foreign ( $f$ ), in a world of perfect capital mobility the exchange rate (expressed as domestic currency per foreign currency unit) will be driven to the point at which the expected percentage change in the exchange rate equals the “excess” risk-adjusted expected return on the domestic portfolio over the foreign portfolio. This idea can be expressed concretely using a building block approach to expected returns.

#### Equation (9)

$$E(\% \Delta S_{d/f}) = (r^d - r^f) + (\text{Term}^d - \text{Term}^f) + (\text{Credit}^d - \text{Credit}^f) + (\text{Equity}^d - \text{Equity}^f) + (\text{Liquid}^d - \text{Liquid}^f).$$

The expected change in the exchange rate ( $\% \Delta S_{d/f}$ ) will reflect the differences in the nominal short-term interest rates ( $r$ ), term premiums (Term), credit premiums (Credit), equity premiums (Equity), and liquidity premiums (Liquid) in the two markets. The components of this equation can be associated with the expected return on various segments of the portfolio: the money market (first term), government bonds (first and second), corporate bonds (first–third), publicly traded equities (first–fourth), and private assets (all terms), including direct investment in plant and equipment.

As an example, suppose the domestic market has a 1% higher short-term rate, a 0.25% lower term premium, a 0.50% higher credit premium, and the same equity and liquidity premiums as the foreign market. Equation 9 implies that the domestic currency must be expected to depreciate by 1.25% ( $= 1\% - 0.25\% + 0.5\%$ )—that is,  $E(\% \Delta S_{d/f}) = 1.25\%$ —to equalize risk-adjusted expected returns.

It may seem counterintuitive that the domestic currency should be expected to depreciate if its portfolio offers a higher risk-adjusted expected return. The puzzle is resolved by the key phrase “driven to the point . . . ” in this subsection’s opening paragraph. In theory, the exchange rate will instantly move (“jump”) to a level where the currency with higher (lower) risk-adjusted expected return will be so strong (weak) that it will be expected to depreciate (appreciate) going forward. This is known as the *overshooting* mechanism, introduced by [Dornbusch \(1976\)](#). In reality, the move will not be instantaneous, but it may occur very quickly if there is a consensus about the relative attractiveness of assets denominated in each

currency. Of course, asset prices will also be adjusting.

The overshooting mechanism suggests that there are likely to be relative improvement in investment opportunities. First, the exchange rate ( $S_{d/f}$  will decline) as capital flows toward the more attractive market. Second, the faster and greater the appreciation of the domestic currency will also drive up asset prices in that market. Second, in the intermediate period of consolidation as investors begin to question the extent of the move and to form expectations of a reversal. Third, in the longer run, the exchange rate will move depending on the extent to which investment opportunities have been equalized by asset price adjustments. This is reflected in Equation 9.

Importantly, these three phases imply that the relationship between exchange rate appreciation/depreciation and apparent investment incentives will change direction. This fact is especially important with respect to interest rate differentials that are directly observable. At some times, higher-interest rate currencies depreciate; at other times, they appreciate.

### **7.2.2. Uncovered Interest Rate Parity and Hot Money Flows**

Uncovered interest rate parity (UIP) asserts that the expected percentage change in the exchange rate should be equal to the nominal interest rate differential. The implicit assumption is that the real interest rate differentials will be so strong that it overwhelms all other considerations.

Contrary to UIP, the empirical evidence consistently shows that carry trades in high-rate currencies and lending in low-rate currencies—earn money. For example, [Burnside, Eichenbaum, Kleshchelski, and Reb](#) (2010) find that from February 1976 to July 2009, a strategy of rolling carry trades involving high- and low-rate currencies returned 4.31% per annum after transaction costs for the Japanese yen and dollar and 2.88% per annum versus the British pound.

The profitability of carry trades is usually ascribed to a risk premium. The risk premium is consistent with the idea that the risk premiums in Equation 9 may also be capturing primarily the overshooting phase of the real exchange rate differentials. In any case, carry trades tend to be profitable on average and have been used up well as a predictor of exchange rates.

Vigorous flows of capital in response to interest rate differentials are known as *money flows*. Hot money flows are problematic for central banks because they undermine a bank's ability to run an effective monetary policy. This is the key









































































































# Study Session 3

## Asset Allocation and Related Decisions in Portfolio Management

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Often considered the most important activity in the investment process, the strategic asset allocation decision takes place after the formation of capital market expectations. The portfolio's long-term asset class, or factor, exposures and the best means to achieve these exposures are determined only after considering the investor's unique financial situation and objectives, risk–return tradeoffs, and other key inputs.

This study session provides a conceptual framework for understanding asset allocation considerations and key implementation approaches. Consideration of an investor's overall financial context using an economic balance sheet to incorporate all relevant investor assets and liabilities is presented. Three major approaches to asset allocation are described: asset only, liability relative, and goals based. Concepts underlying active and passive implementation and strategic rebalancing are also introduced.

In practice, the asset allocation decision is affected by numerous constraints that present practical challenges to asset allocation. Significant investor-based constraints include investable assets, liquidity needs, time horizon, and regulatory and tax environments. The final reading examines the effects of these constraints and presents adaptations to address them by institutional investor type. Also discussed are behavioral biases that influence the asset allocation process and ways to overcome these biases.

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## READING ASSIGNMENTS

**Reading 5** Overview of Asset Allocation  
by William W. Jennings, PhD, CFA, and Eugene L. Podkaminer, CFA

**Reading 6** Principles of Asset Allocation

by Jean L.P. Brunel, CFA, Thomas M. Idzorek, CFA, and John M. Mulvey,  
PhD

**Reading 7** Asset Allocation with Real-World Constraints

by Peter Mladina, Brian J. Murphy, CFA, Mark Ruloff, FSA, EA, CERA

# Reading 5

## Overview of Asset Allocation

by William W. Jennings, PhD, CFA, and Eugene L. Podkaminer, CFA

*William W. Jennings, PhD, CFA, is at the US Air Force Academy (USA). Eugene L. Podkaminer, CFA, is at Franklin Templeton Investments (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** describe elements of effective investment governance and investment governance considerations in asset allocation;
- b.** formulate an economic balance sheet for a client and interpret its implications for asset allocation;
- c.** compare the investment objectives of asset-only, liability-relative, and goals-based asset allocation approaches;
- d.** contrast concepts of risk relevant to asset-only, liability-relative, and goals-based asset allocation approaches;
- e.** explain how asset classes are used to represent exposures to systematic risk and discuss criteria for asset class specification;
- f.** explain the use of risk factors in asset allocation and their relation to traditional asset class-based approaches;
- g.** recommend and justify an asset allocation based on an investor's objectives and constraints;
- h.** describe the use of the global market portfolio as a baseline portfolio in asset allocation;
- i.** discuss strategic implementation choices in asset allocation, including passive/active

choices and vehicles for implementing passive and active mandates;

- j. discuss strategic considerations in rebalancing asset allocations.

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# 1. INTRODUCTION AND ASSET ALLOCATION: IMPORTANCE IN INVESTMENT MANAGEMENT

- a. describe elements of effective investment governance and investment governance considerations in asset allocation

Asset owners are concerned with accumulating and maintaining the wealth needed to meet their needs and aspirations. In that endeavor, investment portfolios—including individuals' portfolios and institutional funds—play important roles. Asset allocation is a strategic—and often a first or early—decision in portfolio construction. Because it holds that position, it is widely accepted as important and meriting careful attention. Among the questions addressed in this reading are the following:

- What is a sound governance context for making asset allocation decisions?
- How broad a picture should an adviser have of an asset owner's assets and liabilities in recommending an asset allocation?
- How can an asset owner's objectives and sensitivities to risk be represented in asset allocation?
- What are the broad approaches available in developing an asset allocation recommendation, and when might one approach be more or less appropriate than another?
- What are the top-level decisions that need to be made in implementing a chosen asset allocation?
- How may asset allocations be rebalanced as asset prices change?

The strategic asset allocation decision determines return levels<sup>1</sup> in which allocations are invested, irrespective of the degree of active management. Because of its strategic importance, the investment committee, at the highest level of the governance hierarchy, typically retains approval of the strategic asset allocation decision. Often a proposal is developed only after a formal asset allocation study that incorporates obligations, objectives,



and constraints; simulates possible investment outcomes over an agreed-on investment horizon; and evaluates the risk and return characteristics of the possible allocation strategies.

In providing an overview of asset allocation, this reading's focus is the alignment of asset allocation with the asset owner's investment objectives, constraints, and overall financial condition. This is the first reading in several sequences of readings that address, respectively, asset allocation and portfolio management of equities, fixed income, and alternative investments. Asset allocation is also linked to other facets of portfolio management, including risk management and behavioral finance. As coverage of asset allocation progresses in the sequence of readings, various connections to these topics, covered in detail in other areas of the curriculum, will be made.<sup>2</sup>

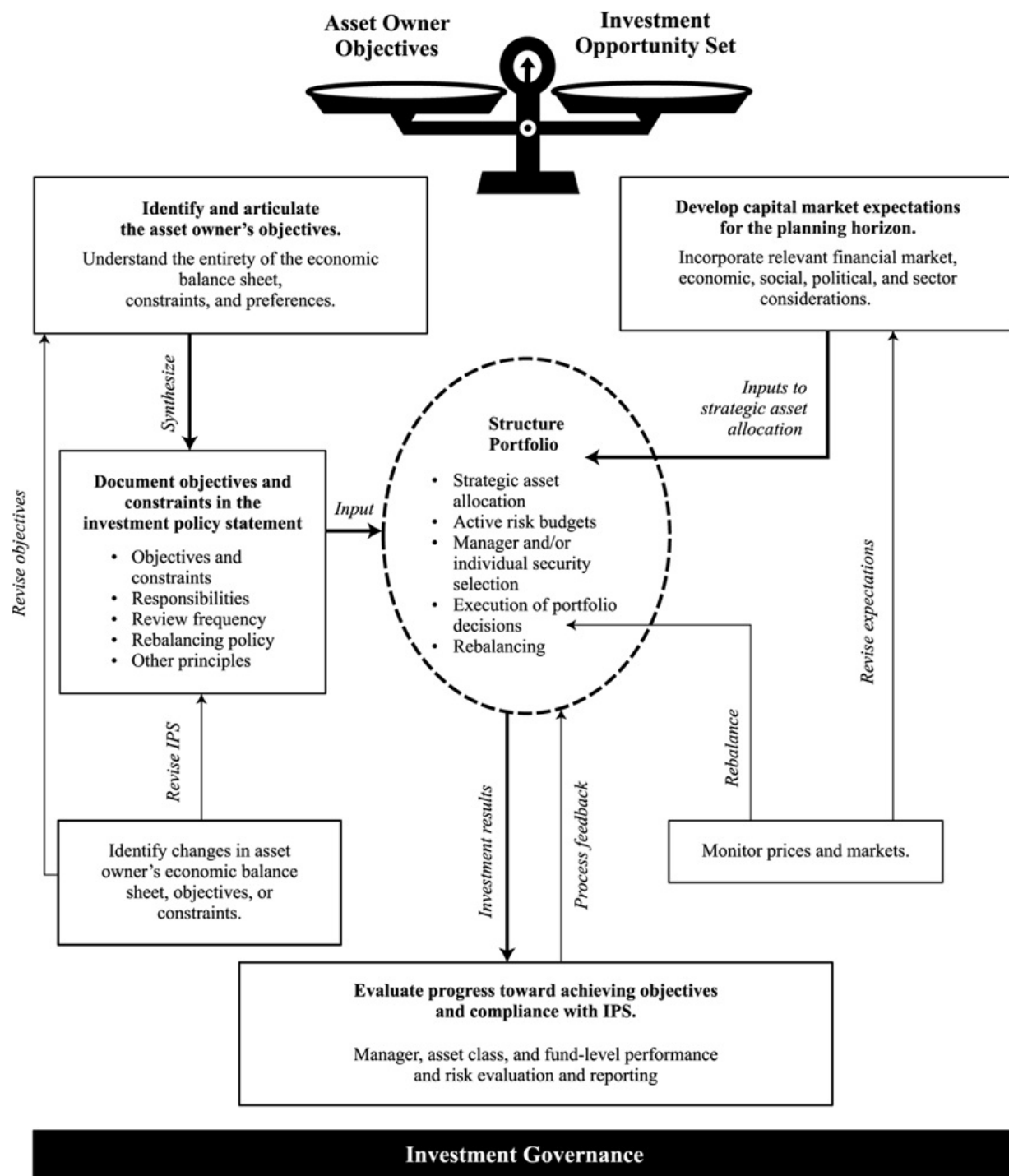
In the asset allocation sequence, the role of this reading is the “big picture.” It also offers definitions that will provide a coordinated treatment of many later topics in portfolio management. The second reading provides the basic “how” of developing an asset allocation, and the third reading explores various common, real-world complexities in developing an asset allocation.

This reading is organized as follows: Section 1 explains the importance of asset allocation in investment management. Section 2 addresses the investment governance context in which asset allocation decisions are made. Section 3 considers asset allocation from the comprehensive perspective offered by the asset owner's economic balance sheet. Sections 4 and 5 distinguish three broad approaches to asset allocation and explain how they differ in investment objective and risk. In Sections 6–9, these three approaches are discussed at a high level in relation to three cases. Section 10 provides a top-level orientation to how a chosen asset allocation may be implemented, providing a set of definitions that underlie subsequent readings. Section 11 discusses rebalancing considerations.

## **1.1. Asset Allocation: Importance in Investment Management**

**Exhibit 1** places asset allocation in a stylized model of the investment management process viewed as an integrated set of activities aimed at attaining investor objectives.

### **Exhibit 1. The Portfolio Management Process**



**Exhibit 1** shows that an investment process that is in the asset owner's best interest rests on a foundation of good investment governance, which includes the assignment of decision-making responsibilities to qualified individuals and oversight of processes. The balance at the top of the chart suggests that the portfolio management process must reconcile (balance) investor objectives (on the left) with the possibilities offered by the investment opportunity set (on the right).

The investment process shows a sequence of activities that begins with understanding the

asset owner's entire circumstance; objectives, including any constraints; and preferences. These factors, in conjunction with capital market inputs,<sup>3</sup> form the basis for asset allocation as a first step in portfolio construction and give a structure within which other decisions—such as the decision to invest passively or actively—take place. In the flow chart, thick lines show initial flows (or relations of logic) and thin lines show feedback flows.

Asset allocation is widely considered to be the most important decision in the investment process. The strategic asset allocation decision completely determines return levels<sup>4</sup> in which allocations are invested passively and also in the aggregate of all investors, irrespective of the degree of active management.

In providing an overview of asset allocation, this reading's focus is the alignment of asset allocation with the asset owner's investment objectives, constraints, and overall financial condition. The presentation begins with an introduction to the investment governance context of asset allocation. It then moves to present the economic balance sheet as the financial context for asset allocation itself.

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## 2. THE INVESTMENT GOVERNANCE BACKGROUND TO ASSET ALLOCATION

- a. describe elements of effective investment governance and investment governance considerations in asset allocation

Investment governance represents the organization of decision-making responsibilities and oversight activities. Effective investment governance ensures that assets are invested to achieve the asset owner's investment objectives within the asset owner's risk tolerance and constraints, and in compliance with all applicable laws and regulations. In addition, effective governance ensures that decisions are made by individuals or groups with the necessary skills and capacity.

Investment performance depends on asset allocation *and* its implementation. Sound investment governance practices seek to align asset allocation and implementation to achieve the asset owner's stated goals.

Investment governance structures are relevant to both institutional and individual investors. Because such structures are often formalized and articulated in detail for defined benefit pension plans, we will build our discussion using a pension plan governance framework. Elements of pension plan governance that are not directly related to the management of plan

assets—plan design, funding policy, and communications to participants—are not discussed in this reading. Instead, we focus on those aspects of governance that directly affect the asset allocation decision.

## 2.1. Governance Structures

Governance and management are two separate but related functions. Both are directed toward achieving the same end. But governance focuses on clarifying the mission, creating a plan, and reviewing progress toward achieving long- and short-term objectives, whereas management efforts are geared to outcomes—the execution of the plan to achieve the agreed-on goals and objectives. A common governance structure in an institutional investor context will have three levels within the governance hierarchy:

- governing investment committee
- investment staff
- third-party resources

The investment committee may be a committee of the board of directors, or the board of directors may have delegated its oversight responsibilities to an internal investment committee made up of staff. Investment staff may be large, with full in-house asset management capabilities, or small—for example, two to five investment staff responsible for overseeing external investment managers and consultants. It may even be part time—a treasurer or chief financial officer with many other, competing responsibilities. The term “third-party resources” is used to describe a range of professional resources—investment managers, investment consultants, custodians, and actuaries, for example.

Although there are many governance models in use, most effective models share six common elements. Effective governance models perform the following tasks:

1. Articulate the long- and short-term objectives of the investment program.
2. Allocate decision rights and responsibilities among the functional units in the governance hierarchy effectively, taking account of their knowledge, capacity, time, and position in the governance hierarchy.
3. Specify processes for developing and approving the investment policy statement that will govern the day-to-day operations of the investment program.
4. Specify processes for developing and approving the program’s strategic asset allocation.

5. Establish a reporting framework to monitor the program's progress toward the agreed-on goals and objectives.
6. Periodically undertake a governance audit.

In the sections that follow, we will discuss selected elements from this list.

## 2.2. Articulating Investment Objectives

Articulating long- and short-term objectives for an investor first requires an understanding of purpose—that is, what the investor is trying to achieve. Below are examples of simple investment objective statements that can be clearly tied to purposes:

- *Defined benefit pension fund.* The investment objective of the fund is to ensure that plan assets are sufficient to meet current and future pension liabilities.
- *Endowment fund.* The investment objective of the endowment is to earn a rate of return in excess of the return required to fund, after accounting for inflation, ongoing distributions consistent with the endowment's mission.
- *Individual investor.* The investment objective is to provide for retirement at the investor's desired retirement age, family needs, and bequests, subject to stated risk tolerance and investment constraints.

A return requirement is often considered the essence of an investment objective statement, but for that portion of the objective statement to be properly understood requires additional context, including the obligations the assets are expected to fund, the nature of cash flows into and out of the fund, and the asset owner's willingness and ability to withstand interim changes in portfolio value. The ultimate goal is to find the best risk/return trade-off consistent with the asset owner's resource constraints and risk tolerance.

As an example of how the overall context can affect decision making, the pension fund may be an active plan, with new participants added as they are hired, or it may be "frozen" (no additional benefits are being accrued by participants in the plan). The status of the plan, considered in conjunction with its funded ratio (the ratio of pension assets to pension liabilities), has a bearing on future contributions and benefit payments. The company offering the pension benefit may operate in a highly cyclical industry, where revenues ebb and flow over the course of the economic cycle. In this case, the plan sponsor may prefer a more conservative asset allocation to minimize the year-to-year fluctuations in its pension contribution.

The nature of inflows and outflows for an endowment fund can be quite different from those

of a pension fund. An endowment fund may be used to support scholarships, capital improvements, or university operating expenses. The fund sponsor has some degree of control over the outflows from the fund but very little control over the timing and amounts of contributions to the fund because the contributions are typically coming from external donors.

These cash inflow and outflow characteristics must be considered when establishing the goals and objectives of the fund.

A third, inter-related aspect of defining the sponsor's goals and objectives is determining and communicating risk tolerance. There are multiple dimensions of risk to be considered: liquidity risk, volatility, risk of loss, and risk of abandoning a chosen course of action at the wrong time.

Effective investment governance requires consideration of the liquidity needs of the fund and the liquidity characteristics of the fund's investments. For example, too large an allocation to relatively illiquid assets, such as real estate or private equity, might impair the ability to make payouts in times of market stress.

A high risk/high expected return asset allocation is likely to lead to wider swings in interim valuations. Any minimum thresholds for funded status that, if breached, would trigger an adverse event, such as higher pension insurance premiums, must be considered in the asset allocation decision.

For individual investors, the risk of substantial losses may be unacceptable for a variety of financial and psychological reasons. When such losses occur after retirement, lost capital cannot be replaced with future earnings.

Asset owners have their own unique return requirements and risk sensitivities. Managing an investment program without a clear understanding of long- and short-term objectives is similar to navigating without a map: Arriving at the correct destination on time and intact is not compatible with leaving much to chance.

## **2.3. Allocation of Rights and Responsibilities**

The rights and responsibilities necessary to execute the investment program are generally determined at the highest level of investment governance. The allocation of those rights and responsibilities among the governance units is likely to vary depending on the size of the investment program; the knowledge, skills, and abilities of the internal staff; and the amount of time staff can devote to the investment program if they have other, competing responsibilities. Above all, good governance requires that decisions be delegated to those best qualified to make an informed decision.

The resources available to an organization will affect the scope and complexity of the investment program and the allocation of rights and responsibilities. A small investment program may result in having a narrower opportunity set because of either asset size (too small to diversify across the range of asset classes and investment managers) or staffing constraints (insufficient asset size to justify a dedicated internal staff). Complex strategies may be beyond the reach of entities that have chosen not to develop investment expertise internally or whose oversight committee lacks individuals with sufficient investment understanding. Organizations willing to invest in attracting, developing, and retaining staff resources and in developing strong internal control processes, including risk management systems, are better able to adopt more complex investment programs. The largest investors, however, may find their size creates governance issues: Manager capacity constraints might lead to so many managers that it challenges the investor’s oversight capacity.

Allocation of rights and responsibilities across the governance hierarchy is a key element in the success of an investment program. Effective governance requires that the individuals charged with any given decision have the required *knowledge* and expertise to thoroughly evaluate the alternative courses of action and the *capacity* to take on the ongoing responsibility of those decisions, and they must be able to execute those decisions in a timely fashion. (Individual investors engaging a private wealth manager are delegating these expertise, capacity, and execution responsibilities.)

Exhibit 2 presents a systematic way of allocating among governance units the primary duties and responsibilities of running an investment program.

**Exhibit 2. Allocation of Rights and Responsibilities**

Investment Activity	Investment Committee	Investment Staff	Third-Party Resource
Mission	Craft and approve	n/a	n/a
Investment policy statement	Approve	Draft	Consultants provide input
Asset allocation policy	Approve with input from staff and consultants	Draft with input from consultants	Consultants provide input
Investment manager and other service	Delegate to investment staff; approval	Research, evaluation, and selection of investment managers	Consultants provide input



provider selection	authority retained for certain service providers	and service providers	
Portfolio construction (individual asset selection)	Delegate to outside managers, or to staff if sufficient internal resources	Execution if assets are managed in-house	Execution by independent investment manager
Monitoring asset prices & portfolio rebalancing	Delegate to staff within confines of the investment policy statement	Assure that the sum of all sub-portfolios equals the desired overall portfolio positioning; approve and execute rebalancing	Consultants and custodian provide input
Risk management	Approve principles and conduct oversight	Create risk management infrastructure and design reporting	Investment manager manages portfolio within established risk guidelines; consultants may provide input and support
Investment manager monitoring	Oversight	Ongoing assessment of managers	Consultants and custodian provide input
Performance evaluation and reporting	Oversight	Evaluate manager's continued suitability for assigned role; analyze sources of portfolio return	Consultants and custodian provide input
Governance audit	Commission and assess	Responds and corrects	Investment Committee contracts with an independent third party for the audit



The available knowledge and expertise at each level of the hierarchy, the resource capacity of the decision makers, and the ability to act on a timely basis all influence the allocation of these rights and responsibilities.

## **2.4. Investment Policy Statement**

The investment policy statement (IPS) is the foundation of an effective investment program. A well-crafted IPS can serve as a blueprint for ongoing fund management and assures stakeholders that program assets are managed with the appropriate care and diligence.

Often, the IPS itself will be a foundation document that is revised slowly over time, whereas information relating to more variable aspects of the program—the asset allocation policy and guidelines for individual investment managers—will be contained in a more easily modified appendix.

## **2.5. Asset Allocation and Rebalancing Policy**

Because of its strategic importance, the investment committee, at the highest level of the governance hierarchy, typically retains approval of the strategic asset allocation decision. A proposal is often developed only after a formal asset allocation study that incorporates obligations, objectives, and constraints; simulates possible investment outcomes over an agreed-on investment horizon; and evaluates the risk and return characteristics of the possible allocation strategies.

Governance considerations inform not only the overall strategic asset allocation decision but also rebalancing decisions. The IPS should contain at least general orienting information relevant to rebalancing. In an institutional setting, rebalancing policy might be the responsibility of the investment committee, organizational staff, or the external consultant. Likewise, individual investors might specify that they have delegated rebalancing authority to their investment adviser. Specification of rebalancing responsibilities is good governance.

## **2.6. Reporting Framework**

The reporting framework in a well-run investment program should be designed in a manner that enables the overseers to evaluate quickly and clearly how well the investment program is progressing toward the agreed-on goals and objectives. The reporting should be clear and concise, accurately answering the following three questions:

- Where are we now?
- Where are we relative to the goals and objectives?
- What value has been added or subtracted by management decisions?

Key elements of a reporting framework should address performance evaluation, compliance with investment guidelines, and progress toward achieving the stated goals and objectives.

- Benchmarking is necessary for performance measurement, attribution, and evaluation. Effective benchmarking allows the investment committee to evaluate staff and external managers. Two separate levels of benchmarks are appropriate: one that measures the success of the investment managers relative to the purpose for which they were hired and another to measure the gap between the policy portfolio and the portfolio as actually implemented.
- Management reporting, typically prepared by staff with input from consultants and custodians, provides responsible parties with the information necessary to understand which parts of the portfolio are performing ahead of or behind the plan and why, as well as whether assets are being managed in accordance with investment guidelines.
- Governance reporting, which addresses strengths and weaknesses in program execution, should be structured in such a way that regular committee meetings can efficiently address any concerns. Although a crisis might necessitate calling an extraordinary meeting, good governance structures minimize this need.

## 2.7. The Governance Audit

The purpose of the governance audit is to ensure that the established policies, procedures, and governance structures are effective. The audit should be performed by an independent third party. The governance auditor examines the fund's governing documents, assesses the capacity of the organization to execute effectively within the confines of those governing documents, and evaluates the existing portfolio for its "efficiency" given the governance constraints.

Effective investment governance ensures the durability or survivability of the investment program. An investment program must be able to survive unexpected market turmoil, and good investment governance makes certain that the consequences of such turmoil are considered before it is experienced. Good governance seeks to avoid **decision-reversal risk**—the risk of reversing a chosen course of action at exactly the wrong time, the point of maximum loss. Good investment governance also considers the effect of investment committee member and staff turnover on the durability of the investment program.

Orientation sessions for new committee members and proper documentation of investment beliefs, policies, and decisions enhance the likelihood that the chosen course of action will be given sufficient time to succeed. New staff or investment committee members should be able to perceive easily the design and intent of the investment program and be able to continue to execute it. Similarly, good investment governance prevents key person risk—overreliance on any one staff member or long-term, illiquid investments dependent on a staff member.

Good governance works to assure accountability. O’Barr and Conley (1992, p.21), who studied investment management organizations using anthropological techniques, found that blame avoidance (not accepting personal responsibility when appropriate to do so) is a common feature of institutional investors. Good governance works to prevent such behavior.

## EXAMPLE 1

### Investment Governance: Hypothetical Case 1

In January 2016, the Caflandia Office Workers Union Pension (COWUP) made the following announcement:

“COWUP will fully exit all hedge funds and funds of funds. Assets currently amounting to 15% of its investment program are involved. Although hedge funds are a viable strategy for some, when judged against their complexity and cost, hedge fund investment is no longer warranted for COWUP.”

One week later, a financial news service reported the following:

“The COWUP decision on hedge funds was precipitated by an allegation of wrongdoing by a senior executive with hedge fund selection responsibilities in COWUP’s alternative investments strategy group.”

1. Considering only the first statement, state what facts would be relevant in evaluating whether the decision to exit hedge funds was consistent with effective investment governance.
2. Considering both statements, identify deficiencies in COWUP’s investment governance.

### Solution to 1:

The knowledge, capacity, and time available within COWUP to have an effective hedge fund investment program would need to be assessed against the stated concern for complexity and cost. The investment purpose served by hedge funds in COWUP’s investment program before it exited them needs to be analyzed.

## Solution to 2:

The second statement raises these concerns about the decision described in the first statement:

- Hiring and oversight of COWUP executives may have been inadequate.
- The initial COWUP information release was incomplete and possibly misleading. Public communications appear not to have received adequate oversight.
- Divesting hedge funds may be a reaction to the personnel issue rather than being based on investment considerations.

## EXAMPLE 2

### Investment Governance: Hypothetical Case 2

The imaginary country of Caflandia has a sovereign wealth fund with assets of CAF\$40 billion. A governance audit includes the following:

“The professional chief investment officer (CIO) reports to a nine-member appointed investment committee board of directors headed by an executive director. Investment staff members draft asset allocation policy in conjunction with consultants and make recommendation to the investment committee; the investment committee reviews and approves policy and any changes in policy, including the strategic asset allocation. The investment committee makes manager structure, conducts manager analysis, and makes manager selection decisions. The CIO has built a staff organization, which includes heads for each major asset class. In examining decisions over the last five years, we have noted several instances in which political or non-economic considerations appear to have influenced the investment program, including the selection of local private equity investments. Generally, the board spends much of its time debating individual manager strategies for inclusion in the portfolio and in evaluating investment managers’ performance with comparatively little time devoted to asset allocation or risk management.”

Based on this information and that in [Exhibit 2](#), identify sound and questionable governance practices in the management of the Caflandia sovereign wealth fund.

## Solution:

*Sound practices:* The allocation of responsibilities for asset allocation between investment staff and the investment committee is sound practice. Staff investment expertise should be reflected in the process of asset allocation policy and analysis. The investment committee assumes final responsibility for choices and decisions, which is appropriate given its position in receiving information from all parts of the organization and from all interested parties.

*Questionable practices:* The investment committee's level of involvement in individual manager selection and evaluation is probably too deep. [Exhibit 2](#) indicates that these functions more effectively reside with staff. Individual manager selection is an implementation and execution decision designed to achieve strategic decisions made by the investment committee and is typically not a strategic decision itself. Manager evaluation has substantial data analysis and technical elements that can be efficiently provided by staff experts and consultants. The finding about political/non-economic influences indicates multiple problems. It confirms that the investment manager analysis and selection processes were misplaced. It also suggests that the investment committee has an inadequate set of governance principles or checks and balances as relates to the investment committee itself.

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### 3. THE ECONOMIC BALANCE SHEET AND ASSET ALLOCATION

- b. formulate an economic balance sheet for a client and interpret its implications for asset allocation

An accounting balance sheet reflects a point-in-time snapshot of an organization's financial condition and shows the assets, liabilities, and owners' equity recognized by accountants. An **economic balance sheet** includes conventional assets and liabilities (called "financial assets" and "financial liabilities" in this reading) as well as additional assets and liabilities—known as **extended portfolio assets and liabilities**—that are relevant in making asset allocation decisions but do not appear on conventional balance sheets.

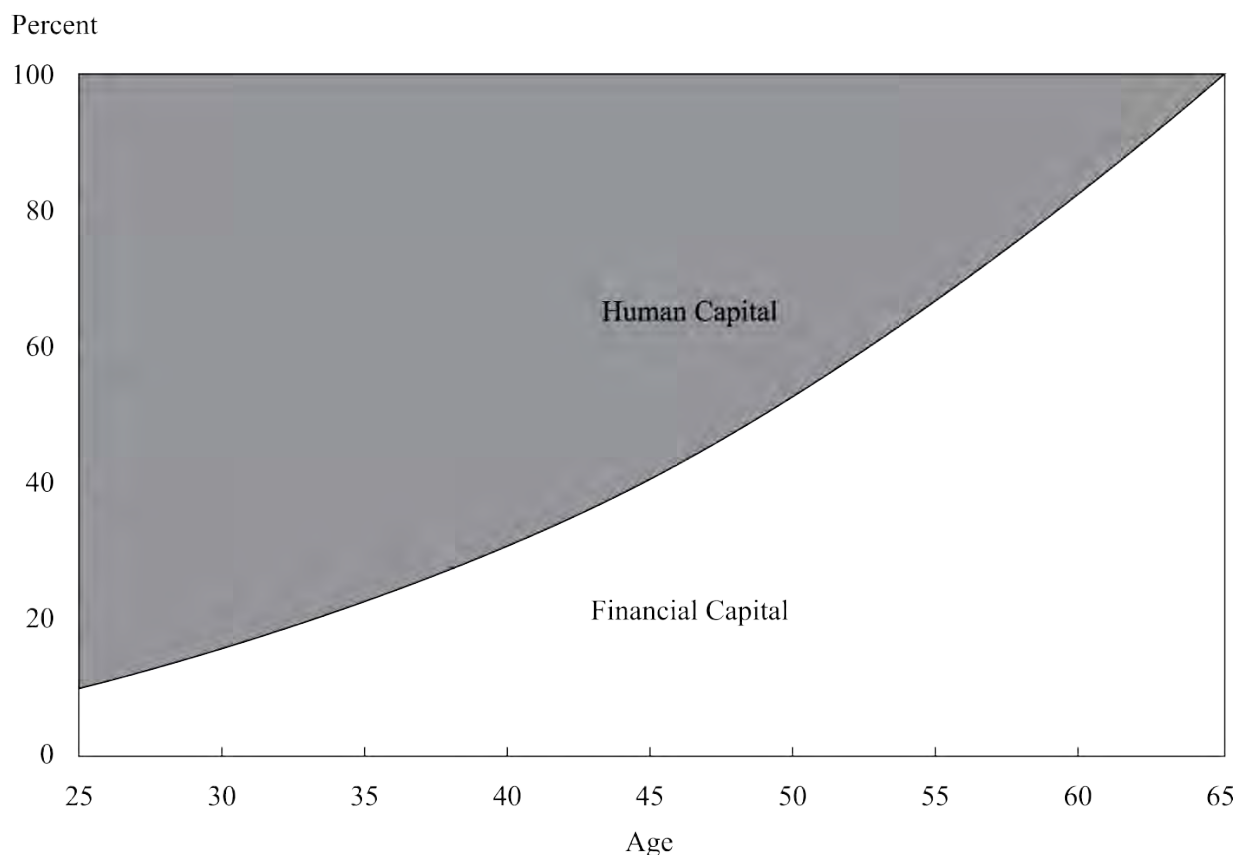
For individual investors, extended portfolio assets include human capital (the present value of future earnings), the present value of pension income, and the present value of expected inheritances. Likewise, the present value of future consumption is an extended portfolio liability.

For an institutional investor, extended portfolio assets might include underground mineral resources or the present value of future intellectual property royalties. Extended portfolio liabilities might include the present value of prospective payouts for foundations, whereas grants payable would appear as conventional liabilities.

Theory and, increasingly, practice suggest that asset allocation should consider the full range of assets and liabilities—both the financial portfolio and extended portfolio assets and liabilities—to arrive at an appropriate asset allocation choice. For example, an asset allocation process that considers the extended balance sheet, including the sensitivity of an individual investor’s earnings to equity market risk (and that of the industry in which the individual is working), may result in a more appropriate allocation to equities than one that does not.

Life-cycle balanced funds (also known as target date funds) are examples of investments that seek to coordinate asset allocation with human capital. A 2040 life-cycle balanced fund that seeks to provide a retirement investment vehicle appropriate for many individuals retiring in 2040. [Exhibit 3](#) illustrates a typical path for the composition of an individual’s economic balance sheet from age 25 through age 65.

### Exhibit 3. Human Capital (HC) and Financial Capital (FC) relative to Total Wealth



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At age 25, with most of the individual's working life ahead of him, human capital dominates the economic balance sheet. As the individual progresses through life, the present value of human capital declines as human capital is transformed into earnings. Earnings saved and invested build financial capital balances. By a retirement age of 65, the conversion of human capital to earnings and financial capital is assumed to be complete.

Life-cycle balanced funds reflect these extended portfolio assets. Research indicates that, on average, human capital is roughly 30% equity-like and 70% bond-like, with significant variation among industries.<sup>5</sup> Making the simplifying assumption that investors have approximately constant risk tolerance through life, their asset allocation for total overall wealth (including human capital and financial capital) should be, in theory, constant over time. In this case, the asset allocation chosen for financial capital should reflect an increasing allocation to bonds as human capital declines to age 65, holding all else constant. [Exhibit 4](#) shows the glide path for the equity/bond allocation chosen by one US mutual fund family. The increasing allocation to bonds is consistent with the view that human capital has preponderant bond-like characteristics.

#### **Exhibit 4. Glide Path of Target Date Investment Funds in One Family**

<b>Assumed Age</b>	<b>Equity Allocation</b>	<b>Bond Allocation</b>
25	85%	15%
35	82	18
45	77	23
55	63	37
65	49	51

*Note:* Allocations as of 31 December 2009.

*Source:* Based on data in [Idzorek, Stempien, and Voris \(2013\)](#).

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Although estimating human capital is quite complex, including human capital and other extended portfolio assets and economic liabilities in asset allocation decisions is good practice.<sup>6</sup>

### **EXAMPLE 3**



# The Economic Balance Sheet of Auldberg University Endowment

- *Name:* Auldberg University Endowment (AUE)
  - *Narrative:* AUE was established in 1852 in Caflandia and largely serves the tiny province of Auldberg. AUE supports about one-sixth of Auldberg University's CAF\$60 million operating budget; real estate income and provincial subsidies provide the remainder and have been relatively stable. The endowment has historically had a portfolio limited to domestic equities, bonds, and real estate holdings; that policy is under current review. Auldberg University itself (not the endowment) has a CAF\$350 million investment in domestic commercial real estate assets, including office buildings and industrial parks, much of it near the campus. AUE employs a well-qualified staff with substantial diverse experience in equities, fixed income, and real estate.
  - *Assets:* Endowment assets include CAF\$100 million in domestic equities, CAF\$60 million in domestic government debt, and CAF\$40 million in Class B office real estate. The present value of expected future contributions (from real estate and provincial subsidies) is estimated to be CAF\$400 million.
  - *Liabilities:* These include CAF\$10 million in short-term borrowings and CAF\$35 million in mortgage debt related to real estate investments. Although it has no specific legal requirement, AUE has a policy to distribute to the university 5% of 36-month moving average net assets. In effect, the endowment supports \$10 million of Auldberg University's annual operating budget. The present value of expected future support is CAF\$450 million.
1. Prepare an economic balance sheet for AUE.
  2. Describe elements in Auldberg University's investments that might affect AUE's asset allocation choices.

## Solution to 1:

The economic balance sheet for the endowment (given in the following table) does not include the real estate owned by Auldberg University. The economic net worth is found as a plug item ( $600 - 10 - 35 - 450 = 105$ ).

**AUE Economic Balance Sheet (in CAF\$ millions) 31 December 20x6**



<b>Assets</b>		<b>Liabilities and Economic Net Worth</b>	
<i>Financial Assets</i>		<i>Financial Liabilities</i>	
Domestic equities	100	Short-term borrowing	10
Domestic fixed income	60	Mortgage debt	35
Class B office real estate	40		
<i>Extended Assets</i>		<i>Extended Liabilities</i>	
Present value of expected future contributions to AUE	400	Present value of expected future support	450
		<i>Economic Net Worth</i>	
		Economic net worth (Economic assets – Economic liabilities)	105
<b>Total</b>	<b>600</b>		<b>600</b>

## Solution to 2:

AUE's Class B real estate investments' value and income are likely to be stressed during the same economic circumstances as the university's own real estate investments. In such periods, the university may look to the endowment for increased operating support and AUE may not be well positioned to meet that need. Thus, the AUE's real estate investment is actually less diversifying than it may appear and the allocation to it may need to be re-examined. Similar considerations apply to AUE's holdings in equities in relation to Auldborg University's.

## 4. APPROACHES TO ASSET ALLOCATION, RELEVANT OBJECTIVES AND RELEVANT RISK CONCEPTS

- c. compare the investment objectives of asset-only, liability-relative, and goals-based asset allocation approaches
- d. contrast concepts of risk relevant to asset-only, liability-relative, and goals-based asset allocation approaches

We can identify three broad approaches to asset allocation: (1) **asset-only**, (2) **liability-relative**, and (3) **goals-based**. These are decision-making frameworks that take account of or emphasize different aspects of the investment problem.

Asset-only approaches to asset allocation focus solely on the asset side of the investor's balance sheet. Liabilities are not explicitly modeled. Mean–variance optimization (MVO) is the most familiar and deeply studied asset-only approach. MVO considers only the expected returns, risks, and correlations of the asset classes in the opportunity set. In contrast, liability-relative and goals-based approaches explicitly account for the liabilities side of the economic balance sheet, dedicating assets to meet, respectively, legal liabilities and quasi-liabilities (other needs that are not strictly liabilities but are treated as such) or goals.

Liability-relative approaches to asset allocation choose an asset allocation in relation to the objective of funding liabilities. The phrase “funding of liabilities” means to provide for the money to pay liabilities when they come due. An example is surplus optimization: mean–variance optimization applied to surplus (defined as the value of the investor's assets minus the present value of the investor's liabilities). In modeling, liabilities might be represented by a short position in a bond or series of bonds matched to the present value and duration of the liabilities. Another approach involves constructing a liability-hedging portfolio focused on funding liabilities and, for any remaining balance of assets, a risky-asset portfolio (so called because it is risky or riskier in relation to liabilities—often also called a “return-seeking portfolio” because it explicitly seeks return above and beyond the liability benchmark).

**Liability-driven investing** (LDI) is an investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities. Related fixed-income techniques are covered in the fixed-income sequence under liability-based mandates.

All approaches to asset allocation can be said to address goals. In investment practice and literature, however, the term “goals based” has come to be widely associated with a particular type of approach to asset allocation and investing.

Goals-based approaches to asset allocation, as discussed here, are used primarily for individuals and families, involve specifying asset allocations for sub-portfolios, each of which is aligned to specified goals ranging from supporting lifestyle needs to aspirational. Each goal is associated with regular, irregular, or bulleted cash flows; a distinct time horizon; and a risk tolerance level expressed as a required probability of achieving the goal.<sup>7</sup> For example, a middle-aged individual might specify a goal of maintaining his current lifestyle and require a high level of confidence that this goal will be attained. That same individual

might express a goal of leaving a bequest to his alma mater. This would be a very long-term goal and might have a low required probability. Each goal is assigned to its own sub-portfolio, and an asset allocation strategy specific to that sub-portfolio is derived. The sum of all sub-portfolio asset allocations results in an overall strategic asset allocation for the total portfolio. **Goals-based investing** (GBI) is an investment industry term that encompasses the asset allocation focused on addressing an investor's goals.

## Institutions and Goals-Based Asset Allocation

Asset segmentation as practiced by some life insurers has some similarities to goals-based investing. Asset segmentation involves notionally or actually segmenting general account assets into sub-portfolios associated with specific lines of business or blocks of liabilities. On one hand, such an approach may be distinguished from goals-based asset allocation for individual investors in being motivated by competitive concerns (to facilitate offering competitive crediting rates on groups of contracts) rather than behavioral ones. On the other hand, [Fraser and Jennings \(2006\)](#) described a behaviorally motivated goals-based approach to asset allocation for foundations and endowments. Following their approach, components of an overall appropriate mean–variance optimal portfolio are allocated to time-based sub-portfolios such that uncomfortably novel or risky positions for the entity's governing body are made acceptable by being placed in longer-term sub-portfolios.

Although any asset allocation approach that considers the liabilities side of the economic balance sheet might be termed “liability relative,” there are several important distinctions between liabilities for an institutional investor and goals for an individual investor. These distinctions have meaningful implications for asset allocation:<sup>8</sup>

- Liabilities of institutional investors are legal obligations or debts, whereas goals, such as meeting lifestyle or aspirational objectives, are not. Failing to meet them does not trigger similar consequences.
- Whereas institutional liabilities, such as life insurer obligations or pension benefit obligations, are uniform in nature (all of a single type), an individual's goals may be many and varied.
- Liabilities of institutional investors of a given type (e.g., the pension benefits owed to

retirees) are often numerous and so, through averaging, may often be forecast with confidence. In contrast, individual goals are not subject to the law of large numbers and averaging. Contrast an estimate of expected death benefits payable for a group of life insurance policies against an individual's uncertainty about the resources needed in retirement: For a 65-year-old individual, the number of remaining years of life is very uncertain, but insurers can estimate the average for a group of 65-year-olds with some precision.

## Liability-Relative and Goals-Based Approaches to Investing

Various perspectives exist concerning the relationship between liability-relative and goals-based approaches to investing. Professor Lionel Martellini summarizes one perspective in the following three statements:<sup>9</sup>

1. Goals-based investing is related to a new paradigm that advocates more granular and investor-centric investment solutions.
2. This new investment solutions paradigm translates into goals-based investing (GBI) approaches in individual money management, in which investors' problems can be summarized in terms of their goals, and it translates into liability-driven investing (LDI) approaches in institutional money management, where the investors' liability is treated as a proxy for their goal.
3. GBI and LDI are therefore related, but each of these approaches has its own specific characteristics. For example, GBI implies the capacity to help individual investors identify a hierarchical list of goals, with a distinction between different types of goals (affordable versus non affordable, essential versus aspirational, etc.) for which no exact counterpart exists in institutional money management.

### 4.1. Relevant Objectives

All three of the asset allocation approaches listed here seek to make optimal use of the amount of risk that the asset owner is comfortable bearing to achieve stated investment objectives, although they generally define risk differently. [Exhibit 5](#) summarizes typical

objectives.

## Exhibit 5. Asset Allocation Approaches: Investment Objective

<b>Asset Allocation Approach</b>	<b>Relation to Economic Balance Sheet</b>	<b>Typical Objective</b>	<b>Typical Uses and Asset Owner Types</b>
Asset only	Does not explicitly model liabilities or goals	Maximize Sharpe ratio for acceptable level of volatility	Liabilities or goals not defined and/or simplicity is important <ul style="list-style-type: none"><li>■ Some foundations, endowments</li><li>■ Sovereign wealth funds</li><li>■ Individual investors</li></ul>
Liability relative	Models legal and quasi-liabilities	Fund liabilities and invest excess assets for growth	Penalty for not meeting liabilities high <ul style="list-style-type: none"><li>■ Banks</li><li>■ Defined benefit pensions</li><li>■ Insurers</li></ul>
Goals based	Models goals	Achieve goals with specified required probabilities of success	Individual investors

In a mean–variance asset-only approach, the objective is to maximize expected portfolio return per unit of portfolio volatility over some time horizon, consistent with the investor’s tolerance for risk and consistent with any constraints stated in the IPS. A portfolio’s Sharpe ratio is a characteristic metric for evaluating portfolios in an asset-only mean–variance approach.

The basic objective of a liability-relative asset allocation approach is to ensure payment of liabilities when they are due.

A goals-based approach is similar to a liability-relative approach in that it also seeks to ensure that there are sufficient assets to meet the desired payouts. In goals-based approaches, however, goals are generally associated with individual sub-portfolios, and an asset allocation is designed for each sub-portfolio that reflects the time horizon and required probability of success such that the sum of the sub-portfolios addresses the totality of goals satisfactorily.

## 4.2. Relevant Risk Concepts

Asset-only approaches focus on asset class risk and effective combinations of asset classes. The baseline asset-only approach, mean–variance optimization, uses volatility (standard deviation) of portfolio return as a primary measure of risk, which is a function of component asset class volatilities and the correlations of asset class returns. A mean–variance asset allocation can also incorporate other risk sensitivities, including risk relative to benchmarks and downside risk. Risk relative to benchmarks is usually measured by tracking risk (tracking error). Downside risk can be represented in various ways, including semi-variance, peak-to-trough maximum drawdown, and measures that focus on the extreme (tail) segment of the downside, such as value at risk.

Mean–variance results, although often the starting point for understanding portfolio risk, are regularly augmented by Monte Carlo simulation. By providing information about how an asset allocation performs when one or more variables are changed—for example, to values representing conditions of financial market stress—simulation helps complete the picture of risk, including downside and tail risk. Insights from simulation can then be incorporated as refinements to the asset allocation.

Liability-relative approaches focus on the risk of having insufficient assets to pay obligations when due, which is a kind of shortfall risk. Other risk concerns include the volatility of contributions needed to fund liabilities. Risk in a liability-relative context is generally underpinned by the differences between asset and liability characteristics (e.g., their relative size, their interest rate sensitivity, their sensitivity to inflation).

Goals-based approaches are concerned with the risk of failing to achieve goals.<sup>10</sup> The risk limits can be quantified as the maximum acceptable probability of not achieving a goal.<sup>11</sup> The plural in “liabilities” and “goals” underscores that these risks are generally related to multiple future points in time. Overall portfolio risk is thus the weighted sum of the risks associated with each goal.

Generally, a given statistical risk measure may be relevant in any of the three approaches. For example, standard deviation can be used to assess overall portfolio volatility in asset-only approaches, and it may be used to measure surplus volatility (the volatility of the difference between the values of assets and liabilities) or the volatility of the funded ratio (the ratio of the values of assets and liabilities) in liability-relative asset allocation.

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## 5. MODELING ASSET CLASS RISK

- e. explain how asset classes are used to represent exposures to systematic risk and discuss criteria for asset class specification
- f. explain the use of risk factors in asset allocation and their relation to traditional asset class-based approaches

Asset classes are one of the most widely used investment concepts but are often interpreted in distinct ways. [Greer \(1997\)](#) defines an asset class as “a set of assets that bear some fundamental economic similarities to each other, and that have characteristics that make them distinct from other assets that are not part of that class.” He specifies three “super classes” of assets:

- *Capital assets*. An ongoing source of something of value (such as interest or dividends); capital assets can be valued by net present value.
- *Consumable/transformable assets*. Assets, such as commodities, that can be consumed or transformed, as part of the production process, into something else of economic value, but which do not yield an ongoing stream of value.
- *Store of value assets*. Neither income generating nor valuable as a consumable or an economic input; examples include currencies and art, whose economic value is realized through sale or exchange.

### EXAMPLE 4

## Asset Classes (1)

Classify the following investments based on [Greer's \(1997\)](#) framework, or explain how they *do not* fit in the framework:

1. Precious metals
2. Petroleum
3. Hedge funds
4. Timberland
5. Inflation-linked fixed-income securities
6. Volatility

## Solutions:

1. Precious metals are a store of value asset except in certain industrial applications (e.g., palladium and platinum in the manufacture of catalytic converters).
2. Petroleum is a consumable/transformable asset; it can be consumed to generate power or provide fuel for transport.
3. Hedge funds do not fit into [Greer's \(1997\)](#) super class framework; a hedge fund strategy invests in underlying asset classes.
4. Timberland is a capital asset or consumable/transformable asset. It is a capital asset in the sense that timber can be harvested and replanted cyclically to generate a stream of cash flows; it is a consumable asset in that timber can be used to produce building materials/ packaging or paper.
5. Inflation-linked fixed-income securities is a capital asset because cash flows can be determined based on the characteristics of the security.
6. Volatility does not fit; it is a measurable investment characteristic. Because equity volatility is the underlying for various derivative contracts and an investable risk premium may be associated with it, it is mentioned by some as an asset.

[Greer \(1997\)](#) approaches the classification of asset classes in an abstract or generic sense. The next question is how to specify asset classes to support the purposes of strategic asset allocation.<sup>12</sup> For example, if a manager lumps together very different investments, such as distressed credit and Treasury securities, into an asset class called “fixed income,” asset allocation becomes less effective in diversifying and controlling risk. Furthermore, the investor needs a logical framework for distinguishing an asset class from an investment strategy. The following are five criteria that will help in effectively *specifying asset classes*



for the purpose of asset allocation:<sup>13</sup>

1. *Assets within an asset class should be relatively homogeneous.* Assets within an asset class should have similar attributes. In the example just given, defining equities to include both real estate and common stock would result in a non-homogeneous asset class.
2. *Asset classes should be mutually exclusive.* Overlapping asset classes will reduce the effectiveness of strategic asset allocation in controlling risk and could introduce problems in developing asset class return expectations. For example, if one asset class for a US investor is domestic common equities, then world equities ex-US is more appropriate as another asset class rather than global equities, which include US equities.
3. *Asset classes should be diversifying.* For risk control purposes, an included asset class should not have extremely high expected correlations with other asset classes or with a linear combination of other asset classes. Otherwise, the included asset class will be effectively redundant in a portfolio because it will duplicate risk exposures already present. In general, a pairwise correlation above 0.95 is undesirable (given a sufficient number of observations to have confidence in the correlation estimate).
4. *The asset classes as a group should make up a preponderance of world investable wealth.* From the perspective of portfolio theory, selecting an asset allocation from a group of asset classes satisfying this criterion should tend to increase expected return for a given level of risk. Furthermore, the inclusion of more markets expands the opportunities for applying active investment strategies, assuming the decision to invest actively has been made. However, such factors as regulatory restrictions on investments and government-imposed limitations on investment by foreigners may limit the asset classes an investor can invest in.
5. *Asset classes selected for investment should have the capacity to absorb a meaningful proportion of an investor's portfolio.* Liquidity and transaction costs are both significant considerations. If liquidity and expected transaction costs for an investment of a size meaningful for an investor are unfavorable, an asset class may not be practically suitable for investment.

Note that Criteria 1 through 3 strictly focus on assets themselves, while Criterion 5, and to some extent Criterion 4, involve potential investor-specific considerations.

## Asset Classes Should Be Diversifying

Pairwise asset class correlations are often useful information and are readily obtained.

However, in evaluating an investment's value as a diversifier at the portfolio level, it is important to consider an asset in relation to all other assets as a group rather than in a one-by-one (pairwise) fashion. It is possible to reach limited or incorrect conclusions by solely considering pairwise correlations. To give an example, denote the returns to three assets by  $X$ ,  $Y$ , and  $Z$ , respectively. Suppose that  $Z = aX + bY$ ;  $a$  and  $b$  are constants, not both equal to zero. Asset  $Z$  is an exact weighted combination of  $X$  and  $Y$  and so has no value as a diversifier added to a portfolio consisting of assets  $X$  and  $Y$ . Yet, if the correlation between  $X$  and  $Y$  is  $-0.5$ , it can be shown that  $Z$  has a correlation of just  $0.5$  with  $X$  as well as with  $Y$ .

Examining return series' correlations during times of financial market stress can provide practically valuable insight into potential diversification benefits beyond typical correlations that average all market conditions.

In current professional practice, the listing of asset classes often includes the following:

- *Global public equity*—composed of developed, emerging, and sometimes frontier markets and large-, mid-, and small-cap asset classes; sometimes treated as several sub-asset classes (e.g., domestic and non-domestic).
- *Global private equity*—includes venture capital, growth capital, and leveraged buyouts (investment in special situations and distressed securities often occurs within private equity structures too).
- *Global fixed income*—composed of developed and emerging market debt and further divided into sovereign, investment-grade, and high-yield sub-asset classes, and sometimes inflation-linked bonds (unless included in real assets; see the following bullet). Cash and short-duration securities can be included here.
- *Real assets*—includes assets that provide sensitivity to inflation, such as private real estate equity, private infrastructure, and commodities. Sometimes, global inflation-linked bonds are included as a real asset rather than fixed income because of their sensitivity to inflation.

## Emerging Market Equities and Fixed Income

Investment practice distinguishes between developed and emerging market equities and fixed income within global equities. The distinction is based on practical differences in investment characteristics, which can be related to typical market differences including

the following:

- diversification potential, which is related to the degree to which investment factors driving market returns in developed and emerging markets are not identical (a topic known as “market integration”);
- perceived level of informational efficiency; and
- corporate governance, regulation, taxation, and currency convertibility.

As of mid-2016, emerging markets represent approximately 10% of world equity value based on MSCI indices.<sup>14</sup> In fixed income, investment opportunities have expanded as governments and corporations domiciled in emerging markets have increasingly issued debt in their own currency. Markets in local currency inflation-indexed emerging market sovereign debt have become more common.<sup>15</sup>

“Asset classes” are, by definition, groupings of assets. Investment vehicles, such as hedge funds, that apply strategies to asset classes and/or individual investments with the objective of earning a return to investment skill or providing attractive risk characteristics may be treated as a category called “strategies” or “diversifying strategies.” When that is the case, this category is assigned a percentage allocation of assets, similar to a true asset class. Economically, asset classes contrast with “strategies” by offering, in general, an inherent, non-skill-based *ex ante* expected return premium.<sup>16</sup>

Effective portfolio optimization and construction may be hindered by excessive asset class granularity. Consider [Exhibit 6](#).

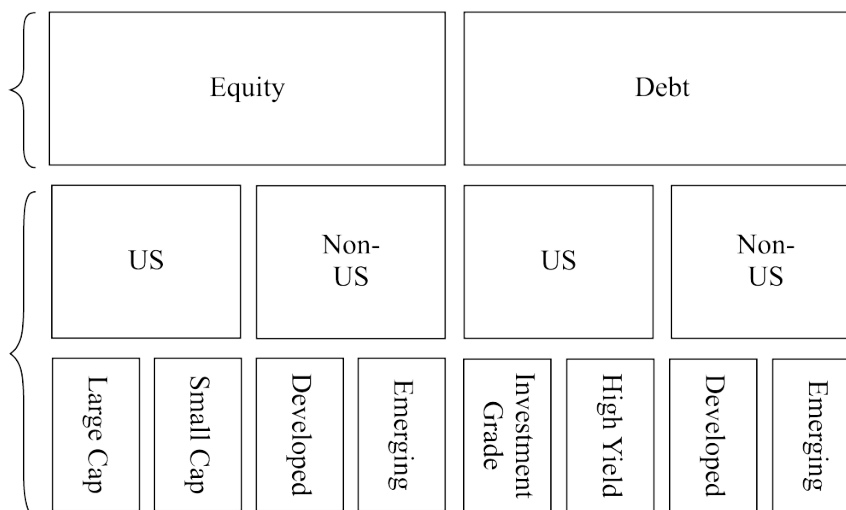
## **Exhibit 6. Examples of Asset Classes and Sub-Asset Classes**

**Asset Class Level**

Few common risk factors result in model correlations.

**Sub-Asset Class Level**

Many common risk factors result in substantially positive correlations.



As more and more sub-asset classes are defined, they become less distinctive. In particular, the sources of risk for more broadly defined asset classes are generally better distinguished than those for narrowly defined subgroups. For example, the overlap in the sources of risk of US large-cap equity and US small-cap equity would be greater than the overlap between US and non-US equity. Using broadly defined asset classes with fewer risk source overlaps in optimization is consistent with achieving a diversified portfolio. Additionally, historical data for broadly defined asset classes may be more readily available or more reliable. The question of how much to allocate to equity versus fixed income versus other assets is far more important in strategic asset allocation than *precisely* how much to allocate to the various sub-classes of equity and fixed income. However, when the investor moves from the strategic asset allocation phase to policy implementation, sub-asset class choices become relevant.

**EXAMPLE 5****Asset Classes (2)**

Discuss a specification of asset classes that distinguishes between “domestic intermediate-duration fixed income” and “domestic long-duration fixed income.” Contrast potential relevance in asset-only and liability-relative contexts.

**Solution:**

These two groups share key risk factors, such as interest rate and credit risk. For achieving diversification in asset risk—for example, in an asset-only context—asset allocation using domestic fixed income, which includes intermediate and long duration, should be effective and simple. Subsequently, allocation within domestic fixed income

could address other considerations, such as interest rate views. When investing in relation to liabilities, distinctions by duration could be of first-order importance and the specification could be relevant.

Any asset allocation, by whatever means arrived at, is expressed ultimately in terms of money allocations to assets. Traditionally—and still in common practice—asset allocation uses asset classes as the unit of analysis. Thus, mean–variance optimization based on four asset classes (e.g., global public equity, global private equity, global fixed income, and real assets) would be based on expected return, return volatility, and return correlation estimates for these asset classes. (The development of such capital market assumptions is the subject of another reading.) Factor-based approaches, discussed in more detail later, do not use asset classes as the basis for portfolio construction. Technically, the set of achievable investment outcomes cannot be enlarged simply by developing an asset allocation by a different means (for instance, using asset classes as the unit of analysis), all else being equal, such as constraints against short selling (non-negativity constraints).<sup>17</sup> Put another way, adopting a factor-based asset allocation approach does not, by default, lead to superior investment outcomes.

There are allocation methods that focus on assigning investments to the investor’s desired exposures to specified risk factors. These methods are premised on the observation that asset classes often exhibit some overlaps in sources of risk, as illustrated in [Exhibit 7](#).<sup>18</sup>

### Exhibit 7. Common Factor Exposures across Asset Classes

US Equity



US Corporate Bonds



The overlaps seen in [Exhibit 7](#) help explain the correlation of equity and credit assets. Modeling using asset classes as the unit of analysis tends to obscure the portfolio's sensitivity to overlapping risk factors, such as inflation risk in this example. As a result, controlling risk exposures may be problematic. Multifactor risk models, which have a history of use in individual asset selection, have been brought to bear on the issue of controlling systematic risk exposures in asset allocation.

In broad terms, when using factors as the units of analysis, we begin with specifying risk factors and the desired exposure to each factor. Asset classes can be described with respect to their sensitivities to each of the factors. Factors, however, are not directly investable. On that basis, asset class portfolios that isolate exposure to the risk factor are constructed; these factor portfolios involve both long and short positions. A choice of risk exposures in factor space can be mapped back to asset class space for implementation. Uses of multifactor risk models in asset allocation have been labeled “factor-based asset allocation” in contrast to “asset class-based asset allocation,” which uses asset classes directly as the unit of analysis.

## Factor Representation

Although risk factors can be thought of as the basic building blocks of investments, most are not directly investable. In this context, risk factors are associated with expected return premiums. Long and short positions in assets (spread positions) may be needed to isolate the respective risks and associated expected return premiums. Other risk factors may be accessed through derivatives. The following are a few examples of how risk factor exposures can be achieved.

- *Inflation.* Going long nominal Treasuries and short inflation-linked bonds isolates the inflation component.
- *Real interest rates.* Inflation-linked bonds provide a proxy for real interest rates.
- *US volatility.* VIX (Chicago Board Options Exchange Volatility Index) futures provide a proxy for implied volatility.
- *Credit spread.* Going long high-quality credit and short Treasuries/government bonds isolates credit exposure.
- *Duration.* Going long 10+ year Treasuries and short 1–3 year Treasuries isolates the duration exposure being targeted.

# Factor Models in Asset Allocation

The interest in using factors for asset allocation stems from a number of considerations, including the following:

- The desire to shape the asset allocation based on goals and objectives that cannot be expressed by asset classes (such as matching liability characteristics in a liability-relative approach).
- An intense focus on portfolio risk in all of its various dimensions, helped along by availability of commercial factor-based risk measurement and management tools.
- The acknowledgment that many highly correlated so-called asset classes are better defined as parts of the same high-level asset class. For example, domestic and foreign equity may be better seen as sub-classes of global public equity.
- The realization that equity risk can be the dominant risk exposure even in a seemingly well-diversified portfolio.

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## 6. STRATEGIC ASSET ALLOCATION

- g. recommend and justify an asset allocation based on an investor's objectives and constraints

An asset allocation that arises in long-term investment planning is often called the “strategic asset allocation” or “policy portfolio”: It is an asset allocation that is expected to be effective in achieving an asset owner's investment objectives, given his or her investment constraints and risk tolerance, as documented in the investment policy statement.

A theoretical underpinning for quantitative approaches to asset allocation is utility theory, which uses a utility function as a mathematical representation of preferences that incorporates the investor's risk aversion. According to utility theory, the optimal asset allocation is the one that is expected to provide the highest utility to the investor at the investor's investment time horizon. The optimization program, in broad terms, is



$$\begin{aligned} &\text{Maximize} && E[U(W_T)] = f\left(\begin{array}{l} W_0, w_i, \text{asset class return distributions,} \\ \text{degree of risk aversion} \end{array}\right) \\ &\text{by choice of asset class weights } w_i \\ &&& \text{subject to } \sum_{i=1}^n w_i = 1 \text{ and any other constraints on } w_i \end{aligned}$$

The first line is the objective function, and the second line consists of constraints on asset class weights; other constraints besides those on weights can also be incorporated (for example, specified levels of bond duration or portfolio yield may be targeted). With  $W_0$  and  $W_T$  (the values of wealth today and at time horizon  $T$ , respectively) the investor's problem is to select the asset allocation that maximizes the expected utility of ending wealth,  $E[U(W_T)]$ , subject to the constraints that asset class weights sum to 1 and that weights observe any limits the investor places on them. Beginning wealth, asset class weights, and asset class returns imply a distribution of values for ending wealth, and the utility function assigns a value to each of them; by weighting these values by their probability of occurrence, an expected utility for the asset allocation is determined.

An expected utility framework underlies many, but not all, quantitative approaches to asset allocation. A widely used group in asset allocation consists of power utility functions,<sup>19</sup> which exhibit the analytically convenient characteristic that risk aversion does not depend on the level of wealth. Power utility can be approximated by mean–variance utility, which underlies mean–variance optimization.

## Optimal Choice in the Simplest Case

The simplest asset allocation decision problem involves one risky asset and one risk-free asset. Let  $\lambda$ ,  $\mu$ ,  $r_f$  and  $\sigma^2$  represent, respectively, the investor's degree of risk aversion, the risk asset's expected return, the risk-free interest rate, and the variance of return. With mean–variance utility, the optimal allocation to the risky asset,  $w^*$ , can be shown to equal

$$w^* = \frac{1}{\lambda} \left( \frac{\mu - r_f}{\sigma^2} \right)$$

The allocation to the risky asset is inversely proportional to the investor's risk aversion and directly proportional to the risk asset's expected return per unit of risk (represented by return variance).<sup>20</sup>



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Selection of a strategic asset allocation generally involves the following steps:<sup>21</sup>

1. Determine and quantify the investor's objectives. What is the pool of assets meant for (e.g., paying future benefit payments, contributing to a university's budget, securing ample assets for retirement)? What is the investor trying to achieve? What liabilities or needs or goals need to be recognized (explicitly or implicitly)? How should objectives be modeled?
2. Determine the investor's risk tolerance and how risk should be expressed and measured. What is the investor's overall tolerance for risk and specific risk sensitivities? How should these be quantified in the process of developing an appropriate asset allocation (risk measures, factor models)?
3. Determine the investment horizon(s). What are the appropriate planning horizons to use for asset allocation; that is, over what horizon(s) should the objectives and risk tolerance be evaluated?
4. Determine other constraints and the requirements they impose on asset allocation choices. What is the tax status of the investor? Should assets be managed with consideration given to ESG issues? Are there any legal and regulatory factors that need to be considered? Are any political sensitivities relevant? Are there any other constraints that the investor has imposed in the IPS and other communications?
5. Determine the approach to asset allocation that is most suitable for the investor.
6. Specify asset classes, and develop a set of capital market expectations for the specified asset classes.
7. Develop a range of potential asset allocation choices for consideration. These choices are often developed through optimization exercises. Specifics depend on the approach taken to asset allocation.
8. Test the robustness of the potential choices. This testing often involves conducting simulations to evaluate potential results in relation to investment objectives and risk tolerance over appropriate planning horizon(s) for the different asset allocations developed in Step 7. The sensitivity of the outcomes to changes in capital market expectations is also tested.
9. Iterate back to Step 7 until an appropriate and agreed-on asset allocation is constructed.

Subsequent readings on asset allocation in practice will address the “how.” The following sections give an indication of thematic considerations. We use investors with specific characteristics to illustrate the several approaches distinguished: sovereign wealth fund for

asset-only allocation; a frozen corporate DB plan for liability-relative allocation; and an ultra-high-net-worth family for goals-based allocation. In practice, any type of investor could approach asset allocation with varying degrees of focus on modeling and integrating liabilities-side balance sheet considerations. How these cases are analyzed in this reading should not be viewed as specifying normative limits of application for various asset allocation approaches. For example, a liability-relative perspective has wide potential relevance for institutional investors because it has the potential to incorporate all information on the economic balance sheet. Investment advisers to high-net-worth investors may choose to use any of the approaches.

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## 7. STRATEGIC ASSET ALLOCATION: ASSET ONLY

- g.** recommend and justify an asset allocation based on an investor's objectives and constraints
- h.** describe the use of the global market portfolio as a baseline portfolio in asset allocation

Asset-only allocation is based on the principle of selecting portfolios that make efficient use of asset risk. The focus here is mean–variance optimization, the mainstay among such approaches. Given a set of asset classes and assumptions concerning their expected returns, volatilities, and correlations, this approach traces out an efficient frontier that consists of portfolios that are expected to offer the greatest return at each level of portfolio return volatility. The Sharpe ratio is a key descriptor of an asset allocation: If a portfolio is efficient, it has the highest Sharpe ratio among portfolios with the same volatility of return.

An example of an investor that might use an asset-only approach is the (hypothetical) Government Petroleum Fund of Caflandia (GPFC) introduced next.

### Investor Case Facts: GPFC, A Sovereign Wealth Fund

- *Name:* Government Petroleum Fund of Caflandia (GPFC)
- *Narrative:* The emerging country of Caflandia has established a sovereign wealth

fund to capture revenue from its abundant petroleum reserves. The government's goal in setting up the fund is to promote a fair sharing of the benefits between current and future generations (intergenerational equity) from the export of the country's petroleum resources. Caflandia's equity market represents 0.50% of global equity market capitalization. Economists estimate that distributions in the interest of intergenerational equity may need to begin in 20 years. Future distribution policy is undetermined.

- *Tax status:* Non-taxable.
- *Financial assets and financial liabilities:* Financial assets are CAF\$40 billion at market value, making GPFC among the largest investors in Caflandia. GPFC has no borrowings.
- *Extended assets and liabilities:* Cash inflows from petroleum exports are assumed to grow at inflation + 1% for the next 15 years and may change depending on reserves and global commodity demand. The present value of expected future income from state-owned reserves is estimated to be CAF\$60 billion. Future spending needs are positively correlated with consumer inflation and population growth. In [Exhibit 8](#), the amount for the present value (PV) of future spending, which GPFC has not yet determined, is merely a placeholder to balance assets and liabilities; as a result, no equity is shown.

#### Exhibit 8. GPFC Economic Balance Sheet (in CAF\$ billions) 31 December 20x6

<b>Assets</b>		<b>Liabilities and Economic Net Worth</b>	
<i>Financial Assets</i>		<i>Financial Liabilities</i>	
Investments (includes cash, equities, fixed income, and other investments)	40		
<i>Extended Assets</i>		<i>Extended Liabilities</i>	
PV of expected future income	60	PV of future spending	100

		<i>Economic Net Worth</i>	
		Economic net worth	0
<b>Total</b>	100		100

For GPFC, the amount and timing of funds needed for future distributions to Caflandia citizens are, as yet, unclear. GPFC can currently focus on asset risk and its efficient use to grow assets within the limits of the fund’s risk tolerance. In addition to considering expected return in relation to volatility in selecting an asset allocation, GPFC might include such considerations as the following:

- diversification across global asset classes (possibly quantified as a constraint on the proportion allocated to any given asset classes);
- correlations with the petroleum sources of income to GPFC;
- the potential positive correlation of future spending with inflation and population growth in Caflandia;
- long investment horizon (as a long-term investor, GPFC may be well positioned to earn any return premium that may be associated with the relatively illiquid asset classes); and
- return outcomes in severe financial market downturns.

Suppose GPFC quantifies its risk tolerance in traditional mean–variance terms as willingness to bear portfolio volatility of up to 17% per year. This risk tolerance is partly based on GPFC’s unwillingness to allow the fund to fall below 90% funded. GPFC’s current strategic asset allocation, along with several alternatives that have been developed by its staff during an asset allocation review, are shown in [Exhibit 9](#). The category “Diversifying strategies” consists of a diversified allocation to hedge funds.

Exhibit 9. GPFC Strategic Asset Allocation Decision<sup>22</sup>

Asset Allocation
Proposed

	Current	A	B	C
<b>Investment</b>				
Equities				
Domestic	50%	40%	45%	30%
Global ex-domestic		10%	20%	25%
Bonds				
Nominal	30%	30%	20%	10%
Inflation linked				10%
Real estate	20%	10%	15%	10%
Diversifying strategies		10%		15%
<b>Portfolio statistics</b>				
Expected arithmetic return	8.50%	8.25%	8.88%	8.20%
Volatility (standard deviation)	15.57%	14.24%	16.63%	14.06%
Sharpe ratio	0.353	0.369	0.353	0.370
One-year 5% VaR	-17.11%	-15.18%	-18.48%	-14.93%

Notes: The government bond rate is 3%. The acceptable level of volatility is  $\leq 17\%$  per year. The value at risk (VaR) is stated as a percent of the initial portfolio value over one year (e.g., -16% means a decline of 16%).

GPFC decides it is willing to tolerate a 5% chance of losing 22% or more of portfolio value in a given year. This risk is evaluated by examining the one-year 5% VaR of potential asset allocations.

Let us examine GPFC's decision. The current asset allocation and the alternatives developed by staff all satisfy the GPFC's tolerance for volatility and VaR limit. The staff's alternatives appear to represent incremental, rather than large-scale, changes from the current strategic asset allocation. We do not know whether capital market assumptions have changed since the current strategic asset allocation was approved.

Mix A, compared with the current asset allocation, diversifies the equity allocation to include non-domestic (global ex-domestic) equities and spreads the current allocation to real estate over real estate and diversifying strategies. Given GPFC's long investment horizon and absence of liquidity needs, an allocation to diversifying strategies at 10% should not present liquidity concerns. Because diversifying strategies are more liquid than private real estate, the overall liquidity profile of the fund improves. It is important to note that given the illiquid nature of real estate, it could take considerable time to reallocate from real estate to

diversifying strategies. Mix A has a lower volatility (by 133 bps) than the current allocation and slightly lower tail risk (the 5% VaR for Mix A is  $-15\%$ , whereas the 5% VaR for the current asset mix is  $-17\%$ ). Mix A's Sharpe ratio is slightly higher. On the basis of the facts given, Mix A appears to be an incremental improvement on the current asset allocation.

Compared with Mix A and the current asset allocation, Mix B increases the allocation to equities by 15 percentage points and pulls back from the allocation to bonds and, in relation to Mix A, diversifying strategies. Although Mix B has a higher expected return and its VaR is within GPFC's tolerance of  $22\%$ , Mix B's lower Sharpe ratio indicates that it makes inefficient use of its additional risk. Mix B does not appear to deserve additional consideration.

Compared with the current asset allocation and Mix A, Mix C's total allocation to equities, at  $55\%$ , is higher and the mix is more diversified considering the allocation of  $25\%$  non-domestic equities. Mix C's allocation to fixed income is  $20\%$  compared with  $30\%$  for Mix A and the current asset mix. The remaining fixed-income allocation has been diversified with an exposure to both nominal and inflation-linked bonds. The diversifying strategies allocation is funded by a combination of the reduced weights to fixed income and real estate. The following observations may be made:

- Mix C's increase in equity exposure (compared with the equity exposure of Mix A and the current mix) has merit because more equity-like choices in the asset allocation could be expected to give GPFC more exposure to such a factor as a GDP growth factor (see [Exhibit 9](#)); population growth is one driver of GDP.
- Within fixed income, Mix C's allocation to inflation-linked bonds could be expected to hedge the inflation risk inherent in future distributions.
- Mix C has the lowest volatility and the lowest VaR among the asset allocations, although the differences compared with Mix A are very small. Mix C's Sharpe ratio is comparable to (insignificantly higher than) Mix A's.

Based on the facts given, Mix A and Mix C appear to be improvements over the current mix. Mix C may have the edge over Mix A based on the discussion. As a further step in the evaluation process, GPFC may examine the robustness of the forecasted results by changing the capital market assumptions and simulating shocks to such variables as inflation. The discussion of Mix C shows that there are means for potential liability concerns (the probable sensitivity of spending to inflation and population growth) to enter decision making even from a mean–variance optimization perspective.

## EXAMPLE 6

# Asset-Only Asset Allocation

1. Describe how the Sharpe ratio, considered in isolation, would rank the asset allocation in [Exhibit 9](#).
2. State a limitation of basing a decision only on the Sharpe ratio addressed in Question 1.
3. An assertion is heard in an investment committee discussion that because the Sharpe ratio of diversifying strategies (0.55) is higher than real estate's (0.50), any potential allocation to real estate would be better used in diversifying strategies. Describe why the argument is incomplete.

### Solution to 1:

The ranking by Sharpe ratios in isolation is C (3.70), A (3.69), and current and B (both 3.53). Using only the Sharpe ratio, Mix C appears superior to the other choices, but such an approach ignores several important considerations.

### Solution to 2:

The Sharpe ratio, while providing a means to rank choices on the basis of return per unit of volatility, does not capture other characteristics that are likely to be important to the asset owner, such as VaR and funded ratio. Furthermore, the Sharpe ratio by itself cannot confirm that the absolute level of portfolio risk is within the investor's specified range.

### Solution to 3:

It is true that the higher the Sharpe ratio of an investment, the greater its contribution to the Sharpe ratio of the overall portfolio, *holding all other things equal*. However, that condition is not usually true. Diversification potential in a portfolio (quantified by correlations) may differ. For example, including both diversifying strategies and real estate in an allocation may ultimately decrease portfolio-level risk through favorable correlation characteristics. Also, as in the solution to Question 2, other risk considerations besides volatility may be relevant.

Financial theory suggests that investors should consider the global market-value weighted portfolio as a baseline asset allocation. This portfolio, which sums all investable assets (global stocks, bonds, real estate, and so forth) held by investors, reflects the balancing of supply and demand across world markets. In financial theory, it is the portfolio that minimizes diversifiable risk, which in principle is uncompensated. Because of that characteristic, theory indicates that the global market portfolio should be the available



portfolio that makes the most efficient use of the risk budget.<sup>23</sup> Other arguments for using it as a baseline include its position as a reference point for a highly diversified portfolio and the discipline it provides in relation to mitigating any investment biases, such as home-country bias (discussed below).

At a minimum, the global market portfolio serves as a starting point for discussion and ensures that the investor articulates a clear justification for moving away from global capitalization market weights. The global market portfolio is expressed in two phases. The first phase allocates assets in proportion to the global portfolio of stocks, bonds, and real assets. The second phase disaggregates each of these broad asset classes into regional, country, and security weights using capitalization weights. The second phase is typically used within a global equity portfolio where an asset owner will examine the global capitalization market weights and either accept them or alter them. Common tilts (biases) include overweighting the home-country market, value, size (small cap), and emerging markets. For many investors, allocations to foreign fixed income have been adopted more slowly than allocations to foreign equity. Most investors have at least some amount in non-home-country equity.

## Home-Country Bias

A given for GPFC was that Caflandia's equity markets represent only 0.50% of the value of world equity markets. However, in all asset allocations in [Exhibit 9](#), the share of domestic equity ranged from 50% for the current asset allocation to 30% for Mix C. The favouring of domestic over non-domestic investment relative to global market value weights is called **home-country bias** and is very common. Even relatively small economies feature pension plans, endowments, and other funds, which are disproportionately tilted toward the equity and fixed-income offerings in the domestic market. The same tendency is true for very large markets, such as the United States and the eurozone. By biasing toward the home market, asset owners may not be optimally aligning regional weights with the global market portfolio and are implicitly implementing a market view. Investment explanations for the bias, such as offsetting liabilities that are denominated in the home currency, may be relevant in some cases, however.

For reference, the MSCI All Country World Portfolio (ACWI), a proxy for the public equities portion of the global equity market portfolio, contains the following capitalization weights as of 31 December 2015:

- Developed Europe and the Middle East: 22.8%



- Developed Pacific: 11.7%
- North America: 55.9%
- Emerging markets: 9.6%

Investing in a global market portfolio faces several implementation hurdles. First, estimating the size of each asset class on a global basis is an imprecise exercise given the uneven availability of information on non-publicly traded assets. Second, the practicality of investing proportionately in residential real estate, much of which is held in individual homeowners' hands, has been questioned. Third, private commercial real estate and global private equity assets are not easily carved into pieces of a size that is accessible to most investors. Practically, proxies for the global market portfolio are often based only on traded assets, such as portfolios of exchange-traded funds (ETFs). Furthermore, some investors have implemented alternative weighting schemes, such as GDP weight or equal weight. However, it is a useful discipline to articulate a justification for any deviation from the capitalization-weighted global market portfolio.

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## 8. STRATEGIC ASSET ALLOCATION: LIABILITY RELATIVE

- g. recommend and justify an asset allocation based on an investor's objectives and constraints

To illustrate the liability-relative approach, we take the defined benefit (DB) pension plan of (hypothetical) GPLE Corporation, with case facts given below.

### A Frozen DB Plan, GPLE Corporation Pension

- *Name:* GPLE Corporation Pension

- *Narrative:* GPLE is a machine tool manufacturer with a net worth of \$1.25 billion. GPLE is the sponsor of a \$1.25 billion legacy DB plan, with no new plan participants and no new benefits accruing for participants. GPLE Pension has a funded ratio (the ratio of assets to liabilities) of 1.15. Thus, the plan is slightly overfunded. The plan's management rests with the firm's treasury department (responsibility for GPLE Corporation treasury operations).
- *Tax status:* Non-taxable.
- *Financial assets and financial liabilities:* Assets amount to \$1.25 billion at market value. Given a funded ratio of 1.15, that amount implies liabilities at about \$1.087 billion. Projected distributions to pension participants have a present value of \$1.087 billion at market value.

GPLE does not reflect any extended assets or liabilities; thus, its economic net worth is identical to traditional accounting net worth.

#### Exhibit 10. GPLE Pension Economic Balance Sheet December 20x6

<b>Assets</b>		<b>Liabilities and Economic Net Worth</b>
<i>Financial Assets</i>		<i>Financial Liabilities</i>
Pension assets	1.250	PV of pension liability
		<i>Economic Net Worth</i>
		Economic net worth
<b>Total</b>	1.250	

GPLE, the plan sponsor, receives two asset allocation recommendations. The first recommendation, "Recommendation A," does not explicitly consider GPLE's pension's liabilities but is in the context of the mean-variance efficient frontier given a set of candidate assets. The second recommendation, "Recommendation B," does explicitly consider liabilities by incorporating a liability-hedging portfolio based on an analysis of

















































































# Reading 6

## Principles of Asset Allocation

by Jean L.P. Brunel, CFA, Thomas M. Idzorek, CFA, and John M. Mulvey, PhD

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** describe and evaluate the use of mean–variance optimization in asset allocation;
- b.** recommend and justify an asset allocation using mean–variance optimization;
- c.** interpret and evaluate an asset allocation in relation to an investor’s economic balance sheet;
- d.** discuss asset class liquidity considerations in asset allocation;
- e.** explain absolute and relative risk budgets and their use in determining and implementing an asset allocation;
- f.** describe how client needs and preferences regarding investment risks can be incorporated into asset allocation;
- g.** discuss the use of Monte Carlo simulation and scenario analysis to evaluate the robustness of an asset allocation;
- h.** describe the use of investment factors in constructing and analyzing an asset allocation;
- i.** recommend and justify an asset allocation based on the global market portfolio;
- j.** describe and evaluate characteristics of liabilities that are relevant to asset allocation;

- k.** discuss approaches to liability-relative asset allocation;
  - l.** recommend and justify a liability-relative asset allocation;
  - m.** recommend and justify an asset allocation using a goals-based approach;
  - n.** describe and evaluate heuristic and other approaches to asset allocation;
  - o.** discuss factors affecting rebalancing policy.
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## 1. INTRODUCTION

Determining a strategic asset allocation is arguably the most important aspect of the investment process. This reading builds on the “Introduction to Asset Allocation” reading and focuses on several of the primary frameworks for developing an asset allocation, including asset-only mean–variance optimization, various liability-relative asset allocation techniques, and goals-based investing. Additionally, it touches on various other asset allocation techniques used by practitioners, as well as important related topics, such as rebalancing.

The process of creating a diversified, multi-asset class portfolio typically involves two separate steps. The first step is the asset allocation decision, which can refer to both the process and the result of determining long-term (strategic) exposures to the available asset classes (or risk factors) that make up the investor’s opportunity set. Asset allocation is the first and primary step in translating the client’s circumstances, objectives, and constraints into an appropriate portfolio (or, for some approaches, multiple portfolios) for achieving the client’s goals within the client’s tolerance for risk. The second step in creating a diversified, multi-asset-class portfolio involves implementation decisions that determine the specific investments (individual securities, pooled investment vehicles, and separate accounts) that will be used to implement the targeted allocations.

Although it is possible to carry out the asset allocation process and the implementation process simultaneously, in practice, these two steps are often separated for two reasons. First, the frameworks for simultaneously determining an asset allocation and its implementation are often complex. Second, in practice, many investors prefer to revisit their strategic asset allocation policy somewhat infrequently (e.g., annually or less frequently) in a dedicated asset allocation study, while most of these same investors prefer to revisit/monitor implementation vehicles (actual investments) far more frequently (e.g., monthly or quarterly).



Sections 2–9 cover the traditional mean–variance optimization (MVO) approach to asset allocation. We apply this approach in what is referred to as an “asset-only” setting, in which the goal is to create the most efficient mixes of asset classes in the absence of any liabilities. We highlight key criticisms of mean–variance optimization and methods used to address them. This section also covers risk budgeting in relation to asset allocation, factor-based asset allocation, and asset allocation with illiquid assets. The observation that almost all portfolios exist to help pay for what can be characterized as a “liability” leads to the next subject.

Sections 10–14 introduce liability-relative asset allocation—including a straightforward extension of mean–variance optimization known as surplus optimization. Surplus optimization is an economic balance sheet approach extended to the liability side of the balance sheet that finds the most efficient asset class mixes in the presence of liabilities. Liability-relative optimization is simultaneously concerned with the return of the assets, the change in value of the liabilities, and how assets and liabilities interact to determine the overall value or health of the total portfolio.

Sections 15–18 cover an increasingly popular approach to asset allocation called goals-based asset allocation. Conceptually, goals-based approaches are similar to liability-relative asset allocation in viewing risk in relation to specific needs or objectives associated with different time horizons and degrees of urgency.

Section 19 introduces some informal (heuristic) ways that asset allocations have been determined and other approaches to asset allocation that emphasize specific objectives.

Section 20 addresses the factors affecting choices that are made in developing specific policies relating to rebalancing to the strategic asset allocation. Factors discussed include transaction costs, correlations, volatility, and risk aversion.<sup>1</sup>

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## **2. DEVELOPING ASSET-ONLY ASSET ALLOCATIONS; AND MEAN-VARIANCE OPTIMIZATION: OVERVIEW**

- a.** describe and evaluate the use of mean–variance optimization in asset allocation;
- b.** recommend and justify an asset allocation using mean–variance optimization;
- c.** interpret and evaluate an asset allocation in relation to an investor’s economic balance sheet;

- i. recommend and justify an asset allocation based on the global market portfolio;

In this section, we discuss several of the primary techniques and considerations involved in developing strategic asset allocations, leaving the issue of considering the liabilities to Sections 10–14 and the issue of tailoring the strategic asset allocation to meet specific goals to Sections 15–18.

We start by introducing mean–variance optimization, beginning with unconstrained optimization, prior to moving on to the more common mean–variance optimization problem in which the weights, in addition to summing to 1, are constrained to be positive (no shorting allowed). We present a detailed example, along with several variations, highlighting some of the important considerations in this approach. We also identify several criticisms of mean–variance optimization and the major ways these criticisms have been addressed in practice.

## 2.1. Mean–Variance Optimization: Overview

Mean–variance optimization (MVO), as introduced by Markowitz (1952, 1959), is perhaps the most common approach used in practice to develop and set asset allocation policy. Widely used on its own, MVO is also often the basis for more sophisticated approaches that overcome some of the limitations or weaknesses of MVO.

Markowitz recognized that whenever the returns of two assets are not perfectly correlated, the assets can be combined to form a portfolio whose risk (as measured by standard deviation or variance) is less than the weighted-average risk of the assets themselves. An additional and equally important observation is that as one adds assets to the portfolio, one should focus not on the individual risk characteristics of the additional assets but rather on those assets' effect on the risk characteristics of the entire portfolio. Mean–variance optimization provides us with a framework for determining how much to allocate to each asset in order to maximize the *expected* return of the portfolio for an *expected* level of risk. In this sense, mean–variance optimization is a risk-budgeting tool that helps investors to spend their risk budget—the amount of risk they are willing to assume—wisely. We emphasize the word “expected” because the inputs to mean–variance optimization are necessarily forward-looking estimates, and the resulting portfolios reflect the quality of the inputs.

Mean–variance optimization requires three sets of inputs: returns, risks (standard deviations), and pair-wise correlations for the assets in the opportunity set. The objective function is often expressed as follows:

### Equation (1)

$$U_m = E(R_m) - 0.005\lambda\sigma_m^2$$

where

$U_m$  = the investor's utility for asset mix (allocation)  $m$

$R_m$  = the return for asset mix  $m$

$\lambda$  = the investor's risk aversion coefficient

$\sigma_m^2$  = the expected variance of return for asset mix  $m$

The risk aversion coefficient ( $\lambda$ ) characterizes the investor's risk–return trade-off; in this context, it is the rate at which an investor will forgo expected return for less variance. The value of 0.005 in [Equation 1](#) is based on the assumption that  $E(R_m)$  and  $\sigma_m$  are expressed as percentages rather than as decimals. (In using Equation 1, omit % signs.) If those quantities were expressed as decimals, the 0.005 would change to 0.5. For example, if  $E(R_m) = 0.10$ ,  $\lambda = 2$ , and  $\sigma = 0.20$  (variance is 0.04), then  $U_m$  is 0.06, or 6% [=  $0.10 - 0.5(2)(0.04)$ ]. In this case,  $U_m$  can be interpreted as a certainty-equivalent return—that is, the utility value of the risky return offered by the asset mix, stated in terms of the risk-free return that the investor would value equally. In [Equation 1](#), 0.005 merely scales the second term appropriately.

In words, the objective function says that the value of an asset mix for an investor is equal to the expected return of the asset mix minus a penalty that is equal to one-half of the expected variance of the asset mix scaled by the investor's risk aversion coefficient. Optimization involves selecting the asset mix with the highest such value (certainty equivalent). Smaller risk aversion coefficients result in relatively small penalties for risk, leading to aggressive asset mixes. Conversely, larger risk aversion coefficients result in relatively large penalties for risk, leading to conservative asset mixes. A value of  $\lambda = 0$  corresponds to a risk-neutral investor because it implies indifference to volatility. Most investors' risk aversion is consistent with  $\lambda$  between 1 and 10.<sup>2</sup> Empirically,  $\lambda = 4$  can be taken to represent a moderately risk-averse investor, although the specific value is sensitive to the opportunity set in question and to market volatility.

In the absence of constraints, there is a closed-form solution that calculates, for a given set of inputs, the single set of weights (allocation) to the assets in the opportunity set that maximizes the investor's utility. Typically, this single set of weights is relatively extreme, with very large long and short positions in each asset class. Except in the special case in which the expected returns are derived using the reverse-optimization process of [Sharpe \(1974\)](#), the expected-utility-maximizing weights will not add up to 100%. We elaborate on reverse optimization in Section 19.

In most real-world applications, asset allocation weights must add up to 100%, reflecting a fully invested, non-leveraged portfolio. From an optimization perspective, when seeking the asset allocation weights that maximize the investor's utility, one must constrain the asset

allocation weights to sum to 1 (100%). This constraint that weights sum to 100% is referred to as the “budget constraint” or “unity constraint.” The inclusion of this constraint, or any other constraint, moves us from a problem that has a closed-form solution to a problem that must be solved numerically using optimization techniques.

In contrast to the single solution (single set of weights) that is often associated with unconstrained optimization (one could create an efficient frontier using unconstrained weights, but it is seldom done in practice), Markowitz’s mean–variance optimization paradigm is most often identified with an efficient frontier that plots all potential efficient asset mixes subject to some common constraints. In addition to a typical budget constraint that the weights must sum to 1 (100% in percentage terms), the next most common constraint allows only positive weights or allocations (i.e., no negative or short positions).

Efficient asset mixes are combinations of the assets in the opportunity set that maximize expected return per unit of expected risk or, alternatively (and equivalently), minimize expected risk for a given level of expected return. To find all possible efficient mixes that collectively form the efficient frontier, *conceptually* the optimizer iterates through all the possible values of the risk aversion coefficient ( $\lambda$ ) and for each value finds the combination of assets that maximizes expected utility. We have used the word *conceptually* because there are different techniques for carrying out the optimization that may vary slightly from our description, even though the solution (efficient frontier and efficient mixes) is the same. The efficient mix at the far left of the frontier with the lowest risk is referred to as the global minimum variance portfolio, while the portfolio at the far right of the frontier is the maximum expected return portfolio. In the absence of constraints beyond the budget and non-negativity constraints, the maximum expected return portfolio consists of a 100% allocation to the single asset with the highest expected return (which is not necessarily the asset with the highest level of risk).

## Risk Aversion

Unfortunately, it is extremely difficult to precisely estimate a given investor’s risk aversion coefficient ( $\lambda$ ). Best practices suggest that when estimating risk aversion (or, conversely, risk tolerance), one should examine both the investor’s *preference* for risk (willingness to take risk) and the investor’s *capacity* for taking risk. Risk preference is a subjective measure and typically focuses on how an investor feels about and potentially reacts to the ups and downs of portfolio value. The level of return an investor hopes to earn can influence the investor’s willingness to take risk, but investors must be realistic when setting such objectives. Risk capacity is an objective measure of the investor’s ability to tolerate portfolio losses and the potential decrease in future consumption associated with those losses.<sup>3</sup> The psychometric literature has developed validated

questionnaires, such as that of Grable and Joo (2004), to approximately locate an investor's risk preference, although this result then needs to be blended with risk capacity to determine risk tolerance. For individuals, risk capacity is affected by factors such as net worth, income, the size of an emergency fund in relation to consumption needs, and the rate at which the individual saves out of gross income, according to the practice of financial planners noted in Grable (2008).

With this guidance in mind, we move forward with a relatively global opportunity set, in this case defined from the point of view of an investor from the United Kingdom with an approximate 10-year time horizon. The analysis is carried out in British pounds (GBP), and none of the currency exposure is hedged. Exhibit 1 identifies 12 asset classes within the universe of available investments and a set of plausible forward-looking capital market assumptions: expected returns, standard deviations, and correlations. The reading on capital market expectations covers how such inputs may be developed.<sup>4</sup> In the exhibit, three significant digits at most are shown, but the subsequent analysis is based on full precision.

## Time Horizon

Mean–variance optimization is a “single-period” framework in which the single period could be a week, a month, a year, or some other time period. When working in a “strategic” setting, many practitioners typically find it most intuitive to work with annual capital market assumptions, even though the investment time horizon could be considerably longer (e.g., 10 years). If the strategic asset allocation will not be re-evaluated within a long time frame, capital market assumptions should reflect the average annual distributions of returns expected over the entire investment time horizon. In most cases, investors revisit the strategic asset allocation decision more frequently, such as annually or every three years, rerunning the analysis and making adjustments to the asset allocation; thus, the annual capital market assumption often reflects the expectations associated with the evaluation horizon (e.g., one year or three years).

### **Exhibit 1. Hypothetical UK-Based Investor's Opportunity Set with Expected Returns, Standard Deviations, and Correlations**

## Panel A: Expected Returns and Standard Deviations

Asset Class	Expected Return (%)	Standard Deviation (%)
UK large cap	6.6	14.8
UK mid cap	6.9	16.7
UK small cap	7.1	19.6
US equities	7.8	15.7
Europe ex UK equities	8.6	19.6
Asia Pacific ex Japan equities	8.5	20.9
Japan equities	6.4	15.2
Emerging market equities	9.0	23.0
Global REITs	9.0	22.5
Global ex UK bonds	4.0	10.4
UK bonds	2.9	6.1
Cash	2.5	0.7

## Panel B: Correlations

	UK Large Cap	UK Mid Cap	UK Small Cap	US Equities	Europe ex UK Equities	Asia Pacific ex Japan Equities	Japan Equities
UK large cap	1.00	0.86	0.79	0.76	0.88	0.82	0.55
UK mid cap	0.86	1.00	0.95	0.76	0.84	0.75	0.51
UK small cap	0.79	0.95	1.00	0.67	0.79	0.70	0.49
US equities	0.76	0.76	0.67	1.00	0.81	0.72	0.62

Europe ex UK equities	0.88	0.84	0.79	0.81	1.00	0.82	0.60
Asia Pacific ex Japan equities	0.82	0.75	0.70	0.72	0.82	1.00	0.54
Japan equities	0.55	0.51	0.49	0.62	0.60	0.54	1.00
Emerging market equities	0.78	0.74	0.71	0.69	0.80	0.94	0.56
Global REITs	0.64	0.67	0.61	0.77	0.72	0.67	0.52
Global ex UK bonds	-0.12	-0.16	-0.22	0.14	0.04	0.00	0.18
UK bonds	-0.12	-0.10	-0.15	0.00	-0.04	-0.02	0.07
Cash	-0.06	-0.17	-0.17	-0.12	-0.03	0.02	-0.01

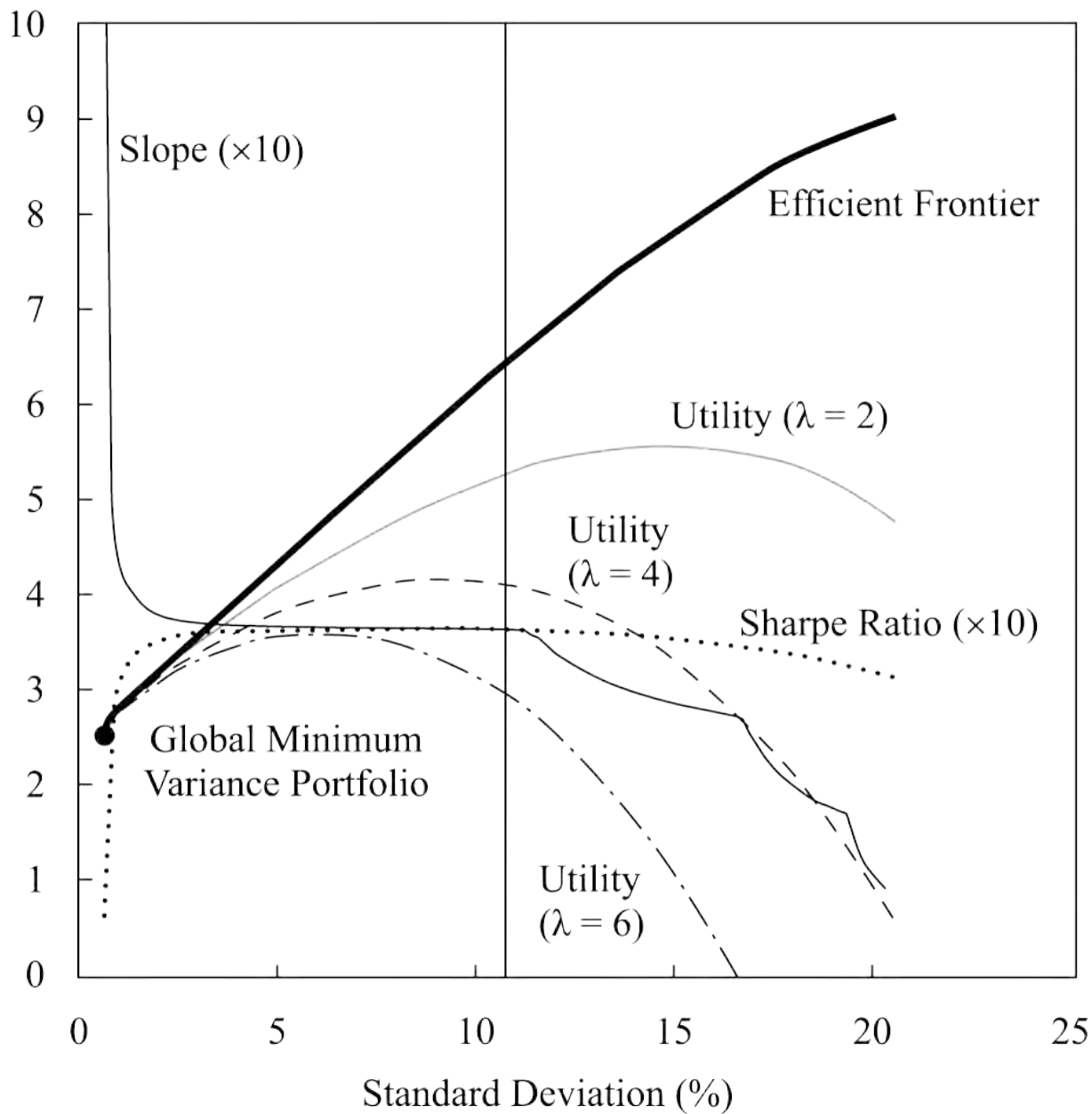
The classification of asset classes in the universe of available investments may vary according to local practices. For example, in the United States and some other larger markets, it is common to classify equities by market capitalization, whereas the practice of classifying equities by valuation (“growth” versus “value”) is less common outside of the United States. Similarly, with regard to fixed income, some asset allocators may classify bonds based on various attributes—nominal versus inflation linked, corporate versus government issued, investment grade versus non-investment grade (high yield)—and/or by maturity/duration (short, intermediate, and long). By means of the non-negativity constraint and using a reverse-optimization procedure (to be explained later) based on asset class market values to generate expected return estimates, we control the typically high sensitivity of the composition of efficient portfolios to expected return estimates (discussed further in Sections 19 and 20). Without such precautions, we would often find that efficient portfolios are highly concentrated in a subset of the available asset classes.

Running this set of capital market assumptions through a mean–variance optimizer with the traditional non-negativity and unity constraints produces the efficient frontier depicted in [Exhibit 2](#). We have augmented this efficient frontier with some non-traditional information

that will assist with the understanding of some key concepts related to the efficient frontier. A risk-free return of 2.5% is used in calculating the reserve-optimized expected returns as well as the Sharpe ratios in [Exhibit 2](#).

**Exhibit 2. Efficient Frontier—Base Case**

Expected Return (%)  
Slope, Sharpe Ratio, Utility



The slope of the efficient frontier is greatest at the far left of the efficient frontier, at the point



representing the global minimum variance portfolio. Slope represents the rate at which expected return increases per increase in risk. As one moves to the right, in the direction of increasing risk, the slope decreases; it is lowest at the point representing the maximum return portfolio. Thus, as one moves from left to right along the efficient frontier, the investor takes on larger and larger amounts of risk for smaller and smaller increases in expected return. The “kinks” in the line representing the slope (times 10) of the efficient frontier correspond to portfolios (known as corner portfolios) in which an asset either enters or leaves the efficient mix.

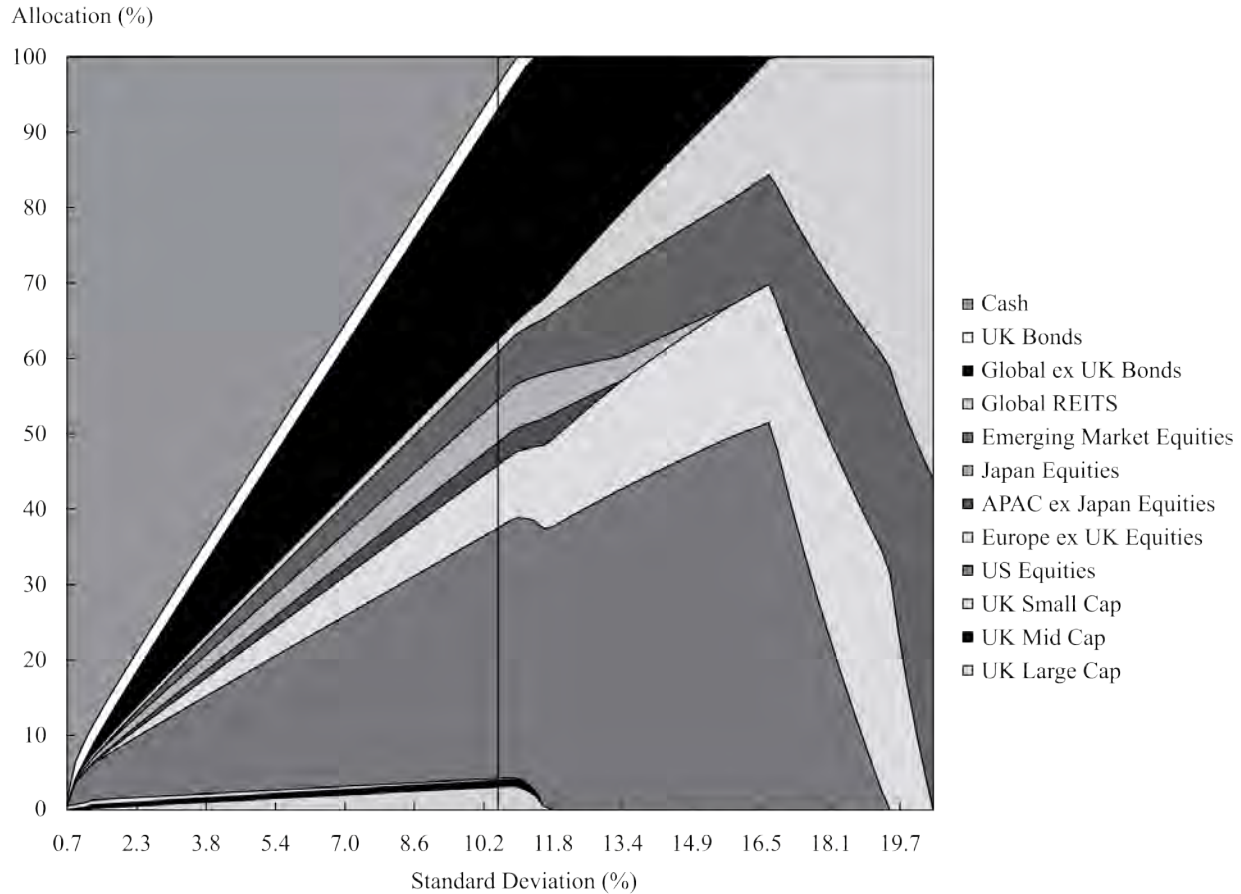
For most investors, at the far left of the efficient frontier, the increases in expected return associated with small increases in expected risk represent a desirable trade-off. The risk aversion coefficient identifies the specific point on the efficient frontier at which the investor refuses to take on additional risk because he or she feels the associated increase in expected return is not high enough to compensate for the increase in risk. Of course, each investor makes this trade-off differently.

For this particular efficient frontier, the three expected utility curves plot the solution to [Equation 1](#) for three different risk aversion coefficients: 2.0, 4.0, and 6.0, respectively.<sup>5</sup> For a given risk aversion coefficient, the appropriate efficient mix from the efficient frontier is simply the mix in which expected utility is highest (i.e., maximized). As illustrated in [Exhibit 2](#), a lower risk aversion coefficient leads to a riskier (higher) point on the efficient frontier, while a higher risk aversion coefficient leads to a more conservative (lower) point on the efficient frontier.

The vertical line (at volatility of 10.88%) identifies the asset mix with the highest Sharpe ratio; it intersects the Sharpe ratio line at a value of 3.7 (an unscaled value of 0.37). This portfolio is also represented by the intersection of the slope line and the Sharpe ratio line.

[Exhibit 3](#) is an efficient frontier asset allocation area graph. Each vertical cross section identifies the asset allocation at a point along the efficient frontier; thus, the vertical cross section at the far left, with nearly 100% cash, is the asset allocation of the minimum variance portfolio, and the vertical cross section at the far right, with 45% in emerging markets and 55% in global REITs, is the optimal asset allocation for a standard deviation of 20.5%, the highest level of portfolio volatility shown. In this example, cash is treated as a risky asset; although its return volatility is very low, because it is less than perfectly correlated with the other asset classes, mixing it with small amounts of other asset classes reduces risk further. The vertical line identifies the asset mix with the highest Sharpe ratio and corresponds to the similar line shown on the original efficient frontier graph ([Exhibit 2](#)). The asset allocation mixes are well diversified for most of the first half of the efficient frontier, and in fact, for a large portion of the efficient frontier, all 12 asset classes in our opportunity set receive a positive allocation.<sup>6</sup>

### Exhibit 3. Efficient Frontier Asset Allocation Area Graph—Base Case



The investment characteristics of potential asset mixes based on mean–variance theory are often further investigated by means of Monte Carlo simulation, as discussed in Section 3. Several observations from theory and practice are relevant to narrowing the choices.

**Equation 1** indicates that the basic approach to asset allocation involves estimating the investor’s risk aversion parameter and then finding the efficient mix that maximizes expected utility. When the risk aversion coefficient has not been estimated, the investor may be able to identify the maximum tolerable level of portfolio return volatility. If that level is 10% per annum, for example, only the part of the efficient frontier associated with volatility less than or equal to 10% is relevant. This approach is justifiable because for a given efficient frontier, every value of the risk aversion coefficient can be associated with a value of volatility that identifies the best point on the efficient frontier for the investor; the investor may also have experience with thinking in terms of volatility. In addition, when the investor has a numerical return objective, he or she can further narrow the range of potential efficient mixes by identifying the efficient portfolios expected to meet that return objective. For example, if the return objective is 5%, one can select the asset allocation with a 5% expected return.

**Example 1** illustrates the use of **Equation 1** and shows the adaptability of MVO by introducing the choice problem in the context of an investor who also has a shortfall risk concern.

## EXAMPLE 1

### Mean–Variance-Efficient Portfolio Choice 1

An investment adviser is counseling Aimée Goddard, a client who recently inherited €1,200,000 and who has above-average risk tolerance ( $\lambda = 2$ ). Because Goddard is young and one of her goals is to fund a comfortable retirement, she wants to earn returns that will outpace inflation in the long term. Goddard expects to liquidate €60,000 of the inherited portfolio in 12 months to fund the down payment on a house. She states that it is important for her to be able to take out the €60,000 without invading the initial capital of €1,200,000. **Exhibit 4** shows three alternative strategic asset allocations.

**Exhibit 4. Strategic Asset Allocation Choices for Goddard**

Asset Allocation	Investor's Forecasts	
	Expected Return	Standard Deviation of Return
A	10.00%	20%
B	7.00	10
C	5.25	5

1. Based only on Goddard's risk-adjusted expected returns for the asset allocations, which asset allocation would she prefer?
2. Recommend and justify a strategic asset allocation for Goddard.

Note: In addressing 2, calculate the minimum return,  $R_L$ , that needs to be achieved to meet the investor's objective not to invade capital, using the expression ratio  $[E(R_P) - R_L]/\sigma_P$ , which reflects the probability of exceeding the minimum given a normal return distribution assumption in a safety-first approach.<sup>7</sup>

#### Solution to 1:

Using Equation 1,

$$\begin{aligned}U_m &= E(R_m) - 0.005\lambda\sigma_m^2 \\&= E(R_m) - 0.005(2)\sigma_m^2 \\&= E(R_m) - 0.01\sigma_m^2\end{aligned}$$

So Goddard's utility for Asset Allocations A, B, and C are as follows:

$$\begin{aligned}U_A &= E(R_A) - 0.01\sigma_A^2 \\&= 10.0 - 0.01(20)^2 \\&= 10.0 - 4.0 \\&= 6.0 \text{ or } 6.0\%\end{aligned}$$

$$\begin{aligned}U_B &= E(R_B) - 0.01\sigma_B^2 \\&= 7.0 - 0.01(10)^2 \\&= 7.0 - 1.0 \\&= 6.0 \text{ or } 6.0\%\end{aligned}$$

$$\begin{aligned}U_C &= E(R_C) - 0.01\sigma_C^2 \\&= 5.25 - 0.01(5)^2 \\&= 5.25 - 0.25 \\&= 5.0 \text{ or } 5.0\%\end{aligned}$$

Goddard would be indifferent between A and B based only on their common perceived certainty-equivalent return of 6%.

## Solution to 2:

Because €60,000/€1,200,000 is 5.0%, for any return less than 5.0%, Goddard will need to invade principal when she liquidates €60,000. So 5% is a threshold return level.

To decide which of the three allocations is best for Goddard, we calculate the ratio  $[E(R_P) - R_L]/\sigma_P$ :

### **Allocation A**

$$(10\% - 5\%)/20\% = 0.25$$

### **Allocation B**

$$(7\% - 5\%)/10\% = 0.20$$

### **Allocation C**

$$(5.25\% - 5\%)/5\% = 0.05$$

Both Allocations A and B have the same expected utility, but Allocation A has a higher probability of meeting the threshold 5% return than Allocation B. Therefore, A would be the recommended strategic asset allocation.

There are several different approaches to determining an allocation to cash and cash equivalents, such as government bills. [Exhibit 1](#) included cash among the assets for which we conducted an optimization to trace out an efficient frontier. The return to cash over a short time horizon is essentially certain in nominal terms. One approach to asset allocation separates out cash and cash equivalents as a (nominally) risk-free asset and calculates an efficient frontier of risky assets. Alternatively, a ray from the risk-free rate (a point on the return axis) tangent to the risky-asset efficient frontier (with cash excluded) then defines a linear efficient frontier. The efficient frontier then consists of combinations of the risk-free asset with the tangency portfolio (which has the highest Sharpe ratio among portfolios on the risky-asset efficient frontier).

A number of standard finance models (including Tobin two-fund separation) adopt this treatment of cash. According to two-fund separation, if investors can borrow or lend at the risk-free rate, they will choose the tangency portfolio for the risky-asset holdings and borrow at the risk-free rate to leverage the position in that portfolio to achieve a higher expected return, or they will split money between the tangency portfolio and the risk-free asset to reach a position with lower risk and lower expected return than that represented by the tangency portfolio. Since over horizons that are longer than the maturity of a money market instrument, the return earned would not be known, another approach that is well established in practice and reflected in [Exhibit 1](#) is to include cash in the optimization. The amount of cash indicated by an optimization may be adjusted in light of short-term liquidity needs; for example, some financial advisers advocate that individuals hold an amount of cash equivalent to six months of expenses. All of these approaches are reasonable alternatives in practice.

Although we will treat cash as a risky asset in the following discussions, in [Example 2](#), we

stop to show the application of the alternative approach based on distinguishing a risk-free asset.

## EXAMPLE 2

# A Strategic Asset Allocation Based on Distinguishing a Nominal Risk-Free Asset

The Caflandia Foundation for the Fine Arts (CFFA) is a hypothetical charitable organization established to provide funding to Caflandia museums for their art acquisition programs.

CFFA's overall investment objective is to maintain its portfolio's real purchasing power after distributions. CFFA targets a 4% annual distribution of assets. CFFA has the following current specific investment policies.

## Return objective

CFFA's assets shall be invested with the objective of earning an average nominal 6.5% annual return. This level reflects a spending rate of 4%, an expected inflation rate of 2%, and a 40 bp cost of earning investment returns. The calculation is  $(1.04)(1.02)(1.004) - 1 = 0.065$ , or 6.5%.

## Risk considerations

CFFA's assets shall be invested to minimize the level of standard deviation of return subject to satisfying the expected return objective.

The investment office of CFFA distinguishes a nominally risk-free asset. As of the date of the optimization, the risk-free rate is determined to be 2.2%.

Exhibit 5 gives key outputs from a mean–variance optimization in which asset class weights are constrained to be non-negative.

### Exhibit 5. Corner Portfolios Defining the Risky-Asset Efficient Frontier

Portfolio Number	Expected Nominal Returns	Standard Deviation	Sharpe Ratio
1	9.50%	18.00%	0.406

2	8.90	15.98	0.419
3	8.61	15.20	0.422
4	7.24	11.65	0.433
5	5.61	7.89	0.432
6	5.49	7.65	0.430
7	3.61	5.39	0.262

The portfolios shown are corner portfolios (see footnote 6), which as a group define the risky-asset efficient frontier in the sense that any portfolio on the frontier is a combination of the two corner portfolios that bracket it in terms of expected return.

Based only on the facts given, determine the most appropriate strategic asset allocation for CFFA given its stated investment policies.

### Solution:

An 85%/15% combination of Portfolio 4 and the risk-free asset is the most appropriate asset allocation. This combination has the required 6.5% expected return with the minimum level of risk. Stated another way, this combination defines the efficient portfolio at a 6.5% level of expected return based on the linear efficient frontier created by the introduction of a risk-free asset.

Note that Portfolio 4 has the highest Sharpe ratio and is the tangency portfolio. With an expected return of 7.24%, it can be combined with the risk-free asset, with a return of 2.2%, to achieve an expected return of 6.5%:

$$6.50 = 7.24w + 2.2(1 - w)$$

$$w = 0.853$$

Placing about 85% of assets in Portfolio 4 and 15% in the risk-free asset achieves an efficient portfolio with expected return of 6.4 with a volatility of  $0.853(11.65) = 9.94\%$ . (The risk-free asset has no return volatility by assumption and, also by assumption, zero correlation with any risky portfolio return.) This portfolio lies on a linear efficient frontier formed by a ray from the risk-free rate to the tangency portfolio and can be shown to have the same Sharpe ratio as the tangency portfolio, 0.433. The combination of Portfolio 4 with Portfolio 5 to achieve a 6.5% expected return would have a lower Sharpe ratio and would not lie on the efficient frontier.



Asset allocation decisions have traditionally been made considering only the investor's investment portfolio (and financial liabilities) and not the total picture that includes human capital and other non-traded assets (and liabilities), which are missing in a traditional balance sheet. Taking such extended assets and liabilities into account can lead to improved asset allocation decisions, however.

Depending on the nature of an individual's career, human capital can provide relatively stable cash flows similar to bond payments. At the other extreme, the cash flows from human capital can be much more volatile and uncertain, reflecting a lumpy, commission-based pay structure or perhaps a career in a seasonal business. For many individuals working in stable job markets, the cash flows associated with their human capital are somewhat like those of an inflation-linked bond, relatively consistent and tending to increase with inflation. If human capital is a relatively large component of the individual's total economic worth, accounting for this type of hidden asset in an asset allocation setting is extremely important and would presumably increase the individual's capacity to take on risk.

Let us look at a hypothetical example. Emma Beel is a 45-year-old tenured university professor in London. Capital market assumptions are as before (see [Exhibit 1](#)). Beel has GBP 1,500,000 in liquid financial assets, largely due to a best-selling book. Her employment as a tenured university professor is viewed as very secure and produces cash flows that resemble those of a very large, inflation-adjusted, long-duration bond portfolio. The net present value of her human capital is estimated at GBP 500,000. Beel inherited her grandmother's home on the edge of the city, valued at GBP 750,000. The results of a risk tolerance questionnaire that considers both risk preference and risk capacity suggest that Beel should have an asset allocation involving moderate risk. Furthermore, given our earlier assumption that the collective market risk aversion coefficient is 4.0, we assume that the risk aversion coefficient of a moderately risk-averse investor is approximately 4.0, from a total wealth perspective.

To account for Beel's human capital and residential real estate, these two asset classes were modeled and added to the optimization. Beel's human capital of GBP 500,000 was modeled as 70% UK long-duration inflation-linked bonds, 15% UK corporate bonds, and 15% UK equities.<sup>8</sup> Residential real estate was modeled based on a de-smoothed residential property index for London. (We will leave the complexities of modeling liabilities to Sections 10–14.) Beel's assets include those shown in [Exhibit 6](#).

#### **Exhibit 6. Emma Beel's Assets**

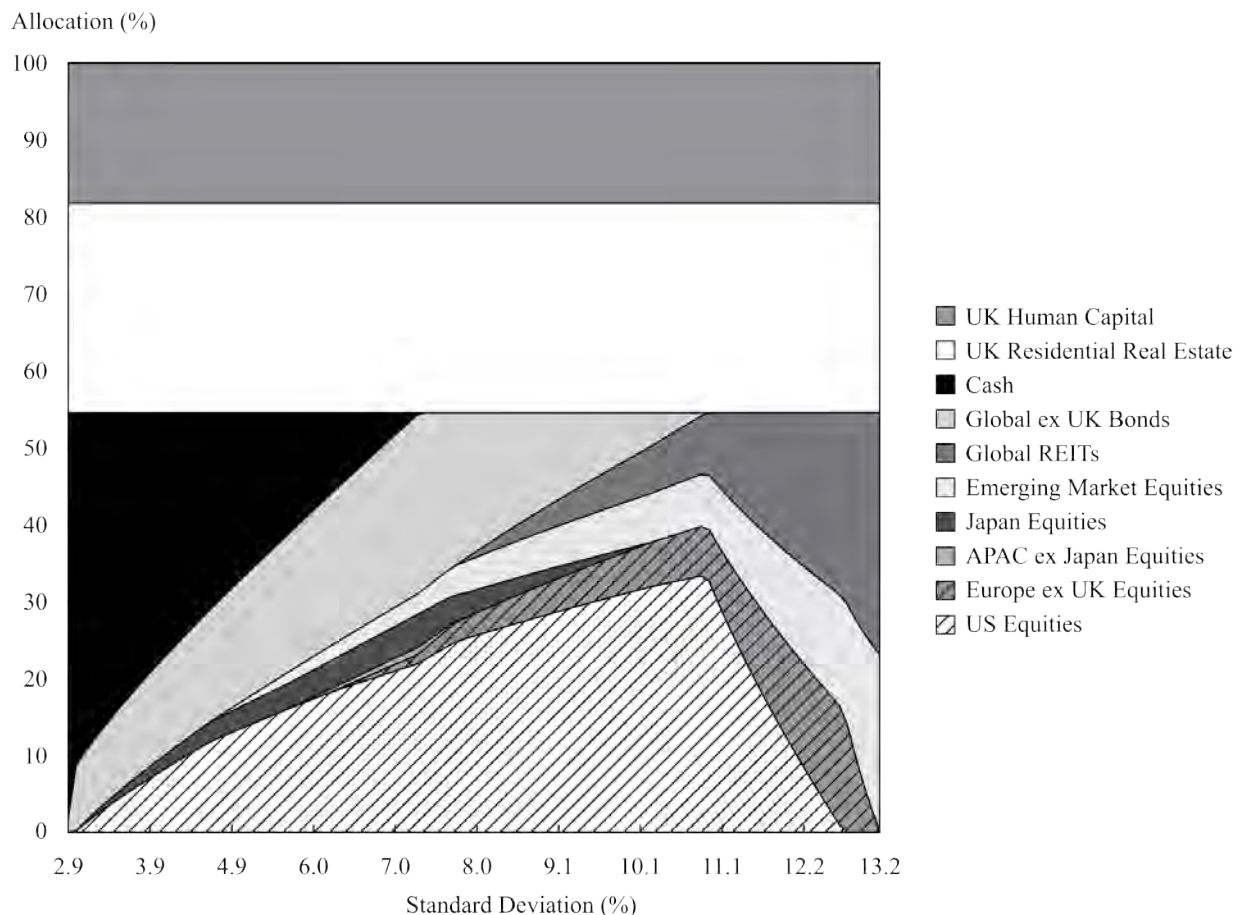
<b>Asset</b>	<b>Value (GBP)</b>	<b>Percentage</b>
Liquid financial assets	1,500,000	54.55
UK residential real estate	750,000	27.27



Human capital	500,000	18.18
	2,750,000	100

Beel's UK residential real estate (representing the London house) and human capital were added to the optimization opportunity set. Additionally, working under the assumption that Beel's house and human capital are non-tradable assets, the optimizer was forced to allocate 27.27% or more to UK residential real estate and 18.18% to human capital and then determined the optimal asset allocation based on a risk aversion coefficient of 4. Beel's expected utility is maximized by an efficient asset allocation with volatility of approximately 8.2%. [Exhibit 7](#) displays the resulting asset allocation area graph.

### Exhibit 7. Efficient Frontier Asset Allocation Area Graph—Balance Sheet Approach



Looking past the constrained allocations to human capital and UK residential real estate, the

remaining allocations associated with Beel's liquid financial assets do not include UK equities or UK fixed income. Each of these three asset classes is relatively highly correlated with either UK residential real estate or UK human capital.<sup>9</sup>

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### 3. MONTE CARLO SIMULATION

- g.** discuss the use of Monte Carlo simulation and scenario analysis to evaluate the robustness of an asset allocation;
- b.** recommend and justify an asset allocation using mean–variance optimization;

Monte Carlo simulation complements MVO by addressing the limitations of MVO as a single-period framework. Additionally, in the case in which the investor's risk tolerance is either unknown or in need of further validation, Monte Carlo simulation can help paint a realistic picture of potential future outcomes, including the likelihood of meeting various goals, the distribution of the portfolio's expected value through time, and potential maximum drawdowns. Simulation also provides a tool for investigating the effects of trading/rebalancing costs and taxes and the interaction of evolving financial markets with asset allocation. It is important to note that not all Monte Carlo simulation tools are the same: They vary significantly in their ability to model non-normal multivariate returns, serial and cross-correlations, tax rates, distribution requirements, an evolving asset allocation schedule (target-date glide path), non-traditional investments (e.g., annuities), and human capital (based on age, geography, education, and/or occupation).

Using Monte Carlo simulation, an investment adviser can effectively grapple with a range of practical issues that are difficult or impossible to formulate analytically. Consider rebalancing to a strategic asset allocation for a taxable investor. We can readily calculate the impact of taxes during a single time period. Also, in a single-period setting, as assumed by MVO, rebalancing is irrelevant. In the multi-period world of most investment problems, however, the portfolio will predictably be rebalanced, triggering the realization of capital gains and losses. Given a specific rebalancing rule, different strategic asset allocations will result in different patterns of tax payments (and different transaction costs too). Formulating the multi-period problem mathematically would be a daunting challenge. We could more easily incorporate the interaction between rebalancing and taxes in a Monte Carlo simulation.

We will examine a simple multi-period problem to illustrate the use of Monte Carlo simulation, evaluating the range of outcomes for wealth that may result from a strategic asset allocation (and not incorporating taxes).

The value of wealth at the terminal point of an investor’s time horizon is a possible criterion for choosing among asset allocations. Future wealth incorporates the interaction of risk and return. The need for Monte Carlo simulation in evaluating an asset allocation depends on whether there are cash flows into or out of the portfolio over time. For a given asset allocation with no cash flows, the sequence of returns is irrelevant; ending wealth will be path independent (unaffected by the sequence or path of returns through time). With cash flows, the sequence is also irrelevant if simulated returns are independent, identically distributed random variables. We could find expected terminal wealth and percentiles of terminal wealth analytically.<sup>10</sup> Investors save/deposit money in and spend money out of their portfolios; thus, in the more typical case, terminal wealth is path dependent (the sequence of returns matters) because of the interaction of cash flows and returns. When terminal wealth is path dependent, an analytical approach is not feasible but Monte Carlo simulation is. **Example 3** applies Monte Carlo simulation to evaluate the strategic asset allocation of an investor who regularly withdraws from the portfolio.

EXAMPLE 3

Monte Carlo Simulation for a Retirement Portfolio with a Proposed Asset Allocation

Malala Ali, a resident of the hypothetical country of Caflandia, has sought the advice of an investment adviser concerning her retirement portfolio. At the end of 2017, she is 65 years old and holds a portfolio valued at CAF\$1 million. Ali would like to withdraw CAF\$40,000 a year to supplement the corporate pension she has begun to receive. Given her health and family history, Ali believes she should plan for a retirement lasting 25 years. She is also concerned about passing along a portion of her portfolio to the families of her three children; she hopes that at least the portfolio’s current real value can go to them. Consulting with her adviser, Ali has expressed this desire quantitatively: She wants the median value of her bequest to her children to be no less than her portfolio’s current value of CAF\$1 million in real terms. The median is the 50th percentile outcome. The asset allocation of her retirement portfolio is currently 50/50 Caflandia equities/Caflandia intermediate-term government bonds. Ali and her adviser have decided on the following set of capital market expectations (**Exhibit 8**):

Exhibit 8. Caflandia Capital Market Expectations

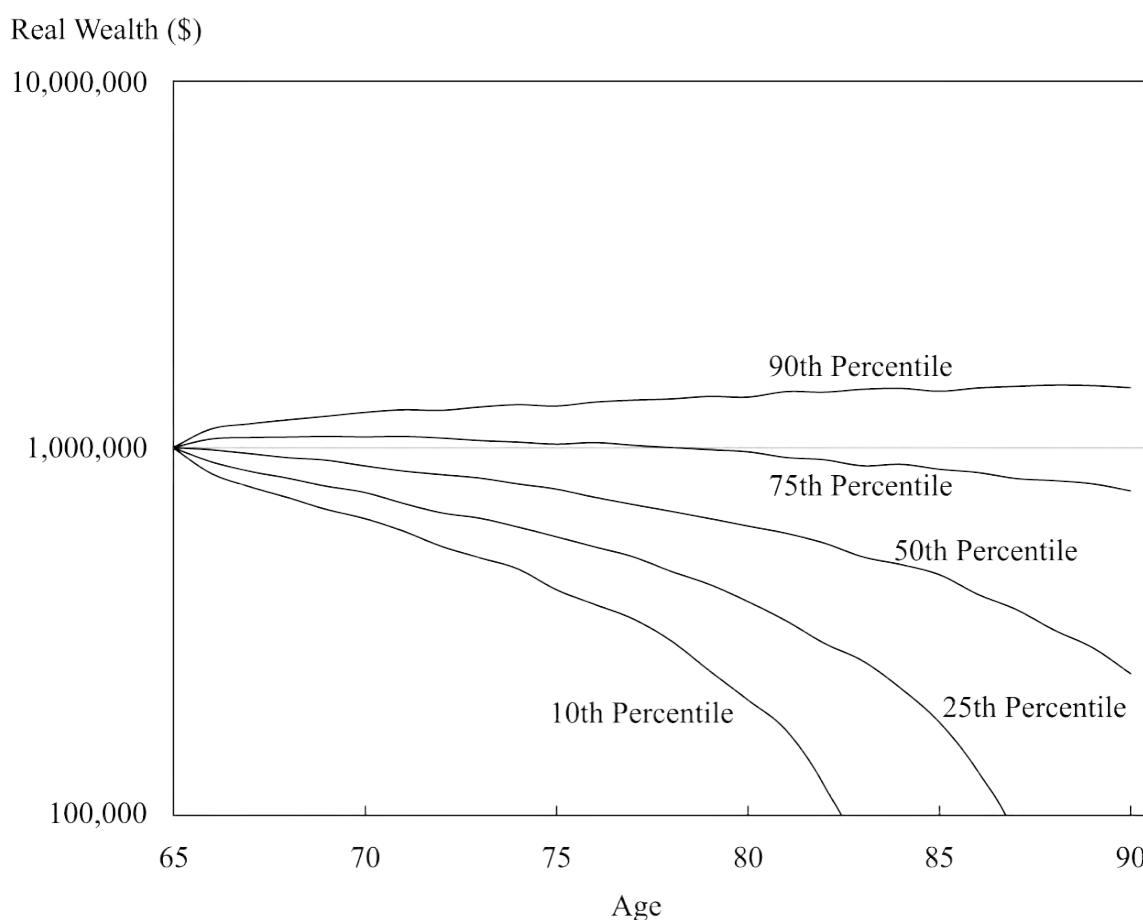
Asset Class	Investor’s Forecasts	
	Expected Return	Standard Deviation of Return
Caflandia equities	9.4%	20.4%

Caflandia bonds	5.6%	4.1%
Inflation	2.6%	

The predicted correlation between returns of Caflandia equities and Caflandia intermediate-term government bonds is 0.15.

With the current asset allocation, the expected nominal return on Ali's retirement portfolio is 7.5% with a standard deviation of 11%. [Exhibit 9](#) gives the results of the Monte Carlo simulation.<sup>11</sup> In [Exhibit 9](#), the lowest curve represents, at various ages, levels of real wealth at or below which the 10% of worst real wealth outcomes lie (i.e., the 10th percentile for real wealth); curves above that represent, respectively, 25th, 50th, 75th, and 90th percentiles for real wealth.

### Exhibit 9. Monte Carlo Simulation of Ending Real Wealth with Annual Cash Outflows



Based on the information given, address the following:

1. Justify the presentation of ending wealth in terms of real rather than nominal wealth in [Exhibit 9](#).
2. Is the current asset allocation expected to satisfy Ali's investment objectives?

### **Solution to 1:**

Ali wants the median real value of her bequest to her children to be “no less than her portfolio's current value of CAF\$1 million.” We need to state future amounts in terms of today's values (i.e., in real dollars) to assess the purchasing power of those amounts relative to CAF\$1 million today. [Exhibit 9](#) thus gives the results of the Monte Carlo simulation in real dollar terms. The median real wealth at age 90 is clearly well below the target ending wealth of real CAF\$1 million.

### **Solution to 2:**

From [Exhibit 9](#), we see that the median terminal (at age 90) value of the retirement portfolio in real dollars is less than the stated bequest goal of CAF\$1 million. Therefore, the most likely bequest is less than the amount Ali has said she wants. The current asset allocation is not expected to satisfy all her investment objectives. Although one potential lever would be to invest more aggressively, given Ali's age and risk tolerance, this approach seems imprudent. An adviser may need to counsel that the desired size of the bequest may be unrealistic given Ali's desired income to support her expenditures. Ali will likely need to make a relatively tough choice between her living standard (spending less) and her desire to leave a CAF\$1 million bequest in real terms. A third alternative would be to delay retirement, which may or may not be feasible.

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## **4. CRITICISMS OF MEAN-VARIANCE OPTIMIZATION**

- a. describe and evaluate the use of mean–variance optimization in asset allocation;

With this initial understanding of mean–variance optimization, we can now elaborate on some of the most common criticisms of it. The following criticisms and the ways they have

been addressed motivate the balance of the coverage of MVO:

1. The outputs (asset allocations) are highly sensitive to small changes in the inputs.
2. The asset allocations tend to be highly concentrated in a subset of the available asset classes.
3. Many investors are concerned about more than the mean and variance of returns, the focus of MVO.
4. Although the asset allocations may appear diversified across assets, the sources of risk may not be diversified.
5. Most portfolios exist to pay for a liability or consumption series, and MVO allocations are not directly connected to what influences the value of the liability or the consumption series.
6. MVO is a single-period framework that does not take account of trading/rebalancing costs and taxes.

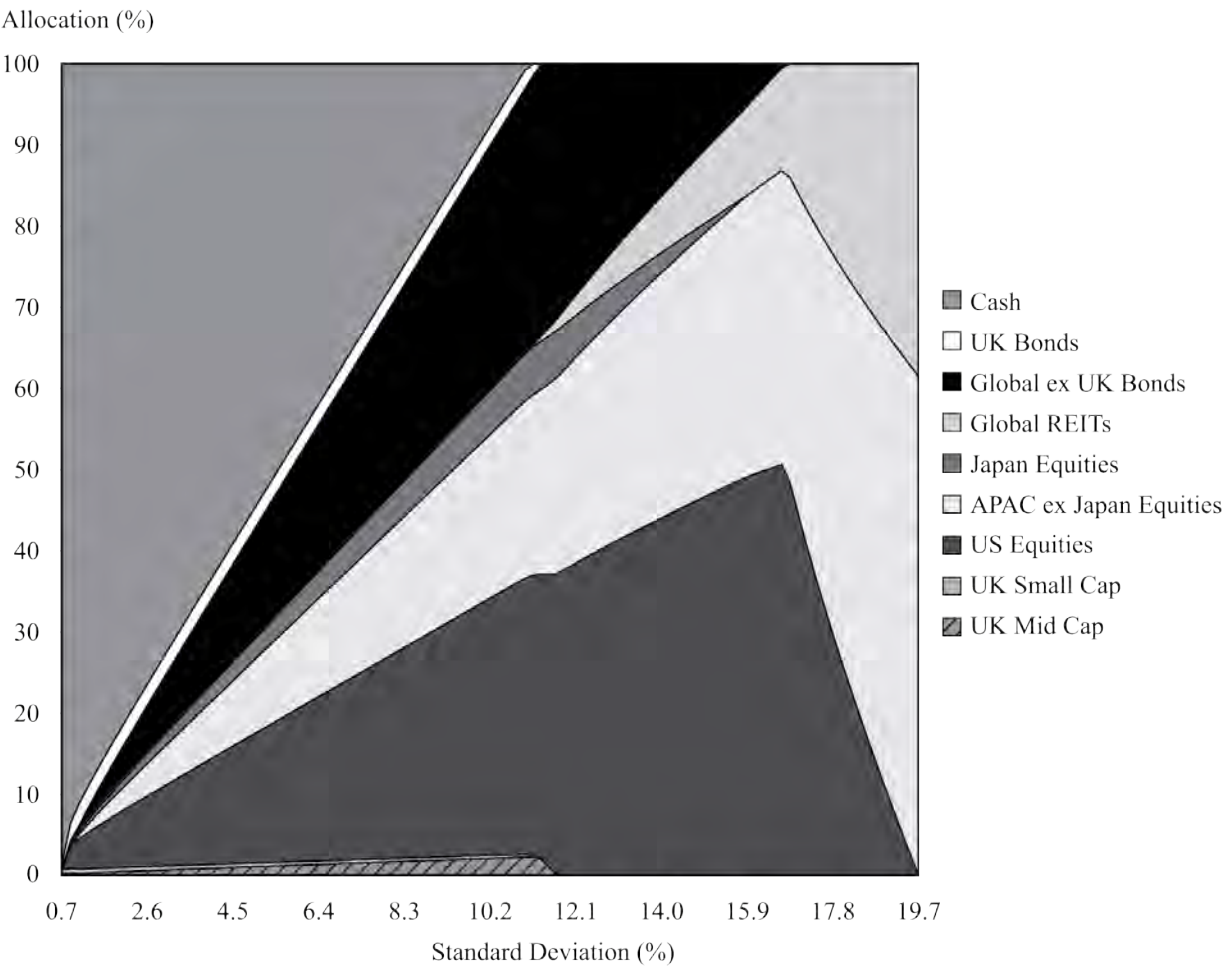
In the rest of Sections 2–9, we look at various approaches to addressing criticisms 1 and 2, giving some attention also to criticisms 3 and 4. Sections 10–18 present approaches to addressing criticism 5. “Asset Allocation with Real World Constraints” addresses some aspects of criticism 6.

It is important to understand that the first criticism above is not unique to MVO. Any optimization model that uses forward-looking quantities as inputs faces similar consequences of treating input values as capable of being determined with certainty. Sensitivity to errors in inputs is a problem that cannot be fully solved because it is inherent in the structure of optimization models that use as inputs forecasts of uncertain quantities.

To illustrate the importance of the quality of inputs, the sensitivity of asset weights in efficient portfolios to small changes in inputs, and the propensity of mean–variance optimization to allocate to a relatively small subset of the available asset classes, we made changes to the expected return of two asset classes in our base-case UK-centric opportunity set in [Exhibit 1](#). We increased the expected return of Asia Pacific ex Japan equities from 8.5% to 9.0% and decreased the expected return of Europe ex UK equities from 8.6% to 8.1% (both changes are approximately 50 bps). We left all of the other inputs unchanged and reran the optimization. The efficient frontier as depicted in mean–variance space appears virtually unchanged (not shown); however, the efficient asset mixes of this new efficient frontier are dramatically different. [Exhibit 10](#) displays the efficient frontier asset allocation area graph based on the slightly changed capital market assumptions. Notice the dramatic difference between [Exhibit 10](#) and [Exhibit 3](#). The small change in return assumptions has driven UK large cap, Europe ex-UK equities, and emerging market equities out of the

efficient mixes, and the efficient mixes are now highly concentrated in a smaller subset of the available asset classes. Given that the expected returns of UK large cap and emerging market equities were unchanged, their disappearance from the efficient frontier is not intuitive.

**Exhibit 10. Efficient Frontier Asset Allocation Area Graph—Changed Expected Returns**



To aid with the comparison of [Exhibit 10](#) with [Exhibit 3](#), we identified three specific efficient asset allocation mixes and compared the version based on the ad hoc modification of expected returns to that of the base case. This comparison is shown in [Exhibit 11](#).

**Exhibit 11. Comparison of Select Efficient Asset Allocations—Ad Hoc Return Modification Allocations vs. Base-Case Allocations**

Base	Base
------	------



	<b>Modified 25/75</b>	<b>Case 25/75</b>	<b>Difference</b>	<b>Modified 50/50</b>	<b>Case 50/50</b>	<b>Difference</b>
UK large cap	0.0%	1.2%	−1.2%	0.0%	2.5%	−2.5%
UK mid cap	0.8%	0.6%	0.3%	1.7%	0.8%	0.9%
UK small cap	0.5%	0.5%	−0.1%	0.4%	0.4%	0.0%
US equities	13.7%	13.8%	−0.1%	26.6%	26.8%	−0.2%
Europe ex UK equities	0.0%	2.7%	−2.7%	0.0%	6.5%	−6.5%
Asia Pacific ex Japan equities	7.5%	1.0%	6.5%	16.6%	2.3%	14.2%
Japan equities	2.2%	2.3%	−0.1%	4.5%	4.5%	0.0%
Emerging market equities	0.0%	2.0%	−2.0%	0.0%	4.9%	−4.9%
Global REITs	0.3%	0.9%	−0.6%	0.2%	1.4%	−1.3%
Global ex UK bonds	10.9%	10.6%	0.3%	24.7%	23.9%	0.7%
UK bonds	2.5%	2.7%	−0.2%	2.4%	3.0%	−0.6%
Cash	61.6%	61.7%	−0.1%	22.9%	23.1%	−0.1%
Subtotal equities	25.0%	25.0%		50.0%	50.0%	
Subtotal fixed income	75.0%	75.0%		50.0%	50.0%	



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## 5. ADDRESSING THE CRITICISMS OF MEAN-VARIANCE OPTIMIZATION; REVERSE OPTIMIZATION AND BLACK LITTERMAN MODEL

- a. describe and evaluate the use of mean–variance optimization in asset allocation;

In this section, we explore several methods for overcoming some of the potential shortcomings of mean–variance optimization. Techniques that address the first two criticisms mostly take three approaches: improving the quality of inputs, constraining the optimization, and treating the efficient frontier as a statistical construct. These approaches are treated in the following three subsections.

In MVO, the composition of efficient portfolios is typically more sensitive to expected return estimates than it is to estimates of volatilities and correlations. Furthermore, expected returns are generally more difficult to estimate accurately than are volatilities and correlations. Thus, in addressing the first criticism of MVO—that outputs are highly sensitive to small changes in inputs—the reading will focus on expected return inputs. However, volatility and correlation inputs are also sources of potential error.

### 5.1. Reverse Optimization

Reverse optimization is a powerful tool that helps explain the implied returns associated with any portfolio. It can be used to estimate expected returns for use in a forward-looking optimization. MVO solves for optimal asset weights based on expected returns, covariances, and a risk aversion coefficient. Based on predetermined inputs, an optimizer solves for the optimal asset allocation weights. As the name implies, *reverse* optimization works in the opposite direction. Reverse optimization takes as its inputs a set of asset allocation weights *that are assumed to be optimal* and, with the additional inputs of covariances and the risk aversion coefficient, solves for expected returns. These reverse-optimized returns are sometimes referred to as implied or imputed returns.

When using reverse optimization to estimate a set of expected returns for use in a forward-looking optimization, the most common set of starting weights is the observed market-capitalization value of the assets or asset classes that form the opportunity set. The market capitalization of a given asset or asset classes should reflect the collective information of market participants. In representing the world market portfolio, the use of non-overlapping

asset classes representing the majority of the world's investable assets is most consistent with theory.

Some practitioners will find the link between reverse optimization and CAPM equilibrium elegant, while others will see it as a shortcoming. For those who truly object to the use of market-capitalization weights in estimating inputs, the mechanics of reverse optimization can work with any set of starting weights—such as those of an existing policy portfolio, the average asset allocation policy of a peer group, or a fundamental weighting scheme. For those with more minor objections, we will shortly introduce the Black–Litterman model, which allows the expression of alternative forecasts or views.

In order to apply reverse optimization, one must create a working version of the all-inclusive market portfolio based on the constituents of the opportunity set. The market size or capitalization for most of the traditional stock and bond asset classes can be easily inferred from the various indexes that are used as asset class proxies. Many broad market-capitalization-weighted indexes report that they comprise over 95% of the securities, by market capitalization, of the asset classes they are attempting to represent. [Exhibit 12](#) lists approximate values and weights for the 12 asset classes in our opportunity set, uses the weights associated with the asset classes to form a working version of the global market portfolio, and then uses the beta of each asset relative to our working version of the global market portfolio to infer what expected returns would be if all assets were priced by the CAPM according to their market beta. We assume a risk-free rate of 2.5% and a global market risk premium of 4%. Note that expected returns are rounded to one decimal place from the more precise values shown later (in [Exhibit 13](#)); expected returns cannot in every case be exactly reproduced based on [Exhibit 12](#) alone because of the approximations mentioned. Also, notice in the final row of [Exhibit 12](#) that the weighted average return and beta of the assets are 6.5% and 1, respectively.

**Exhibit 12. Reverse-Optimization Example (Market Capitalization in £ billions)**

Asset Class	Mkt Cap	Weight	Return $E[R_i]$		Risk-Free Rate $r_f$		Beta $\beta_{i,mkt}$	Market Risk Premium
UK large cap	£1,354.06	3.2%	6.62%	=	2.5%	+	1.03	(4%)
UK mid cap	£369.61	0.9%	6.92%	=	2.5%	+	1.11	(4%)
UK small	£108.24	0.3%	7.07%	=	2.5%	+	1.14	(4%)

cap								
US equities	£14,411.66	34.4%	7.84%	=	2.5%	+	1.33	(4%)
Europe ex UK equities	£3,640.48	8.7%	8.63%	=	2.5%	+	1.53	(4%)
Asia Pacific ex Japan equities	£1,304.81	3.1%	8.51%	=	2.5%	+	1.50	(4%)
Japan equities	£2,747.63	6.6%	6.43%	=	2.5%	+	0.98	(4%)
Emerging market equities	£2,448.60	5.9%	8.94%	=	2.5%	+	1.61	(4%)
Global REITs	£732.65	1.8%	9.04%	=	2.5%	+	1.64	(4%)
Global ex UK bonds	£13,318.58	31.8%	4.05%	=	2.5%	+	0.39	(4%)
UK bonds	£1,320.71	3.2%	2.95%	=	2.5%	+	0.112	(4%)
Cash	£83.00	0.2%	2.50%	=	2.5%	+	0.00	(4%)
	£41,840.04	100.0%	6.50%				1	

Notes: For the Mkt Cap and Weight columns, the final row is the simple sum. For the Return and Beta columns, the final row is the weighted average.

Looking back at our original asset allocation area graph ([Exhibit 3](#)), the reason for the well-behaved and well-diversified asset allocation mixes is now clear. By using reverse optimization, we are consistently relating assets' expected returns to their systematic risk. If there isn't a consistent relationship between the expected return and systematic risk, the optimizer will see this inconsistency as an opportunity and seek to take advantage of the more attractive attributes. This effect was clearly visible in our second asset allocation area graph after we altered the expected returns of Asia Pacific ex Japan equities and Europe ex UK equities.

As alluded to earlier, some practitioners find that the reverse-optimization process leads to a nice starting point, but they often have alternative forecasts or views regarding the expected return of one or more of the asset classes that differ from the returns implied by reverse optimization based on market-capitalization weights. One example of having views that differ from the reverse-optimized returns has already been illustrated, when we altered the returns of Asia Pacific ex Japan equities and Europe ex UK equities by approximately 50 bps. Unfortunately, due to the sensitivity of mean–variance optimization to small changes in inputs, directly altering the expected returns caused relatively extreme and unintuitive changes in the resulting asset allocations. If one has strong views on expected returns that differ from the reverse-optimized returns, an alternative or additional approach is needed; the next section presents one alternative.

## 5.2. Black–Litterman Model

A complementary addition to reverse optimization is the Black–Litterman model, created by Fischer Black and Robert Litterman (see [Black and Litterman 1990, 1991, 1992](#)). Although the Black–Litterman model is often characterized as an asset allocation model, it is really a model for deriving a set of expected returns that can be used in an unconstrained or constrained optimization setting. The Black–Litterman model starts with excess returns (in excess of the risk-free rate) produced from reverse optimization and then provides a technique for altering reverse-optimized expected returns in such a way that they reflect an investor’s own distinctive views yet still behave well in an optimizer.

The Black–Litterman model has helped make the mean–variance optimization framework more useful. It enables investors to combine their unique forecasts of expected returns with reverse-optimized returns in an elegant manner. When coupled with a mean–variance or related framework, the resulting Black–Litterman expected returns often lead to well-diversified asset allocations by improving the consistency between each asset class’s expected return and its contribution to systematic risk. These asset allocations are grounded in economic reality—via the market capitalization of the assets typically used in the reverse-optimization process—but still reflect the information contained in the investor’s unique forecasts (or views) of expected return.

The mathematical details of the Black–Litterman model are beyond the scope of this reading, but many practitioners have access to asset allocation software that includes the Black–Litterman model.<sup>12</sup> To assist with an intuitive understanding of the model and to show the model’s ability to blend new information (views) with reverse-optimized returns, we present an example based on the earlier views regarding the expected returns of Asia Pacific ex Japan equities and Europe ex UK equities. The Black–Litterman model has two methods for accepting views: one in which an absolute return forecast is associated with a given asset class and one in which the return differential of an asset (or group of assets) is expressed

relative to another asset (or group of assets). Using the relative view format of the Black–Litterman model, we expressed the view that we believe Asia Pacific ex Japan equities will outperform Europe ex UK equities by 100 bps. We placed this view into the Black–Litterman model, which blends reverse-optimized returns with such views to create a new, mixed estimate.

**Exhibit 13** compares the Black–Litterman model returns to the original reverse-optimized returns (as in **Exhibit 12** but showing returns to the second decimal place based on calculations with full precision). The model accounts for the correlations of the assets with each other, and as one might expect, all of the returns change slightly (the change in return on cash was extremely small).

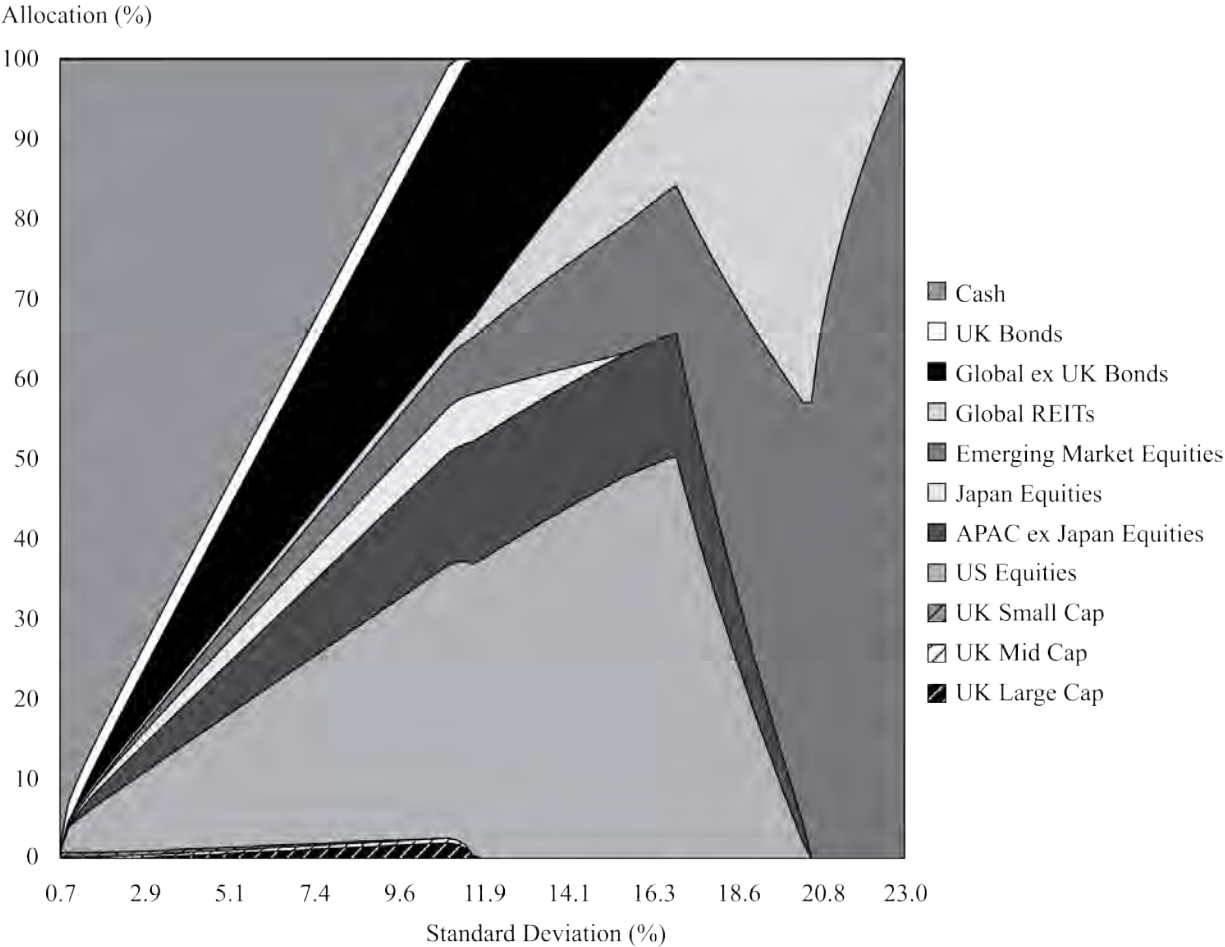
### Exhibit 13. Comparison of Black–Litterman and Reverse-Optimized Returns

Asset Class	Reverse-Optimized Returns	Black–Litterman Returns	Difference
UK large cap	6.62%	6.60%	–0.02%
UK mid cap	6.92	6.87	–0.05
UK small cap	7.08	7.03	–0.05
US equities	7.81	7.76	–0.05
Europe ex UK equities	8.62	8.44	–0.18
Asia Pacific ex Japan equities	8.53	8.90	0.37
Japan equities	6.39	6.37	–0.02
Emerging market equities	8.96	9.30	0.33
Global REITs	9.02	9.00	–0.01
Global ex UK bonds	4.03	4.00	–0.03
UK bonds	2.94	2.95	0.01
Cash	2.50	2.50	0.00

Next, we created another efficient frontier asset allocation area graph based on these new returns from the Black–Litterman model, as shown in **Exhibit 14**. The allocations look

relatively similar to those depicted in [Exhibit 3](#). However, if you compare the allocations to Asia Pacific ex Japan equities and Europe ex UK equities to their allocations in the original efficient frontier asset allocation graph, you will notice that allocations to Asia Pacific ex Japan equities have increased across the frontier and allocations to Europe ex UK equities have decreased across the frontier with very little impact on the other asset allocations.

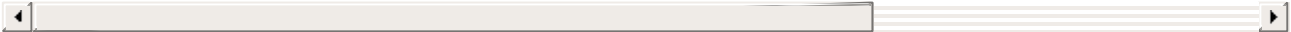
**Exhibit 14. Efficient Frontier Asset Allocation Area Graph, Black–Litterman Returns**



As before, to aid in the comparison of [Exhibit 14](#) (Black–Litterman allocations) with [Exhibit 3](#) (the base-case allocations), we identified three specific mixes in [Exhibit 14](#) and compared those efficient asset allocation mixes based on the expected returns from the Black–Litterman model to those of the base case. The results are shown in [Exhibit 15](#).

**Exhibit 15. Comparison of Select Efficient Asset Allocations, Black–Litterman Allocations vs. Base-Case Allocations**

	Modified 25/75	Base Case 25/75	Difference	Modified 50/50	Base Case 50/50	Difference	]
UK large cap	0.4%	1.2%	−0.8%	1.4%	2.5%	−1.1%	
UK mid cap	0.4	0.6	−0.2	0.5	0.8	−0.3	
UK small cap	0.4	0.5	−0.1	0.2	0.4	−0.2	
US equities	13.8	13.8	0.0	26.8	26.8	0.0	
Europe ex UK equities	0.0	2.7	−2.7	0.0	6.5	−6.5	
Asia Pacific ex Japan equities	5.2	1.0	4.2	10.8	2.3	8.5	
Japan equities	2.2	2.3	0.0	4.5	4.5	0.0	
Emerging market equities	1.8	2.0	−0.1	4.6	4.9	−0.2	
Global REITs	0.8	0.9	−0.1	1.3	1.4	−0.2	
Global ex UK bonds	10.3	10.6	−0.2	23.6	23.9	−0.3	
UK bonds	3.1	2.7	0.3	3.5	3.0	0.5	
Cash	61.6	61.7	−0.1	22.9	23.1	−0.1	
Subtotal equities	25.0%	25.0%		50.0%	50.0%		
Subtotal fixed income	75.0%	75.0%		50.0%	50.0%		



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## 6. ADDRESSING THE CRITICISMS OF MEAN-VARIANCE OPTIMIZATION; ADDING CONSTRAINTS BEYOND BUDGET CONSTRAINTS, RESAMPLED MEAN-VARIANCE OPTIMIZATIONS AND OTHER NON-NORMAL OPTIMIZATION APPROACHES

- a. describe and evaluate the use of mean–variance optimization in asset allocation;

When running an optimization, in addition to the typical budget constraint and the non-negativity constraint, one can impose additional constraints. There are two primary reasons practitioners typically apply additional constraints: (1) to incorporate real-world constraints into the optimization problem and (2) to help overcome some of the potential shortcomings of mean–variance optimization elaborated above (input quality, input sensitivity, and highly concentrated allocations).

Most commercial optimizers accommodate a wide range of constraints. Typical constraints include the following:

1. Specify a set allocation to a specific asset—for example, 30% to real estate or 45% to human capital. This kind of constraint is typically used when one wants to include a non-tradable asset in the asset allocation decision and optimize around the non-tradable asset.
2. Specify an asset allocation range for an asset—for example, the emerging market allocation must be between 5% and 20%. This specification could be used to accommodate a constraint created by an investment policy, or it might reflect the user's desire to control the output of the optimization.
3. Specify an upper limit, due to liquidity considerations, on an alternative asset class, such as private equity or hedge funds.
4. Specify the relative allocation of two or more assets—for example, the allocation to



emerging market equities must be less than the allocation to developed equities.

5. In a liability-relative (or surplus) optimization setting, one can constrain the optimizer to hold one or more assets representing the systematic characteristics of the liability short. (We elaborate on this scenario in Sections 10–14.)

In general, good constraints are those that model the actual circumstances/context in which one is attempting to set asset allocation policy. In contrast, constraints that are simply intended to control the output of a mean–variance optimization should be used cautiously. A perceived need to add constraints to control the MVO output would suggest a need to revisit one’s inputs. If a very large number of constraints are imposed, one is no longer optimizing but rather specifying an asset allocation through a series of binding constraints.

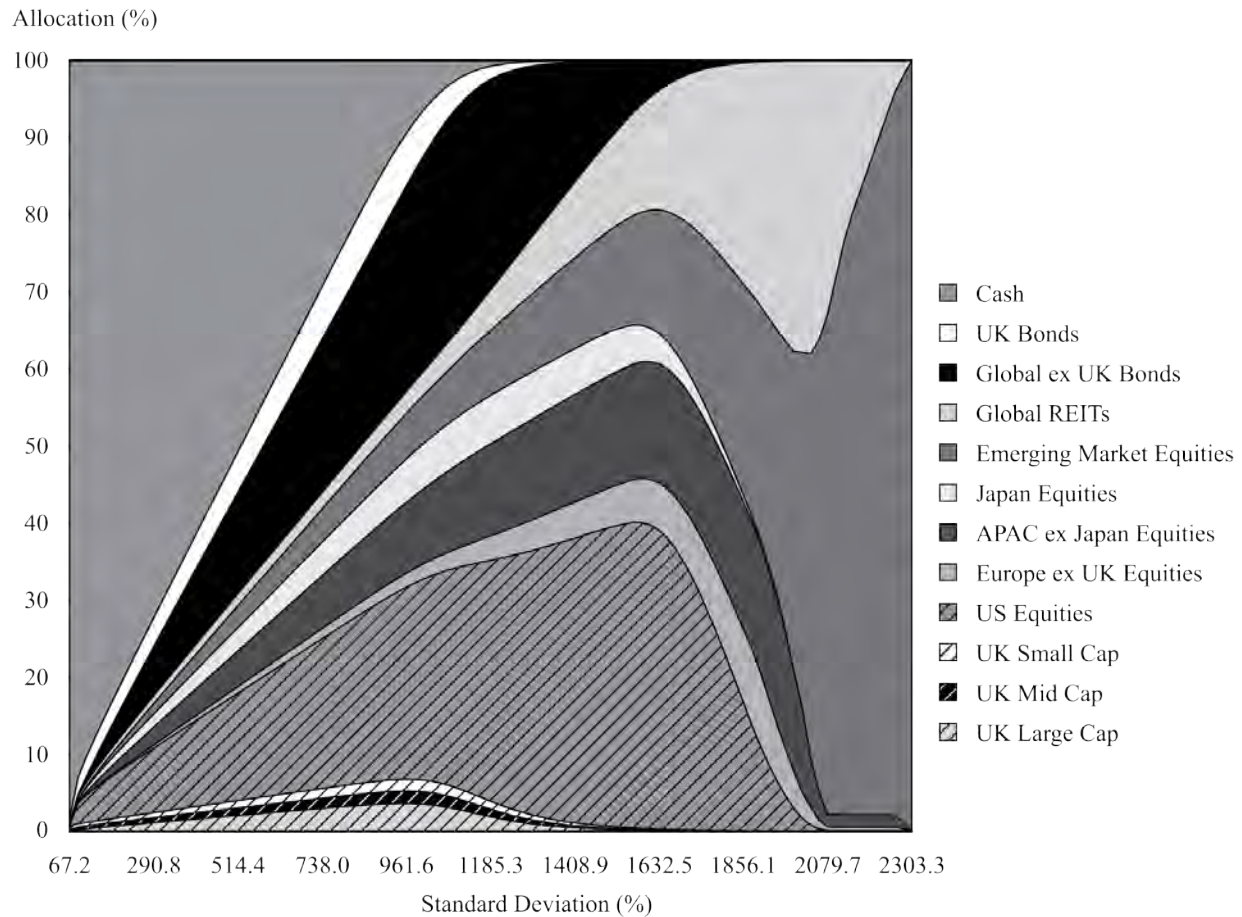
## 6.1. Resampled Mean–Variance Optimization

Another technique used by asset allocators is called resampled mean–variance optimization (or sometimes “resampling” for short).<sup>13</sup> Resampled mean–variance optimization combines Markowitz’s mean–variance optimization framework with Monte Carlo simulation and, all else equal, leads to more-diversified asset allocations. In contrast to reverse optimization, the Black–Litterman model, and constraints, resampled mean–variance optimization is an attempt to build a better optimizer that recognizes that forward-looking inputs are inherently subject to error.

Resampling uses Monte Carlo simulation to estimate a large number of potential capital market assumptions for mean–variance optimization and, eventually, for the resampled frontier. Conceptually, resampling is a large-scale sensitivity analysis in which hundreds or perhaps thousands of variations on baseline capital market assumptions lead to an equal number of mean–variance optimization frontiers based on the Monte Carlo–generated capital market assumptions. These intermediate frontiers are referred to as simulated frontiers. The resulting asset allocations, or portfolio weights, from these simulated frontiers are saved and averaged (using a variety of methods). To draw the resampled frontier, the averaged asset allocations are coupled with the starting capital market assumptions.

To illustrate how resampling can be used with other techniques, we conducted a resampled mean–variance optimization using the Black–Litterman returns from [Exhibit 10](#), above. [Exhibit 16](#) provides the asset allocation area graph from this optimization. Notice that the resulting asset allocations are smoother than in any of the previous asset allocation area graphs. Additionally, relative to [Exhibit 15](#), based on the same inputs, the smallest allocations have increased in size while the largest allocations have decreased somewhat.

## Exhibit 16. Efficient Frontier Asset Allocation Area Graph, Black–Litterman Returns with Resampling



The asset allocations from resampling as depicted in [Exhibit 16](#) are appealing. Criticisms include the following: (1) Some frontiers have concave “bumps” where expected return decreases as expected risk increases; (2) the “riskier” asset allocations are over-diversified; (3) the asset allocations inherit the estimation errors in the original inputs; and (4) the approach lacks a foundation in theory.<sup>14</sup>

## 6.2. Other Non-Normal Optimization Approaches

From our list of shortcomings/criticisms of mean–variance optimization, the third is that investor preferences may go beyond the first two moments (mean and variance) of a portfolio’s return distribution. The third and fourth moments are, respectively, skewness and kurtosis. Skewness measures the degree to which return distributions are asymmetrical, and kurtosis measures the thickness of the distributions’ tails (i.e., how frequently extreme events

occur). A normal distribution is fully explained by the first two moments because the skewness and (excess) kurtosis of the normal distribution are both zero.

Returning to the discussion of [Equation 1](#), the mean–variance optimization program involves maximizing expected utility, which is equal to expected return minus a penalty for risk, where risk is measured as variance (standard deviation). Unfortunately, variance or standard deviation is an incomplete measure of risk when returns are not normally distributed. By studying historical return distributions for the major asset classes and comparing those historical distributions to normal distributions, one will quickly see that, historically, asset class returns are not normally distributed. In fact, empirically extreme returns seem to occur approximately 10 times more often than the normal distribution would suggest. Coupling this finding with the asymmetrical risk preferences observed in investors—whereby the pain of a loss is approximately twice as significant as the joy from an equivalent gain (according to Prospect theory)—has led to more complex utility functions and optimizers that expressly account for non-normal returns and asymmetric risk preference.<sup>15</sup> A number of variations of these more sophisticated optimization techniques have been put forth, making them challenging to cover. In general, most of them consider the non-normal return distribution characteristics and use a more sophisticated definition of risk, such as conditional value-at-risk. We view these as important advancements in the toolkit available to practitioners.

[Exhibit 17](#) summarizes selected extensions of quantitative asset allocation approaches outside the sphere of traditional mean–variance optimization.

Exhibit 17. Selected Non-Mean–Variance Developments	
Key Non-Normal Frameworks	Research/Recommended Reading
Mean–semivariance optimization	Markowitz (1959)
Mean–conditional value-at-risk optimization	Goldberg, Hayes, and Mahmoud (2013) Rockafellar and Uryasev (2000) Xiong and Idzorek (2011)
Mean–variance-skewness optimization	Briec, Kerstens, and Jokung (2007) Harvey, Liechty, Liechty, and Müller (2010)
Mean–variance-skewness-kurtosis optimization	Athayde and Flôres (2003) Beardsley, Field, and Xiao (2012)

## Long-Term versus Short-Term Inputs

Strategic asset allocation is often described as “long term,” while tactical asset allocation involves short-term movements away from the strategic asset allocation. In this context, “long term” is often defined as 10 or perhaps 20 or more years, yet in practice, very few asset allocators revisit their strategic asset allocation this infrequently. Many asset allocators update their strategic asset allocation annually, which makes it a bit more challenging to distinguish between strategic and tactical asset allocations. This frequent revisiting of the asset allocation policy brings up important questions about the time horizon associated with the inputs. In general, long-term (10-plus-year) capital market assumptions that ignore current market conditions, such as valuation levels, the business cycle, and interest rates, are often thought of as *unconditional* inputs. Unconditional inputs focus on the average capital market assumptions over the 10-plus-year time horizon. In contrast, shorter-term capital market assumptions that explicitly attempt to incorporate current market conditions (i.e., that are “conditioned” on them) are conditional inputs. For example, a practitioner who believes that the market is overvalued and that as a result we are entering a period of low returns, high volatility, and high correlations might prefer to use conditional inputs that reflect these beliefs.<sup>16</sup>

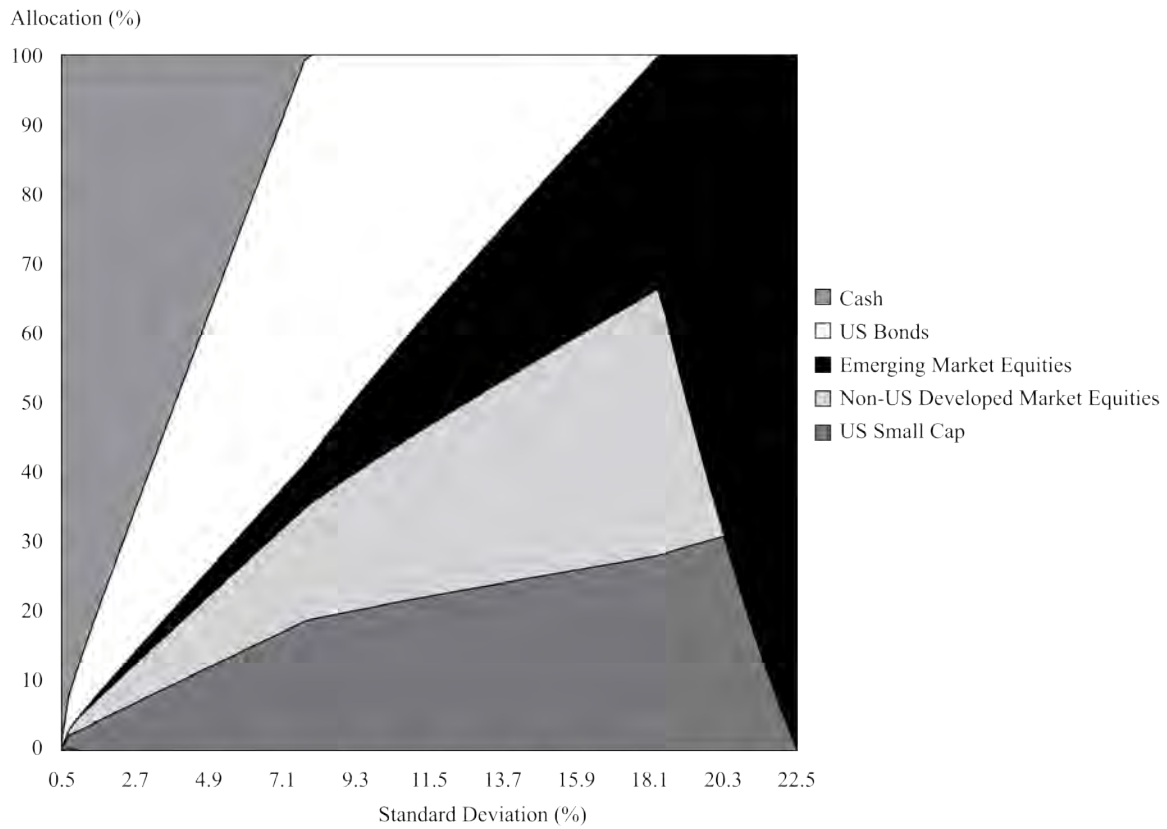
### EXAMPLE 4

## Problems in Mean–Variance Optimization

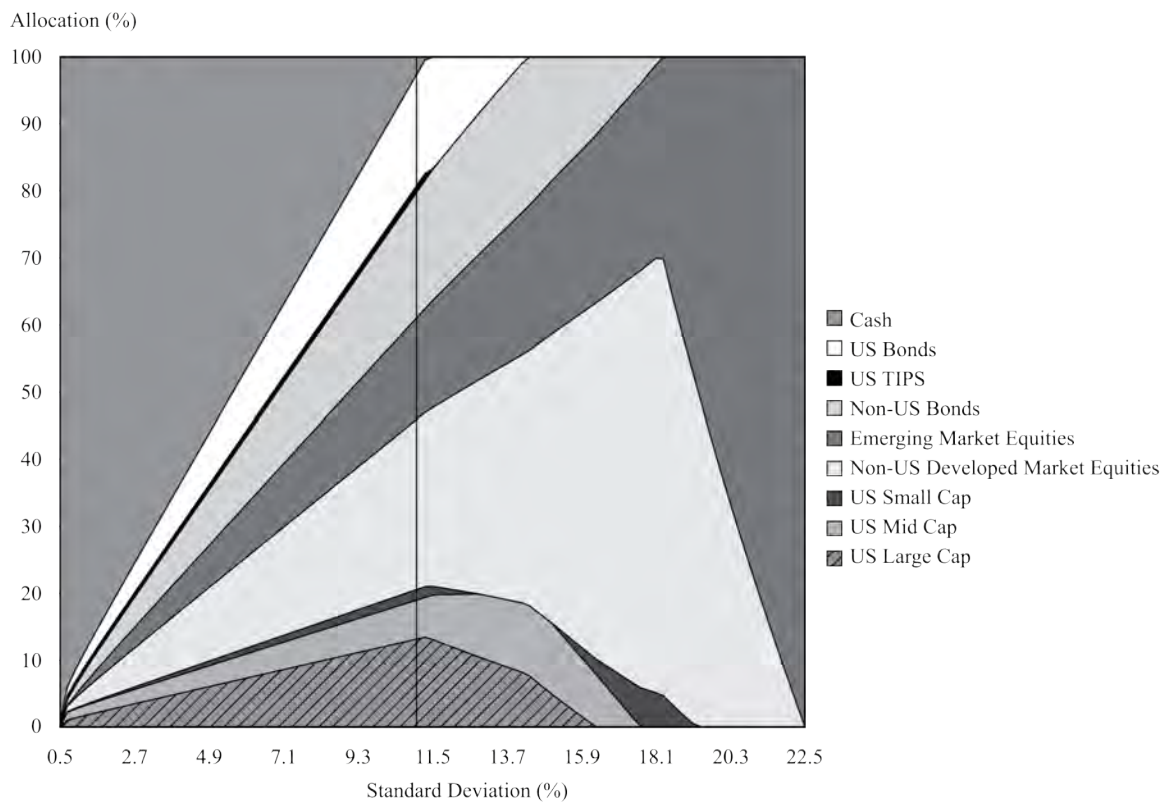
In a presentation to US-based investment clients on asset allocation, the results of two asset allocation exercises are shown, as presented in [Exhibit 18](#).

### Exhibit 18. Asset Allocation Choices

#### Panel A: Area Graph 1



**Panel B: Area Graph 2**



1. Based on Panel A, address the following:

- A. Based on mean–variance analysis, what is the asset allocation that would most likely be selected by a risk-neutral investor?
  - B. Based only on the information that can be inferred from Panel A, discuss the investment characteristics of non-US developed market equity (NUSD) in efficient portfolios.
  - C. Critique the efficient asset mixes represented in Panel A.
2. Compare the asset allocations shown in Panel A with the corresponding asset allocations shown in Panel B. (Include a comparison of the panels at the level of risk indicated by the line in Panel B.)
- 3.
- A. Identify three techniques that the asset allocations in Panel B might have incorporated to improve the characteristics relative to those of Panel A.
  - B. Discuss how the techniques described in your answer to 3A address the high input sensitivity of MVO.

### **Solution to 1A:**

For a risk-neutral investor, the optimal asset allocation is 100% invested in emerging market equities. For a risk-neutral investor ( $\lambda = 0$ ), expected utility is simply equal to expected return. The efficient asset allocation that maximizes expected return is the one with the highest level of volatility, as indicated on the x-axis. Panel A shows that that asset allocation consists entirely of emerging market equities.

### **Solution to 1B:**

The weights of NUSD as the efficient frontier moves from its minimum to its maximum risk point suggest NUSD's investment characteristics. This asset class is neither the lowest-volatility asset (which can be inferred to be cash) nor the highest-volatility asset (which is emerging market equity). At the point of the peak of NUSD, when the weight in NUSD is about to begin its decline in higher-risk efficient portfolios, US bonds drop out of the efficient frontier. Further, NUSD leaves the efficient frontier portfolio at a point at which US small cap reaches its highest weight. These observations suggest that NUSD provided diversification benefits in portfolios including US bonds—a relatively low correlation with US bonds can be inferred—that are lost at this point on the efficient frontier. Beyond a volatility level of 20.3%, representing a corner portfolio, NUSD drops out of the efficient frontier.



## **Solution to 1C:**

Of the nine asset classes in the investor's defined opportunity set, five at most are represented by portfolios on the efficient frontier. Thus, a criticism of the efficient frontier associated with Panel A is that the efficient portfolios are highly concentrated in a subset of the available asset classes, which likely reflects the input sensitivity of MVO.

## **Solution to 2:**

The efficient asset mixes in Panels A and B cover a similar risk range: The risk levels of the two minimum-variance portfolios are similar, and the risk levels of the two maximum-return portfolios are similar. Over most of the range of volatility, however, the efficient frontier associated with Panel B is better diversified. For example, at the line in Panel B, representing a moderate level of volatility likely relevant to many investors, the efficient portfolio contains nine asset classes rather than four, as in Panel A. At that point, for example, the allocation to fixed income is spread over US bonds, non-US bonds, and US TIPS in Panel B, as opposed to just US bonds in Panel A.

## **Solution to 3A:**

To achieve the better-diversified efficient frontier shown in Panel B, several methods might have been used, including reverse optimization, the Black–Litterman model, and constrained asset class weights.

## **Solution to 3B:**

Reverse optimization and the Black–Litterman model address the issue of MVO's sensitivity to small differences in expected return estimates by anchoring expected returns to those implied by the asset class weights of a proxy for the global market portfolio. The Black–Litterman framework provides a disciplined way to tilt the expected return inputs in the direction of the investor's own views. These approaches address the problem by improving the balance between risk and return that is implicit in the inputs.

A very direct approach to the problem can be taken by placing constraints on weights in the optimization to force an asset class to appear in a constrained efficient frontier within some desired range of values. For example, non-US bonds did not appear in any efficient portfolio in Panel A. The investor could specify that the weight on non-US bonds be strictly positive. Another approach would be to place a maximum on the weight in US bonds to make the optimizer spread the fixed-income allocation over other fixed-income assets besides US bonds.

## 7. ALLOCATING TO LESS LIQUID ASSET CLASSES

- d. discuss asset class liquidity considerations in asset allocation;

Large institutional investors have the ability to invest in less liquid asset classes, such as direct real estate, infrastructure, and private equity. These less liquid asset classes represent unique challenges to many of the common asset allocation techniques, such as mean–variance optimization.

For traditional, highly liquid asset classes, such as publicly listed equities and bonds, almost all of the major index providers have indexes that do an outstanding job of representing the performance characteristics of the asset class (and its various sub–asset classes). For example, over any reasonably long time period, the risk and return characteristics of a given asset class are nearly identical across the major global equity indexes and the correlations between the returns of the indexes are close to 1. Additionally, in most cases, there are passive, low-cost investment vehicles that allow investors to capture the performance of the asset class with very little tracking error.

### Cash, the Risk-Free Asset, and Liquidity Needs

The so called “risk-free asset” has a special and somewhat tricky spot in the world of finance. Asset allocators typically use indexes for either 30-day or 90-day government bills to represent the characteristics associated with holding cash, which they may or may not treat as the risk-free asset. The volatility associated with these total return indexes is extremely low, but it isn’t zero. An alternative to using a cash index as a proxy for the risk-free asset is to use a government bond with a duration/maturity that matches the time horizon of the investor. Some asset allocators like to include cash or another asset that could be considered a risk-free asset in the optimization and to allow the optimizer to determine how to mix it with the other asset classes included in the optimization. Other asset allocators prefer to exclude the risk-free asset from the



optimization and allow real-world needs, such as liquidity needs, to determine how much to allocate to cash-like assets.

Illiquid assets may offer an expected return premium as compensation for illiquidity as well as diversification benefits. Determining an appropriate allocation to these assets is associated with various challenges, however. Common illiquid asset classes cannot be readily diversified to eliminate idiosyncratic risk, so representing an overall asset class performance is problematic. Furthermore, for less liquid asset classes, such as direct real estate, infrastructure, and private equity, there are, in general, far fewer indexes that attempt to represent aggregate performance. If one were to compare the performance characteristics of multiple indexes representing one of these less liquid asset classes, there would be noticeable risk and return differences, suggesting that it is difficult to accurately measure the risk and return characteristics of these asset classes. Also, due to the illiquid nature of the constituents that make up these asset classes, it is widely believed that the indexes don't accurately reflect their true volatility. In contrast to the more traditional, highly liquid asset classes, there are no low-cost passive investment vehicles that would allow investors to closely track the aggregate performance of these less liquid asset classes.

Thus, the problem is twofold: (1) Due to the lack of accurate indexes, it is more challenging to make capital market assumptions for these less liquid asset classes, and (2) even if there were accurate indexes, there are no low-cost passive investment vehicles to track them.

Compounding the asset allocator's dilemma is the fact that the risk and return characteristics associated with actual investment vehicles, such as direct real estate funds, infrastructure funds, and private equity funds, are typically significantly different from the characteristics of the asset classes themselves. For example, the private equity "asset class" should represent the risk and return characteristics of owning all private equity, just as the MSCI All Country World Index represents the risk and return characteristics of owning all public equity. Purchasing the exchange-traded fund (ETF) that tracks the MSCI All Country World Index completely diversifies public company-specific risk. This scenario is in direct contrast to the typical private equity fund, in which the risk and return characteristics are often dominated by company-specific (idiosyncratic) risk.

In addressing asset allocation involving less liquid asset classes, practical options include the following:

1. Exclude less liquid asset classes (direct real estate, infrastructure, and private equity) from the asset allocation decision and then consider real estate funds, infrastructure funds, and private equity funds as potential implementation vehicles when fulfilling the target strategic asset allocation.
2. Include less liquid asset classes in the asset allocation decision and attempt to model the

inputs to represent the *specific risk* characteristics associated with *implementation vehicles*.

3. Include less liquid asset classes in the asset allocation decision inputs to represent the *highly diversified* characteristics associated with *asset classes*.

Related to this last option, some practitioners use listed real estate infrastructure, and public equity indexes that are deemed to have the same characteristics as their private equity counterparts to help estimate the risk of the less liquid asset classes. The use of listed alternative indexes often violates the recommendation that asset classes be mutually exclusive—the securities in these indexes are likely also representing other asset classes—and thus typically results in higher correlation between different asset classes, which has the negative impact of increasing the risk of the optimization settings.

For investors who do not have access to direct real estate funds, including private equity funds—for example, small investors—the most common solution is to use one of the indexes based on listed equities to represent the asset class. This approach is often used to represent the target allocation with a fund that invests similarly. Thus global real estate is often represented (approximately) by global real estate.

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## 8. RISK BUDGETING

- e. explain absolute and relative risk budgets and their use in developing and implementing an asset allocation;
- f. describe how client needs and preferences regarding investment risk are incorporated into asset allocation;

[A] risk budget is simply a particular allocation of portfolio risk. The risk budget is simply the allocation of risk such that the first order of conditions for portfolio optimization are satisfied. The risk budgeting process is the process of determining the optimal risk budget.

Kurt Winkelmann (2003, p. 173)

As this quote from Kurt Winkelmann suggests, there are three as-

























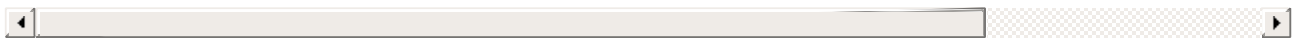






























































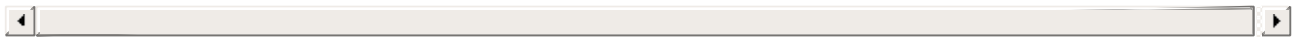






































































































































# Reading 7

## Asset Allocation with Real-World Constraints

by Peter Mladina, Brian J. Murphy, CFA, and Mark Ruloff, FSA, EA, CERA

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss asset size, liquidity needs, time horizon, and regulatory or other considerations as constraints on asset allocation;
- b.** discuss tax considerations in asset allocation and rebalancing;
- c.** recommend and justify revisions to an asset allocation given change(s) in investment objectives and/or constraints;
- d.** discuss the use of short-term shifts in asset allocation;
- e.** identify behavioral biases that arise in asset allocation and recommend methods to overcome them.

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## 1. INTRODUCTION

This reading illustrates ways in which the asset allocation process must be adapted to accommodate specific asset owner circumstances and constraints. It addresses adaptations to the asset allocation inputs given an asset owner's asset size, liquidity, and time horizon as well as external constraints that may affect the asset allocation choice (Sections 2). We also

discuss the ways in which taxes influence the asset allocation process for the taxable investor (Sections 6–7). In addition, we discuss the circumstances that should trigger a re-evaluation of the long-term strategic asset allocation (Section 8), when and how an asset owner might want to make short-term shifts in asset allocation (Section 9), and how innate investor behaviors can interfere with successful long-term planning for the investment portfolio (Section 10). Throughout the reading, we illustrate the application of these concepts using a series of hypothetical investors.

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## 2. CONSTRAINTS IN ASSET ALLOCATION AND ASSET SIZE

- a. discuss asset size, liquidity needs, time horizon, and regulatory or other considerations as constraints on asset allocation;

General asset allocation principles assume that all asset owners have equal ability to access the entirety of the investment opportunity set, and that it is merely a matter of finding that combination of asset classes that best meets the wants, needs, and obligations of the asset owner. In practice, however, it is not so simple. An asset owner must consider a number of constraints when modeling and choosing among asset allocation alternatives. Some of the most important are asset size, liquidity needs, taxes, and time horizon. Moreover, regulatory and other external considerations may influence the investment opportunity set or the optimal asset allocation decision.

### 2.1. Asset Size

The size of an asset owner's portfolio has implications for asset allocation. It may limit the opportunity set—the asset classes accessible to the asset owner—by virtue of the scale needed to invest successfully in certain asset classes or by the availability of investment vehicles necessary to implement the asset allocation.

Economies and diseconomies of scale are perhaps the most important factors relevant to understanding asset size as a constraint. The size of an asset owner's investment pool may be too small—or too large—to capture the returns of certain asset classes or strategies efficiently. Asset owners with larger portfolios can generally consider a broader set of asset classes and strategies. On the one hand, they are more likely to have sufficient governance capacity—sophistication and staff resources—to develop the required knowledge base for the

more complex asset classes and investment vehicles. They also have sufficient size to build a diversified portfolio of investment strategies, many of which have substantial minimum investment requirements. On the other hand, some asset owners may have portfolios that are *too large*; their desired minimum investment may exhaust the capacity of active external investment managers in certain asset classes and strategies. Although “too large” and “too small” are not rigidly defined, the following example illustrates the difficulty of investing a very large portfolio. Consider an asset owner with an investment portfolio of US\$25 billion who is seeking to make a 5% investment in global small-cap stocks:

- The median total market capitalization of the stocks in the S&P Global SmallCap is approximately US\$555 million.
- Assume a small-cap manager operates a 50-stock portfolio and is willing to own 3% of the market cap of any one of its portfolio companies. Their average position size would be US\$17 million, and an effective level of assets under management (AUM) would be on the order of US\$850 million. Beyond that level, the manager may be forced to expand the portfolio beyond 50 stocks or to hold position sizes greater than 3% of a company’s market cap, which could then create liquidity issues for the manager.
- Now, our US\$25 billion fund is looking to allocate US\$1.25 billion to small-cap stocks ( $\text{US\$25 billion} \times 5\%$ ). They want to diversify this allocation across three or four active managers—a reasonable allocation of governance resources in the context of all of the fund’s investment activities. The average allocation per manager is approximately US\$300 to US\$400 million, which would constitute between 35% and 50% of each manager’s AUM. This exposes both the asset owner and the investment manager to an undesirable level of operational risk.

Although many large asset owners have found effective ways to implement a small-cap allocation, this example illustrates some of the issues associated with managing a large asset pool. These include such practical considerations as the number of investment managers that might need to be hired to fulfill an investment allocation and the ability of the asset owner to identify and monitor the required number of managers.

Research has shown that investment managers tend to incur certain disadvantages from increasing scale: Growth in AUM leads to larger trade sizes, incurring greater price impact; capital inflows may cause active investment managers to pursue ideas outside of their core investment theses; and organizational hierarchies may slow down decision making and reduce incentives.<sup>1</sup> Asset owners, however, are found to have *increasing* returns to scale, as discussed below.

A study of pension plan size and performance (using data spanning 1990–2008) found that large defined benefit plans outperformed smaller ones by 45–50 basis points per year on a risk-adjusted basis.<sup>2</sup> The gains are derived from a combination of cost savings related to internal management, a greater ability to negotiate fees with external managers, and the

ability to support larger allocations to private equity and real estate investments. As fund size increases, the “per participant” costs of a larger governance infrastructure decline and the plan sponsor can allocate resources away from such asset classes as small-cap stocks, which are sensitive to diseconomies of scale, to such other areas as private equity funds or co-investments where they are more likely to realize scale-related benefits.

Whereas owners of large asset pools may achieve these operating efficiencies, scale may also impose obstacles related to the liquidity and trading costs of the underlying asset. Above some size, it becomes difficult to deploy capital effectively in certain active investment strategies. As illustrated in [Exhibit 1](#), owners of very large portfolios may face size constraints in allocating to active equity strategies. The studies referenced earlier noted that these asset owners frequently choose to invest passively in developed equity markets where their size inhibits alpha potential. The asset owner’s finite resources can then be allocated instead toward such strategies as private equity, hedge funds, and infrastructure, where their scale and resources provide a competitive advantage.

**Exhibit 1. Asset Size and Investor Constraints**

Asset Class	Investor Constraints by Size
■ Cash equivalents and money market funds	No size constraints.
■ Large-cap developed market equity	Generally accessible to large and small asset owners, although the very large asset owner may be constrained in the amount of assets allocated to certain active strategies and managers.
■ Small-cap developed market equity	
■ Emerging market equity	
■ Developed market sovereign	Generally accessible to large and small asset owners, although to achieve prudent diversification, smaller asset owners may need to implement via a commingled vehicle.



bonds

- Investment-grade bonds
- Non-investment-grade bonds
- Private real estate equity

Alternative Investments

- Hedge funds
- Private debt
- Private equity
- Infrastructure
- Timberland and farmland

May be accessible to large and small asset owners, although if offered as private investment vehicles, there may be legal minimum qualifications that exclude smaller asset owners. The ability to successfully invest in these asset classes may also be limited by the asset owner's level of investment understanding/expertise. Prudent diversification may require that smaller asset owners implement via a commingled vehicle, such as a fund of funds, or an ancillary access channel, such as a liquid alternatives vehicle or an alternatives ETF. For very large funds, the allocation may be constrained by the number of funds available.

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Even in these strategies, very large asset owners may be constrained by scale. In smaller or less liquid markets, can a large asset owner invest enough that the exposure contributes a material benefit to the broader portfolio? For example, a sovereign wealth fund or large public pension plan may not find enough attractive hedge fund managers to fulfill their desired allocation to hedge funds. True alpha is rare, limiting the opportunity set. Asset owners who find that they have to split their mandate into many smaller pieces may end up with an index-like portfolio but with high active management fees; one manager's active bets may cancel out those of another active manager. A manager mix with no true alpha becomes index-like because the uncompensated, idiosyncratic return variation is diversified away. A much smaller allocation may be achievable, but it may be too small to meaningfully affect the risk and return characteristics of the overall portfolio. More broadly, a very large size makes it more difficult to benefit from opportunistic investments in smaller niche markets or from skilled investment managers who have a small set of unique ideas or concentrated bets. No hard and fast rules exist to determine whether a particular asset owner is too small or too

large to effectively access an asset class. Greater governance resources more commonly found among owners of larger asset pools create the capacity to pursue the more complex investment opportunities, but the asset owner may still need to find creative ways to implement the desired allocation. Each asset owner has a unique set of knowledge and constraints that will influence the opportunity set.

Smaller asset owners (typically institutions with less than US\$500 million in assets, and private wealth investors with less than US\$25 million in assets) also find that their opportunity set may be constrained by the size of their investment portfolio. This is primarily a function of the more limited governance infrastructure typical of smaller asset owners: They may be too small to adequately diversify across the range of asset classes and investment managers or may have staffing constraints (insufficient asset size to justify a dedicated internal staff). Complex strategies may be beyond the reach of asset owners that have chosen not to develop investment expertise internally or where the oversight committee lacks individuals with sufficient investment understanding. In some asset classes and strategies, commingled investment vehicles can be used to achieve the needed diversification, provided the governing documents do not prohibit their use.

Access to other asset classes and strategies—private equity, private real estate, hedge funds, and infrastructure—may still be constrained for smaller asset owners. The commingled vehicles through which these strategies are offered typically require high minimum investments. For successful private equity and hedge fund managers, in particular, minimum investments can be in the tens of millions of (US) dollars, even for funds of funds.

Regulatory restrictions can also impose a size constraint. In the United Kingdom, for example, an asset owner in a private investment vehicle must qualify as an elective professional client, meaning they must meet two of the following three conditions:

1. The client has carried out transactions, in significant size, on the relevant market at an average frequency of 10 per quarter over the previous four quarters.
2. The size of the client's financial instrument portfolio exceeds €500,000.
3. The client works or has worked in the financial sector for at least one year in a professional position, which requires knowledge of the transactions or services envisaged.

In the United States, investors must be either accredited or qualified purchasers to invest in many private equity and hedge fund vehicles. To be a qualified purchaser, a natural person must have at least US\$5 million in investments, a company must have at least US\$25 million in investable assets, and an investment manager must have at least US\$25 million under management. In Hong Kong SAR, the Securities and Futures Commission requires that an investor must meet the qualifications of a "Professional Investor" to invest in certain categories of assets. A Professional Investor is generally defined as a trust with total assets of

not less than HK\$40 million, an individual with a portfolio not less than HK\$8 million, or a corporation or partnership with a portfolio not less than HK\$8 million or total assets of not less than HK\$40 million. The size constraints related to these asset classes suggest that smaller asset owners have real challenges achieving an effective private equity or hedge fund allocation.

Asset size as a constraint is often a more acute issue for individual investors than institutional asset owners. Wealthy families may pool assets through such vehicles as family limited partnerships, investment companies, fund of funds, or other forms of commingled vehicles to hold their assets. These pooled vehicles can then access investment vehicles, asset classes, and strategies that individual family members may not have portfolios large enough to access on their own.

## Where Asset Size Constrains Investment Opportunity

As of early 2016, the 10 largest sovereign wealth funds globally each exceed US\$400 billion in assets. For a fund of this size, a 5% allocation to hedge funds (the average sovereign wealth fund allocation) would imply US\$20 *billion* to be deployed. The global hedge fund industry manages approximately US\$2.8 trillion in total; 73% of the funds manage less than US\$100 million. The remaining 27% of the funds (roughly 3,000) manage 72% of the industry's AUM; their implied average AUM is therefore US\$670 million. If we assume that the asset owner would want to be no more than 20% of a firm's AUM, we can infer that the average investment might be approximately US\$130 million. With US\$20 billion to deploy, the fund would need to invest with nearly 150 funds to achieve a 5% allocation to hedge funds.

*Sources:* Sovereign Wealth Fund Institute, BarclayHedge, Eurekahedge (2016).

### EXAMPLE 1

## Asset Size Constraints in Asset Allocation

1. Akkarat Aromdee is the recently retired President of Alpha Beverage, a producer and distributor of energy drinks throughout Southeast Asia. Upon retiring, the company provided a lump sum retirement payment of THB880,000,000 (equivalent to €20 million), which was rolled over to a tax-deferred individual

retirement savings plan. Aside from these assets, Aromdee owns company stock worth about THB70,000,000. The stock is infrequently traded. He has consulted with an investment adviser, and they are reviewing the following asset allocation proposal:

Global equities	40%
Global high-yield bonds	15%
Domestic intermediate bonds	30%
Hedge funds	10%
Private equity	5%

Describe asset size constraints that Aromdee might encounter in implementing this asset allocation. Discuss possible means to address them.

2. The CAF\$40 billion Government Petroleum Fund of Caflandia is overseen by a nine-member Investment Committee. The chief investment officer has a staff with sector heads in global equities, global bonds, real estate, hedge funds, and derivatives. The majority of assets are managed by outside investment managers. The Investment Committee, of which you are a member, approves the asset allocation policy and makes manager selection decisions. Staff has recommended an increase in the private equity allocation from its current 0% to 15%, to be implemented over the next 12 to 36 months. The head of global equities will oversee the implementation of the private equity allocation.

Given the asset size of the fund, formulate a set of questions regarding the feasibility of this recommendation that you would like staff to address at the next Investment Committee meeting.

3. The Courneuve University Endowment has US\$250 million in assets. The current allocation is 65% global large-capitalization stocks and 35% high-quality bonds, with a duration target of 5.0 years. The University has adopted a 5% spending policy. University enrollment is stable and expected to remain so. A capital spending initiative of US\$100 million for new science buildings in the next three to seven years is being discussed, but it has not yet been approved. The University has no dedicated investment staff and makes limited use of external resources. Investment recommendations are formulated by the University's treasurer and approved by the Investment Committee, composed entirely of external board members.

The new president of the University has stated that he feels the current policy is overly

restrictive, and he would like to see a more diversified program that takes advantage of the types of investment strategies used by large endowment programs. Choosing from among the following asset classes, propose a set of asset classes to be considered in the revised asset allocation. Justify your response.

- Cash equivalents and money market funds
- Large-cap developed market equity
- Small-cap developed market equity
- Emerging market equity
- Developed market sovereign bonds
- Investment-grade bonds
- Non-investment-grade bonds
- Private real estate equity
- Hedge funds
- Private debt
- Private equity

### **Solution to 1:**

With a THB88 million (€2 million) allocation to hedge funds and a THB44 million (€1 million) allocation to private equity funds, Aromdee may encounter restrictions on his eligibility to invest in the private investment vehicles typically used for hedge fund and private equity investment. To the extent he is eligible to invest in hedge funds and/or private equity funds, a fund-of-funds or similar commingled arrangement would be essential to achieving an appropriate level of diversification. Additionally, it is essential that he and his adviser develop the necessary level of expertise to invest in these alternative assets. To achieve a prudent level of diversification, the allocation to global high-yield bonds would most likely need to be accomplished via a commingled investment vehicle.

### **Solution to 2:**

Questions regarding the feasibility of the recommendation include the following:

- How many private equity funds do you expect to invest in to achieve the 15% allocation to private equity?
- What is the anticipated average allocation to each fund?
- Are there a sufficient number of high-quality private equity funds willing to accept an allocation of that size?

- What expertise exists at the staff or board level to conduct due diligence on private equity investment funds?
- What resources does the staff have to oversee the increased allocation to private equity?

### **Solution to 3:**

Asset size and limited governance resources are significant constraints on the investment opportunity set available to the Endowment. The asset allocation should emphasize large and liquid investments, such as cash equivalents, developed and emerging market equity, and sovereign and investment-grade bonds. Some small portion of assets, however, could be allocated to commingled investments in real estate, private equity, or hedge funds. Given the University's limited staff resources, it is necessary to ensure that the board members have the level of expertise necessary to select and monitor these more complex asset classes. The Endowment might also consider engaging an outside expert to advise on investment activities in these asset classes.

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## **3. LIQUIDITY**

- a. discuss asset size, liquidity needs, time horizon, and regulatory or other considerations as constraints on asset allocation;

Two dimensions of liquidity must be considered when developing an asset appropriate allocation solution: the liquidity needs of the asset owner and the liquidity characteristics of the asset classes in the opportunity set. Integrating the two dimensions is an essential element of successful investment planning.

The need for liquidity in an investment portfolio will vary greatly by asset owner and by the goals the assets are set aside to achieve. For example, a bank will typically have a very large portfolio supporting its day-to-day operations. That portfolio is likely to experience very high turnover and a very high need for liquidity; therefore, the investment portfolio must hold high-quality, very short-term, and highly liquid assets.

The same bank may have another designated investment pool one level removed from operating assets. Although the liquidity requirements for this portfolio may be lower, the investments most likely feature a high degree of liquidity—a substantial allocation to

investment-grade bonds, perhaps with a slight extension of maturity. For its longer-term investment portfolio, the bank may choose to allocate some portion of its portfolio to less liquid investments. The opportunity set for each portfolio will be constrained by applicable banking laws and regulations.

Long-term investors, such as sovereign wealth funds and endowment funds, can generally exploit illiquidity premiums available in such asset classes as private equity, real estate, and infrastructure investments. However, pension plans may be limited in the amount of illiquidity they can absorb. For example, a frozen pension plan may anticipate the possibility of eliminating its pension obligation completely by purchasing a group annuity and relinquishing the responsibility for making pension payments to an insurance company. If there is a significant probability that the company will take this step in the near term, liquidity of plan assets will become a primary concern; and if there is a substantial allocation to illiquid assets, the plan sponsor may be unable to execute the desired annuity purchase transaction.

Liquidity needs must also consider the particular circumstances and financial strength of the asset owner and what resources they may have beyond those held in the investment portfolio. The following examples illustrate this point:

- A university must consider its prospects for future enrollments and the extent to which it relies on tuition to meet operating needs. If the university experiences a significant drop in enrollment, perhaps because of a poor economic environment, or takes on a new capital improvement project, the asset allocation policy for the endowment should reflect the increased probability of higher outflows to support university operations.
- A foundation whose mission supports medical research in a field in which a breakthrough appears imminent may desire a higher level of liquidity to fund critical projects than would a foundation that supports ongoing community efforts.
- An insurance company whose business is predominantly life or auto insurance, where losses are actuarially predictable, can absorb more liquidity risk than a property/casualty reinsurer whose losses are subject to unpredictable events, such as natural disasters.
- A family with several children nearing college-age will have higher liquidity needs than a couple of the same age and circumstances with no children.

When assessing the appropriateness of any given asset class for a given asset owner, it is wise to evaluate potential liquidity needs in the context of an extreme market stress event. The market losses of the 2008–2009 global financial crisis were extreme. Simultaneously, other forces exacerbated investors' distress: Many university endowments were called upon to provide an increased level of operating support; insurers dipped into reserves to offset operating losses; community foundations found their beneficiaries in even greater need of financial support; and some individual investors experienced setbacks that caused them to

move, if only temporarily, from being net contributors to net spenders of financial wealth. A successful asset allocation effort will stress the proposed allocation; it will anticipate, where possible, the likely behavior of other facets of the saving/spending equation during times of stress.

It is also important to consider the intersection of asset class and investor liquidity in the context of the asset owner's governance capacity. Although the mission of the organization or trust may allow for a certain level of illiquidity, if those responsible for the oversight of the investment program do not have the mental fortitude or discipline to maintain course through the crisis, illiquid and less liquid investments are unlikely to produce the rewards typically expected of these exposures. Although rates of return may be mean-reverting, wealth is not. Losses resulting from panic selling during times of stress become permanent losses; there are fewer assets left to earn returns in a post-crash recovery.

## The Case of Vanishing Liquidity

In the global financial crisis of 2008–2009, many investors learned painful truths about liquidity. When most needed—whether to rebalance or to meet spending obligations—it can evaporate. As investors liquidated their most liquid assets to meet financial obligations (or to raise cash in fear of further market declines), the remaining less liquid assets in their portfolios became an ever-larger percentage of the portfolio. Many investors were forced to sell private partnership interests on the secondary market at steeply discounted prices. Others defaulted on outstanding private fund capital commitments by refusing to honor future obligations.

Similarly, illiquidity became a substantial problem during the Asian currency crisis of 1997–1998 and again with the Russian debt default and Long-Term Capital Management (LTCM) crisis of 1998. In the following paragraphs, we describe several “liquidity crises” that are often used in stress testing asset allocation choices.

### The Asian Currency Crisis of 1997

In the spring of 1997, Thailand spent billions to defend the Thai baht against speculative attacks, finally capitulating and devaluing the baht in July 1997. This triggered a series of moves throughout the region to defend currencies against speculators. Ultimately, these efforts were unsuccessful and many countries abandoned the effort and allowed their currencies to float freely. The Philippines, Indonesia, and South Korea abandoned their pegs against the US dollar. On 27 October 1997, rattled by the currency crisis, Asian and European markets declined sharply in advance of the opening of the US markets. The S&P 500 declined nearly 7%, and trading on US stock markets was



suspended.

## The Russian Debt/LTCM Crisis of August 1998

On 17 August 1998, the Russian government defaulted on its short-term debt. This unprecedented default of a sovereign debtor roiled the global bond markets. A global flight-to-quality ensued, which caused credit spreads to widen and liquidity to evaporate. Highly levered investors experienced significant losses. Long-Term Capital Management, with reported notional exposure of over US\$125 billion (a 25-to-1 leverage ratio), exacerbated these price declines as they faced their own liquidity crisis and were forced to liquidate large relative value, distressed, convertible arbitrage, merger arbitrage, and equity positions. Ultimately, the magnitude of the liquidity squeeze for LTCM and the risk of potential disruption to global markets caused the New York branch of the Federal Reserve Bank to orchestrate a disciplined, structured bailout of the LTCM fund.

Financial markets are increasingly linked across borders and asset classes; as a result, changes in liquidity conditions in one country can directly affect liquidity conditions elsewhere. These linkages do improve access to financing and capital markets, but they also show that a liquidity problem in one part of the world can ripple across the globe—increasing volatility, creating higher execution costs for investors, and possibly leading to a reduction in credit availability and a decline in economic activity.

### EXAMPLE 2

## Liquidity Constraints in Asset Allocation

The Frentel Furniture Pension Fund has £200 million frozen in a defined benefit pension plan that is 85% funded. The plan has a provision that allows employees to elect a lump sum distribution of their pension benefit at retirement. The company is strong financially and is committed to fully funding the pension obligations over time. However, they also want to minimize cash contributions to the plan. Few governance resources are allocated to the pension fund, and there is no dedicated staff for pension investment activities. The current asset allocation is as shown:

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Global equities	20%
Private equity	10%
Real estate	10%

Infrastructure	5%
Hedge funds	15%
Bonds	40%

The company expects to reduce their employee headcount sometime in the next three to five years, and they are tentatively planning incentives to encourage employees to retire early.

Discuss the appropriateness of the current asset allocation strategy for the pension fund, including benefits and concerns.

### Solution:

In addition to the size constraints a £200 million ( $\approx$  US\$250 million) plan faces when attempting to invest in real estate, private equity, infrastructure, and hedge funds, the likelihood of early retirement incentives and lump-sum distribution requests in the next three to five years indicates a need for increased sensitivity to liquidity concerns. Investments in private equity, infrastructure, and real estate may be unsuitable for the plan given their less liquid nature. Although hedge fund investments would likely be accessible via a commingled vehicle, the liquidity of the commingled vehicle should be evaluated to determine if it is consistent with the liquidity needs of the plan.

## 4. TIME HORIZON

- a. discuss asset size, liquidity needs, time horizon, and regulatory or other considerations as constraints on asset allocation;

An asset owner's time horizon is a critical constraint that must be considered in any asset allocation exercise. A liability to be paid at a given point in the future or a goal to be funded by a specified date each define the asset owner's horizon, thus becoming a basic input to the asset allocation solution. The changing composition of the asset owner's assets and liabilities must also be considered. As time progresses, the character of both *assets* (human capital) and *liabilities* changes.

## 4.1. Changing Human Capital

When asset allocation considers such extended portfolio assets as human capital, the optimal allocation of financial capital can change through time (Bodie, Merton, and Samuelson 1992). Assuming no change in the investor's utility function, as human capital—with its predominately bond-like risk—declines over time, the asset allocation for financial capital would reflect an increasing allocation to bonds. This is a prime example of how time horizon can influence asset allocation.

## 4.2. Changing Character of Liabilities

The changing character of liabilities through time will also affect the asset allocation aligned to fund those liabilities.

As an example, the term structure of liabilities changes as they approach maturity. A pension benefit program is a simple way to illustrate this point. When the employee base is young and retirements are far into the future, the liability can be hedged with long-term bonds. As the employee base ages and prospective retirements are not so far into the future, the liability is more comparable to intermediate- or even short-term bonds. When retirements are imminent, the structure of the liabilities can be characterized as cash-like, and an optimal asset allocation would also have cash-like characteristics.

Similarly, the overall profile of an individual investor's liabilities changes with the progression of time, particularly for investors with finite investment horizons. Nearer-term goals and liabilities move from partially funded to fully funded, while other, longer-term goals and liabilities move progressively closer to funding. As the relative weights of the goals to be funded shift and the time horizon associated with certain goals shortens, the aggregate asset allocation must be adapted if it is to remain aligned with the individual's goals.

Time horizon is also likely to affect the manner in which an investor prioritizes certain goals and liabilities. This will influence the desired risk profile of the assets aligned to fund them. Consider a 75-year-old retired investor with two goals:

1. Fund consumption needs through age 95
2. Fund consumption needs from age 95 through age 105

He most likely assigns a much higher priority to funding goal 1, given the lower probability that he will live beyond age 95.<sup>3</sup> Let's also assume that he has sufficient assets to fund goal 1 and to partially fund goal 2. The higher priority assigned to goal 1 indicates he is less willing

to take risk, and this sub-portfolio will be invested more conservatively. Now consider goal 2: Given the low probability of living past 95 and the fact that he does not currently have sufficient assets to fund that goal, the sub-portfolio assigned to goal 2 is likely to have a more growth-oriented asset allocation. The priority of a given goal can change as the investor's time horizon shortens—or lengthens.

Consider the hypothetical investors Ivy and Charles Lee from the reading “Introduction to Asset Allocation.” Ivy is a 54-year-old life science entrepreneur. Charles is a 55-year-old orthopedic surgeon. They have two unmarried children aged 25 (Deborah) and 18 (David). Deborah has a daughter with physical limitations. Four goals have been identified for the Lees:

1. Lifestyle/future consumption needs
2. College education for son David, 18 years old
3. Charitable gift to a local art museum in 5 years
4. Special needs trust for their granddaughter, to be funded at the death of Charles

The lifestyle/consumption goal is split into three components: required minimum consumption requirements (a worst-case scenario of reduced lifestyle), baseline consumption needs (maintaining current standard of living), and aspirational consumption needs (an improved standard of living). At age 54, the risk preferences assigned to these goals might look something like the following:

<b>Lifestyle Goals</b>	<b>Risk Preference</b>	<b>Asset Allocation</b>	<b>Sub-Portfolio as % of Total*</b>
<i>Required minimum</i>	Conservative	100% bonds and cash	65%
<i>Baseline</i>	Moderate	60% equities/40% bonds	10%
<i>Aspirational</i>	Aggressive	100% equities	4%
College education	Conservative	100% bonds and cash	1%
Charitable gift (aspirational)	Aggressive	100% equities	5%
Special needs trust	Moderate	60% equities/40% bonds	15%
Aggregate portfolio		≈ 25% equities/75% bonds and cash	100%

\* The present value of each goal as a proportion of the total portfolio.

The asset allocation for the total portfolio aggregates the asset allocations for each of the goal-aligned sub-portfolios, weighted by the present value of each goal. For the Lees, this is an overall asset allocation of about 25% equities and 75% bonds and cash. (Each goal is discounted to its present value by expected return of its respective goal-aligned sub-portfolio.)

Move forward 20 years. The Lees are now in their mid-70s, and their life expectancy is about 12 years. Their son has completed his college education and is successfully established in his own career. The charitable gift has been made. These two goals have been realized. The assets needed to fund the baseline consumption goal are significantly reduced because fewer future consumption years need to be funded. The special needs trust for their granddaughter remains a high priority. Although the Lee's risk preferences for these goals have not changed, the overall asset allocation *will* change because the total portfolio is an aggregated mix of the remaining goal-aligned sub-portfolios, weighted by their current present values:

<b>Lifestyle Goals</b>	<b>Risk Preference</b>	<b>Asset Allocation</b>	<b>Sub-Portfolio as % of Total*</b>
<i>Required minimum</i>	Conservative	100% bonds and cash	54%
<i>Baseline</i>	Moderate	60% equities/40% bonds	9%
<i>Aspirational</i>	Aggressive	100% equities	3%
Special needs trust	Moderate	60% equities/40% bonds	34%
Aggregate portfolio		≈ 30% equities/70% bonds and cash	100%

\* The present value of each goal as a proportion of the total portfolio. The implied assumption is that current assets are sufficient to fund all goals, provided the Lees adopt an aggressive asset allocation strategy for the aspirational and charitable gifting goals. If the value of current assets exceeds the present value of all goals, the Lees would have greater flexibility to adopt a lower risk preference for some or all goals.

Although for ease of illustration our example assumed the Lee's risk preferences remained the same, this is not likely to be the case in the real world. Required minimum and baseline consumption goals would remain very important; there is less flexibility to withstand losses caused by either reduced earnings potential or lower likelihood of the market regaining lost ground within the shorter horizon. The aspirational lifestyle goal is likely to be a much lower priority, and it may have been eliminated altogether. The special needs trust may have a higher (or lower) priority as the needs of the granddaughter and the ability of her parents to provide for her needs after their death become more evident. The preferred asset allocation for each of these goals will shift over the course of the investor's lifetime.

As an investor's time horizon shifts, both human capital and financial market considerations, along with changes in the investor's priorities, will most likely lead to different asset allocation decisions.

### EXAMPLE 3

## Time Horizon Constraints in Asset Allocation

Akkarat Aromdee, the recently retired President of Alpha Beverage, is 67 years old with a remaining life expectancy of 15 years. Upon his retirement two years ago, he established a charitable foundation and funded it with THB600 million ( $\approx$  US\$17.3 million). The remaining financial assets, THB350 million ( $\approx$  US\$10 million), were transferred to a trust that will allow him to draw a lifetime income. The assets are invested 100% in fixed-income securities, consistent with Aromdee's desire for a high level of certainty in meeting his goals. He is a widower with no children. His consumption needs are estimated at THB20 million annually. Assets remaining in the trust at his death will pass to the charities named in the trust.

While vacationing in Ko Samui, Aromdee met and later married a 45-year-old woman with two teenage children. She has limited financial assets of her own. Upon returning from his honeymoon, Aromdee meets with his investment adviser. He intends to pay the college expenses of his new stepchildren—THB2 million annually for eight years, beginning five years from now. He would also like to ensure that his portfolio can provide a modest lifetime income for his wife after his death.

Discuss how these changed circumstances are likely to influence Aromdee's asset allocation.

### Solution:

At the time Aromdee established the trust, the investment horizon was 15 years and his annual consumption expenditures could easily be funded from the trust. His desire to support his new family introduces two new horizons to be considered: In five years, the trust will begin making annual payments of THB2 million to fund college expenses, and the trust will continue to make distributions to his wife after his death, though at a reduced rate. When the trust needed to support only his consumption requirements, a conservative asset allocation was appropriate. However, the payment of college expenses will reduce his margin of safety and the lengthening of the investment horizon suggests that he should consider adding equity-oriented investments to the asset mix to provide for growth in assets over time.

## Time Diversification of Risk

In practice, investors often align lower risk/lower return assets with short-term goals and liabilities and higher risk/higher return assets with long-term goals and liabilities. It is generally believed that longer-horizon goals can tolerate the higher volatility associated with higher risk/higher return assets as below average and above average returns even out over time. This is the notion of time diversification.

Mean–variance optimization, typically conducted using a multi-year time horizon, assumes that asset returns follow a random walk; returns in Year X are independent of returns in Year X – 1. Under this baseline assumption, there is no reduction in risk with longer time horizons.<sup>4</sup> Although the *probability* of reduced wealth or of a shortfall in funding a goal or liability (based on the mean of the distribution of possible outcomes) may be lower at longer time horizons, the dispersion of possible outcomes widens as the investment horizon expands. Thus, the *magnitude* of potential loss or shortfall can be greater.

Consider the choice of investing US\$100,000 in an S&P 500 Index fund with a 10% expected return and 15% standard deviation versus a risk-free asset with a 3% annual return.<sup>5</sup> The table below compares the return of the risk-free asset over various time horizons, with the range of predicted returns for the S&P 500 Index fund at a 95% confidence interval. Although the *mean* return of the distribution of S&P 500 returns exceeds that of the risk-free asset in each time period (thus the notion that the volatility of higher risk, higher return assets evens out over time), the lower boundary of expected S&P 500 returns is less than the initial investment for all periods less than 10 years! The lower boundary of the S&P 500 outcomes does not exceed the ending wealth of the risk-free investment until the investment horizon is extended to 20 years. If the confidence interval is expanded to 99%, the lower boundary of S&P 500 outcomes falls below the initial investment up until and through 20 years!

	Ending Wealth (US\$)		
	S&P 500		Risk-Free Asset
	95% Confidence Interval		
	Lower Boundary	Upper Boundary	
1 year	81,980	147,596	103,000
5 years	83,456	310,792	115,927
10 years	102,367	657,196	134,392



15 years	133,776	130,4376	155,797
20 years	180,651	2,565,345	180,611

Although one-year returns are largely independent, there is some evidence that risky asset returns can display mean-reverting tendencies over intermediate to longer time horizons. An assumption of mean-reverting risky asset returns would support the conventional arguments for funding long-term goals and liabilities with higher risk/higher return assets, and it would also support a reduction in the allocation to these riskier assets as the time horizon shortens.

## 5. REGULATORY AND OTHER EXTERNAL CONSTRAINTS

- a. discuss asset size, liquidity needs, time horizon, and regulatory or other considerations as constraints on asset allocation;

Just as an integrated asset/liability approach to asset allocation is likely to result in a different allocation decision than what might have been selected in an asset-only context, external considerations may also influence the asset allocation decision. Local laws and regulations can have a material effect on an investor's asset allocation decisions.

Pension funds, insurance companies, sovereign wealth funds, and endowments and foundations are each subject to externally imposed constraints that are likely to tilt their asset allocation decision away from what may have been selected in a pure asset/liability context.

### 5.1. Insurance Companies

Unlike pension fund or endowment assets—which are legally distinct from the assets of the sponsoring entity—insurance companies' investment activities are an integral part of their day-to-day operations. Although skilled underwriting may be the focus of the firm as the key to profitability, investment returns are often a material contributor to profits or losses. Regulatory requirements and accounting treatment vary from country to country, but insurers are most often highly focused on matching assets to the projected, probabilistic cash flows of



the risks they are underwriting. Fixed-income assets, therefore, are typically the largest component of an insurance company's asset base, and investing with skill in this asset class is a key to competitive pricing and success. In some regions, the relevant accounting treatment may be a book value approach, rendering variability in the market pricing of assets to be a secondary consideration as long as an asset does not have to have its book value written down as "other than temporarily impaired" ("OTTI"). Risk considerations for an insurance company include the need for capital to pay policyholder benefits and other factors that directly influence the company's financial strength ratings. Some of the key considerations are risk-based capital measures, yield, liquidity, the potential for forced liquidation of assets to fund negative claims development, and credit ratings.

Additionally, allocations to certain asset classes are often constrained by a regulator. For example, the maximum limit on equity exposure is often 10%, but it ranges as high as 30% in Switzerland and 50% in Mexico. Israel and Korea impose a limit of 15% on real estate investments.<sup>6</sup> Restrictions on non-publicly traded securities might also limit the allocation to such assets as private equity, for example, and there may also be limits on the allocation to high-yield bonds. Insurance regulators generally set a minimum capital level for each insurer based on that insurer's mix of assets, liabilities, and risk. Many countries are moving to Solvency II regulatory standards designed to harmonize risk-based capital requirements for insurance companies across countries.<sup>7</sup> Asset classes are often treated differently for purposes of determining whether an insurer meets risk-based capital requirements.

## 5.2. Pension Funds

Pension fund asset allocation decisions may be constrained by regulation and influenced by tax rules.<sup>8</sup> Some countries regulate maximum or minimum percentages in certain asset classes. For example, Japanese pension funds must hold a certain minimum percentage of assets in Japanese bonds in order to maintain their tax-exempt status. Canada allows a maximum of 10% of market value invested in any one entity or related entities; Switzerland generally limits real estate investments to 30%; Estonia allows a maximum of 75% of assets invested in public equity with no limit on foreign investments; and Brazil allows a maximum of 70% in public equity with a maximum of 10% in foreign public equity.<sup>9</sup> Ukraine limits bond investments to no more than 40%.

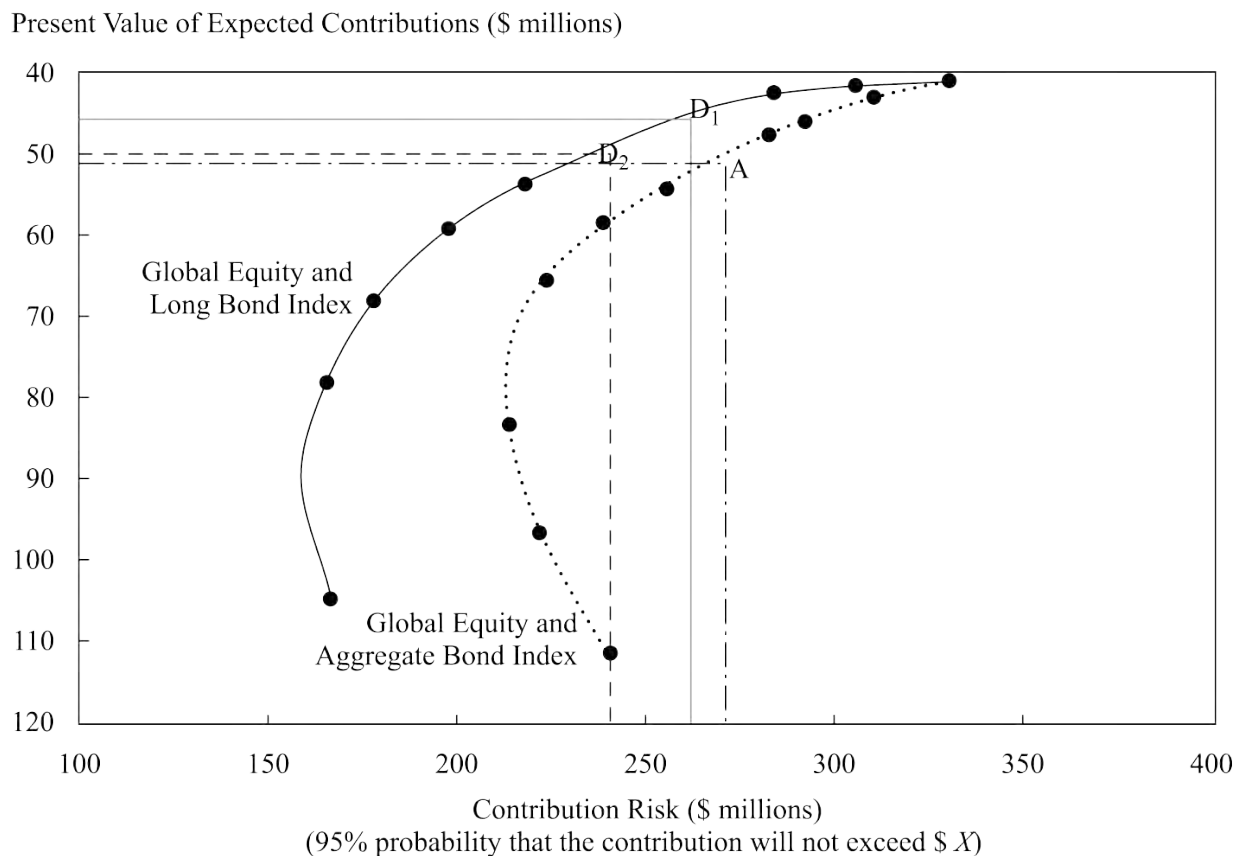
Pension funds are also subject to a wide array of funding, accounting, reporting, and tax constraints that may influence the asset allocation decision. (For example, US public pension funding and public and corporate accounting rules favor equity investments—higher equity allocations support a higher discount rate—and thus lower pension cost. Loss recognition is deferred until later through the smoothing mechanism.) The plan sponsor's appetite for risk is defined in part by these constraints, and the choice among asset allocation alternatives is often influenced by funding and financial statement considerations, such as the anticipated

contributions, the volatility of anticipated contributions, or the forecasted pension expense or income under a given asset allocation scenario. The specific constraints vary by jurisdiction, and companies with plans in multiple jurisdictions must satisfy the rules and regulations of each jurisdiction while making sound financial decisions for the organization as a whole.

**Exhibit 2** illustrates how funding considerations may affect the asset allocation decision. In this chart, risk is defined as the probability of contributions exceeding some threshold amount. In this case, the risk threshold is specified as the 95th percentile of the present value of contributions—that point on the distribution of possible contributions (using Monte Carlo simulation) where the plan sponsor can be 95% certain that contributions will not exceed that amount.

Assume that an allocation of 70% equities/30% aggregate bonds represents the most efficient portfolio for the plan sponsor's desired level of risk in an asset optimization framework. In **Exhibit 2**, we can see that the 70% equity/30% aggregate bond mix (Portfolio A) is associated with a present value (PV) of expected contributions of approximately US\$51 million (y-axis) and a 95% confidence level that contributions will not exceed approximately US\$275 million (x-axis)—Portfolio A in **Exhibit 2**. If the plan sponsor were to maintain the 70/30 asset mix, but shift to longer-duration bonds (from aggregate to long bonds) to better match the duration of liabilities—Portfolio D<sub>1</sub> on **Exhibit 2**—the PV of expected contributions declines by approximately US\$5 million and the 95% confidence threshold improves to approximately US\$265 million. In fact, Portfolio D<sub>1</sub> results in nearly the lowest PV of contributions for this plan sponsor. (Note that the vertical axis is ordered from highest contributions at the bottom and lowest contributions at the top, consistent with the notion of lower contributions as a better outcome.)

## **Exhibit 2. Efficient Frontiers Where Risk Is Defined as the Risk of Large Contributions**



Now consider Portfolio D<sub>2</sub>, 60% equities/40% long bonds. Reducing the equity exposure from 70% to 60% lowers the contribution risk significantly, with only marginally higher expected PV of contributions than Portfolio A. (A lower equity allocation implies a lower expected rate of return, which increases the PV of contributions. However, the lower equity allocation also reduces the probability that less-than-expected returns will lead to unexpectedly large contributions.) The sponsor that wishes to reduce contribution risk substantially is likely to give serious consideration to moving from Portfolio A to Portfolio D<sub>2</sub>.

By iterating through various efficient frontiers using different definitions of risk, the sponsor is able to better understand the risk and reward trade-offs of alternative asset allocation choices. The regulatory or tax constraints on minimum and maximum contributions, or on minimum required funded levels, or other values that are important to the plan sponsor, can be factored into the simulations so the sponsor can better understand how these constraints might affect the risk and reward trade-offs.

## 5.3. Endowments and Foundations

Endowments and foundations are often established with the expectation that they will exist in

perpetuity and thus can invest with a long investment horizon. In addition, the sponsoring entity often has more flexibility over payments from the fund than does a pension plan sponsor or insurance company. As a result, endowments and foundations generally can adopt a higher-risk asset allocation than other institutions. However, two categories of externally imposed constraints may influence the asset allocation decisions of an endowment or foundation: tax incentives and credit-worthiness considerations.

- *Tax incentives.* Although some endowments and foundations—US public foundations and some Austrian and Asian foundations, for example—are not required to make minimum distributions, many countries provide tax benefits tied to certain minimum spending requirements. For example, a private foundation may be subject to a requirement that it make charitable expenditures equal to at least 5% of the market value of its assets each year or risk losing its tax-favored status. These spending requirements may be relaxed if certain types of socially responsible investments are made, which can, in turn, create a bias toward socially responsible investments for some endowments and foundations, irrespective of their merits in an asset allocation context.
- *Credit considerations.* Although endowments and foundations typically have a very long investment horizon, sometimes external factors may restrict the level of risk-taking in the portfolio. For example, endowment or foundation assets are often used to support the balance sheet and borrowing capabilities of the university or the foundation organization. Lenders often require that the borrower maintain certain minimum balance sheet ratios. Therefore, the asset allocation adopted by the organization will consider the risks of breaking these bond covenants or otherwise negatively affecting the borrowing capabilities of the organization.

As an example, although a hospital foundation fund would normally have a long investment horizon and the ability to invest in less liquid asset classes, it might limit the allocation to illiquid assets in order to support certain liquidity and balance sheet metrics specified by its lender(s).

## 5.4. Sovereign Wealth Funds

Although every sovereign wealth fund (SWF) is unique with respect to its mission and objectives, some broad generalizations can be made with respect to the external constraints that may affect a fund's asset allocation choices. In general, SWFs are government-owned pools of capital invested on behalf of the peoples of their states or countries, investing with a long-term orientation. They are not generally seeking to defease a set of liabilities or known obligations as is common with pension funds and, to a lesser extent, endowment funds.

The governing entities adopt regulations that constrain the opportunity set for asset allocation. For example, the Korean SWF KIC cannot invest in Korean won-denominated

domestic assets;<sup>10</sup> and the Norwegian SWF NBIM is not permitted to invest in any alternative asset class other than real estate, which is limited to no more than 7% of assets.<sup>11</sup> Furthermore, as publicly owned entities, SWFs are typically subject to broad public scrutiny and tend to adopt a lower-risk asset allocation than might otherwise be considered appropriate given their long-term investment horizon in order to avoid reputation risk.

In addition to the broad constraints of asset size, liquidity, time horizon, and regulations, there may be cultural or religious factors which also constrain the asset allocation choices. Environmental, social, and governance (ESG) considerations are becoming increasingly important to institutional and individual investors alike. Sharia law, for example, prohibits investment in any business that has links to pork, alcohol, tobacco, pornography, prostitution, gambling, or weaponry, and it constrains investments in most businesses that operate on interest payments (like major Western banks and mortgage providers) and in businesses that transfer risk (such as major Western insurers).<sup>12</sup>

ESG goals are not typically modeled during the asset allocation decision process. Instead, these goals may be achieved through the implementation of the asset allocation, or the asset owner may choose to set aside a targeted portion of the assets for these missions. The asset allocation process would treat this “set-aside” in much the same way that a concentrated stock position might be handled: The risk, return, and correlation characteristics of this holding are specified; the “set aside” asset becomes an asset class in the investor’s opportunity set; and the asset allocation constraints will designate a certain minimum investment in this asset class.

#### EXAMPLE 4

### External Constraints and Asset Allocation

1. An insurance company has traditionally invested its pension plan using the asset allocation strategy adopted for its insurance assets: The pension assets are 95% invested in high-quality intermediate duration bonds and 5% in global equities. The duration of pension liabilities is approximately 25 years. Until now, the company has always made contributions sufficient to maintain a fully funded status. Although the company has a strong capability to fund the plan adequately and a relatively high tolerance for variability in asset returns, as part of a refinement in corporate strategy, management is now seeking to reduce long-term expected future cash contributions. Management is willing to accept more risk in the asset return, but they would like to limit contribution risk and the risk to the plan’s funded status. The Investment Committee is considering three asset allocation proposals for the pension plan:
  - A. Maintain the current asset allocation with the same bond portfolio duration.

- B. Increase the equity allocation and lengthen the bond portfolio duration to increase the hedge of the duration risk in the liabilities.
- C. Maintain the current asset allocation of 95% bonds and 5% global equities, but increase the duration of bond investments.

Discuss the merits of each proposal.

2. A multinational corporation headquartered in Mexico has acquired a former competitor in the United States. It will maintain both the US pension plan with US\$250 million in assets and the Mexican pension plan with MXN\$18,600 million in assets ( $\approx$  US\$1 billion). Both plans are 95% funded and have similar liability profiles. The Mexican pension trust has an asset allocation policy of 30% equities (10% invested in the Mexican equity market and 20% in equity markets outside Mexico), 10% hedge funds, 10% private equity, and 50% bonds. The treasurer has proposed that the company adopt a consistent asset allocation policy across all of the company's pension plans worldwide.

Critique the treasurer's proposal.

### Solution to 1:

Given the intermediate duration bond allocation, Proposal A fails to consider the mismatch between pension assets and liabilities and risks a reduction in the funded status and *increased* contributions if bond yields decline. (If yields decline across the curve, the shorter duration bond portfolio will fail to hedge the increase in liabilities.) To meet the objective of lower future contributions, the asset allocation must include a higher allocation to equities. Proposal B has this higher allocation, and the extension of duration in the bond portfolio in Proposal B reduces balance sheet and surplus risk relative to the pension liabilities. The net effect could be a reduction in short-term contribution risk; moreover, if the greater expected return on equities is realized, it should result in reduced contributions to the plan over the long term. Proposal C improves the hedging of the liabilities, and it may result in a modest improvement in the expected return on assets if the yield curve is upward-sloping. However, the expected return on Proposal C is likely lower than the expected return of Proposal B and is therefore unlikely to achieve the same magnitude of reduction in future cash contributions. Proposal C would be appropriate if the goal was focused on reducing surplus risk rather than reducing long-term contributions.

### Solution to 2:

The treasurer's proposal fails to consider the relative asset size of the two pension plans as well as the likelihood that plans in different jurisdictions may be subject to different

funding, regulatory, and financial reporting requirements. The US pension plan may be unable to effectively access certain alternative asset classes, such as private equity, infrastructure, and hedge funds. Although economies of scale may be realized if management of the pension assets is consolidated under one team, the legal and regulatory differences of the markets in which they operate mean that the asset allocation policy must be customized to each plan.

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## 6. ASSET ALLOCATION FOR THE TAXABLE INVESTOR AND AFTER-TAX PORTFOLIO OPTIMIZATION

### b. discuss tax considerations in asset allocation and rebalancing;

Portfolio theory developed in a frictionless world. But in the real world, taxes on income and capital gains can erode the returns achieved by taxable investors. The asset owner who ignores taxes during the asset allocation process is overlooking an economic variable that can materially alter the outcome. Although tax adjustments can be made after the asset allocation has been determined, this is a suboptimal approach because the pre-tax and after-tax risk and return characteristics of each asset class can be materially different.

Some assets are less tax efficient than others because of the character of their returns—the contribution of interest, dividends, and realized or unrealized capital gains to the total return. Interest income is usually taxed in the tax year it is received, and it often faces the highest tax rates. Therefore, assets that generate returns largely comprised of interest income tend to be less tax efficient in many countries.<sup>13</sup> Jurisdictional rules can also affect how the returns of certain assets are taxed. In the United States, for example, the interest income from state and local government bonds is generally exempt from federal income taxation. As a result, these bonds often constitute a large portion of a US high-net-worth investor's bond allocation. Preferred stocks, often used in lieu of bonds as an income-producing asset, are also eligible for more favorable tax treatment in many jurisdictions, where the income from preferred shares may be taxed at more favorable dividend tax rates.

The tax environment is complex. Different countries have different tax rules and rates, and these rules and rates can change frequently. However, looking across the major economies, there are some high-level commonalities in how investment returns are taxed. Interest income



is taxed typically (but not always) at progressively higher income tax rates. Dividend income and capital gains are taxed typically (but not always) at lower tax rates than those applied to interest income and earned income (wages and salaries, for example). Capital losses can be used to offset capital gains (and sometimes income). Generally, interest income incurs the highest tax rate, with dividend income taxed at a lower rate in some countries, and long-term capital gains receive the most favorable tax treatment in many jurisdictions. Once we move beyond these general commonalities, however, the details of tax treatment among countries quickly diverge.

Entities and accounts can be subject to different tax rules. For example, retirement savings accounts may be tax deferred or tax exempt, with implications for the optimal asset allocation solution. These rules provide opportunities for strategic asset *location*—placing less tax-efficient assets in tax-advantaged accounts.

We will provide a general framework for considering taxes in asset allocation. We will not survey global tax regimes or incorporate all potential tax complexities into the asset allocation solution. When considering taxes in asset allocation, the objective is to model material investment-related taxes, thereby providing a closer approximation to economic reality than is represented when ignoring taxes altogether.

For simplicity, we will assume a basic tax regime that represents no single country but includes the key elements of investment-related taxes that are roughly representative of what a typical taxable asset owner in the major developed economies must contend with.

## 6.1. After-Tax Portfolio Optimization

After-tax portfolio optimization requires adjusting each asset class's expected return and risk for expected tax. The expected after-tax return is defined in [Equation 1](#):

### Equation (1)

$$r_{at} = r_{pt}(1 - t)$$

where

$r_{at}$  = the expected after-tax return

$r_{pt}$  = the expected pre-tax (gross) return

$t$  = the expected tax rate

This can be straightforward for bonds in cases where the expected return is driven by interest



income. Take, for example, an investment-grade par bond with a 3% coupon expected to be held to maturity. If interest income is subject to a 40% expected tax rate, the bond has an expected after-tax return of 1.80% [ $0.03(1 - 0.40) = 0.018$ ].

The expected return for equity typically includes both dividend income and price appreciation (capital gains). Equation 2 expands Equation 1 accordingly:

### Equation (2)

$$r_{at} = p_d r_{pt}(1 - t_d) + p_a r_{pt}(1 - t_{cg})$$

where

$p_d$  = the proportion of  $r_{pt}$  attributed to dividend income

$p_a$  = the proportion of  $r_{pt}$  attributed to price appreciation

$t_d$  = the dividend tax rate

$t_{cg}$  = the capital gains tax rate

The treatment of the capital gains portion of equity returns can be more complex. Assuming no dividend income, a stock with an 8% expected pre-tax return that is subject to a 25% capital gains tax rate has an expected after-tax return of 6% [ $0.08(1 - 0.25) = 0.06$ ]. This is an approximation satisfactory for modeling purposes.<sup>14</sup>

Taxable assets may have existing unrealized capital gains or losses (i.e., the cost basis is below or above market value), which come with embedded tax liabilities (or tax assets). Although there is not a clear consensus on how best to deal with existing unrealized capital gains (losses), many approaches adjust the asset's current market value for the value of the embedded tax liability (asset) to create an after-tax value. Reichenstein (2006) approximates the after-tax value by subtracting the value of the embedded capital gains tax from the market value, as if the asset were sold today. Horan and Al Zaman (2008) assume the asset is sold in the future and discount the tax liability to its present value using the asset's after-tax return as the discount rate. Turvey, Basu, and Verhoeven (2013) argue that the after-tax risk-free rate is the more appropriate discount rate because the embedded tax liability is analogous to an interest-free loan from the government, where the tax liability can be arbitrated away by dynamically investing in the risk-free asset. We will discuss how to incorporate after-tax values into the portfolio optimization process in Section 7, where we address strategies to reduce the impact of taxes.

The ultimate purpose of an asset can be a consideration when modeling tax adjustments. In the preceding material on asset allocation, we discussed goals-based investing. If the purpose

of a given pool of assets is to fund consumption in 10 years, then that 10-year holding period may influence the estimated implied annual capital gains tax rate. If the purpose of the specified pool of assets is to fund a future gift of appreciated stock to a tax-exempt charity, then capital gains tax may be ignored altogether. Through this alignment of goals with assets, goals-based investing facilitates more-precise tax adjustments.

Although correlation assumptions need not be adjusted when modeling asset allocation choices for the taxable asset owner (taxes are proportional to return, after-tax co-movements are the same as pre-tax co-movements), taxes do affect the standard deviation assumption for each asset class. The expected after-tax standard deviation is defined in [Equation 3](#):

### Equation (3)

$$\sigma_{at} = \sigma_{pt}(1 - t)$$

where

$\sigma_{at}$  = the expected after-tax standard deviation

$\sigma_{pt}$  = the expected pre-tax standard deviation

Taxes alter the distribution of returns by both reducing the expected mean return and muting the dispersion of returns. Taxes truncate both the high and low ends of the distribution of returns, resulting in lower highs and higher lows. The effect of taxes is intuitive when considering a positive return, but the same economics apply to a negative return: Losses are muted by the same  $(1 - t)$  tax adjustment. The investor is not taxed on losses but instead receives the economic benefit of a capital loss, whether realized or not. In many countries, a realized capital loss can offset a current or future realized capital gain. An unrealized capital loss captures the economic benefit of a cost basis that is above the current market value, making a portion of expected future appreciation tax free.

How does the optimal asset allocation along a pre-tax efficient frontier compare with the optimal asset allocation along an after-tax efficient frontier? Let's assume all investment assets are taxable and that cost bases equal current market values. Assume also that interest income is taxed at 40%, and dividend income and capital gains are taxed at 25%.

The asset classes we will consider include investment-grade (IG) bonds, high-yield (HY) bonds, and equity. [Exhibit 3](#) shows the expected pre-tax returns and standard deviations for each asset class as well as the correlation matrix. Note that for ease of illustration, we have assumed that the IG bonds and HY bond returns are comprised of 100% interest income. In practice, some portion of the expected return would be eligible for capital gains tax treatment.

### Exhibit 3. Expected Pre-Tax Return and Risk

	Return	Std. Dev.
IG bonds	3.0%	4.0%
HY bonds	5.0%	10.0%
Equity	8.0%	20.0%

Correlations	IG Bonds	HY Bonds	Equity
IG bonds	1.0	0.2	0.0
HY bonds	0.2	1.0	0.7
Equity	0.0	0.7	1.0

Employing mean–variance portfolio optimization with these pre-tax inputs, we obtain the optimal asset allocations in [Exhibit 4](#), which shows the allocations for portfolios P1 (lowest risk), P25, P50 (median risk), P75, and P100 (highest risk)—each on an efficient frontier comprised of 100 portfolios.

### Exhibit 4. Optimal Pre-Tax Asset Mixes

	P1 <sub>pt</sub>	P25 <sub>pt</sub>	P50 <sub>pt</sub>	P75 <sub>pt</sub>	P100 <sub>pt</sub>
IG bonds	93%	52%	25%	0%	0%
HY bonds	5%	18%	26%	33%	0%
Equity	2%	30%	49%	67%	100%

Using [Equations 1, 2, and 3](#), we calculate the expected after-tax returns and standard deviations displayed in [Exhibit 5](#). No adjustments are made to correlations.

### Exhibit 5. Expected After-Tax Return and Risk

	<b>Return</b>	<b>Std. Dev.</b>
IG bonds	1.8%	2.4%
HY bonds	3.0%	6.0%
Equity	6.0%	15.0%

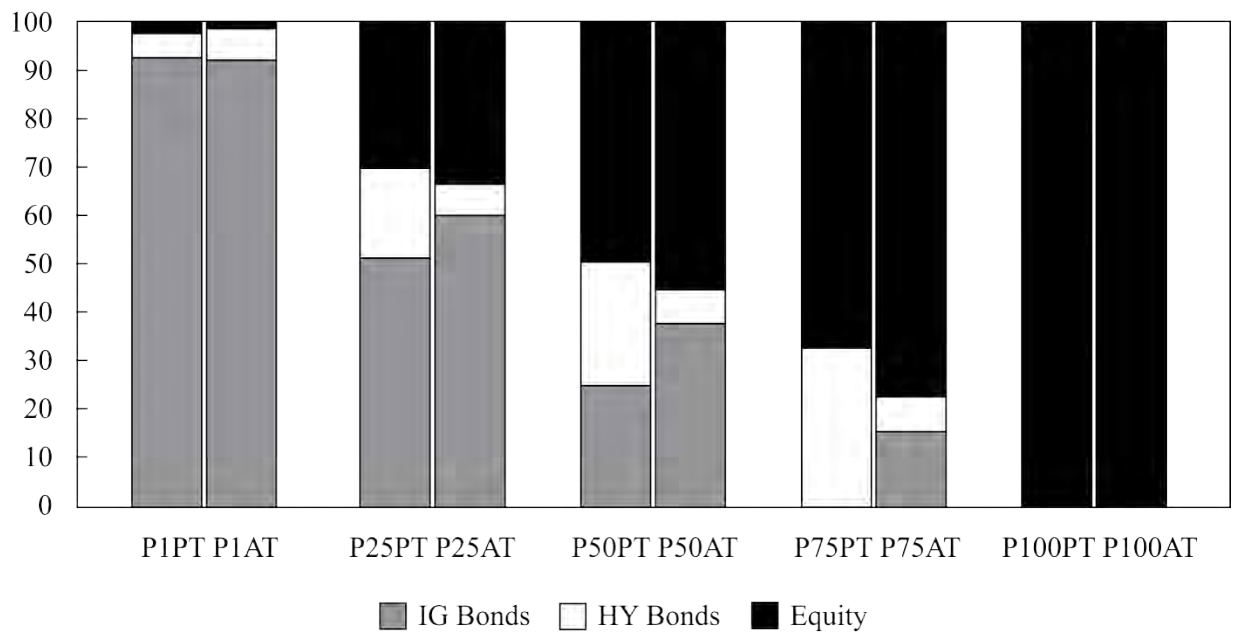
Portfolio optimization using these after-tax inputs produces the optimal asset allocations shown in [Exhibit 6](#).

#### **Exhibit 6. Optimal After-Tax Asset Mixes**

	<b>P1<sub>at</sub></b>	<b>P25<sub>at</sub></b>	<b>P50<sub>at</sub></b>	<b>P75<sub>at</sub></b>	<b>P100<sub>at</sub></b>
IG bonds	92%	60%	38%	16%	0%
HY bonds	7%	7%	7%	7%	0%
Equity	1%	33%	55%	77%	100%

In [Exhibit 7](#), we compare the pre-tax and after-tax efficient frontiers from these previous exhibits. Note that the portfolios at either extreme (P1 and P100) are essentially unchanged after taxes are factored into the assumptions. In portfolios P25, P50, and P75, however, you can see a significant reduction in the allocation to high-yield bonds. This is because of the heavier tax burden imposed on high-yield bonds. Although investment-grade bonds receive the same tax treatment, they are less risky than high-yield bonds and demonstrate a lower correlation with equity, so they continue to play the important role of portfolio risk reduction.

#### **Exhibit 7. Pre-Tax and After-Tax Asset Allocation Comparisons**



The optimal after-tax asset allocation depends on the interaction of after-tax returns, after-tax risk, and correlations. If an asset class or strategy is tax inefficient, it can still play a diversifying role in an optimal after-tax asset allocation if the asset or strategy offers sufficiently low correlations. After-tax portfolio optimization helps answer that question.

## 7. TAXES AND PORTFOLIO REBALANCING AND STRATEGIES TO REDUCE TAX IMPACT

### b. discuss tax considerations in asset allocation and rebalancing;

Among tax-exempt institutional asset owners, periodic portfolio rebalancing—reallocating assets to return the portfolio to its target strategic asset allocation—is an integral part of sound portfolio management. This is no less true for taxable asset owners, but with the important distinction that more frequent rebalancing exposes the taxable asset owner to realized taxes that could have otherwise been deferred or even avoided. Whereas the tax burden incurred by liquidating assets to fund-required consumption cannot be avoided, rebalancing is discretionary; thus, the taxable asset owner should consider the trade-off between the benefits of tax minimization and the merits of maintaining the targeted asset allocation by rebalancing. The decision to rebalance and incur taxes is driven by each asset owner's unique circumstances.

Because after-tax volatility is less than pre-tax volatility ([Equation 3](#)) and asset class correlations remain the same, it takes larger asset class movements to materially alter the risk profile of the taxable portfolio. This suggests that rebalancing ranges for a taxable portfolio can be wider than those of a tax-exempt portfolio with a similar risk profile.

For example, consider a portfolio with a 50% allocation to equity, where equity returns are subject to a 25% tax rate. A tax-exempt investor may establish a target allocation to equities of 50%, with an acceptable range of 40% to 60% (50% plus or minus 10%). A taxable investor with the same target equity allocation can achieve a similar risk constraint with a range of 37% to 63% (50% plus or minus 13%). The equivalent rebalancing range for the taxable investor is derived by adjusting the permitted 10% deviation (up or down) by the tax rate, as shown in [Equation 4](#):

#### **Equation (4)**

$$R_{at} = R_{pt} / (1 - t)$$

where

$R_{at}$  = the after-tax rebalancing range

$R_{pt}$  = the pre-tax rebalancing range

In our example, the 10% rebalancing range for a tax-exempt investor becomes a 13.3% rebalancing range for a taxable investor (when ranges are viewed and monitored from the same gross return perspective):

$$0.10 / (1 - 0.25) = 13.3\%$$

Broader rebalancing ranges for the taxable investor reduce the frequency of trading and, consequently, the amount of taxable gains.

## **7.1. Strategies to Reduce Tax Impact**

Additional strategies can be used to reduce taxes, including tax-loss harvesting and choices in the placement of certain types of assets in taxable or tax-exempt accounts (strategic asset location). Tax-loss harvesting is intentionally trading to realize a capital loss, which is then used to offset a current or future realized capital gain in another part of the portfolio, thereby reducing the taxes owed by the investor. It is discussed elsewhere in the curriculum, but we address strategic asset location strategies here.

Strategic asset location refers to placing (or locating) less tax-efficient assets in accounts with

more favorable tax treatment, such as retirement savings accounts.

Aggregating assets across accounts with differing tax treatment requires modifying the asset value inputs to the portfolio optimization. Assets held in tax-*exempt* accounts require no tax adjustment to their market values. Assets in tax-*deferred* accounts grow tax free but are taxed upon distribution. Because these assets cannot be distributed (and consumed) without incurring the tax, the tax burden is inseparable from the economic value of the assets. Thus, the after-tax value of assets in a tax-deferred account is defined by [Equation 5](#):

### Equation (5)

$$v_{at} = v_{pt}(1 - t_i)$$

where

$v_{at}$  = the after-tax value of assets

$v_{pt}$  = the pre-tax market value of assets

$t_i$  = the expected income tax rate upon distribution

In our earlier example, we had three asset classes: investment-grade bonds, high-yield bonds, and equities. If we assume that each of these three asset classes can be held in either of two account types—taxable or tax-deferred—then our optimization uses six different after-tax asset classes (three asset classes times two account types). The three asset classes in taxable accounts use the after-tax return and risk inputs derived earlier. The three asset classes in tax-deferred accounts (which grow tax free) use expected pre-tax return and risk inputs. The optimization adds constraints based on the after-tax value of the assets currently available in each account type and derives the optimal after-tax asset allocation and asset location simultaneously.

As a general rule, the portion of a taxable asset owner's assets that are eligible for lower tax rates and deferred capital gains tax treatment should first be allocated to the investor's taxable accounts. For example, equities should generally be held in taxable accounts, while taxable bonds and high-turnover trading strategies should generally be located in tax-exempt and tax-deferred accounts to the extent possible.

One important exception to this general rule regarding asset location applies to assets held for near-term liquidity needs. Because tax-exempt and tax-deferred accounts may not be immediately accessible without tax penalty, a portion of the bond allocation may be held in taxable accounts if its role is to fund near-term consumption requirements.

## EXAMPLE 5

# Asset Allocation and the Taxable Investor

1. Sarah Moreau, 45 years old, is a mid-level manager at a consumer products company. Her investment portfolio consists entirely of tax-deferred retirement savings accounts. Through careful savings and investments, she is on track to accumulate sufficient assets to retire at age 60. Her portfolio is currently allocated as indicated below:

Investment-grade bonds	20%
High-yield bonds	20%
Common stock–dividend income strategy	30%
Common stock–total return (capital gain) strategy	30%
Total portfolio	100%

The common stock–dividend income strategy focuses on income-oriented, high-dividend-paying stocks; the common stock–total return strategy focuses on stocks that represent good, long-term opportunities but pay little to no dividend. For the purposes of this example, we will assume that the expected long-term return is equivalent between the two strategies. Moreau has a high comfort level with this portfolio and the overall level of risk it entails.

Moreau has recently inherited additional monies, doubling her investable assets. She intends to use this new, taxable portfolio to support causes important to her personally over her lifetime. There is no change in her risk tolerance. She is interviewing prospective investment managers and has asked each to recommend an asset allocation strategy for the new portfolio using the same set of asset classes. She has received the following recommendations:

	Recommendation		
	A	B	C
Investment-grade bonds	20%	40%	30%
High-yield bonds	20%	0%	0%
Common stock–dividend income strategy	30%	30%	0%
Common stock–total return (capital gain) strategy	30%	30%	70%
Total portfolio	100%	100%	100%



Which asset allocation is *most* appropriate for the new portfolio? Justify your response.

2. How should Moreau distribute these investments among her taxable and tax-exempt accounts?
3. You are a member of the Investment Committee for a multinational corporation, responsible for the supervision of two portfolios. Both portfolios were established to fund retirement benefits: One is a tax-exempt defined benefit pension fund, and the other is taxable, holding assets intended to fund non-exempt retirement benefits. The pension fund has a target allocation of 70% equities and 30% fixed income, with a  $\pm 5\%$  rebalancing range. There is no formal asset allocation policy for the taxable portfolio; it has simply followed the same allocation adopted by the pension portfolio. Because of recent strong equity market returns, both portfolios are now allocated 77% to equities and 23% to bonds. Management expects that the equity markets will continue to produce strong returns in the near term. Staff has offered the following options for rebalancing the portfolios:
  - A. Do not rebalance.
  - B. Rebalance both portfolios to the 70% equity/30% fixed-income target allocation.
  - C. Rebalance the tax-exempt portfolio to the 70% equity/30% fixed-income target allocation, but expand the rebalancing range for the taxable portfolio.

Which recommendation is *most* appropriate? Justify your response.

## **Solution to 1:**

Recommendation C would be the most appropriate asset allocation for the new portfolio. The high-yield bond and common stock–dividend income strategies are tax disadvantaged in a taxable portfolio. (Although investment-grade bonds are also tax disadvantaged, they maintain the role of controlling portfolio risk to maintain Moreau’s risk preference.) By shifting this equity-like risk to the total return common stock strategy, Moreau should achieve a greater after-tax return. Given the lower standard deviation characteristics of after-tax equity returns when held in the taxable portfolio, a higher allocation to common stocks may be justified without exceeding Moreau’s desired risk level. Recommendations A and B do not consider the negative tax implications of holding the high-yield and/or common stock–dividend income strategies in a taxable portfolio. Recommendation B also fails to consider Moreau’s overall risk tolerance: The volatility of the common stock–capital gain strategy is lower when held in a taxable portfolio, thus a higher allocation to this strategy can enhance returns while

remaining within Moreau’s overall risk tolerance.<sup>15</sup>

## Solution to 2:

If Moreau is willing to think of her investable portfolio as a single portfolio, rather than as independent “retirement” and “important causes” portfolios, she should hold the allocation to high-yield bonds and dividend-paying stocks in her tax-exempt retirement portfolio. In addition, subject to the overall volatility of the individual tax-exempt and taxable portfolios, it would be sensible to bear any increased stock risk in the taxable portfolio. A new optimization for *all* of Moreau’s assets—using pre-tax and after-tax risk and return assumptions and subject to the constraint that half of the assets are held in a taxable portfolio and half are held in the tax-exempt portfolio—would more precisely allocate investments across portfolio (account) types.

### Asset Location for Optimal Tax Efficiency

	<b>Tax Advantaged Retirement Account</b>	<b>Taxable Account</b>
Investment-grade bonds	X	
High-yield bonds	X	
Common stock–dividend income strategy	X	
Common stock–total return (capital gain) strategy		X

## Solution to 3:

Recommendation C is the most appropriate course of action. Rebalancing of the tax-exempt portfolio is unencumbered by tax considerations, and rebalancing maintains the desired level of risk. The rebalancing range for the taxable portfolio can be wider than that of the tax-exempt portfolio based on the desire to minimize avoidable taxes and the lower volatility of after-tax equity returns. Recommendation A (no rebalancing) does not address the increased level of risk in the tax-exempt portfolio that results from the increase in the stock allocation. Recommendation B would create an unnecessary tax liability for the company, given that the portfolio is still operating in a reasonable range of risk when adjusted for taxes.

# Increasing Allocations to Fixed Income in Corporate Pension Plans

Increasing allocations to fixed income by defined benefit pension funds worldwide have been driven largely by a desire to better hedge plan liabilities. In some countries, accounting standards discourage de-risking. De-risking, however, is not the only argument in favor of a higher fixed-income allocation.

## De-risking

There has been much discussion globally of pension plans “de-risking”—moving toward larger fixed-income allocations to better hedge liabilities, thereby reducing contribution uncertainty. Some countries’ accounting rules, however—most notably those in the United States—discourage companies from moving in that direction. Under US GAAP accounting rules, for example, a higher allocation to equities allows the plan sponsor to employ a higher return assumption, thereby reducing pension cost, a non-cash expense that directly affects reported income.

For underfunded pension plans, de-risking leads to higher pension contributions. If a company has a weak core business with a higher-than-average probability of going bankrupt and makes only the minimum required contribution, it might be argued that the asset allocation decision was contrary to the interests of plan participants. If the company were to go bankrupt, the participants would get only the benefits covered by any government guaranty program. Had the company taken equity risk in the plan, there would have been a possibility of closing the funding gap, resulting in higher benefit payments.

## Efficient Allocation of Risk

A higher allocation to fixed income—and a lower allocation to equity—might also be driven by corporate governance considerations. Pension investment activities are not a core competency of many companies, especially non-financial companies. Assuming that the company has a limited appetite for risk, shareholders might prefer that management allocate its risk budget to the core business of the company where they are expected to have skill, rather than to the pension fund. The rewards per unit of risk should presumably be greater in the company’s core business, and the improved profitability should offset the increase in pension contributions required as a result of the

lower equity allocation.

## A Holistic Approach to Asset Location

Finally, some have argued that an asset allocation of 100% fixed-income securities can be justified on the premise that the company is acting as an agent for the benefit of all stakeholders, including shareholders and plan participants. This argument centers on tax-efficient asset location. A taxable investor—the shareholder and plan participant—should prefer to take his long-term equity risk in that portion of his overall portfolio where he will receive the benefit of lower capital gains rates rather than in tax-deferred accounts, the proceeds of which will be taxed at income tax rates. Consider a small business owner with US\$3 million in total assets. The assets are split between a pension fund of which he is the sole participant (US\$1 million) and a taxable portfolio (US\$2 million). Assume that the asset allocation that represents his preferred level of risk is 67% equities and 33% fixed income. Where should this individual hold his equity exposure? As discussed, the more favorable tax treatment of equity returns argues for holding the equity exposure in his taxable account, while the investments subject to the higher tax rate should be held in the tax-deferred account—the pension plan. Theoretically, this tax efficiency argument can be extended to pension funds operated by publicly traded companies.<sup>16</sup>

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## 8. REVISING THE STRATEGIC ASSET ALLOCATION

- c. recommend and justify revisions to an asset allocation given change(s) in investment objectives and/or constraints;

An asset owner's strategic asset allocation is not a static decision. Circumstances often arise that justify revisiting the original decision, either to confirm its appropriateness or to consider a change to the current allocation strategy. It is sound financial practice to periodically re-examine the asset allocation strategy even in the absence of one of the external factors discussed next. Many institutional asset owners typically re-visit the asset allocation policy at least once every five years through a formal asset allocation study, and all asset owners should affirm annually that the asset allocation remains appropriate given their needs and circumstances.

The circumstances that might trigger a special review of the asset allocation policy can generally be classified as relating to a change in *goals*, a change in *constraints*, or a change in *beliefs*. Among the reasons to review the strategic asset allocation are the following:

## 8.1. Goals

- Changes in business conditions affecting the organization supporting the fund and, therefore, expected changes in the cash flows
- A change in the investor's personal circumstances that may alter her risk appetite or risk capacity

Over an individual's lifespan, or throughout the course of an institutional fund's lifespan, it is unlikely that the investment goals and objectives will remain unchanged. An individual may get married, have children, or become disabled, for example, each of which may have implications for the asset allocation strategy.

Significant changes in the core business of an organization supporting or benefiting from the trust might prompt a re-examination of the asset allocation strategy. For example, an automobile manufacturer that has historically generated a significant portion of its revenues from its consumer finance activities may find that technology is disrupting this source of revenue as more online tools become available to car buyers. With greater uncertainty in its revenue stream, company management may move to reduce risk-taking in the pension fund in order to achieve a goal of reducing the variability in year-to-year contributions.

A university may embark on a long-term capital improvement plan that is reliant on the endowment fund for financial support. Or the university may be experiencing declining enrollments and must lean more heavily on the endowment fund to support its ongoing operational expenditures. The source of funds to a sovereign wealth fund may shrink considerably or even evaporate. When any of these, or similar, events occur or are anticipated, the existing asset allocation policy should be re-evaluated.

## 8.2. Constraints

A material change in any one of the constraints mentioned earlier—time horizon, liquidity needs, asset size, or regulatory or other external constraints—is also reason to re-examine the existing asset allocation policy. Some of these changes might include the following:

- Changes in the expected payments from the fund

- A significant cash inflow or unanticipated expenditure
- Changes in regulations governing donations or contributions to the fund
- Changes in time horizon resulting from the adoption of a lump sum distribution option at retirement
- Changes in asset size as a result of the merging of pension plans

Changes in the expected payments from the fund can materially affect the asset allocation strategy. For example, a university reduces its spending policy from 5% to 4% of assets annually; an individual retires early, perhaps for health reasons or an involuntary late-career layoff; or a US corporate pension sponsor reduces or freezes pension benefits because it can no longer afford increasing Pension Benefit Guaranty Corporation<sup>17</sup> premiums. Faced with lower payouts, the university endowment may have greater latitude to invest in less liquid segments of the market. Decisions as to how and where to invest given this greater flexibility should be made within the framework of an asset allocation study to ensure the resulting allocation achieves the optimal trade-off of risk and return.

Similarly, a significant cash inflow has the potential to materially affect the asset allocation strategy. If a university endowment fund with £500 million in assets receives a gift of £100 million, the new monies *could* be invested in parallel with the existing assets, but that fails to consider the increased earning potential of the fund and any spending requirements associated with the donation. Pausing to formally reassess the fund's goals, objectives, constraints, and opportunities through an asset allocation study allows the asset owner to consider more broadly how best to maximize this additional wealth.

A change in regulations may also give rise to a change in asset allocation policy. Examples of regulatory changes that could trigger a re-examination of the asset allocation include the following:

- Regulatory changes in the United States in 2006 mandated a change in the liability discount rate, which resulted in larger pension contributions. With higher required contributions, there was less need to reach for higher investment returns. Many US corporate pension plans began de-risking (adopting an asset allocation strategy focused on hedging the liabilities) to reduce contribution volatility.
- UK tax incentives (30% of social impact investment costs can be deducted from income tax) and relaxed regulations for institutional investors were instituted to encourage socially responsible (impact) investing.

Again, an asset allocation study to objectively evaluate the effect of these changes on the investment opportunity set can help ensure that any new investment strategies adopted are consistent with the fund's overarching goals and objectives.

## 8.3. Beliefs

Investment beliefs are a set of guiding principles that govern the asset owner's investment activities. Beliefs are not static, however, and changes in the economic environment and capital market expectations or a change in trustees or committee members are two factors that may lead to an altering of the principles that guide investment activities.<sup>18</sup>

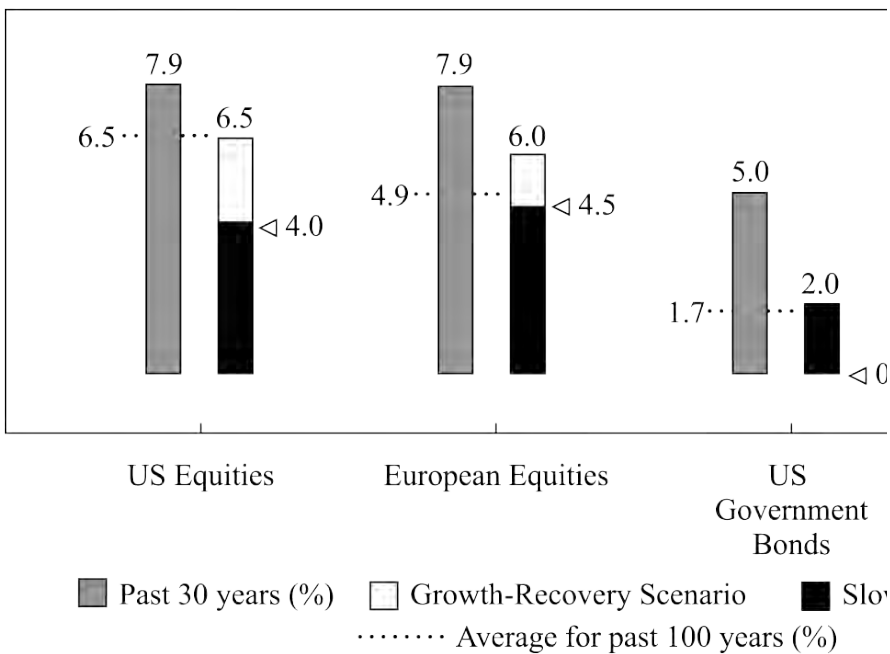
An integral aspect of any asset allocation exercise is the forecasting of expected returns, volatilities, and correlations of the asset classes in the opportunity set. It follows, then, that a material change in the outlook for one or more of the asset classes may heavily influence the asset allocation outcome.

Consider the 2015–2016 environment relative to the environment that prevailed in 1984–2014. The 1984–2014 investing environment was characterized by declining inflation and interest rates (from the extraordinarily high levels of the 1970s and early 1980s); strong global GDP growth, aided by favorable demographics; gains in productivity; and rapid growth in China. Corporate profit growth was extremely robust, reflecting revenue growth from new markets, declining corporate taxes over the period, and improved efficiencies. Despite increased market turbulence, returns on US and Western European equities and bonds during the past 30 years were considerably higher than the long-run trend.

The environment of 2015–2016 was much less favorable for investors. The dramatic decline in inflation and interest rates ended, and labor force expansion and productivity gains stalled, with negative implications for GDP growth. The largest developed-country companies that generated much of the profits of the past 30 years were faced with competitive pressures as emerging-market companies expanded and technology advances changed the competitive landscape. In April 2016, McKinsey Global Institute published a projection of stocks and bonds under two growth scenarios—a slow growth scenario and a moderate growth scenario ([Exhibit 8](#)). In neither instance do the expected returns of the next 30 years come close to the returns of the past 30 years.<sup>19</sup> Clearly, an asset allocation developed in 2010 built on return expectations based on the prior 26 years would look materially different than an asset allocation developed using more current, forward-looking return assumptions.

### **Exhibit 8. A Major Shift in Underlying Return Assumptions**





*Notes:*

Numbers for growth-recovery and slow-growth scenarios reflect the range between the growth scenario and the high end of the growth-recovery scenario.

European equities: Weighted average real returns based on each year's Geary-K GDP for 14 countries in Western Europe.

US and European government bonds: Bond duration for United States is primarily 20 years; duration varies by country but is typically 20 years.

Source: McKinsey Global Institute ([www.mckinsey.com/industries/private-equity-investors/our-insights/why-investors-may-need-to-lower-their-sights](http://www.mckinsey.com/industries/private-equity-investors/our-insights/why-investors-may-need-to-lower-their-sights)).

Finally, as new advisers or members join the Investment Committee, they bring their own beliefs and biases regarding certain investment activities. Conduct a study to educate these new members of the oversight group and inform them of the investment philosophy and process that has been adopted by the firm. Ensure their integration into the governance system and ensure that they align with the asset owner's goals and objectives.

In some instances, a change to an asset allocation strategy may occur without a formal asset allocation study. Certain milestones are required to implement a change in the policy, in most instances, reducing the number of funds, these "milestones" are typically related to changes in the portfolio. Anticipating these milestones by putting an asset allocation policy in place before these changes allows the investor to respond more quickly to change in a non-reactive and objective manner. This rebalancing policy is often referred to as a "glide path." Target-date mutual funds common in retirement investments use a glide path to gradually shift the asset allocation over time.











































































































# GLOSSARY

## A

### **Absolute return benchmark**

A minimum target return that an investment manager is expected to beat.

### **Accounting defeasance**

Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

### **Accumulation phase**

Phase where the government predominantly contributes to a sovereign wealth pension reserve fund.

### **Active management**

A portfolio management approach that allows risk factor mismatches relative to a benchmark index causing potentially significant return differences between the active portfolio and the underlying benchmark.

### **Active return**

Portfolio return minus benchmark return.

### **Active risk**

The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

### **Active risk budgeting**

Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).



## **Active share**

A measure of how similar a portfolio is to its benchmark. A manager who precisely replicates the benchmark will have an Active Share of zero; a manager with no holdings in common with the benchmark will have an Active Share of one.

## **Activist short selling**

A hedge fund strategy in which the manager takes a short position in a given security and then publicly presents his/her research backing the short thesis.

## **After-tax excess return**

Calculated as the after-tax return of the portfolio minus the after-tax return of the associated benchmark portfolio.

## **Agency trade**

A trade in which the broker is engaged to find the other side of the trade, acting as an agent. In doing so, the broker does not assume any risk for the trade.

## **Alpha decay**

In a trading context, alpha decay is the erosion or deterioration in short term alpha after the investment decision has been made.

## **Alternative trading systems**

(ATS) Non-exchange trading venues that bring together buyers and sellers to find transaction counterparties. Also called *multilateral trading facilities (MTF)*.

## **Anchoring and adjustment**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anchoring and adjustment bias**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anomalies**

Apparent deviations from market efficiency.

## **Arithmetic attribution**

An attribution approach which explains the arithmetic difference between the portfolio return and its benchmark return. The single-period attribution effects sum to the excess return, however, when combining multiple periods, the sub-period attribution effects will not sum to the excess return.

## **Arrival price**

In a trading context, the arrival price is the security price at the time the order was released to the market for execution.

## **Asset location**

The type of account an asset is held within, e.g., taxable or tax deferred.

## **Asset-only**

With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

## **Asset swap spread (ASW)**

The spread over MRR on an interest rate swap for the remaining life of the bond that is equivalent to the bond's fixed coupon.

## **Asset swaps**

Convert a bond's fixed coupon to MRR plus (or minus) a spread.

## **Authorized participants**

Institutional investors who create and redeem ETF shares using an OTC primary market with an ETF sponsor.

## **Availability bias**

An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

# **B**

## **Back-fill bias**

The distortion in index or peer group data which results when returns are reported to a database only after they are known to be good returns.

## **Barbell**

A fixed-income investment strategy combining short- and long-term bond positions.

## **Base**

With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in “one unit of a currency.”

## **Base-rate neglect**

A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

## **Basis risk**

The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

## **Bear flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in short-term bond yields-to-maturity.

## **Bear spread**

An option strategy that becomes more valuable when the price of the underlying asset declines, so requires buying one option and writing another with a *lower* exercise price. A put bear spread involves buying a put with a higher exercise price and selling a put with a lower exercise price. A bear spread can also be executed with calls.

## **Bear steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in long-term bond yields-to-maturity.

## **Behavioral finance macro**

A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

## **Behavioral finance micro**

A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

## **Bequest**

The transferring, or bequeathing, of assets in some other way upon a person's death. Also referred to as a testamentary bequest or testamentary gratuitous transfer.

## **Best-in-class**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *positive screening*.

## **Bid price**

In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

## **Breadth**

The number of truly independent decisions made each year.

## **Buffering**

Establishing ranges around breakpoints that define whether a stock belongs in one index or another.

## **Bull flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in long-term bond yields-to-maturity.

## **Bull spread**

An option strategy that becomes more valuable when the price of the underlying asset rises, so requires buying one option and writing another with a *higher* exercise price. A call bull spread involves buying a call with a lower exercise price and selling a call with a higher exercise price. A bull spread can also be executed with puts.

## **Bull steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in short-term bond yields-to-maturity.

## **Bullet**

A fixed-income investment strategy that focuses on the intermediate term (or “belly”) of the yield curve.

## **Business cycle**

Fluctuations in GDP in relation to long-term trend growth, usually lasting 9-11 years.

## **Butterfly spread**

A measure of yield curve shape or curvature equal to double the intermediate yield-to-maturity less the sum of short- and long-term yields-to-maturity.

## **Butterfly strategy**

A common yield curve shape strategy that combines a long or short bullet position with a barbell portfolio in the opposite direction to capitalize on expected yield curve shape changes.

# **C**

## **Calendar rebalancing**

Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

## **Calendar spread**

A strategy in which one sells an option and buys the same type of option but with different expiration dates, on the same underlying asset and with the same strike. When the investor buys the more distant (near-term) call and sells the near-term (more distant) call, it is a long (short) calendar spread.

## **Canada model**

Characterized by a high allocation to alternatives. Unlike the endowment model, however, the Canada model relies more on internally managed assets. The innovative features of the Canada model are the: a) reference portfolio, b) total portfolio approach, and c) active management.

## **Capital gain or loss**

For tax purposes equals the selling price (net of commissions and other trading costs) of the asset less its tax basis.

## **Capital market expectations**

(CME) Expectations concerning the risk and return prospects of asset classes.

## **Capital needs analysis**

See *capital sufficiency analysis*.

## **Capital sufficiency analysis**

The process by which a wealth manager determines whether a client has, or is likely to accumulate, sufficient financial resources to meet his or her objectives; also known as *capital needs analysis*.

## **Capture ratio**

A measure of the manager's gain or loss relative to the gain or loss of the benchmark.

## **Carhart model**

A four factor model used in performance attribution. The four factors are: market (RMRF), size (SMB), value (HML), and momentum (WML).

## **Carry trade**

A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

## **Carry trade across currencies**

A strategy seeking to benefit from a positive interest rate differential across currencies by combining a short position (or borrowing) in a low-yielding currency and a long position (or lending) in a high-yielding currency.

## **Cash drag**

Tracking error caused by temporarily uninvested cash.

## **Cash flow matching**

Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives.

## **Cash-secured put**

An option strategy involving the writing of a put option and simultaneously depositing an amount of money equal to the exercise price into a designated account (this strategy is also called a fiduciary put).

## **CDS curve**

Plot of CDS spreads across maturities for a single reference entity or group of reference entities in an index.

## **Cell approach**

See *stratified sampling*.

## **Charitable gratuitous transfers**

Asset transfers to not-for-profit or charitable organizations. In most jurisdictions charitable donations are not subject to a gift tax and most jurisdictions permit income tax deductions for charitable donations.

## **Charitable remainder trust**

A trust setup to provide income for the life of named-beneficiaries. When the last named-beneficiary dies any remaining assets in this trust are distributed to the charity named in the trust, hence the term *charitable remainder* trust.

## **Closet indexer**

A fund that advertises itself as being actively managed but is substantially similar to an index fund in its exposures.

## **Cognitive cost**

The effort involved in processing new information and updating beliefs.

## **Cognitive dissonance**

The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

## **Cognitive errors**

Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

## **Collar**

An option position in which the investor is long shares of stock and then buys a put with an exercise price below the current stock price and writes a call with an exercise price above the current stock price. Collars allow a shareholder to acquire downside protection through a protective put but reduce the cash outlay by writing a covered call.

## **Completion overlay**

A type of overlay that addresses an indexed portfolio that has diverged from its proper exposure.

## **Completion portfolio**

Is an index-based portfolio that when added to a given concentrated asset position creates an overall portfolio with exposures similar to the investor's benchmark.

## **Conditional value at risk**

(CVaR) Also known as expected loss The average portfolio loss over a specific time period conditional on that loss exceeding the value at risk (VaR) threshold.

## **Confirmation bias**

A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

## **Conjunction fallacy**

An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

## **Conservatism bias**

A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

## **Contingent immunization**

Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.



## **Controlled foreign corporation (CFC)**

A company located outside a taxpayer's home country in which the taxpayer has a controlling interest as defined under the home country law.

## **Covered call**

An option strategy in which a long position in an asset is combined with a short position in a call on that asset.

## **Covered interest rate parity**

The relationship among the spot exchange rate, the forward exchange rate, and the interest rate in two currencies that ensures that the return on a hedged (i.e., covered) foreign risk-free investment is the same as the return on a domestic risk-free investment. Also called *interest rate parity*.

## **Credit cycle**

The expansion and contraction of credit over the business cycle, which translates into asset price changes based on default and recovery expectations across maturities and rating categories.

## **Credit default swap (CDS) basis**

Yield spread on a bond, as compared to CDS spread of same tenor.

## **Credit loss rate**

The realized percentage of par value lost to default for a group of bonds equal to the bonds' default rate multiplied by the loss severity.

## **Credit migration**

The change in a bond's credit rating over a certain period.

## **Credit valuation adjustment (CVA)**

The present value of credit risk for a loan, bond, or derivative obligation.

## **Cross-currency basis swap**

An interest rate swap involving the periodic exchange of floating payments in one currency for another based upon respective market reference rates with an initial and final exchange of notional principal.

## **Cross hedge**

A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

## **Cross-sectional consistency**

A feature of expectations setting which means that estimates for all classes reflect the same underlying assumptions and are generated with methodologies that reflect or preserve important relationships among the asset classes, such as strong correlations. It is the internal consistency across asset classes.

## **Cross-sectional momentum**

A managed futures trend following strategy implemented with a cross-section of assets (within an asset class) by going long those that are rising in price the most and by shorting those that are falling the most. This approach generally results in holding a net zero (market-neutral) position and works well when a market's out- or underperformance is a reliable predictor of its future performance.

## **Currency overlay**

A type of overlay that helps hedge the returns of securities held in foreign currency back to the home country's currency.

## **Currency overlay programs**

A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

## **Custom security-based benchmark**

Benchmark that is custom built to accurately reflect the investment discipline of a particular investment manager. Also called a *strategy benchmark* because it reflects a manager's particular strategy.

## **D**

## **Decision price**

In a trading context, the decision price is the security price at the time the investment decision was made.

### **Decision-reversal risk**

The risk of reversing a chosen course of action at the point of maximum loss.

### **Decumulation phase**

Phase where the government predominantly withdraws from a sovereign wealth pension reserve fund.

### **Dedicated short-selling**

A hedge fund strategy in which the manager takes short-only positions in equities deemed to be expensively priced versus their deteriorating fundamental situations. Short exposures may vary only in terms of portfolio sizing by, at times, holding higher levels of cash.

### **Default intensity**

POD over a specified time period in a reduced form credit model.

### **Default risk**

Likelihood that a borrower will default or fail to meet its obligation to make full and timely payments of principal and interest according to the terms of a debt obligation.

### **Deferred annuity**

An annuity that enables an individual to purchase an income stream that will begin at a later date.

### **Defined benefit**

A retirement plan in which a plan sponsor commits to paying a specified retirement benefit.

### **Defined contribution**

A retirement plan in which contributions are defined but the ultimate retirement benefit is not specified or guaranteed by the plan sponsor.

### **Delay cost**

The (trading related) cost associated with not submitting the order to the market in a timely manner.

## **Delta**

The change in an option's price in response to a change in price of the underlying, all else equal.

## **Delta hedging**

Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

## **Demand deposits**

Accounts that can be drawn upon regularly and without notice. This category includes checking accounts and certain savings accounts that are often accessible through online banks or automated teller machines (ATMs).

## **Diffusion index**

An index that measures how many indicators are pointing up and how many are pointing down.

## **Direct market access**

(DMA) Access in which market participants can transact orders directly with the order book of an exchange using a broker's exchange connectivity.

## **Disability income insurance**

A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

## **Discount margin**

The discount (or required) margin is the yield spread versus the MRR such that the FRN is priced at par on a rate reset date.

## **Discretionary portfolio management**

An arrangement in which a wealth manager has a client's pre-approval to execute investment decisions.

## **Discretionary trust**

A trust that enables the trustee to determine whether and how much to distribute based on a beneficiary's general welfare.

## **Disposition effect**

As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

## **Dividend capture**

A trading strategy whereby an equity portfolio manager purchases stocks just before their ex-dividend dates, holds these stocks through the ex-dividend date to earn the right to receive the dividend, and subsequently sells the shares.

## **Domestic asset**

An asset that trades in the investor's domestic currency (or home currency).

## **Domestic currency**

The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

## **Domestic-currency return**

A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

## **Double taxation**

A term used to describe situations in which income is taxed twice. For example, when corporate earnings are taxed at the company level and then that portion of earnings paid as dividends is taxed again at the investor level.

## **Drawdown**

A decline in value (represented by a series of negative returns only) following a peak fund valuation.

## **Drawdown duration**

The total time from the start of the drawdown until the cumulative drawdown recovers to zero.

## **Due diligence**

Investigation and analysis in support of an investment action, decision, or recommendation.

## **Duration matching**

Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

## **Duration times spread**

Weighting of spread duration by credit spread in order to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage, rather than absolute, basis.

## **Duration Times Spread (DTS)**

Weighting of spread duration by credit spread to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage rather than absolute basis.

## **Dynamic asset allocation**

A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

## **Dynamic hedge**

A hedge requiring adjustment as the price of the hedged asset changes.

# **E**

## **Earnings risk**

The risk associated with the earning potential of an individual.

## **Econometrics**

The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

## **Economic balance sheet**

A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet*.

## **Economic indicators**

Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

## **Economic net worth**

The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

## **Effective federal funds (FFE) rate**

The fed funds rate actually transacted between depository institutions, not the Fed's target federal funds rate.

## **Emotional biases**

Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

## **Empirical duration**

Estimation of the price-yield relationship using historical bond market data in statistical models.

## **Endowment bias**

An emotional bias in which people value an asset more when they hold rights to it than when they do not.

## **Endowment model**

Characterized by a high allocation to alternative investments (private investments and hedge funds), significant active management, and externally managed assets.

## **Enhanced indexing approach**

Maintains a close link to the benchmark but attempts to generate a modest amount of outperformance relative to the benchmark.

## **Enhanced indexing strategy**

Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

## **Equity monetization**

A group of strategies that allow investors to receive cash for their concentrated stock positions without an outright sale. These transactions are structured to avoid triggering the capital gains tax.

## **Estate**

Consists of all of the property a person owns or controls, which may consist of financial assets (e.g., bank accounts, stocks, bonds, business interests), tangible personal assets (e.g., artwork, collectibles, vehicles), immovable property (e.g., residential real estate, timber rights), and intellectual property (e.g., royalties).

## **Estate planning**

The process of preparing for the disposition of one's estate upon death and during one's lifetime.

## **Estate tax**

Levied on the total value of a deceased person's assets and paid out of the estate before any distributions to beneficiaries.

## **Evaluated pricing**

*See matrix pricing.*

## **Excess return**

Used in various senses appropriate to context: 1) The difference between the portfolio return and the benchmark return; 2) The return in excess of the risk-free rate.

## **Excess spread**

Credit spread return measure that incorporates both changes in spread and expected credit losses for a given period.



## **Exchange fund**

A partnership in which each of the partners have each contributed low cost-basis stock to the fund. Used in the United States as a mechanism to achieve a tax-free exchange of a concentrated asset position.

## **Execution cost**

The difference between the (trading related) cost of the real portfolio and the paper portfolio, based on shares and prices transacted.

## **Exhaustive**

An index construction strategy that selects every constituent of a universe.

## **Expected shortfall**

The average loss conditional on exceeding the VaR cutoff; sometimes referred to as *conditional VaR* or *expected tail loss*.

## **Expected tail loss**

See *expected shortfall*.

## **Extended portfolio assets and liabilities**

Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

# **F**

## **Factor-model-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

## **Family constitution**

Typically a non-binding document that sets forth an agreed-upon set of rights, values, and responsibilities of the family members and other stakeholders. Used by many wealth- and business-owning families as the starting point of conflict resolution

procedures.

## **Family governance**

The process for a family's collective communication and decision making designed to serve current and future generations based on the common values of the family.

## **Financial capital**

The tangible and intangible assets (excluding human capital) owned by an individual or household.

## **Fixed trust**

Distributions to beneficiaries of a fixed trust are specified in the trust document to occur at certain times or in certain amounts.

## **Forced heirship**

Is the requirement that a certain proportion of assets must pass to specified family members, such as a spouse and children.

## **Foreign assets**

Assets denominated in currencies other than the investor's home currency.

## **Foreign currency**

Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

## **Foreign-currency return**

The return of the foreign asset measured in foreign-currency terms.

## **Forward rate bias**

An empirically observed divergence from interest rate parity conditions that active investors seek to benefit from by borrowing in a lower-yield currency and investing in a higher-yield currency.

## **Foundation**

A legal entity available in certain jurisdictions. Foundations are typically set up to hold assets for a specific charitable purpose, such as to promote education or for

philanthropy. When set up and funded by an individual or family and managed by its own directors, it is called a *private foundation*. The term *family foundation* usually refers to a private foundation where donors or members of the donors' family are actively involved.

## **Framing**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Framing bias**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Fulcrum securities**

Partially-in-the-money claims (not expected to be repaid in full) whose holders end up owning the reorganized company in a corporate reorganization situation.

## **Full replication approach**

When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

## **Fund-of-funds**

A fund of hedge funds in which the fund-of-funds manager allocates capital to separate, underlying hedge funds (e.g., single manager and/or multi-manager funds) that themselves run a range of different strategies.

## **Funding currencies**

The low-yield currencies in which borrowing occurs in a carry trade.

# **G**

## **G-spread**

Yield spread for a fixed-rate bond over a government benchmark.

## **Gamblers' fallacy**

A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

## **Gamma**

The change in an option's delta for a change in price of the underlying, all else equal.

## **General account**

Account holding assets to fund future liabilities from traditional life insurance and fixed annuities, the products in which the insurer bears all the risks—particularly mortality risk and longevity risk.

## **Generation-skipping tax**

Taxes levied in some jurisdictions on asset transfers (gifts) that skip one generation such as when a grandparent transfers assets to their grandchildren. (see related Gift Tax).

## **Gift tax**

Depending on the tax laws of the country, assets gifted by one person to another during the giftor's lifetime may be subject to a gift tax.

## **Goals-based**

With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

## **Goals-based investing**

An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

## **Green bonds**

Fixed-income instruments issued by private or public sector borrowers that directly fund ESG initiatives.

## **Grinold–Kroner model**

An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

# H

## **Halo effect**

An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

## **Hard-catalyst event-driven approach**

An event-driven approach in which investments are made in reaction to an already announced corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) in which security prices related to the event have yet to fully converge.

## **Hazard rate**

The conditional POD, or the likelihood that default will occur given that it has not already occurred in a prior period.

## **Health insurance**

A type of insurance used to cover health care and medical costs.

## **Health risk**

The risk associated with illness or injury.

## **Hedge ratio**

The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

## **Herding**

When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

## **High-water mark**

A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

## **Hindsight bias**

A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

### **Holdings-based attribution**

A “buy and hold” attribution approach which calculates the return of portfolio and benchmark components based upon the price and foreign exchange rate changes applied to daily snapshots of portfolio holdings.

### **Holdings-based style analysis**

A bottom-up style analysis that estimates the risk exposures from the actual securities held in the portfolio at a point in time.

### **Holistic balance sheet**

*See economic balance sheet.*

### **Home bias**

A preference for securities listed on the exchanges of one’s home country.

### **Home-country bias**

The favoring of domestic over non-domestic investments relative to global market value weights.

### **Home currency**

*See domestic currency.*

### **Human capital**

An implied asset; the net present value of an investor’s future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital*.

## **I**

### **I-spread (interpolated spread)**

Yield spread measure using swaps or constant maturity Treasury YTM as a benchmark.

## **Illusion of control**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Illusion of control bias**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Immediate annuity**

An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

## **Immunization**

An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

## **Impact investing**

Investment approach that seeks to achieve targeted social or environmental objectives along with measurable financial returns through engagement with a company or by direct investment in projects or companies.

## **Implementation shortfall**

(IS) The difference between the return for a notional or paper portfolio, where all transactions are assumed to take place at the manager's decision price, and the portfolio's actual return, which reflects realized transactions, including all fees and costs.

## **Implied volatility**

The outlook for the future volatility of the underlying asset's price. It is the value (i.e., standard deviation of underlying's returns) that equates the model (e.g., Black–Scholes–Merton model) price of an option to its market price.

## **Implied volatility surface**

A three-dimensional plot, for put and call options on the same underlying asset, of days to expiration ( $x$ -axis), option strike prices ( $y$ -axis), and implied volatilities ( $z$ -axis). It

simultaneously shows the volatility skew (or smile) and the term structure of implied volatility.

### **Incremental VaR (or partial VaR)**

The change in the minimum portfolio loss expected to occur over a given time period at a specific confidence level resulting from increasing or decreasing a portfolio position.

### **Information coefficient**

Formally defined as the correlation between forecast return and actual return. In essence, it measures the effectiveness of investment insight.

### **Inheritance tax**

Paid by each individual beneficiary of a deceased person's estate on the value of the benefit the individual received from the estate.

### **Input uncertainty**

Uncertainty concerning whether the inputs are correct.

### **Interaction effect**

The attribution effect resulting from the interaction of the allocation and selection decisions.

### **Intertemporal consistency**

A feature of expectations setting which means that estimates for an asset class over different horizons reflect the same assumptions with respect to the potential paths of returns over time. It is the internal consistency over various time horizons.

### **Intestate**

A person who dies without a valid will or with a will that does not dispose of their property are considered to have died intestate.

### **Intrinsic value**

The difference between the spot exchange rate and the strike price of a currency option.

### **Investment currencies**

The high-yielding currencies in a carry trade.



## **Investment policy statement**

A written planning document that describes a client's investment objectives and risk tolerance over a relevant time horizon, along with the constraints that apply to the client's portfolio.

## **Investment style**

A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

## **Irrevocable trust**

The person whose assets are used to create the trust gives up the right to rescind the trust relationship and regain title to the trust assets.

# **K**

## **Key person risk**

The risk that results from over-reliance on an individual or individuals whose departure would negatively affect an investment manager.

## **Key rate duration**

A method of measuring interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

## **Knock-in/knock-out**

Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

# **L**

## **Leading economic indicators**

A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

## **Liability-based mandates**

Mandates managed to match or cover expected liability payments (future cash outflows) with future projected cash inflows.

## **Liability-driven investing**

An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

## **Liability driven investing (LDI) model**

In the LDI model, the primary investment objective is to generate returns sufficient to cover liabilities, with a focus on maximizing expected surplus return (excess return of assets over liabilities) and managing surplus volatility.

## **Liability glide path**

A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

## **Liability insurance**

A type of insurance used to manage liability risk.

## **Liability-relative**

With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

## **Liability risk**

The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

## **Life-cycle finance**

A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

## **Life insurance**

A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

## **Life settlement**

The sale of a life insurance contract to a third party. The valuation of a life settlement typically requires detailed biometric analysis of the individual policyholder and an understanding of actuarial analysis.

## **Limited-life foundations**

A type of foundation where founders seek to maintain control of spending while they (or their immediate heirs) are still alive.

## **Liquidity budget**

The portfolio allocations (or weightings) considered acceptable for the liquidity categories in the liquidity classification schedule (or time-to-cash table).

## **Liquidity classification schedule**

A liquidity management classification (or table) that defines portfolio liquidity “buckets” or categories based on the estimated time it would take to convert assets in that particular category into cash.

## **Longevity risk**

The risk of outliving one’s financial resources.

## **Loss-aversion bias**

A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

## **Loss severity**

Also known as loss given default (LGD). The amount of loss if a default occurs, usually expressed as a percentage in annual terms.

# **M**

## **Macro attribution**

Attribution at the sponsor level.

## **Manager peer group**

See *manager universe*.

## **Manager universe**

A broad group of managers with similar investment disciplines. Also called *manager peer group*.

## **Matrix pricing**

An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

## **Matrix pricing (or evaluated pricing)**

Methodology for pricing infrequently traded bonds using bonds from similar issuers and actively traded government benchmarks to establish a bond's fair value.

## **Mental accounting bias**

An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

## **Micro attribution**

Attribution at the portfolio manager level.

## **Minimum-variance hedge ratio**

A mathematical approach to determining the optimal cross hedging ratio.

## **Mission-related investing**

Aims to direct a significant portion of assets in excess of annual grants into projects promoting a foundation's mission.

## **Model uncertainty**

Uncertainty as to whether a selected model is correct.

## **Mortality table**

A table that indicates individual life expectancies at specified ages.

## **Multi-class trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and involves buying and selling different classes of shares of the same company, such as voting and non-voting shares.

### **Multi-manager fund**

Can be of two types—one is a multi-strategy fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund; the second type is a fund of hedge funds (or fund-of-funds) in which the manager allocates capital to separate, underlying hedge funds that themselves run a range of different strategies.

### **Multi-strategy fund**

A fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund.

### **Multilateral trading facilities**

(MTF) See *Alternative trading systems (ATS)*.

## **N**

### **Negative butterfly**

An increase in the butterfly spread due to lower short- and long-term yields-to-maturity and a higher intermediate yield-to-maturity.

### **Negative screening**

An ESG implementation approach that excludes certain sectors or companies that deviate from an investor's accepted standards.

### **Non-deliverable forwards**

Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

### **Nonstationarity**

A characteristic of series of data whose properties, such as mean and variance, are not constant through time. When analyzing historical data it means that different parts of a

data series reflect different underlying statistical properties.

## **Norway model**

Characterized by an almost exclusive reliance on public equities and fixed income (the traditional 60/40 equity/bond model falls under the Norway model), with largely passively managed assets and with very little to no allocation to alternative investments.

## **O**

### **OAS duration**

The change in bond price for a given change in OAS.

### **Offer price**

The price at which a counterparty is willing to sell one unit of the base currency.

### **Opportunity cost**

The (trading related) cost associated with not being able to transact the entire order at the decision price.

### **Option-adjusted spread (OAS)**

A generalization of the Z-spread yield spread calculation that incorporates bond option pricing based on assumed interest rate volatility.

### **Optional stock dividends**

A type of dividend in which shareholders may elect to receive either cash or new shares.

### **Options on bond futures contracts**

Instruments that involve the right, but not the obligation, to enter into a bond futures contract at a pre-determined strike (bond price) on a future date in exchange for an up-front premium.

### **Overbought**

When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

## **Overconfidence bias**

A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

## **Overlay**

A derivative position (or positions) used to adjust a pre-existing portfolio closer to its objectives.

## **Oversold**

The opposite of overbought; see *overbought*.

# **P**

## **Packeting**

Splitting stock positions into multiple parts.

## **Pairs trading**

An equity market-neutral strategy that capitalizes on the misalignment in prices of pairs of similar under- and overvalued equities. The expectation is the differential valuations or trading relationships will revert to their long-term mean values or their fundamentally-correct trading relationships, with the long position rising and the short position declining in value.

## **Parameter uncertainty**

Uncertainty arising because a quantitative model's parameters are estimated with error.

## **Participant/cohort option**

Pools the DC plan member with a cohort that has a similar target retirement date.

## **Participant-switching life-cycle options**

Automatically switch DC plan members into a more conservative asset mix as their age increases. There may be several automatic de-risking switches at different age targets.

## **Passive investment**

In the fixed-income context, it is investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

## **Passive management**

A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

## **Percent-range rebalancing**

An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

## **Performance attribution**

Attribution, including return attribution and risk attribution; often used as a synonym for return attribution.

## **Permanent life insurance**

A type of life insurance that provides lifetime coverage.

## **Portfolio overlay**

An array of derivative positions managed separately from the securities portfolio to achieve overall intended portfolio characteristics.

## **Position delta**

The overall or portfolio delta. For example, the position delta of a covered call, consisting of long 100 shares and short one at-the-money call, is +50 (= +100 for the shares and -50 for the short ATM call).

## **Positive butterfly**

A decrease in the butterfly spread due to higher short- and long-term yields-to-maturity and a lower intermediate yield-to-maturity.

## **Positive screening**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *best-in-class*.



## **Post-liquidation return**

Calculates the return assuming that all portfolio holdings are sold as of the end date of the analysis and that the resulting capital gains tax that would be due is deducted from the ending portfolio value.

## **Potential capital gain exposure (PCGE)**

Is an estimate of the percentage of a fund's assets that represents gains and measures how much the fund's assets have appreciated. It can be an indicator of possible future capital gain distributions.

## **Premature death risk**

The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

## **Present value of distribution of cash flows methodology**

Method used to address a portfolio's sensitivity to rate changes along the yield curve. This approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

## **Principal trade**

A trade in which the market maker or dealer becomes a disclosed counterparty and assumes risk for the trade by transacting the security for their own account. Also called *broker risk trades*.

## **Probability of default**

The likelihood that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest.

## **Probate**

The legal process to confirm the validity of the will so that executors, heirs, and other interested parties can rely on its authenticity.

## **Program trading**

A strategy of buying or selling many stocks simultaneously.

## **Progressive tax rate schedule**

A tax regime in which the tax rate increases as the amount of income or wealth being taxed increases.

## **Property insurance**

A type of insurance used by individuals to manage property risk.

## **Property risk**

The possibility that a person's property may be damaged, destroyed, stolen, or lost.

## **Protective put**

An option strategy in which a long position in an asset is combined with a long position in a put on that asset.

## **Pure indexing**

Attempts to replicate a bond index as closely as possible, targeting zero active return and zero active risk.

## **Put spread**

A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

# **Q**

## **Qualified dividends**

Generally dividends from shares in domestic corporations and certain qualified foreign corporations which have been held for at least a specified minimum period of time.

## **Quantitative market-neutral**

An approach to building market-neutral portfolios in which large numbers of securities are traded and positions are adjusted on a daily or even an hourly basis using algorithm-based models.

## **Quoted margin**

The yield spread over the MRR established upon issuance of an FRN to compensate investors for assuming an issuer's credit risk.

# R

## Re-base

With reference to index construction, to change the time period used as the base of the index.

## Realized volatility

Historical volatility, the square root of the realized variance of returns, which is a measure of the range of past price outcomes for the underlying asset.

## Rebalancing

In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

## Rebalancing overlay

A type of overlay that addresses a portfolio's need to sell certain constituent securities and buy others.

## Rebalancing range

A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

## Rebate rate

The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

## Reduced form credit models

Credit models that solve for default probability over a specific time period using observable company-specific variables such as financial ratios and macroeconomic variables.

## Reduced-form models

Models that use economic theory and other factors such as prior research output to describe hypothesized relationships. Can be described as more compact representations of underlying structural models. Evaluate endogenous variables in terms of observable

exogenous variables.

## **Regime**

The governing set of relationships (between variables) that stem from technological, political, legal, and regulatory environments. Changes in such environments or policy stances can be described as changes in regime.

## **Regret**

The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

## **Regret-aversion bias**

An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

## **Relative value**

A concept that describes the selection of the most attractive individual securities to populate the portfolio with, using ranking and comparing.

## **Relative value volatility arbitrage**

A volatility trading strategy that aims to source and buy cheap volatility and sell more expensive volatility while netting out the time decay aspects normally associated with options portfolios.

## **Relative VaR**

The minimum portfolio loss expected to occur over a given time period at a specific confidence level based on a portfolio containing active positions minus benchmark holdings.

## **Repo rate**

The interest rate on a repurchase agreement.

## **Representativeness bias**

A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

## **Repurchase agreements**

In repurchase agreements, or *repos*, a security owner agrees to sell a security for a specific cash amount while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

## **Request for quote**

(RFQ) A non-binding quote provided by a market maker or dealer to a potential buyer or seller upon request. Commonly used in fixed income markets these quotes are only valid at the time they are provided.

## **Reserve portfolio**

The component of an insurer's general account that is subject to specific regulatory requirements and is intended to ensure the company's ability to meet its policy liabilities. The assets in the reserve portfolio are managed conservatively and must be highly liquid and low risk.

## **Resistance levels**

Price points on dealers' order boards where one would expect to see a clustering of offers.

## **Return attribution**

A set of techniques used to identify the sources of the excess return of a portfolio against its benchmark.

## **Returns-based attribution**

An attribution approach that uses only the total portfolio returns over a period to identify the components of the investment process that have generated the returns. The Brinson–Hood–Beebower approach is a returns-based attribution approach.

## **Returns-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

## **Returns-based style analysis**

A top-down style analysis that involves estimating the sensitivities of a portfolio to security market indexes.

## **Reverse repos**

Repurchase agreements from the standpoint of the lender.

## **Revocable trust**

The person whose assets are used to create the trust retains the right to rescind the trust relationship and regain title to the trust assets.

## **Risk attribution**

The analysis of the sources of risk.

## **Risk aversion**

The degree of an investor's unwillingness to take risk; the inverse of risk tolerance.

## **Risk budgeting**

The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

## **Risk capacity**

The ability to accept financial risk.

## **Risk perception**

The subjective assessment of the risk involved in the outcome of an investment decision.

## **Risk premium**

An extra return expected by investors for bearing some specified risk.

## **Risk reversal**

A strategy used to profit from the existence of an implied volatility skew and from changes in its shape over time. A combination of long (short) calls and short (long) puts on the same underlying with the same expiration is a long (short) risk reversal.

## **Risk tolerance**

The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

# S

## **Sample-size neglect**

A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or “real” data).

## **Scenario analysis**

What-if analysis that involves changing multiple assumptions at the same time in order to evaluate the change in an investment’s value.

## **Seagull spread**

An extension of the risk reversal foreign exchange option strategy that limits downside risk.

## **Securities lending**

A form of collateralized lending that may be used to generate income for portfolios.

## **Selective**

An index construction methodology that targets only those securities with certain characteristics.

## **Self-attribution bias**

A bias in which people take personal credit for successes and attribute failures to external factors outside the individual’s control.

## **Self-control bias**

A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

## **Separate accounts**

Accounts holding assets to fund future liabilities from variable life insurance and variable annuities, the products in which customers make investment decisions from a menu of options and themselves bear investment risk.

## **Sharpe ratio**

The average return in excess of the risk-free rate divided by the standard deviation of return; a measure of the average excess return earned per unit of standard deviation of return. Also known as the *reward-to-variability ratio*.

## **Short-biased**

A hedge fund strategy in which the manager uses a less extreme version of dedicated short-selling. It involves searching for opportunities to sell expensively priced equities, but short exposure may be balanced with some modest value-oriented, or index-oriented, long exposure.

## **Shortfall probability**

The probability of failing to meet a specific liability or goal.

## **Shrinkage estimation**

Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

## **Single-manager fund**

A fund in which one portfolio manager or team of portfolio managers invests in one strategy or style.

## **Smart beta**

Involves the use of transparent, rules-based strategies as a basis for investment decisions.

## **Smart order routers**

(SOR) Smart systems used to electronically route small orders to the best markets for execution based on order type and prevailing market conditions.

## **Social proof**

A bias in which individuals tend to follow the beliefs of a group.

## **Soft-catalyst event-driven approach**

An event-driven approach in which investments are made proactively in anticipation of a corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) that has yet to occur.



## Special dividends

A dividend paid by a company that does not pay dividends on a regular schedule, or a dividend that supplements regular cash dividends with an extra payment.

## Spread duration

The change in bond price for a given change in yield spread. Also referred to as *OAS duration* when the option-adjusted spread (OAS) is the yield measure used.

## Staged diversification strategy

The simplest approach to managing the risk of a concentrated position involves selling the concentrated position over some period of time, paying associated tax, and reinvesting the proceeds in a diversified portfolio.

## Static hedge

A hedge that is not sensitive to changes in the price of the asset hedged.

## Status quo bias

An emotional bias in which people do nothing (i.e., maintain the “status quo”) instead of making a change.

## Stock lending

Securities lending involving the transfer of equities.

## Stop-losses

A trading order that sets a selling price below the current market price with a goal of protecting profits or preventing further losses.

## Stops

Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

## Straddle

An option combination in which one buys *both* puts and calls, with the same exercise price and same expiration date, on the same underlying asset. In contrast to this long straddle, if someone *writes* both options, it is a short straddle.

## **Strangle**

A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

## **Stratified sampling**

A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

## **Structural credit models**

Credit models that apply market-based variables to estimate the value of an issuer's assets and the volatility of asset value.

## **Structural models**

Models that specify functional relationships among variables based on economic theory. The functional form and parameters of these models are derived from the underlying theory. They may include unobservable parameters.

## **Structural risk**

Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

## **Stub trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and entails buying and selling stock of a parent company and its subsidiaries, typically weighted by the percentage ownership of the parent company in the subsidiaries.

## **Support levels**

Price points on dealers' order boards where one would expect to see a clustering of bids.

## **Surplus**

The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

## **Surplus portfolio**

The component of an insurer's general account that is intended to earn higher expected returns than the reserve portfolio and so can assume more risk. Surplus portfolio assets are often managed aggressively with high-risk assets.

## **Survivorship bias**

Bias that arises in a data series when managers with poor track records are dropped from the database whereas managers with good track records remain. A data series of a given date reflects only entities that have survived to that date.

## **Swaption**

This instrument grants a party the right, but not the obligation, to enter into a rate swap at a pre-determined strike (fixed swap rate) on a future date, in exchange for an up-front premium.

## **Synthetic long forward position**

The combination of a long call and a short put with identical strike prices, both traded at the same time on the same underlying.

## **Synthetic short forward position**

The combination of a short call and a long put at the same strike price, both traded at the same time on the same underlying.

# **T**

## **Tactical asset allocation**

Asset allocation that involves making short-term adjustments to the portfolio based on short-term predictions of relative performance among asset classes.

## **Tax alpha**

Calculated by subtracting the pre-tax excess return from the total return. Tax alpha isolates the benefit of tax management of the portfolio.

## **Tax avoidance**

The legal activity of understanding the tax laws and finding ways to minimize tax liability.

















# **DERIVATIVES, CURRENCY MANAGEMENT, AND FIXED INCOME**

CFA® Program Curriculum  
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    - 7.1.2. Bear Spread
    - 7.1.3. Refining Spreads
      - 7.1.3.1. Adding a Short Leg to a Long Position
      - 7.1.3.2. Spreads and Delta
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    - 8.1.1. Collars on an Existing Holding
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- 9. Implied Volatility and Volatility Skew
- 10. Investment Objectives and Strategy Selection
  - 10.1. The Necessity of Setting an Objective
  - 10.2. Criteria for Identifying Appropriate Option Strategies
- 11. Uses of Options in Portfolio Management
  - 11.1. Covered Call Writing
    - Solution:
  - 11.2. Put Writing
    - Solution:
      - Scenario A:
      - Scenario B:
  - 11.3. Long Straddle
    - Solution:
  - 11.4. Collar
    - Solution:
  - 11.5. Calendar Spread
    - Solution to 1:

Solution to 2:

Scenario 1:

Scenario 2:

Scenario 3:

Scenario 4:

## 12. Hedging an Expected Increase in Equity Market Volatility

Solution to 1:

Solution to 2:

Solution to 3:

### 12.1. Establishing or Modifying Equity Risk Exposure

#### 12.1.1. Long Call

Solution:

#### 12.1.2. Risk Management: Protective Put Position

Situation A: Before Relais Corporation's quarterly earnings release:

Solution to 1:

Situation B: One week later, just after Relais Corporation's earnings release:

Solution to 2:

Summary

Practice Problems

Solutions

## Reading 9. Swaps, Forwards, and Futures Strategies

### Learning Outcomes

#### 1. Managing Interest Rate Risk with Swaps

##### 1.1. Changing Risk Exposures with Swaps, Futures, and Forwards

###### 1.1.1. Managing Interest Rate Risk

###### 1.1.1.1. Interest Rate Swaps

#### 2. Managing Interest Rate Risk with Forwards, Futures and Fixed-Income Futures

##### 2.1. Fixed-Income Futures

#### 3. Managing Currency Exposure

##### 3.1. Currency Swaps

##### 3.2. Currency Forwards and Futures

#### 4. Managing Equity Risk

##### 4.1. Equity Swaps

##### 4.2. Equity Forwards and Futures

##### 4.3. Cash Equitization

#### 5. Volatility Derivatives: Futures and Options

##### 5.1. Volatility Futures and Options

#### 6. Volatility Derivatives: Variance Swaps

## 7. Using Derivatives to Manage Equity Exposure and Tracking Error

Solution:

Scenario A:

Scenario B:

### 7.1. Cash Equitization

Scenario: Three months later, the FTSE 100 Index has increased by 5%.

## 8. Using Derivatives in Asset Allocation

### 8.1. Changing Allocations between Asset Classes Using Futures

Solution to 1:

Solution to 2:

Solution to 3:

### 8.2. Rebalancing an Asset Allocation Using Futures

Solution:

### 8.3. Changing Allocations between Asset Classes Using Swaps

Solution:

## 9. Using Derivatives to Infer Market Expectations

### 9.1. Using Fed Funds Futures to Infer the Expected Average Federal Funds Rate

### 9.2. Inferring Market Expectations

Solution to 1:

Solution to 2:

Summary

Practice Problems

Solutions:

## Reading 10. Currency Management: An Introduction

Learning Outcomes

### 1. Introduction

### 2. Review of Foreign Exchange Concepts

#### 2.1. Spot Markets

#### 2.2. Forward Markets

#### 2.3 FX Swap Markets

#### 2.4. Currency Options

### 3. Currency Risk and Portfolio Risk and Return

#### 3.1. Return Decomposition

#### 3.2. Volatility Decomposition

### 4. Strategic Decisions in Currency Management: Overview

#### 4.1. The Investment Policy Statement

#### 4.2. The Portfolio Optimization Problem

#### 4.3. Choice of Currency Exposures

##### 4.3.1. Diversification Considerations

#### 4.3.2. Cost Considerations

### 5. Strategic Decisions in Currency Management: Spectrum of Currency Risk Management Strategies

#### 5.1. Passive Hedging

#### 5.2. Discretionary Hedging

#### 5.3. Active Currency Management

#### 5.4. Currency Overlay

### 6. Strategic Decisions in Currency Management: Formulating a Currency Management Program

### 7. Active Currency Management: Based on Economic Fundamentals, Technical Analysis and the Carry Trade

#### 7.1. Active Currency Management Based on Economic Fundamentals

#### 7.2. Active Currency Management Based on Technical Analysis

#### 7.3. Active Currency Management Based on the Carry Trade

### 8. Active Currency Management: Based on Volatility Trading

### 9. Currency Management Tools: Forward Contracts, FX Swaps and Currency Options

#### 9.1. Forward Contracts

##### 9.1.1. Hedge Ratios with Forward Contracts

##### 9.1.2. Roll Yield

#### 9.2. Currency Options

### 10. Currency Management Strategies

#### 10.1. Over-/Under-Hedging Using Forward Contracts

#### 10.2. Protective Put Using OTM Options

#### 10.3. Risk Reversal (or Collar)

#### 10.4. Put Spread

#### 10.5. Seagull Spread

#### 10.6. Exotic Options

#### 10.7. Section Summary

### 11. Hedging Multiple Foreign Currencies

#### 11.1. Cross Hedges and Macro Hedges

#### 11.2. Minimum-Variance Hedge Ratio

#### 11.3. Basis Risk

### 12. Currency Management Tools and Strategies: A Summary

### 13. Currency Management for Emerging Market Currencies

#### 13.1. Special Considerations in Managing Emerging Market Currency Exposures

#### 13.2. Non-Deliverable Forwards

### Summary

### References



## Practice Problems

## Solutions

### Study Session 5. Fixed-Income Portfolio Management (1)

#### Reading Assignments

#### Reading 11. Overview of Fixed-Income Portfolio Management

#### Learning Outcomes

1. Introduction
2. Roles of Fixed-Income Securities in Portfolios
  - 2.1. Diversification Benefits
  - 2.2. Benefits of Regular Cash Flows
  - 2.3. Inflation-Hedging Potential
3. Classifying Fixed-Income Mandates
  - 3.1. Liability-Based Mandates
  - 3.2. Total Return Mandates
  - 3.3. Fixed-Income Mandates with ESG Considerations
4. Fixed-Income Portfolio Measures
  - 4.1. Portfolio Measures of Risk and Return
  - 4.2. Correlations between Fixed-Income Sectors
  - 4.3. Use of Measures of Risk and Return in Portfolio Management
    - 4.3.1. Portfolio Duration in Total Return Mandates
    - 4.3.2. Managing Credit Exposure Using Spread Duration
    - 4.3.3. Relative Value Concept
5. Bond Market Liquidity
  - 5.1. Liquidity among Bond Market Sub-Sectors
  - 5.2. The Effects of Liquidity on Fixed-Income Portfolio Management
    - 5.2.1. Pricing
    - 5.2.2. Portfolio Construction
    - 5.2.3. Alternatives to Direct Investment in Bonds
6. A Model for Fixed-Income Returns
  - 6.1. Decomposing Expected Returns
    - 6.1.1. Coupon Income
    - 6.1.2. Roll-down Return
    - 6.1.3. Views of Benchmark Yields
    - 6.1.4. Views of Yield Spreads
    - 6.1.5. Views of Currency Value Changes
  - 6.2. Estimation of the Inputs
  - 6.3. Limitations of the Expected Return Decomposition
7. Leverage
  - 7.1. Using Leverage
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8.1. Principles of Fixed-Income Taxation	
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2. Liability-Driven Investing	
2.1. Liability-Driven Investing vs. Asset-Driven Liabilities	
2.2. Types of Liabilities	
3. Interest Rate Immunization: Managing the Interest Rate Risk of a Single Liability	
3.1. A Numerical Example of Immunization	
3.1.1. Portfolio Features	
3.1.2. Portfolio Duration	
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3.1.10. Structural Risk in Immunization Strategy	
4. Interest Rate Immunization: Managing the Interest Rate Risk of Multiple Liabilities	
4.1. Cash Flow Matching	
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4.2.2. Using ETFs to Build Laddered Portfolios	
4.3. Duration Matching	
4.3.1. Duration Matching—Parallel Shift Example	
4.3.2. Duration Matching—Yield Curve Twist Scenario	
4.4. Derivatives Overlay	

- 4.5. Contingent Immunization
- 5. Liability-Driven Investing: An Example of a Defined Benefit Pension Plan
  - 5.1. Model Assumptions
  - 5.2. Model Inputs
  - 5.3. Calculating Durations
  - 5.4. Addressing the Duration Gap
    - 5.4.1. Using Futures to Reduce the Duration Gap
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- 6. Risks in Liability-Driven Investing
  - 6.1. Model Risk in Liability-Driven Investing
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  - 6.3. Counterparty Credit Risk
  - 6.4. Asset Liquidity Risk
- 7. Bond Indexes and the Challenges of Matching a Fixed-Income Portfolio to an Index
  - 7.1. Size and Breadth of the Fixed-Income Universe
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  - 7.3. Unique Issuance and Trading Patterns
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## Glossary

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# How to Use the CFA Program Curriculum

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Congratulations on your decision to enter the Chartered Financial Analyst (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities (competencies) it develops. Your commitment should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. CFA Program enrollment represents the first step toward a career-long commitment to professional education.

The CFA exam measures your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major CFA Program topic areas ([www.cfainstitute.org/programs/cfa/curriculum/cbok](http://www.cfainstitute.org/programs/cfa/curriculum/cbok));
- Topic area weights that indicate the relative exam weightings of the top-level topic areas ([www.cfainstitute.org/programs/cfa/curriculum](http://www.cfainstitute.org/programs/cfa/curriculum));
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- CFA Program curriculum that candidates receive upon exam registration.

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, features of the curriculum, and tips for designing an effective personal study program.

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# BACKGROUND ON THE CBOK

CFA Program is grounded in the practice of the investment profession. CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the competencies that are relevant to the profession, beginning with the Global Body of Investment Knowledge (GBIK®). Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback about the GBIK. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

The CFA Institute staff—in conjunction with the Education Advisory Committee and Curriculum Level Advisors, who consist of practicing CFA charterholders—designs the CFA Program curriculum in order to deliver the CBOK to candidates. The exams, also written by CFA charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into six topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected. It is then divided into one or more study sessions. These study sessions should form the basic structure of your reading and preparation. Each study session includes a statement of its structure and objective and is further divided into assigned readings. An outline illustrating the organization of these study sessions can be found at the front of each volume of the curriculum.

The readings are commissioned by CFA Institute and written by content experts, including investment professionals and university professors. Each reading includes LOS and the core material to be studied, often a combination of text, exhibits, and in-text examples and questions. End of Reading Questions (EORQs) followed by solutions help you understand and master the material. The LOS indicate what you should be able to accomplish after

studying the material. The LOS, the core material, and the EORQs are dependent on each other, with the core material and EORQs providing context for understanding the scope of the LOS and enabling you to apply a principle or concept in a variety of scenarios.

*The entire readings, including the EORQs, are the basis for all exam questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK.*

You should use the LOS to guide and focus your study because each exam question is based on one or more LOS and the core material and practice problems associated with the LOS. As a candidate, you are responsible for the entirety of the required material in a study session.

We encourage you to review the information about the LOS on our website ([www.cfainstitute.org/programs/cfa/curriculum/study-sessions](http://www.cfainstitute.org/programs/cfa/curriculum/study-sessions)), including the descriptions of LOS “command words” on the candidate resources page at [www.cfainstitute.org](http://www.cfainstitute.org).

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## FEATURES OF THE CURRICULUM

### End of Reading Questions/Solutions

*All End of Reading Questions (EORQs) as well as their solutions are part of the curriculum and are required material for the exam.* In addition to the in-text examples and questions, these EORQs help demonstrate practical applications and reinforce your understanding of the concepts presented. Some of these EORQs are adapted from past CFA exams and/or may serve as a basis for exam questions.

### Glossary

For your convenience, each volume includes a comprehensive Glossary. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the Glossary.

Note that the digital curriculum that is included in your exam registration fee is searchable for key words, including Glossary terms.

### LOS Self-Check

We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

## Source Material

The CFA Institute curriculum cites textbooks, journal articles, and other publications that provide additional context or information about topics covered in the readings. As a candidate, you are not responsible for familiarity with the original source materials cited in the curriculum.

Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written or updated but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*<sup>®</sup>, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and several Nobel laureates have contributed articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this, and other, CFA Institute practice-oriented publications through the Research & Analysis webpage ([www.cfainstitute.org/en/research](http://www.cfainstitute.org/en/research)).

## Errata

The curriculum development process is rigorous and includes multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, there are times when we must make corrections. Curriculum errata are periodically updated and posted



by exam level and test date online ([www.cfainstitute.org/en/programs/submit-errata](http://www.cfainstitute.org/en/programs/submit-errata)). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

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## DESIGNING YOUR PERSONAL STUDY PROGRAM

### Create a Schedule

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all assigned readings and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skills, and abilities described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will probably spend more time on some study sessions than on others.

You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

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## CFA INSTITUTE LEARNING ECOSYSTEM (LES)

As you prepare for your exam, we will email you important exam updates, testing policies, and study tips. Be sure to read these carefully.

Your exam registration fee includes access to the CFA Program Learning Ecosystem (LES). This digital learning platform provides access, even offline, to all of the readings and End of Reading Questions found in the print curriculum organized as a series of shorter online

lessons with associated EORQs. This tool is your one-stop location for all study materials, including practice questions and mock exams.

The LES provides the following supplemental study tools:

## **Structured and Adaptive Study Plans**

The LES offers two ways to plan your study through the curriculum. The first is a structured plan that allows you to move through the material in the way that you feel best suits your learning. The second is an adaptive study plan based on the results of an assessment test that uses actual practice questions.

Regardless of your chosen study path, the LES tracks your level of proficiency in each topic area and presents you with a dashboard of where you stand in terms of proficiency so that you can allocate your study time efficiently.

## **Flashcards and Game Center**

The LES offers all the Glossary terms as Flashcards and tracks correct and incorrect answers. Flashcards can be filtered both by curriculum topic area and by action taken—for example, answered correctly, unanswered, and so on. These Flashcards provide a flexible way to study Glossary item definitions.

The Game Center provides several engaging ways to interact with the Flashcards in a game context. Each game tests your knowledge of the Glossary terms a in different way. Your results are scored and presented, along with a summary of candidates with high scores on the game, on your Dashboard.

## **Discussion Board**

The Discussion Board within the LES provides a way for you to interact with other candidates as you pursue your study plan. Discussions can happen at the level of individual lessons to raise questions about material in those lessons that you or other candidates can clarify or comment on. Discussions can also be posted at the level of topics or in the initial Welcome section to connect with other candidates in your area.

## **Practice Question Bank**

The LES offers access to a question bank of hundreds of practice questions that are in addition to the End of Reading Questions. These practice questions, only available on the LES, are intended to help you assess your mastery of individual topic areas as you progress through your studies. After each practice question, you will receive immediate feedback

noting the correct response and indicating the relevant assigned reading so you can identify areas of weakness for further study.

## Mock Exams

The LES also includes access to three-hour Mock Exams that simulate the morning and afternoon sessions of the actual CFA exam. These Mock Exams are intended to be taken after you complete your study of the full curriculum and take practice questions so you can test your understanding of the curriculum and your readiness for the exam. If you take these Mock Exams within the LES, you will receive feedback afterward that notes the correct responses and indicates the relevant assigned readings so you can assess areas of weakness for further study. We recommend that you take Mock Exams during the final stages of your preparation for the actual CFA exam. For more information on the Mock Exams, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## PREP PROVIDERS

You may choose to seek study support outside CFA Institute in the form of exam prep providers. After your CFA Program enrollment, you may receive numerous solicitations for exam prep courses and review materials. When considering a prep course, make sure the provider is committed to following the CFA Institute guidelines and high standards in its offerings.

Remember, however, that there are no shortcuts to success on the CFA exams; reading and studying the CFA Program curriculum *is* the key to success on the exam. The CFA Program exams reference only the CFA Institute assigned curriculum; no prep course or review course materials are consulted or referenced.

### SUMMARY

Every question on the CFA exam is based on the content contained in the required readings and on one or more LOS. Frequently, an exam question is based on a specific example highlighted within a reading or on a specific practice problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the exam.

2. All questions, problems, and their solutions are part of the curriculum and are required study material for the exam. These questions are found at the end of the readings in the print versions of the curriculum. In the LES, these questions appear directly after the lesson with which they are associated. The LES provides immediate feedback on your answers and tracks your performance on these questions throughout your study.
3. We strongly encourage you to use the CFA Program Learning Ecosystem. In addition to providing access to all the curriculum material, including EORQs, in the form of shorter, focused lessons, the LES offers structured and adaptive study planning, a Discussion Board to communicate with other candidates, Flashcards, a Game Center for study activities, a test bank of practice questions, and online Mock Exams. Other supplemental study tools, such as eBook and PDF versions of the print curriculum, and additional candidate resources are available at [www.cfainstitute.org](http://www.cfainstitute.org).
4. Using the study planner, create a schedule and commit sufficient study time to cover the study sessions. You should also plan to review the materials, answer practice questions, and take Mock Exams.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

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## FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and investment professional comments and feedback as we work to improve the curriculum, supplemental study tools, and candidate resources.

Please send any comments or feedback to [info@cfainstitute.org](mailto:info@cfainstitute.org). You can be assured that we will review your suggestions carefully. Ongoing improvements in the curriculum will help you prepare for success on the upcoming exams and for a lifetime of learning as a serious investment professional.



# Portfolio Management

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## STUDY SESSIONS

<b>Study Session 1</b>	Behavioral Finance
<b>Study Session 2</b>	Capital Market Expectations
<b>Study Session 3</b>	Asset Allocation and Related Decisions in Portfolio Management
<b>Study Session 4</b>	Derivatives and Currency Management
<b>Study Session 5</b>	Fixed-Income Portfolio Management (1)
<b>Study Session 6</b>	Fixed-Income Portfolio Management (2)
<b>Study Session 7</b>	Equity Portfolio Management (1)
<b>Study Session 8</b>	Equity Portfolio Management (2)
<b>Study Session 9</b>	Alternative Investments Portfolio Management
<b>Study Session 10</b>	Private Wealth Management (1)
<b>Study Session 11</b>	Private Wealth Management (2)
<b>Study Session 12</b>	Portfolio Management for Institutional Investors
<b>Study Session 13</b>	Trading, Performance Evaluation, and Manager Selection
<b>Study Session 14</b>	Cases in Portfolio Management and Risk Management

This volume includes Study Sessions 4 and 5.

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## TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; and evaluate portfolio performance.

# Study Session 4

## Derivatives and Currency Management

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The purpose of this study session is to illustrate ways in which derivatives might be used in typical investment situations. Few asset managers or individual investors will ever use all of the strategies described here. However, an informed investment professional should still be aware of these important strategies and understand the associated risk–return trade-offs.

The first reading examines widely used options strategies, including covered calls, protective puts and select spread and combination option strategies. Derivatives strategy selection is discussed and demonstrated in a series of applications.

The second reading shows how swaps, forwards, and futures can be used to change the risk exposure of an existing position. There are many ways in which investment managers and investors can use swaps, forwards, futures, and volatility derivatives. The typical applications of these derivatives involve modifying investment positions for hedging purposes or for taking directional bets, creating or replicating desired payoffs, implementing asset allocation and portfolio rebalancing decisions, and even inferring current market expectations.

When the strategic asset allocation includes exposure to global markets, non-domestic currencies create additional sources of portfolio volatility and potential returns. The final reading in this study session explores how currency exposures can be managed to reflect a client's investment objectives and constraints.

## READING ASSIGNMENTS

**Reading 8** Option Strategies  
by Adam Schwartz, PhD, CFA, and Barbara Valbuzzi, CFA

**Reading 9** Swaps, Forwards, and Futures Strategies



by Barbara Valbuzzi, CFA

**Reading 10** Currency Management: An Introduction  
by William A. Barker, PhD, CFA

# Reading 8

## Options Strategies

by Adam Schwartz, PhD, CFA, and Barbara Valbuzzi, CFA

*Adam Schwartz, PhD, CFA, is at Bucknell University (USA). Barbara Valbuzzi, CFA (Italy).*

CFA Institute would like to thank Robert Strong, PhD, CFA, and Russell Rhoads, CFA, for their work on previous versions of this reading.

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## LEARNING OUTCOMES

The candidate should be able to:

- a. demonstrate how an asset's returns may be replicated by using options;
- b. discuss the investment objective(s), structure, payoff, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of a covered call position;
- c. discuss the investment objective(s), structure, payoff, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of a protective put position;
- d. compare the delta of covered call and protective put positions with the position of being long an asset and short a forward on the underlying asset;
- e. compare the effect of buying a call on a short underlying position with the effect of selling a put on a short underlying position;
- f. discuss the investment objective(s), structure, payoffs, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of the following option strategies: bull spread, bear spread, straddle, and collar;
- g. describe uses of calendar spreads;
- h. discuss volatility skew and smile;

- i. identify and evaluate appropriate option strategies consistent with given investment objectives;
- j. demonstrate the use of options to achieve targeted equity risk exposures.

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## 1. INTRODUCTION

Derivatives are financial instruments through which counterparties agree to exchange economic cash flows based on the movement of underlying securities, indexes, currencies, or other instruments or factors. A derivative's value is thus *derived* from the economic performance of the underlying. Derivatives may be created directly by counterparties or may be facilitated through established, regulated market exchanges. Direct creation between counterparties has the benefit of tailoring to the counterparties' specific needs but also the disadvantage of potentially low liquidity. Exchange-traded derivatives often do not match counterparties' specific needs but do facilitate early termination of the position, and, importantly, mitigate counterparty risk. Derivatives facilitate the exchange of economic risks and benefits where trades in the underlying securities might be less advantageous because of poor liquidity, transaction costs, regulatory impediments, tax or accounting considerations, or other factors.

Options are an important type of contingent-claim derivative that provide their owner with the right but not an obligation to a payoff determined by the future price of the underlying asset. Unlike other types of derivatives (i.e., swaps, forwards, and futures), options have nonlinear payoffs that enable their owners to benefit from movements in the underlying in one direction without being hurt by movements in the opposite direction. The cost of this opportunity, however, is the upfront cash payment required to enter the options position.

Options can be combined with the underlying and with other options in a variety of different ways to modify investment positions, to implement investment strategies, or even to infer market expectations. Therefore, investment managers routinely use option strategies for hedging risk exposures, for seeking to profit from anticipated market moves, and for implementing desired risk exposures in a cost-effective manner.

The main purpose of this reading is to illustrate how options strategies are used in typical investment situations and to show the risk–return trade-offs associated with their use. Importantly, an informed investment professional should have such a basic understanding of options strategies to competently serve his investment clients.

Section 2 of this reading shows how certain combinations of securities (i.e., options,

underlying) are equivalent to others. Sections 3–6 discuss two of the most widely used options strategies, covered calls and protective puts. In Sections 7 and 8, we look at popular spread and combination option strategies used by investors. The focus of Section 9 is implied volatility embedded in option prices and related volatility skew and surface. Section 10 discusses option strategy selection. Sections 11 and 12 demonstrate a series of applications showing ways in which an investment manager might solve an investment problem with options. The reading concludes with a summary.

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## 2. POSITION EQUIVALENCIES

- a. demonstrate how an asset's returns may be replicated by using options;

It is useful to think of derivatives as building blocks that can be combined to create a specific payoff with the desired risk exposure. A synthetic position can be created for any option or stock strategy. Most of the time, market participants use synthetic positions to transform the payoff profile of their positions when their market views change. We cover a few of these relationships in the following pages. First, a brief recap of put–call parity and put–call–forward parity will help readers to understand such synthetic positions.

As you may remember, put–call parity shows the equivalence (or parity) of a portfolio of a call and a risk-free bond with a portfolio of a put and the underlying, which leads to the relationship between put and call prices. Put–call parity can be expressed in the following formula, where  $S_0$  is the price of the underlying;  $p_0$  and  $c_0$  are the prices (i.e., premiums) of the put and call options, respectively; and  $X/(1 + r)^T$  is the present value of the risk-free bond:  $S_0 + p_0 = c_0 + X/(1 + r)^T$ .

A closely related concept is put–call–forward parity, which identifies the equivalence between buying a fiduciary call, given by the purchase of a call and the risk-free bond, and a synthetic protective put. The latter involves the purchase of a put option and a forward contract on the underlying that expires at the same time as the put option. In the put–call–forward parity formula,  $S_0$  is replaced with a forward contract to buy the underlying, where the forward price is given by  $F_0(T) = S_0(1 + r)^T$ . Therefore, put–call–forward parity is:  $F_0(T)/(1 + r)^T + p_0 = c_0 + X/(1 + r)^T$ .

### 2.1. Synthetic Forward Position

The combination of a long call and a short put with identical strike price and expiration, traded at the same time on the same underlying, is equivalent to a **synthetic long forward position**. In fact, the long call creates the upside and the short put creates the downside on the underlying.

Consider an investor who buys an at-the-money (ATM) call and simultaneously sells a put with the same strike and the same expiration date. Whatever the stock price at expiration, one of the two options will be in the money. If the contract has a physical settlement, the investor will buy the underlying stock by paying the strike price. In fact, on the expiration date, the investor will exercise the call she owns if the stock price is above the strike price. Otherwise, if the underlying price is below the strike price, the put owner will exercise his right to deliver the stock and the investor (who sold the put) must buy it for the strike price. [Exhibit 1](#) shows the values of the two options and the combined position at expiration, compared with the value of the stock purchase at that same time. The stock in this case does not pay dividends.

#### Exhibit 1. Synthetic Long Forward Position at Expiration

<b>Stock price at expiration:</b>	<b>40</b>	<b>50</b>	<b>60</b>
<b>Alternative 1:</b>			
Long 50-strike call payoff	0	0	10
Short 50-strike put payoff	-10	0	0
Total value	-10	0	10
<b>Alternative 2:</b>			
Long stock at 50	-10	0	10
Total value	-10	0	10

We now compare the same option strategy with the payoff of a forward or futures contract in [Exhibit 2](#). The motivation to create a synthetic long forward position could be to exploit an arbitrage opportunity presented by the actual forward price or the need for an alternative to the outright purchase of a long forward position. Frequently, a forward contract is used instead of futures to acquire a stock position because it allows for contract customization.

#### Exhibit 2. Synthetic Long Forward Position vs. Long Forward/Futures

Stock price at expiration:	40	50	60
<b>Alternative 1:</b>			
Long 50-strike call payoff	0	0	10
Short 50-strike put payoff	-10	0	0
Total value	-10	0	10
<b>Alternative 3:</b>			
Long forward/futures at 50			
Value	-10	0	10

## EXAMPLE 1

# Synthetic Long Forward Position vs. Long Forward/Futures

A market maker has sold a three-month forward contract on Vodafone that allows the client (counterparty) to buy 10,000 shares at 200.35 pence (100p = £1) at expiration. The current stock price ( $S_0$ ) is 200p, and the stock does not pay dividends until after the contract matures. The annualized interest rate is 0.70%. The cost (i.e., premium) of puts and calls on Vodafone is identical.

1. Discuss (a) how the market maker can hedge her short forward position upon the sale of the forward contract and (b) the market maker's position upon expiration of the forward contract.
2. Discuss how the market maker can hedge her short forward contract position using a synthetic long forward position, and explain what happens at expiry if the Vodafone share price is above or below 200.35p.

## Solution 1:

- a. To offset the short forward contract position, the market maker can borrow £20,000 ( $= 10,000 \times S_0/100$ ) and buy 10,000 Vodafone shares at 200p. There is no upfront cost because the stock purchase is 100% financed.
- b. At the expiry of the forward contract, the market maker delivers the 10,000 Vodafone shares she owns to the client that is long the forward, and then the market maker repays her loan. The net outflow for the market maker is zero because the

following two transactions offset each other:

Amount received for the delivery of shares:  $10,000 \times 200.35\text{p} = \text{£}20,035$

Repayment of loan:  $10,000 \times 200\text{p} [1 + 0.700\% \times (90/360)] = \text{£}20,035$

## Solution 2:

To hedge her short forward position, the market maker creates a synthetic long forward position. She purchases a call and sells a put, both with a strike price of 200.35p and expiring in three months.

At the expiry of the forward contract, if the stock price is above 200.35p, the market maker exercises her call, pays  $\text{£}20,035 (=10,000 \times 200.35\text{p})$ , and receives 10,000 Vodafone shares. She then delivers these shares to the client and receives  $\text{£}20,035$ .

At the expiry of the forward contract, if the stock price is below 200.35p, the owner of the long put will exercise his option, and the market maker receives the 10,000 Vodafone shares for  $\text{£}20,035$ . She then delivers these shares to the client and receives  $\text{£}20,035$ .

Consider now a trader who wants to short a stock over a specified period. He needs to borrow the stock from the market and then sell the borrowed shares. Instead, the trader can create a **synthetic short forward position** by selling a call and buying a put at the same strike price and maturity. When using options to replicate a short stock position, it is important to be aware of early assignment risk that could arise with American-style options. As [Exhibit 3](#) shows, the payoff is the exact opposite of the synthetic long forward position.

The same outcome can be achieved by selling forwards or futures contracts (as seen in [Exhibit 3](#)). These instruments are also commonly used to eliminate future price risk. Consider an investor who owns a stock and wants to lock in a future sales price. The investor might enter into a forward or futures contract (as seller) requiring her to deliver the shares at a future date in exchange for a cash amount determined today. Because the initial and final stock prices are known, this investment should pay the risk-free rate. For a dividend-paying stock, the dividends expected to be paid on the stock during the term of the contract will decrease the price of the forward or futures.

### Exhibit 3. Synthetic Short Forward Position

<b>Stock price at expiration:</b>	<b>40</b>	<b>50</b>	<b>60</b>
<b>Alternative 1:</b>			
Short 50-strike call payoff	0	0	−10
Long 50-strike put payoff	10	0	0
Total value	10	0	−10
<b>Alternative 2:</b>			
Short stock at 50	10	0	−10
Value	10	0	−10
<b>Alternative 3:</b>			
Short forward/futures at 50	10	0	−10
Value	10	0	−10

Synthetic forwards on stocks and equity indexes are often used by market makers that have sold a forward contract to customers—to hedge the risk, the market-maker would implement a synthetic long forward position—or by investment banks wishing to hedge forward exposure arising from structured products.

## 2.2. Synthetic Put and Call

As already described, market participants can use synthetic positions to transform the payoff and risk profile of their positions. The symmetrical payoffs of long and short stock, forward, and futures positions can be altered by implementing synthetic options positions. For example, the symmetric payoff of a short stock position can become asymmetrical if the investor transforms it into a synthetic long put position by buying a call.

**Exhibit 4** shows the payoffs of a synthetic long put position that consists of short stock at 50 and a long call with an exercise price of 50. It can be seen that the payoffs from this synthetic put position at various stock prices at option expiration are identical to those of a long put with a 50-strike price. Of course, all positions are assumed to expire at the same time. Note that the same transformation of payoff and risk profile for a position of short forwards or futures can also be accomplished using long call options.

### Exhibit 4. Synthetic Long Put



Stock price at expiration:	40	50	60
<b>Alternative 1:</b>			
Short stock at 50	10	0	-10
Long 50-strike call payoff	0	0	+10
Total value	10	0	0
<b>Alternative 2</b>			
Long 50-strike put payoff	10	0	0
Value	10	0	0

## EXAMPLE 2

### Synthetic Long Put

Three months ago, Wing Tan, a hedge fund manager, entered into a short forward contract that requires him to deliver 50,000 Generali shares, which the fund does not currently own, at €18/share in one month from now. The stock price is currently €16/share. The hedge fund's research analyst, Gisele Rossi, has a non-consensus expectation that the company will report an earnings "beat" next month. The stock does not pay dividends.

1. Under the assumption that Tan maintains the payoff profile of his current short forward position, discuss the conditions for profit or loss at contract expiration.
2. After discussing with Rossi her earnings outlook, Tan remains bearish on Generali. He decides to hedge his risk, however, in case the stock does report a positive earnings surprise. Discuss how Tan can modify his existing position to produce an asymmetrical, risk-reducing payoff.

#### Solution 1:

If Tan decides to keep the current payoff profile of his position, at the expiry date, given a stock price of  $S_T$ , the profit or loss on the short forward will be  $50,000 \times (\text{€}18 - S_T)$ . The position will be profitable only if  $S_T$  is below €18; otherwise the manager will incur in a loss.

#### Solution 2:

Tan decides to modify the payoff profile on his short forward position so that, at expiration, it will benefit from any stock price decrease below €16 while avoiding losses if the stock rises above that price. He purchases a call option with a strike price €16 and one month to maturity at a cost (premium) of €0.50. At expiration, the payoffs are as follows:

- On the short forward contract:  $50,000 \times (\text{€}18 - S_T)$
- On the long call:  $50,000 \times \{\text{Max}[0, (S_T - \text{€}16)] - \text{€}0.50\}$
- On the combined position:  $50,000 \times \{(\text{€}18 - S_T) + [\text{Max}[0, (S_T - \text{€}16)] - \text{€}0.50]\}$

If  $S_T \leq \text{€}16$ , the call will expire worthless and the profit will amount to  $50,000 \times (\text{€}18 - S_T + 0 - \text{€}0.50)$ .

If  $S_T > \text{€}16$ , the call is exercised and the Generali shares delivered for a maximum profit of  $50,000 \times (\text{€}18 - \text{€}16 - \text{€}0.50) = \text{€}75,000$ .

In similar fashion, an investor with a long stock position can change his payoff and risk profile into that of a long call by purchasing a put (“protective put” strategy). The long put eliminates the downside risk, whereas the long stock leaves the profit potential unlimited. As shown in [Exhibit 5](#), the strategy has a payoff profile resembling that of a long call. Again, all positions are assumed to expire at the same time. We will have much more to say about the protective put strategy later in this reading. Finally, the payoff profile of a long call can also be achieved by adding a long put to a long forward or futures position, all with the same expiration dates and the same strike and forward (or futures) prices.

#### Exhibit 5. Synthetic Long Call

Stock price at expiration:	40	50	60
<b>Alternative 1:</b>			
Long stock at 50	-10	0	10
Long 50-strike put payoff	10	0	0
Total value	0	0	10
<b>Alternative 2</b>			
Long 50-strike call payoff	0	0	10
Value			

### 3. COVERED CALLS AND PROTECTIVE PUTS

- b. discuss the investment objective(s), structure, payoff, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of a covered call position;

Writing a **covered call** is a very common option strategy used by both individual and institutional investors. In this strategy, a party that already owns shares sells a call option, giving another party the right to buy their shares at the exercise price.<sup>1</sup> The investor owns the shares and has taken on the potential obligation to deliver the shares to the call option buyer and accept the exercise price as the price at which she sells the shares. For her willingness to do this, the investor receives the premium on the option.

When someone simultaneously holds a long position in an asset and a long position in a put option on that asset, the put is often called a **protective put**. The name comes from the fact that the put protects against losses in the value of the underlying asset.

The examples that follow use the convention of identifying an option by the underlying asset, expiration, exercise price, and option type. For example, in [Exhibit 6](#), the PBR October 16 call option sells for 1.42. The underlying asset is Petróleo Brasileiro (PBR) common stock, the expiration is October, the exercise price is 16, the option is a call, and the call premium is 1.42. It is important to note that even though we will refer to this as the October 16 option, it does not expire on 16 October. Rather, 16 reflects the price at which the call owner has the right to buy, otherwise known as the exercise price or strike.

Petróleo Brasileiro (PBR)	October	16	Call
<i>Underlying asset</i>	<i>Expiration</i>	<i>Exercise price</i>	<i>Option type</i>

On some exchanges, certain options may have weekly expirations in addition to a monthly expiration, which means investors need to be careful in specifying the option of interest. For a given underlying asset and exercise price, there may be several weekly and one monthly option expiring in October. The examples that follow all assume a single monthly expiration.

## 3.1. Investment Objectives of Covered Calls

Consider the option data in [Exhibit 6](#). Suppose there is one month until the September expiration. By convention, option listings show data for a single call or put, but in practice, the most common trading unit for an exchange-traded option is one contract covering 100 shares. Besides call and put premiums for various strike (i.e., exercise) prices and monthly expirations, the option data also shows implied volatilities as well as the “Greeks” (variables so named because most of the common ones are denoted by Greek letters). Implied volatility is the value of the unobservable volatility variable that equates the result of an option pricing model—such as the Black–Scholes–Merton (BSM) model—to the market price of an option, using all other required (and observable) input variables, including the option’s strike price, the price of the underlying, the time to option expiration, and the risk-free interest. Before proceeding further, we provide a brief review of the Greeks because they will be an integral part of the discussion of the various option strategies to be presented.

- **Delta ( $\Delta$ )** is the change in an option’s price in response to a change in price of the underlying, all else equal. Delta provides a good approximation of how an option’s price will change for a small change in the underlying’s price. Delta for long calls is always positive; delta for long puts is always negative. *Delta ( $\Delta$ )  $\approx$  Change in value of option/Change in value of underlying.*
- **Gamma ( $\Gamma$ )** is the change in an option’s delta for a change in price of the underlying, all else equal. Gamma is a measure of the curvature in the option price in relationship to the underlying price. Gamma for long calls and long puts is always positive. *Gamma ( $\Gamma$ )  $\approx$  Change in delta/Change in value of underlying.*
- **Vega ( $v$ )** is the change in an option’s price for a change in volatility of the underlying, all else equal. Vega measures the sensitivity of the underlying to volatility. Vega for long calls and long puts is always positive. *Vega ( $v$ )  $\approx$  Change in value of option/Change in volatility of underlying.*
- **Theta ( $\Theta$ )** is the daily change in an option’s price, all else equal. Theta measures the sensitivity of the option’s price to the passage of time, known as time decay. Theta for long calls and long puts is generally negative.

Assume the current PBR share price is 15.84 and the risk-free rate is 4%. Now let us consider three different market participants who might logically use covered calls.

### Exhibit 6. PBR Option Prices, Implied Volatilities, and Greeks

Call Prices	Exercise Price	Put Prices
-------------	----------------	------------

SEP	OCT	NOV		SEP	OCT	NOV
1.64	1.95	2.44	15	0.65	0.99	1.46
0.97	1.42	1.90	16	1.14	1.48	1.96
0.51	1.02	1.44	17	1.76	2.09	2.59

Call Implied Volatility				Put Implied Volatility		
SEP	OCT	NOV		SEP	OCT	NOV
64.42%	57.33%	62.50%	15	58.44%	56.48%	62.81%
55.92%	56.11%	60.37%	16	59.40%	56.35%	62.27%
51.07%	55.87%	58.36%	17	59.59%	56.77%	63.40%

**Delta: change in option price per change of +1 in stock price, all else equal**

Call Deltas				Put Deltas		
SEP	OCT	NOV		SEP	OCT	NOV
0.657	0.647	0.642	15	-0.335	-0.352	-0.359
0.516	0.540	0.560	16	-0.481	-0.460	-0.438
0.351	0.434	0.475	17	-0.620	-0.564	-0.513

**Gamma: change in delta per change of +1 in stock price, all else equal**

Call Gammas				Put Gammas		
SEP	OCT	NOV		SEP	OCT	NOV
0.125	0.100	0.075	15	0.136	0.102	0.075
0.156	0.109	0.082	16	0.147	0.109	0.080
0.159	0.109	0.086	17	0.140	0.107	0.079

**Theta: daily change in option price, all else equal**

Call Thetas (daily)				Put Thetas (daily)		
SEP	OCT	NOV		SEP	OCT	NOV
-0.019	-0.012	-0.011	15	-0.015	-0.010	-0.009
-0.018	-0.013	-0.011	16	-0.017	-0.011	-0.010

-0.015   -0.012   -0.011   17   -0.016   -0.011   -0.010

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Vega: change in option price per 1% increase in volatility, all else equal						
Call Vegas (per %)				Put Vegas (per %)		
SEP	OCT	NOV		SEP	OCT	NOV
0.017	0.024	0.030	15	0.017	0.024	0.030
0.018	0.026	0.031	16	0.018	0.026	0.031
0.017	0.025	0.032	17	0.017	0.025	0.032

### 3.1.1. Market Participant #1: Yield Enhancement

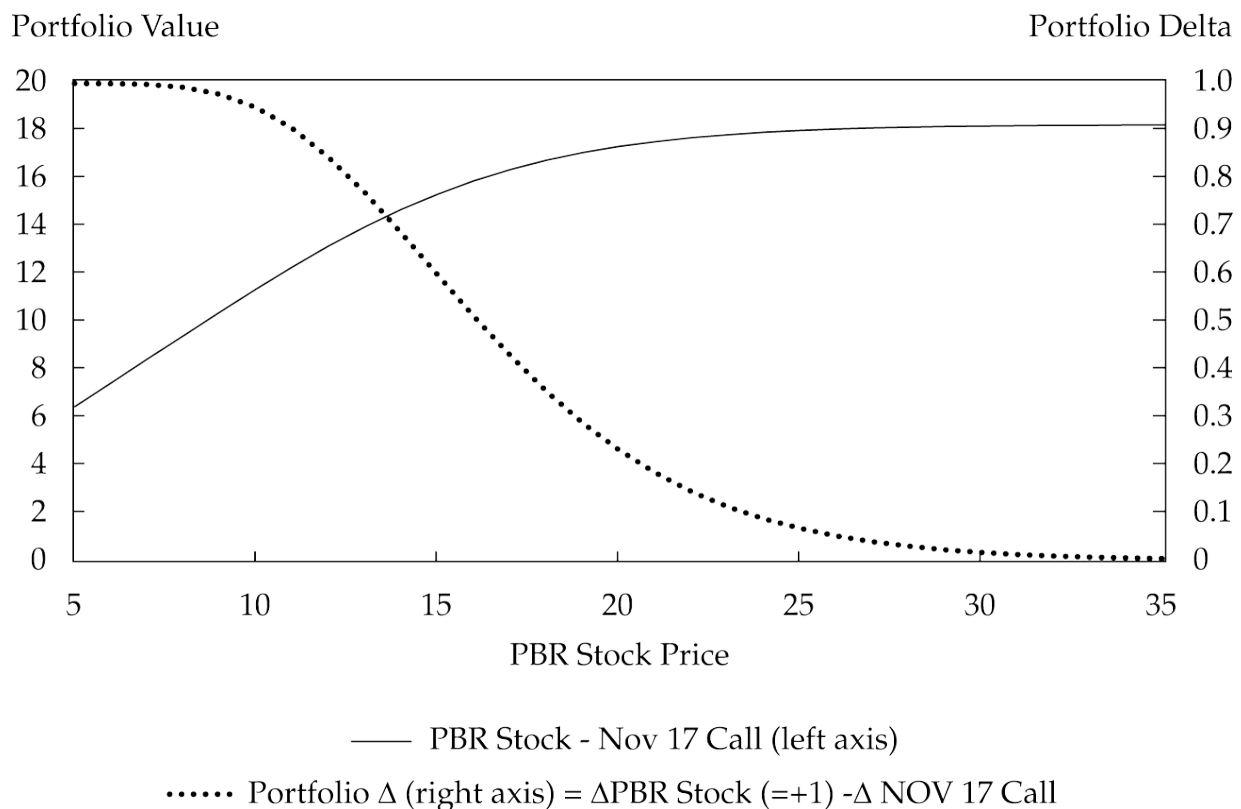
The most common motivation for writing covered calls is cash generation in anticipation of limited upside moves in the underlying. The call option writer keeps the premium regardless of what happens in the future. Some covered call writers view the premium they receive as an additional source of income in the same way they view cash dividends. For a covered call, a long position in 100 shares of the underlying is required for each short call contract. No additional cash margin is needed if the long position in the underlying is maintained. If the stock price exceeds the strike price at expiry, the underlying shares will be “called away” from the covered call writer and then delivered to satisfy the option holder’s right to buy shares at the strike price. It is important to recognize, however, that when someone writes a call option, he is essentially giving up the returns above the strike price to the call holder.

Consider an individual investor who owns PBR and believes the stock price is likely to remain relatively flat over the next few months. With the stock currently trading at just under 16, the investor might think it unlikely that the stock will rise above 17. [Exhibit 6](#) shows that the premium for a call option expiring in September with an exercise price of 17, referred to as the SEP 17 call, is 0.51. She could write that call and receive this premium. Alternatively, she could write a different call, say the NOV 17 call, and receive 1.44. There is a clear trade-off between the size of the option premium and the likelihood of option exercise. The option writer would get more cash from writing the longer-term option (because of a larger time premium), but there is a greater chance that the option would move in the money, resulting in the option being exercised by the buyer and, therefore, the stock being called away from the writer. The view of the covered call writer can be understood in terms of the call option’s implied volatility. Essentially, writing the call expresses the view that the volatility of the underlying asset will be lower than the pricing of the option suggests. As shown in [Exhibit 6](#), the implied volatility of the NOV 17 options is 58.36%. By writing the NOV 17 call for 1.44, the covered call investor believes that the volatility of the underlying asset will be less than

the option's implied volatility of 58.36%. The call buyer believes the stock will move far enough above the strike price of 17 to provide a payoff greater than the 1.44 cost of the call.

Although it may be acceptable to think of the option premium as income, it is important to remember that the call writer has given up an important benefit of stock ownership: capital gains above the strike price. This dynamic can be seen in [Exhibit 7](#). Consider an investor with a long position in PBR stock (with delta of +1) and a short position in a PBR NOV 17 call. The investor enjoys the benefit of the call premium of 1.44. This cushions the value of the position (Stock – Call, or  $S - C$ ) as the PBR share price drops. If the PBR stock price drops to 5, the call option will drop to essentially 0. The portfolio will be worth about 6.44, as shown in [Exhibit 7](#). As the stock price increases, however, the short call position begins to limit portfolio gains. If the price of PBR shares rises to 30, the call option delta approaches 1, so the delta of the portfolio ( $S - C$ ) approaches 0. The portfolio gains from the long PBR stock position will be reduced by losses on the short call position. As the in-the-money option expires, the maximum value of the portfolio will approach 18.44, the exercise price of 17 plus the 1.44 premium, as in [Exhibit 7](#).

### Exhibit 7. Covered Call Portfolio Value: Long PBR Stock—NOV 17 Call



### 3.1.2. Market Participant #2: Reducing a Position at a Favorable

## Price

Next, consider Sofia Porto, a retail portfolio manager with a portfolio that has become overweighted in energy companies. She wants to reduce this imbalance. Porto holds 5,000 shares of PBR, an energy company, and she expects the price of this stock to remain relatively stable over the next month. She may decide to sell 1,000 shares for 15.84 each. As an alternative, Porto might decide to write 10 exchange-traded PBR SEP 15 call contracts. This means she is creating 10 option contracts, each of which covers 100 shares. In exchange for this contingent claim, she receives the option premium of  $1.64/\text{call} \times 100 \text{ calls/contract} \times 10 \text{ contracts} = 1,640$ . Because the current PBR stock price (15.84) is above the exercise price of 15, the options she writes are in the money. Given her expectation that the stock price will be stable over the next month, it is likely that the option will be exercised. Because Porto wants to reduce the overweighting in energy stocks, this outcome is desirable. If the option is exercised, she has effectively sold the stock at 16.64. She receives 1.64 when she writes the option, and she receives 15 when the option is exercised. Porto could have simply sold the shares at their original price of 15.84, but in this specific situation, the option strategy resulted in a price improvement of 0.80 ( $[15 + 1.64] - 15.84$ ) per share, or 5.05% ( $0.80/15.84$ ), in a month's time.<sup>2</sup> By maintaining the stock position and selling a 15 call, she still risks the possibility of a stock price decline during the coming month resulting in a realized price lower than the current market price of 15.84. For example, if the PBR share price declined to 10 over the next month, Porto would realize only  $10 + 1.64 = 11.64$  on her covered call position.

An American option premium can be viewed as having two parts: exercise value (also called intrinsic value) and time value.<sup>3</sup>

$$\text{Call Premium} = \text{Time Value} + \text{Intrinsic Value} = \text{Time Value} + \text{Max}(0, S - X)$$

In this case, the right to buy at 15 when the stock price is 15.84 has an exercise (or intrinsic) value of 0.84. The option premium is 1.64, which is 0.80 more than the exercise value. This difference of 0.80 is called time value.

$$1.64 = \text{Time Value} + (15.84 - 15)$$

Someone who writes covered calls to improve on the market is capturing the time value, which augments the stock selling price. Remember, though, that giving up part of the return distribution would result in an opportunity loss if the underlying goes up.

### 3.1.3. Market Participant #3: Target Price Realization

A third popular use of options is really a hybrid of the first two objectives. This strategy involves writing calls with an exercise price near the target price for the stock. Suppose a



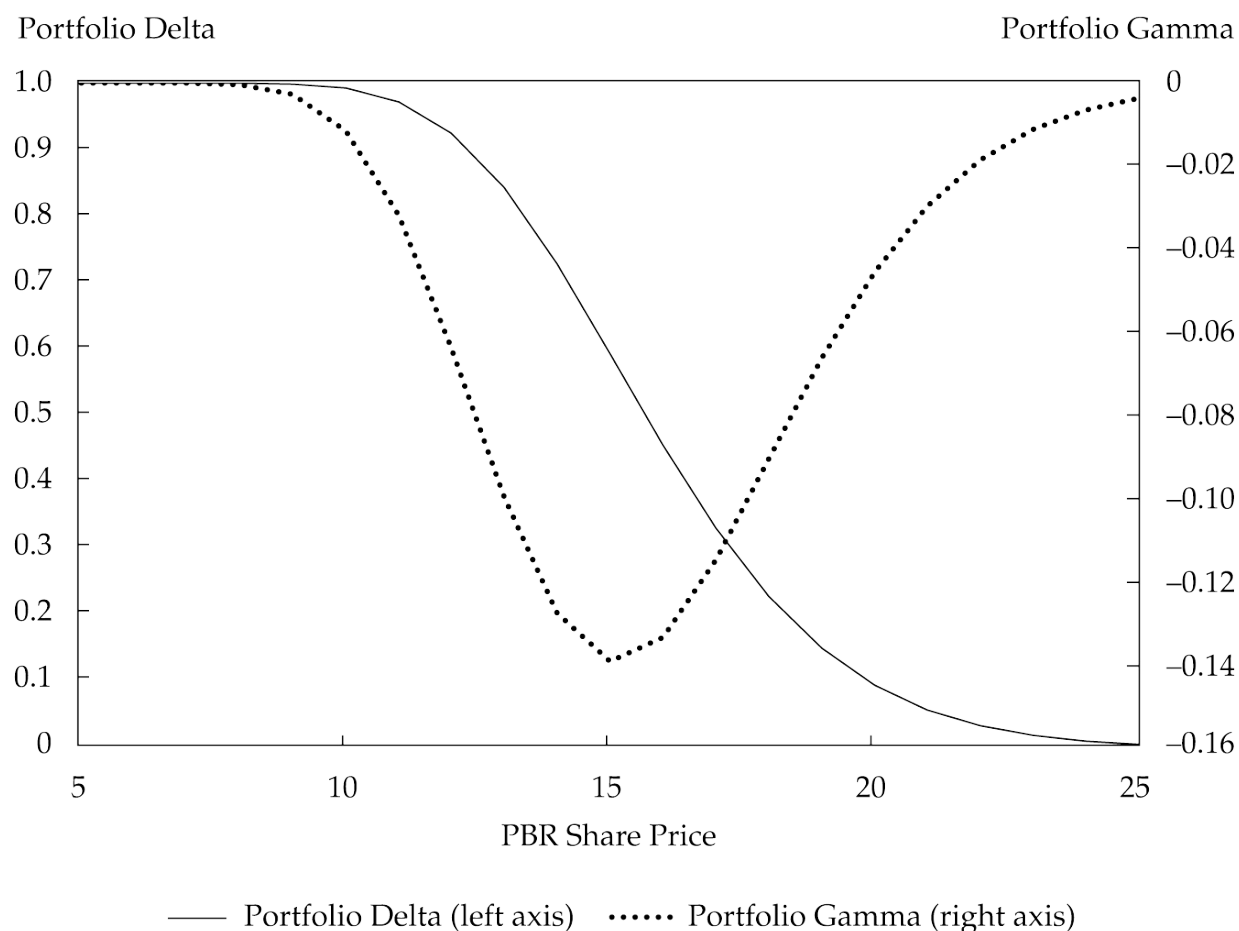
bank trust department holds PBR in many of its accounts and that its research team believes the stock would be properly priced at 16 per share, which is only slightly higher than its current price. In those accounts for which the investment policy statement permits option activity, the manager might choose to write near-term calls with an exercise price near the target price, 16 in this case. Suppose an account holds 500 shares of PBR. Writing 5 SEP 16 call contracts at 0.97 brings in 485 in cash. If the stock is above 16 in a month, the stock will be called away at the strike price (target price), with the option premium adding an additional 6% positive return to the account.<sup>4</sup> If PBR fails to rise to 16, the manager might write a new OCT expiration call with the same objective in mind.

Although this strategy is popular, the investor should not view it as a source of free money. The stock is currently very close to the target price, and the manager could simply sell it and be satisfied. Although the covered call writing program potentially adds to the return, there is also the chance that the stock could experience bad news or the overall market might pull back, resulting in an opportunity loss relative to the outright sale of the stock. The investor also would have an opportunity loss if the stock rose sharply above the exercise price and it was called away at a lower-than-market price.

The exposure from the short position in the PBR SEP 16 call can be understood in terms of the Greeks in [Exhibit 6](#). Delta measures how the option price changes as the underlying asset price changes, and gamma measures the rate of change in delta.<sup>5</sup> A PBR SEP 16 call has a delta = 0.516 and a gamma of 0.156. A short call will reduce the delta of the portfolio ( $S - C$ ) from +1 to +0.484 ( $= +1[\text{Share}] - 0.516[\text{Short Call}]$ ). The lower portfolio delta will reduce the upside opportunity. A share price increase of 1 will result in a portfolio gain of approximately 0.484.<sup>6</sup> The delta of the portfolio is not constant. By selling the PBR 16 call, the portfolio is now “short gamma”. Remember, gamma is the rate of change of delta. Although the underlying PBR share has a gamma of 0, the short call will make the gamma of the portfolio -0.156. As the price of PBR shares increases above 16, the delta of the PBR call position will change, at a rate of gamma. Gamma is greatest for a near-the-money option and becomes progressively smaller as the option moves either into or out of the money (as seen in [Exhibit 8](#)).

Gamma of an ATM option can increase dramatically as the time to expiration approaches or volatility increases. Traders with large gamma exposure (especially large negative gamma) should be aware of the speed with which the position values can change. The change in portfolio delta and gamma for a PBR SEP 16 covered call as a function of share price can be seen in [Exhibit 8](#). As the price of PBR shares increase, the portfolio delta changes at a rate of gamma. As the share price moves above the exercise price of 16, the portfolio ( $S - C$ ) delta drops at a rate gamma towards its eventual limit of 0, effectively eliminating any remaining upside in the position.

#### **Exhibit 8. Delta vs. Gamma for PBR 16 Covered Call Portfolio**



### 3.1.4. Profit and Loss at Expiration

In the process of learning option strategies, it is always helpful to look at a graphical display of the profit and loss possibilities at the option expiration. Suppose an investor owns PBR, currently trading at 15.84. The investor believes gains may be limited above a price of 17 and decides to write a call against the long share position. The 17 strike calls will have no intrinsic value because the share price is currently 15.84. The investor must now consider the available option maturities (SEP, OCT, and NOV) as shown in [Exhibit 6](#). In deciding which option to write, the investor may consider the option premiums and implied volatilities. Based on the investor's view that volatility will remain low over the next three months, the investor chooses to write the NOV call. At 58.36%, the NOV 17 call has highest implied volatility of the available 17 strike options, so it would be the most overvalued assuming low volatility. The option premium of 1.44 is completely explained by the time value of the NOV option, because the NOV 17 option has no exercise value (Option premium = Time value + Intrinsic value;  $1.44 = \text{Time value} + \text{Max}[0, 15.84 - 17]$ ). If the stock is above 17 at expiration, the option holder will exercise the call option and the investor will deliver the shares in exchange for the exercise price of 17. The maximum gain with a covered call is the

appreciation to the exercise price plus the option premium.<sup>7</sup>

Some symbols will be helpful in learning these relationships:

$S_0$  = Stock price when option position opened

$S_T$  = Stock price at option expiration

$X$  = Option exercise price

$c_0$  = Call premium received or paid

The maximum gain is  $(X - S_0) + c_0$ . With a starting price of 15.84, a sale price of 17 results in 1.16 of price appreciation. The option writer would keep the option premium of 1.44 for a total gain of  $1.16 + 1.44 = 2.60$ . This is the maximum gain from this strategy because all price appreciation above 17 belongs to the call holder. The call writer keeps the option premium regardless of what the stock does, so if it were to drop, the overall loss is reduced by the option premium received. [Exhibit 9](#) shows the situation. The breakeven price for a covered call is the stock price minus the premium, or  $S_0 - c_0$ . In other words, the breakeven point occurs when the stock falls by the premium received—in this example,  $15.84 - 1.44 = 14.40$ . The maximum loss would occur if the stock became worthless; it equals the original stock price minus the option premium received, or  $S_0 - c_0$ .<sup>8</sup> In this single unlikely scenario, the investor would lose 15.84 on the stock position but still keep the premium of 1.44, for a total loss of 14.40.

At option expiration, the *value* of the covered call position is the stock price minus the exercise value of the call. Any appreciation beyond the exercise price belongs to the option buyer, so the covered call writer does not earn any gains beyond that point. Symbolically,

### Equation (1)

$$\text{Covered Call Expiration Value} = S_T - \text{Max}[(S_T - X), 0].$$

The *profit* at option expiration is the covered call value plus the option premium received minus the original price of the stock:

### Equation (2)

$$\text{Covered Call Profit at Expiration} = S_T - \text{Max}[(S_T - X), 0] + c_0 - S_0.$$

In summary:

$$\text{Maximum gain} = (X - S_0) + c_0$$

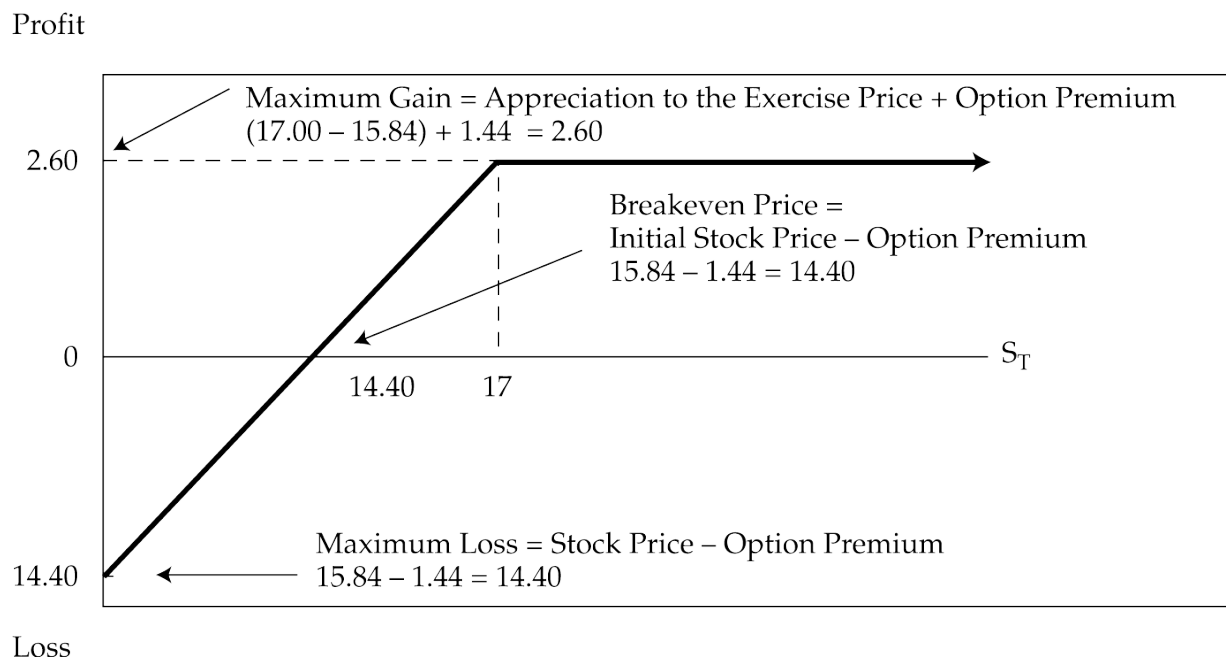
$$\text{Maximum loss} = S_0 - c_0$$

$$\text{Breakeven price} = S_0 - c_0$$

$$\text{Expiration value} = S_T - \text{Max}[(S_T - X), 0]$$

$$\text{Profit at expiration} = S_T - \text{Max}[(S_T - X), 0] + c_0 - S_0$$

### Exhibit 9. Covered Call P&L Diagram: Stock at 15.84, Write 17 Call at 1.44



It is important to remember that these profit and loss diagrams depict the situation only at the end of the option's life.<sup>9</sup> Most equity covered call writing occurs with exchange-traded options, so the call writer always has the ability to buy back the option before expiration. If, for instance, the PBR stock price were to decline by 1 shortly after writing the covered call, the call value would most likely also decline. If this investor correctly believed the decline was temporary, he might buy the call back at the new lower option premium, making a profit on that trade, and then write the option again after the share price recovered.

### EXAMPLE 3

## Characteristics of Covered Calls

$S_0$  = Stock price when option position opened = 25.00

$X$  = Option exercise price = 30.00

$S_T$  = Stock price at option expiration = 31.33

$c_0$  = Call premium received = 1.55

1. Which of the following correctly calculates the maximum gain from writing a covered call?
  - A.  $(S_T - X) + c_0 = 31.33 - 30.00 + 1.55 = 2.88$
  - B.  $(S_T - S_0) - c_0 = 31.33 - 25.00 - 1.55 = 4.78$
  - C.  $(X - S_0) + c_0 = 30.00 - 25.00 + 1.55 = 6.55$
2. Which of the following correctly calculates the breakeven stock price from writing a covered call?
  - A.  $S_0 - c_0 = 25.00 - 1.55 = 23.45$
  - B.  $S_T - c_0 = 31.33 - 1.55 = 29.78$
  - C.  $X + c_0 = 30.00 + 1.55 = 31.55$
3. Which of the following correctly calculates the maximum loss from writing a covered call?
  - A.  $S_0 - c_0 = 25.00 - 1.55 = 23.45$
  - B.  $S_T - c_0 = 31.33 - 1.55 = 29.78$
  - C.  $S_T - X + c_0 = 31.33 - 30.00 + 1.55 = 2.88$

### Solution to 1:

C is correct. The covered call writer participates in gains up to the exercise price, after which further appreciation is lost to the call buyer. That is,  $X - S_0 = 30.00 - 25.00 = 5.00$ . The call writer also keeps  $c_0$ , the option premium, which is 1.55. So, the total maximum gain is  $5.00 + 1.55 = 6.55$ .

### **Solution to 2:**

A is correct. The call premium of 1.55 offsets a decline in the stock price by the amount of the premium received:  $25.00 - 1.55 = 23.45$ .

### **Solution to 3:**

A is correct. The stock price can fall to zero, causing a loss of the entire investment, but the option writer still keeps the option premium received:  $25.00 - 1.55 = 23.45$

---

## **4. INVESTMENT OBJECTIVES OF PROTECTIVE PUTS**

- c. discuss the investment objective(s), structure, payoff, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of a protective put position;

The protective put is often viewed as a classic example of buying insurance. The investor holds a risky asset and wants protection against a loss in value. He then buys insurance in the form of the put, paying a premium to the seller of the insurance, the put writer. The exercise price of the put is similar to the coverage amount for an insurance policy. The insurance policy deductible is similar to the difference between the current asset price and the strike price of the put. A protective put with a low exercise price is like an insurance policy with a high deductible. Although less expensive, a low strike put involves greater price exposure before the payoff function goes into the money. For an insurance policy, a higher deductible is less expensive and reflects the increased risk borne by the insured party. For a protective put, a lower exercise price is less costly and has a greater risk of loss in the position.

Like traditional term insurance, this form of insurance provides coverage for a period of time. At the end of the period, the insurance expires and either pays off or not. The buyer of the insurance may or may not choose to renew the insurance by buying another put. A protective put can appear to be a great transaction with no drawbacks, because it provides downside protection with upside potential, but let us take a closer look.

## 4.1. Loss Protection/Upside Preservation

Suppose a portfolio manager has a client with a 50,000 share position in PBR. Her research suggests there may be a negative shock to the stock price in the next four to six weeks, and he wants to guard against a price decline. Consider the put prices shown in [Exhibit 6](#); the purchase of a protective put presents the manager with some choices. Puts represent a right to sell at the strike price, so higher-strike puts will be more expensive. For this reason, the put buyer may select the 15-strike PBR put. Longer-term American puts are more expensive than their equivalent (same strike price) shorter-maturity puts. The put buyer must be sure the put will not expire before the expected price shock has occurred. The portfolio manager could buy a one-month (SEP) 15-strike put for 0.65. This put insures against the portion of the underlying return distribution that is below 15, but it will not protect against a price shock occurring after the SEP expiration.

Alternatively, the portfolio manager could buy a two-month option, paying 0.99 for an OCT 15 put, or she could buy a three-month option, paying 1.46 for a NOV 15 put. Note that there is not a linear relationship between the put value and its time until expiration. A two-month option does not sell for twice the price of a one-month option, nor does a three-month option sell for three times the price of a one-month option. The portfolio manager can also reduce the cost of insurance by increasing the size of the deductible (i.e., the current stock price minus the put exercise price), perhaps by using a put option with a 14 exercise price. A put option with an exercise price of 14 would have a lower premium but would not protect against losses in the stock until it falls to 14.00 per share. The option price is cheaper, but on a 50,000 share position, the deductible would be 50,000 more than if the exercise price of 15 were selected.<sup>10</sup>

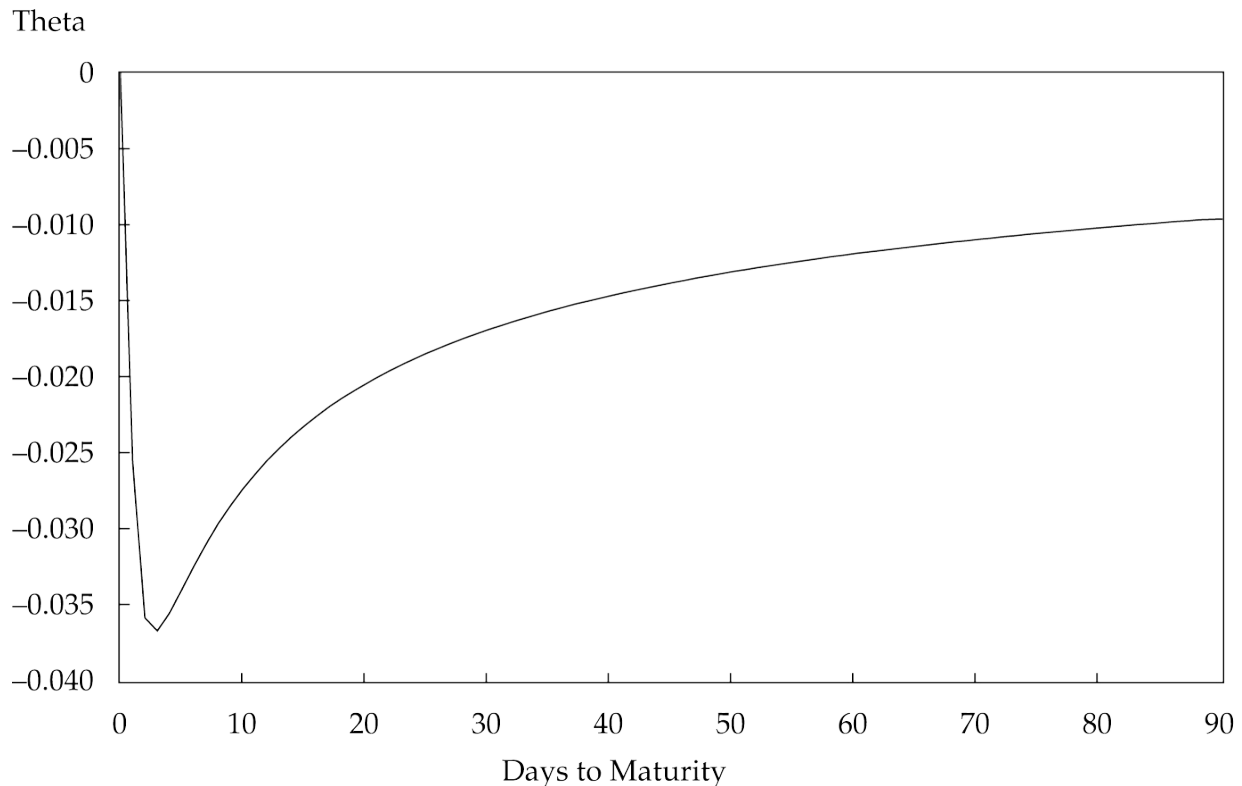
Because of the uncertainty about the timing of the “shock event” she anticipates, the manager might consider the characteristics of the available option maturities. Given our assumptions, three of the BSM model inputs for the available 15 strike options are the same (PBR stock price 15.84, the strike price 15 and the risk-free rate of interest 4%). The difference in the cost of the SEP, OCT, and NOV options will be explained by the differences in time and the term structure of volatility. The BSM model assumes option volatility does not change over time or with strike price. In practice, volatility can vary across time and strike prices. For the 15 puts, the implied volatility is slightly greater for the NOV option, perhaps reflecting other traders’ concerns about a shock event before expiration. Because the PBR stock price is 15.84 and the put options are all 15 strike, all three maturities have no intrinsic value.

The cost of each PBR 15 strike option is entirely explained by the remaining time value. If the stock price does not fall below 15, the SEP, OCT, and NOV put option values will erode to 0 as they approach their expiration dates. The erosion of the options value with time is approximated by the theta. The daily thetas (Theta/365) for the PBR puts and calls are given in [Exhibit 6](#). Notice, all the theta values in the table are negative. These values approximate the daily losses on the option positions as time passes, all else equal. The NOV 15 put (90

days) has a theta of  $-0.009$  and the SEP 15 put (30 days) has a theta of  $-0.015$ . If the NOV 15 option is held for one day, and the price and volatility of the underlying do not change, the put value will decline by approximately 0.009 to approximately 1.45 ( $= 1.46 - 0.009$ ).

The graph of the BSM theta function for the PBR NOV 15 option as it approaches maturity is shown in [Exhibit 10](#). Notice how the rate of decline changes as maturity approaches. If the PBR price does not drop below 15, the NOV 15 put will expire out-of-the-money and the option price will gradually fall to 0. All else equal, the sum of the daily losses approximated by theta will explain the entire loss of 1.46 in option value over that time. The complex shape of the theta graph in [Exhibit 10](#) results from the nature of the BSM theta formula, which includes terms to reflect the probability that the stock price will fall below the strike price during the remaining time. Note that if the price of PBR remains at 15.84 for the last 10 days to maturity, the BSM put option value will erode to 0 at varying rates averaging about  $-0.03/\text{day}$ . Assumptions of the BSM model explain the negative peak in theta around three days prior to maturity as the remaining time value rapidly decays to 0. Theta values might help the investor decide which maturity to choose. If he were to buy the cheaper SEP put, the daily erosion of value ( $-0.015$ ) would be greater than for the more expensive NOV put ( $-0.009$ ).

**Exhibit 10. PBR 15 Put Theta over Time**





Given the four- to six-week time horizon for the shock event anticipated by the portfolio manager, the OCT put seems appropriate, but there is still the potential to lose the premium without realizing any benefit. With a 0.99 premium for the OCT 15 put and 50,000 shares to protect, the cost to the account would be almost 50,000. One advantage of the NOV option is that although it is more expensive, it has the smallest daily loss of value, as captured by theta. This option also has a greater likelihood of not having expired before the news hits. Also, although the portfolio manager could hold onto the put position until its expiration, she might find it preferable to close out the option prior to maturity and recover some of the premium paid.<sup>11</sup>

## 4.2. Profit and Loss at Expiration

**Exhibit 11** shows the profit and loss diagram for the protective put.<sup>12</sup> The stock can rise to any level, and the position would benefit fully from the appreciation; the maximum gain is unlimited. On the downside, losses are “cut off” once the stock price falls to the exercise price. With a protective put, the maximum loss is the depreciation to the exercise price plus the premium paid, or  $S_0 - X + p_0$ . At the option expiration, the value of the protective put is the greater of the stock price or the exercise price. The reason is because the stock can rise to any level but has a floor value of the put exercise price. In symbols,

### Equation (3)

$$\text{Value of Protective Put at Expiration} = S_T + \text{Max}[(X - S_T), 0].$$

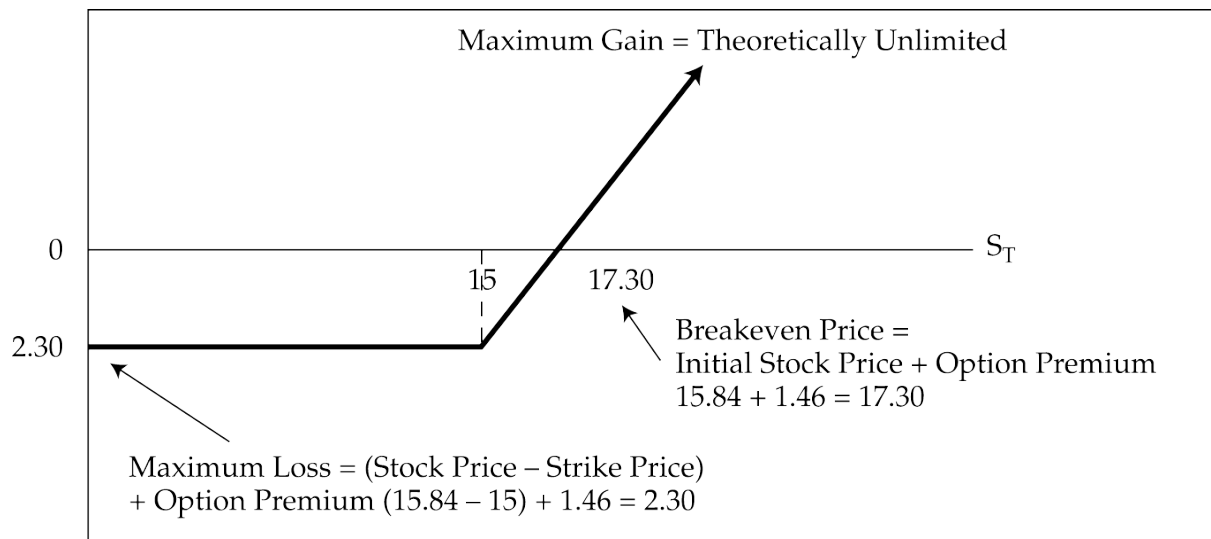
The profit or loss at expiration is the ending value minus the beginning value. The initial value of the protective put is the starting stock price minus the put premium. In symbols,

### Equation (4)

$$\text{Profit of Protective Put at Expiration} = S_T + \text{Max}[(X - S_T), 0] - S_0 - p_0.$$

**Exhibit 11. Protective Put P&L Diagram: Stock at 15.84, Buy 15 Put at 1.46**

Profit



Loss

To break even, the underlying asset must rise by enough to offset the price of the put that was purchased. The breakeven point is the initial stock price plus the option premium. In symbols, Breakeven Price =  $S_0 + p_0$ .

In summary:

$$\text{Maximum gain} = S_T - S_0 - p_0 = \text{Unlimited}$$

$$\text{Maximum loss} = S_0 - X + p_0$$

$$\text{Breakeven price} = S_0 + p_0$$

$$\text{Expiration value} = S_T + \text{Max}[(X - S_T), 0]$$

$$\text{Profit at expiration} = S_T + \text{Max}[(X - S_T), 0] - S_0 - p_0$$

#### EXAMPLE 4

## Characteristics of Protective Puts

$S_0$  = Stock price when option position opened = 25.00

$X$  = Option exercise price = 20.00

$S_T$  = Stock price at option expiration = 31.33

$p_0$  = Put premium paid = 1.15

1. Which of the following correctly calculates the gain with the protective put?

A.  $S_T - S_0 - p_0 = 31.33 - 25.00 - 1.15 = 5.18$

B.  $S_T - S_0 + p_0 = 31.33 - 25.00 + 1.15 = 7.48$

C.  $S_T - X - p_0 = 31.33 - 20.00 - 1.15 = 10.18$

2. Which of the following correctly calculates the breakeven stock price with the protective put?

A.  $S_0 - p_0 = 25.00 - 1.15 = 23.85$

B.  $S_0 + p_0 = 25.00 + 1.15 = 26.15$

C.  $S_T + p_0 = 31.33 + 1.15 = 32.48$

3. Which of the following correctly calculates the maximum loss with the protective put?

A.  $S_0 - X + p_0 = 25.00 - 20.00 + 1.15 = 6.15$

B.  $S_T - X - p_0 = 31.33 - 20.00 - 1.15 = 10.18$

C.  $S_0 - p_0 = 25.00 - 1.15 = 23.85$

### **Solution to 1:**

A is correct. If the stock price is above the put exercise price at expiration, the put will expire worthless. The profit is the gain on the stock ( $S_T - S_0$ ) minus the cost of the put. Note that the maximum profit with a protective put is theoretically unlimited, because the stock can rise to any level and the entire profit is earned by the stockholder.

### **Solution to 2:**

B is correct. Because the option buyer pays the put premium, she does not begin to make money until the stock rises by enough to recover the premium paid.

### Solution to 3:

A is correct. Once the stock falls to the put exercise price, further losses are eliminated. The investor paid the option premium, so the total loss is the “deductible” plus the cost of the insurance.

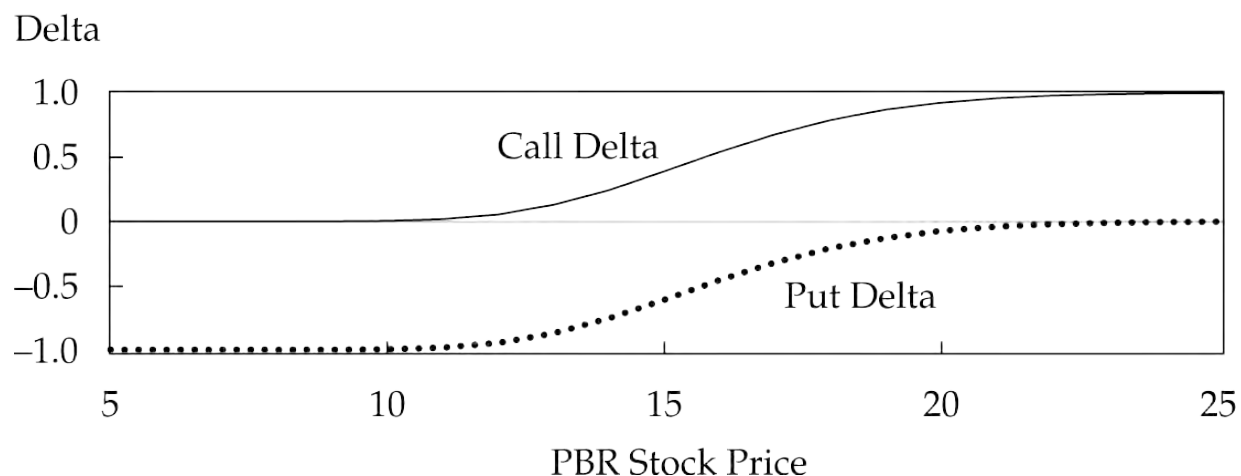
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## 5. EQUIVALENCE TO LONG ASSET/SHORT FORWARD POSITION

- d. compare the delta of covered call and protective put positions with the position of being long an asset and short a forward on the underlying asset;

All investors who consider option strategies should understand that some options are more sensitive to changes in the underlying asset than others. As we have seen, this relationship is measured by delta, an indispensable tool to an options user. Because a long call increases in value and a long put decreases in value as the underlying asset increases in price, call deltas range from 0 to 1 and put deltas range from 0 to  $-1$ . (Naturally, the signs are reversed for short positions in these options.) A long position in the underlying asset has a delta of 1.0, whereas a short position has a delta of  $-1.0$ . When the share price is close to the strike price, a rough approximation is that a long ATM option will have a delta that is approximately 0.5 (for a call) or  $-0.5$  (for a put). [Exhibit 12](#) shows the delta for the PBR SEP 16 put and call versus share price. As the stock price moves toward 16 (the strike price), the call option delta is approximately 0.52 and the put delta is  $-0.48$ . In general,  $\text{Call Delta} - \text{Put Delta} = 1$  for options on the same underlying with the same BSM model inputs.

### Exhibit 12. Delta of PBR Options vs. Stock Price



Delta can be applied to a portfolio as well. Suppose on the Tokyo Stock Exchange, Honda Motor Company stock sells for ¥3,500. A portfolio contains 100 shares, and the manager writes one exchange-traded covered call contract with a ¥3,500 strike. The delta of the 100-share position will be  $100 \times +1 = +100$ . Because the call is at the money, meaning that the stock price and exercise price are equal, it will have a delta of approximately 0.5. The portfolio, however, is short one call contract. From the perspective of the portfolio, the delta of the short call contract is  $-0.5 \times 100 = -50$ . A short call *loses* money as the underlying price rises. So, this covered call has a **position delta** (which is an overall or portfolio delta) of 50, consisting of +100 points for the stock and -50 points for the short call. Compare this call with a protective put, in which someone buys 100 shares of stock and one contract of an ATM put. Its position delta would also be 50: +100 points for the stock and -50 points for the long put.

Finally, consider a long stock position of 100 shares and a short forward position of 50 shares. Because futures and forwards on non-dividend-paying stocks are essentially proxies for the stock, their deltas are also 1.0 for a long position and -1.0 for a short position. In this example, the short forward position “cancels” half the long stock position, so the position delta is also 50. These examples show three different positions: an ATM covered call, an ATM protective put, and a long stock/short forward position that all have the same delta. For small movements in the price of the underlying asset, these positions will show very similar gains and losses.

## 5.1. Writing Puts

If someone writes a put option and simultaneously deposits an amount of money equal to the exercise price into a designated account, it is called writing a **cash-secured put**.<sup>13</sup> This strategy is appropriate for someone who is bullish on a stock or who wants to acquire shares

at a particular price. The fact that the option exercise price is escrowed provides assurance that the put writer will be able to purchase the stock if the option holder chooses to exercise. Think of the cash in a cash-secured put as being similar to the stock part of a covered call. When an investor sells a covered call, she takes on the obligation to sell a stock, and this obligation is covered by ownership in the shares. When a put option is sold to create a new position, the obligation that accompanies this position is to purchase shares. In order to cover the obligation to purchase shares, the portfolio should have enough cash in the account to make good on this obligation. The short put position is covered or secured by cash in the account.

Now consider two slightly different scenarios using the price data from [Exhibit 6](#). In the first scenario, one investor might be bullish on PBR and is interested in buying the stock at a cheaper price. With the stock at 15.84, she writes the SEP 15 put for 0.65, which is purchased by another investor who is bearish on PBR stock. The option writer will keep the option premium regardless of what the stock price does. If the stock is below 15 at expiration, however, the put would be exercised and the option writer would be obliged to purchase shares from the option holder at the exercise price of 15.

Possible small (and independent) changes to the variables from [Exhibit 6](#) are simulated in [Exhibit 13](#) for the *long* PBR SEP 15 put position. The long put is illustrated here for simplicity—these statistics for the long put position should also help the put writer to understand the risks and returns for her position, because a short position is simply the mirror image of the long position. The initial values are 15.84 for the stock and 0.65 for the put, and the put buyer has acquired a delta of  $-0.335$  and a gamma of  $0.136$ .<sup>14</sup>

As demonstrated in change #1, if the stock price rises by 0.10 from 15.84 to 15.94, the long (short) put will lose (gain) approximately  $-0.335 \times 0.10 = -0.0335$  ( $+0.0335$ ), as the put value drops from 0.65 to approximately 0.617 ( $\approx 0.6165 = 0.65 - 0.0335$ ). Remember, this approximation is good for only a small change in the underlying share price. As the stock price rises, the long put’s initial delta,  $-0.335$ , will change at a rate of gamma,  $0.136$ , so the delta then becomes  $-0.321$ .

**Exhibit 13. Long PBR SEP 15 PUT, Greeks and Put Price Changes for Small, Independent Changes in Inputs**

	Stock Price (S)	Delta (Δ)	Gamma (Γ)	Option Price (p)
Initial Values	15.84	-0.335	0.136	0.65
<b>Change #1: Stock Price Increases by 0.10, from 15.84 to 15.94</b>				
<b>ΔS =+0.10</b>	<b>15.94</b>	Δ changes at	Γ changes	$p_1 \approx p_0 + (\Delta_0$

$\Delta t = 0$	rate of $\Gamma$ , so:	slightly to 0.133	$\times \Delta S$
$\Delta Vol = 0$	$\Delta_1 \approx \Delta_0 + (\Gamma \times$		$0.617 \approx$
	$\Delta S)$		$0.65 +$
	$-0.321 \approx$		$(-0.335 \times$
	$-0.335 +$		$0.10)$
	$(0.136 \times 0.10)$		

**Change #2: Time to Expiration Changes by 1 Day, from 30 to 29 Days**

$\Delta S = 0$	15.84	-0.335	0.136	$p_1 \approx p_0 + (\Theta$
$\Delta t = 1 \text{ day (to}$				$\times \Delta t)$
<b>29 Days)</b>				$0.635 \approx$
$\Delta Vol = 0$				$0.65 +$
				$(-0.015 \times 1)$

**Change #3: Implied Volatility Increases by 1 Percentage Point, from 58.44% to 59.44%**

$\Delta S = 0$	15.84	-0.335	0.136	$p_1 \approx p_0 + (v \times$
$\Delta t = 0$				$\Delta Vol)$
$\Delta Vol = +1\%$				$0.667 \approx$
<b>(to 59.44%)</b>				$0.65 + (0.017$
				$\times 1)$

The long SEP 15 put position also has a theta of  $-0.015$  and a vega of  $+0.017$ .<sup>15</sup> As time decays, the long (short) put option will lose (gain) value at a rate of theta, so the value of long (short) position will decrease (increase) by approximately 0.015/per day. As demonstrated in change #2 (which is separate and independent from change #1), all else equal, the long put value would drop from about 0.65 to 0.635 as the put moves one day closer to expiration (from 30 to 29 days). If the implied volatility of the SEP 15 put were to increase by 1% (from 58.44% to 59.44%), all else equal, the option price would increase by 0.017 to approximately 0.667, as demonstrated in change #3. The increase in volatility would benefit the put holder at the expense of the writer, because the short put position would lose 0.017.

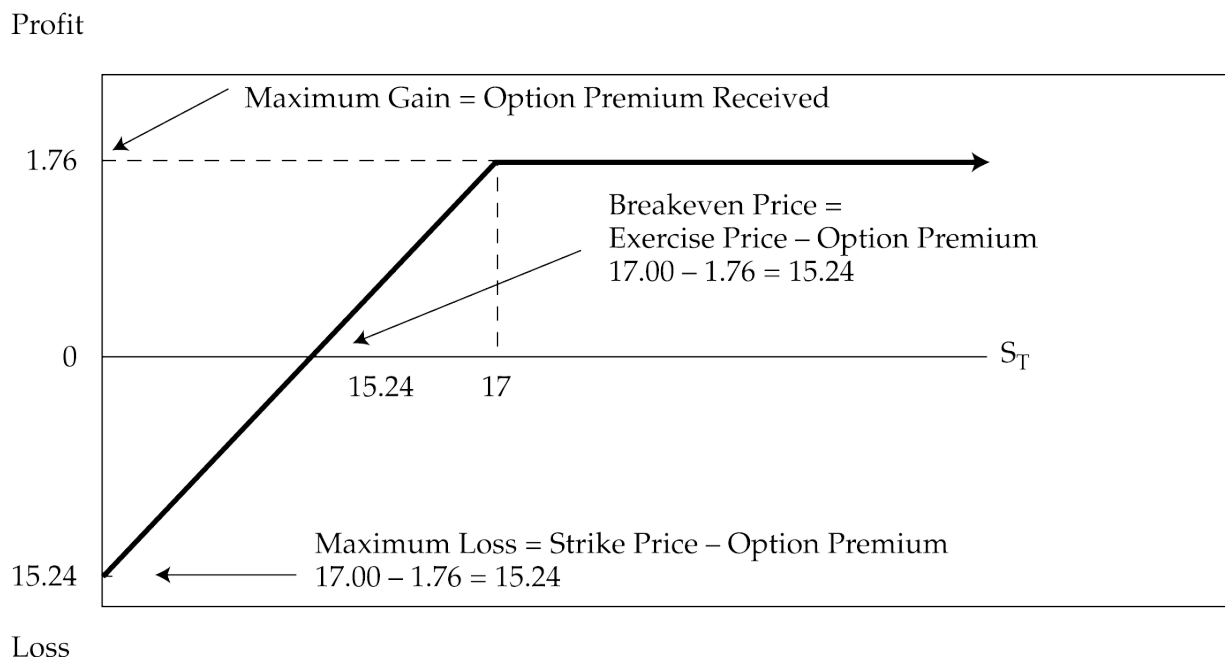
If the stock is above 15 at expiration, the put option will expire unexercised. At the expiration date, the put writer will either keep the premium or have PBR shares put to her at 15. Because the put writer was bullish on PBR and wanted to purchase it at a cheaper price, she may be happy with this result. Netting out the option premium received by the put writer would make her effective purchase price  $15.00 - 0.65 = 14.35$ .

In another scenario, an institutional investor might be interested in purchasing PBR. Suppose the investor wrote the SEP 17 put for 1.76. This strategy will have slightly different values

for the Greeks compared with the previous strategy. The delta of the SEP 17 short put position will be +0.62, gamma will be  $-0.140$ , and theta will equal  $+0.016$ . This position will be more sensitive to changes in the stock price than the SEP 15 put. If the PBR share price increases  $0.10$  from  $15.84$  to  $15.94$ , the put writer will now profit by approximately  $+0.62 \times 0.10 = 0.062$ . The higher strike price makes the short SEP 17 put a more bullish position than the SEP 15 put. This dynamic is reflected in the larger delta for the short SEP 17 put at  $+0.620$  (versus  $+0.335$  for the short SEP 15 put).

If the stock is below  $17$  at expiration, the SEP 17 puts will be exercised and the investor (i.e., put writer) will pay  $17$  for the shares, resulting in a net price of  $17.00 - 1.76 = 15.24$ . Anytime someone writes an option, the maximum gain is the option premium received, so in this case, the maximum gain is  $1.76$ . The maximum loss when writing a put occurs when the stock falls to zero. The option writer pays the exercise price for worthless stock but still keeps the premium. In this example, the maximum loss would be  $17.00 - 1.76 = 15.24$ . [Exhibit 14](#) shows the corresponding profit and loss diagram.

#### Exhibit 14. Short Put P&L Diagram: Write SEP 17 Put at 1.76



Note the similar shape of the covered call position in [Exhibit 9](#) and the short put in [Exhibit 14](#). Writing a covered call and writing a put are very similar with regard to their risk and reward characteristics.<sup>16</sup>



## 6. RISK REDUCTION USING COVERED CALLS AND PROTECTIVE PUTS

- e. compare the effect of buying a call on a short underlying position with the effect of selling a put on a short underlying position;

Covered calls and protective puts may both be viewed as risk-reducing or hedging strategies. In the case of a covered call, some price uncertainty is eliminated for price increases. For a protective put, the price uncertainty is eliminated for price decreases. The risk reduction can be understood by considering hedge statistics.

### 6.1. Covered Calls

Consider the individual who owns 100 shares of a PBR stock at 15.84. The long position has a delta of +100. Suppose the investor now writes a NOV 17 call contract against this entire position. These options have a delta of 0.475. This covered call position has a position delta of  $(100 \times +1.0) - (100 \times 0.475) = +52.5$ . A position delta of 52.5 is equivalent (for small changes) to owning 52.5 shares of the underlying asset. An investor can lose more money on a 100-share position than on a 52.5-share position. Even if the stock declines to nearly zero, the loss is reduced only by the amount of the option premium received. Viewed this way, the covered call position is less risky than the underlying asset held alone. The lower position delta will work against the investor if the share price increases. A PBR share price above 17 would result in the shares getting called away, and portfolio gains per share are limited to  $2.60 = (X - S_0) + c_0 = (17 - 15.84) + 1.44$ .

### 6.2. Protective Puts

Similar logic applies to the use of protective puts. An investor who buys a put is essentially buying insurance on the stock. An investor owning PBR stock could purchase a NOV 15 put with an option delta of  $-0.359$ . The position delta from 100 shares of PBR stock and one NOV 15 put contract would be  $+100 + (-0.359 \times 100) = +64.1$ . For small changes in price, the protective put portfolio reduces the risk of the 100-share PBR position to the equivalent of a 64.1 share position. This insurance lasts only until NOV. One buys insurance to protect against a risk, and the policyholder should not feel bad if the risk event does not materialize and he does not get to use the insurance. Stated another way, a homeowner should be happy if the fire insurance on his house goes unused. Still, we do not want to buy insurance we do

not need, especially if it is expensive. Continually purchasing puts to protect against a possible stock price decline will result in lower volatility in the overall portfolio, but the trade-off between premium cost and risk reduction must be carefully considered. Such continuous purchasing of puts to protect against a possible stock price decline is an expensive strategy that would wipe out most of the long-term gain on an otherwise good investment. The occasional purchase of a protective put to manage a temporary situation, however, can be a sensible risk-reducing activity.

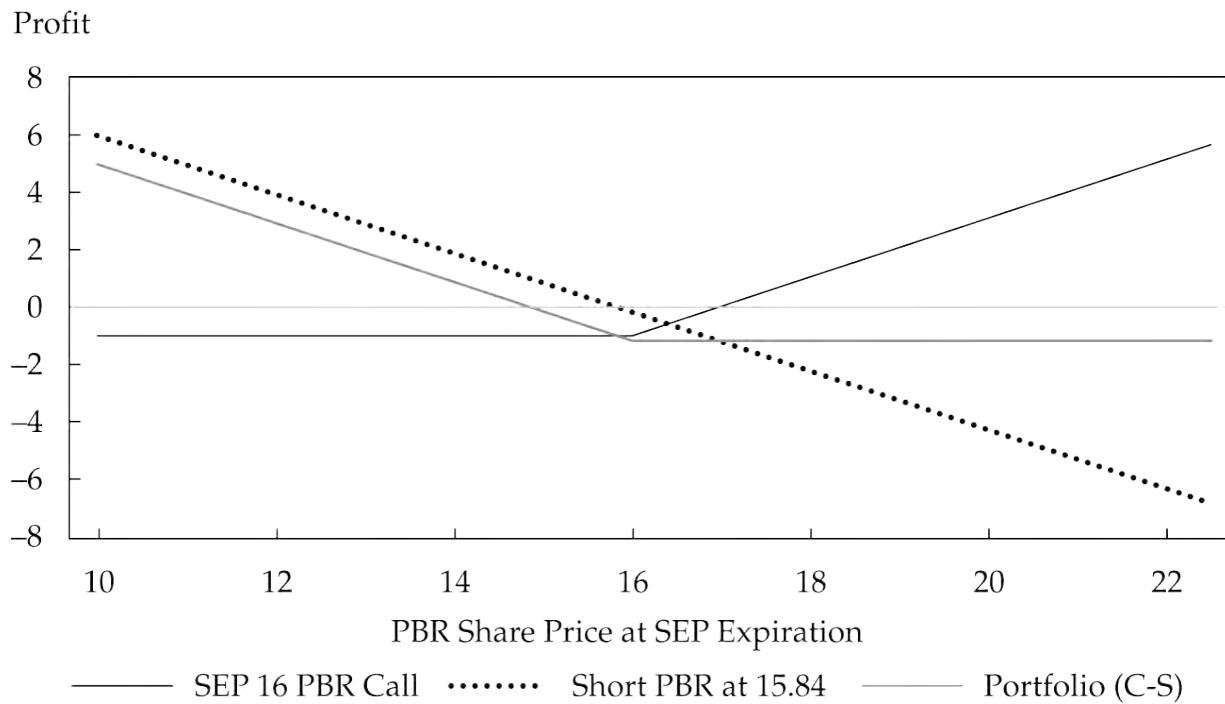
## 6.3. Buying Calls and Writing Puts on a Short Position

The discussion on protective puts (Stock + Put) and covered calls (Stock – Call) describes risk-reduction strategies for investors with long positions in the underlying asset. How can investors reduce risk when they are short the underlying asset? The short investor is worried the underlying stock will go up and profits if the underlying stock goes down. To offset the risks of a short position, an investor may purchase a call. The new portfolio will be (Call – Stock). The long call will offset portfolio losses when the share price increases.

To generate income from option premiums, the investor may also sell a put. As the stock drops in value, the investor profits from the short stock position, but the portfolio (– Put – Stock) gains will be reduced by the short put. When the share price increases, the short position loses money. The put expires worthless, meaning the investor will keep the put premium. The loss on the short position can still be substantial but is somewhat reduced by the put option premium.

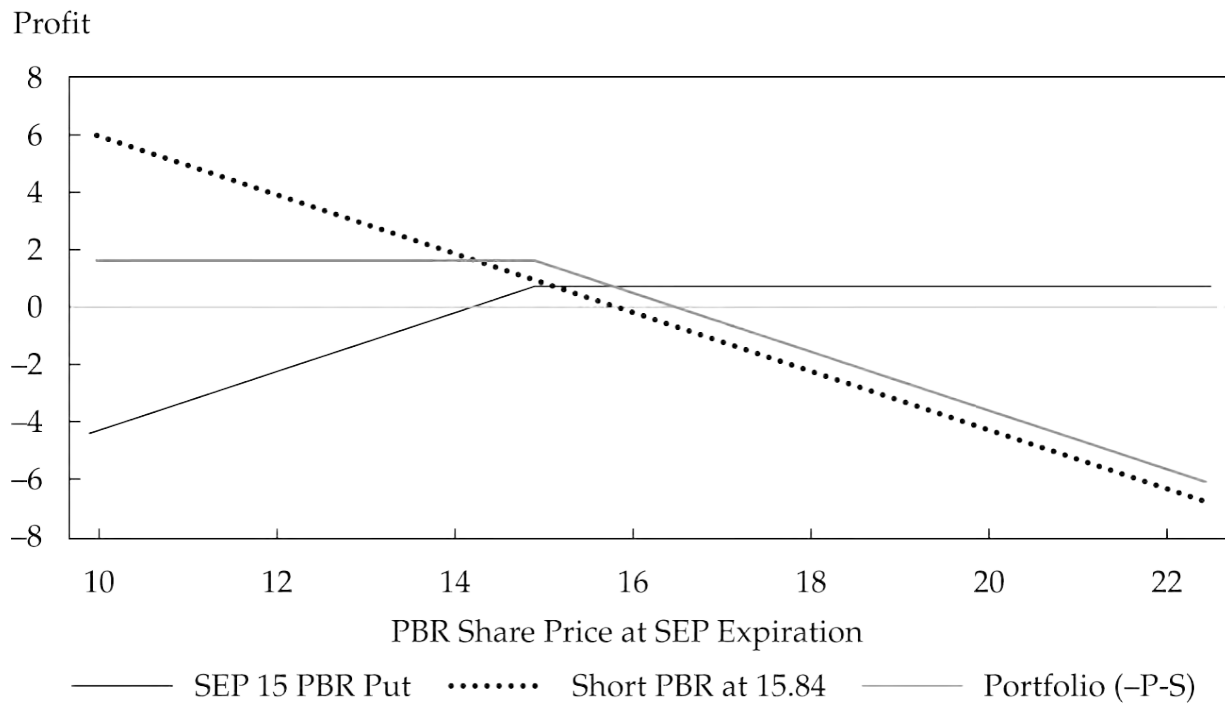
Let us consider these two scenarios using the price data from [Exhibit 6](#). In both cases, the investor is bearish on PBR and shorts the stock at 15.84. In the first case, she purchases the SEP 16 call for 0.97. As the share price increases above 16, the payoff from the call will act to offset losses in the short position. [Exhibit 15](#) illustrates this dynamic. As the share price increases, portfolio losses never exceed 1.13. The profit on the short stock position plus the profit from the in-the-money call equals  $(15.84 - S) + [(S - 16) - 0.97] = -1.13$ . If the share price decreases, the investor profits from the short but loses the call premium of 0.97. The delta from the short PBR shares is –1. The SEP 16 call delta is 0.516. The overall portfolio delta is still negative at –0.484, making this a bearish strategy. The investor is also long vega from purchasing the call, 0.018, and the position is exposed to time decay, because theta is –0.018 per day. So, she is hoping to profit from increased downside volatility from the short PBR shares while the long call cushions losses from increased upside volatility.

### Exhibit 15. P&L of Long PBR SEP 16 Call and Short PBR Stock



In the second scenario, the investor writes the SEP 15 put for 0.65 and collects the put premium. The upside protection from the long call in the first scenario is not provided by writing a put. The short stock position can have potentially unlimited losses. As shown in [Exhibit 16](#), the potential gain from a falling PBR price now belongs to the put owner. The maximum gain from this strategy is given by the profit on the short stock position plus the profit from the out-of-the-money short put, which equals  $(15.84 - S) - [(15 - S) - 0.65] = 1.49$ . Losses from the short stock position will be cushioned only by the 0.65 premium collected from writing the put. The delta of the short PBR shares is  $-1$ , and the delta of the short put is  $-(-0.335)$ , so the position delta is  $-1 + 0.335 = -0.665$ . The investor is bearish and hoping to profit from a downward price move. She is also short vega from writing the put,  $(-0.017)$ , and benefits from time decay, as theta of the short put is  $+0.015 (= -[-0.015])$ . So, she is hoping for reduced volatility to give her an opportunity to collect the put premium without losing from the short on PBR shares.

**Exhibit 16. P&L of Short PBR SEP 15 Put and Short PBR Stock**



## EXAMPLE 5

### Risk-Reduction Strategies

Janet Reiter is a US-based investor who holds a limited partnership investment in a French private equity firm. She has received notice from the firm's general partner of an upcoming capital call. Reiter plans to purchase €1,000,000 in three months to meet the capital call due at that time. The current exchange rate is US\$1.20/€1, but Reiter is concerned the euro will strengthen against the US dollar. She considers the following instruments to reduce the risk of the planned purchase:

- A three-month USD/EUR call option (to buy euros) with a strike rate  $X = \text{US\$1.25/€1}$  and costing  $\text{US\$0.02/€1}$
  - A three-month EUR/USD put option (to sell dollars) with a strike rate  $X = \text{€0.8080/US\$1}$  priced at  $\text{€0.0134/US\$1}$
  - A three-month USD/EUR futures contract (to buy euros) with  $f_0 = \text{US\$1.2052/€1}$
1. Discuss the position required in each instrument to reduce the risk of the planned purchase.
  2. Reiter purchases call options for US\$20,000, and the exchange rate increases to

US\$1.29/€1 (EUR currency strengthens) over the next three months. The effective price Reiter pays for her 1,000,000 EUR purchase is closest to:

A. US\$1,270,000.

B. US\$1,290,000.

C. US\$1,310,000.

3. Calculate the price Reiter will pay for the EUR using the three instruments if the exchange rate in three months falls to US\$1.10/€1 (EUR currency weakens).

### Solution to 1:

Reiter could purchase a €1,000,000 call option struck at US\$1.25/€1 for US\$20,000. If the EUR price were to increase above US\$1.25, she would exercise her right to buy EUR for US\$1.25. She would also benefit from being able to purchase EUR at a cheaper price should the exchange rate weaken. A call on the euro is like a put on the US dollar. So, a put to sell dollars struck at an exchange rate of  $X = €0.8000/\text{US\$1}$  can be viewed as a call to buy Euro at an exchange rate of  $\text{US\$1}/€0.8000 = \text{US\$1.25}/€1$ . Reiter could also buy a put option on USD struck at  $X = €0.8080/\text{US\$1}$  which would allow her to sell US\$1,237,624 ( $= €1,000,000 / [€0.8080/\text{US\$1}]$ ) to receive the €1,000,000 should the dollar weaken below that level. This would cost her  $€0.0134/\text{US\$1} \times \text{US\$1,237,624} = €16,584$  or US\$20,525 upfront. If USD appreciated against the EUR, Reiter would still be able to benefit from the lower cost to purchase the EUR. She could instead enter a long position in a three-month futures contract at US\$1.2052. Reiter would have the obligation to purchase €1,000,000 at US\$1.2052 regardless of the exchange rate in three months. The futures position requires a margin deposit, but no premium is paid.

### Solution to 2:

A is correct. At an exchange rate of US\$1.29/€1, the call with strike of  $X = \text{US\$1.25}/€1$  will be exercised. Including the call premium (US\$0.02/€1), the price effectively paid for the euros is  $\text{US\$1.27}/€1 \times €1,000,000 = \text{US\$1,270,000}$ .

### Solution to 3:

Both the call and the put options will expire unexercised and Reiter benefits from the lower rate by purchasing €1,000,000 for US\$1,100,000. However, she will lose the premiums she paid for the options. For the futures contract, she pays US\$1.2052/€1 or US\$1,205,200 for €1,000,000 regardless of the more favorable rate.

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## 7. SPREADS AND COMBINATIONS

- f. discuss the investment objective(s), structure, payoffs, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of the following option strategies: bull spread, bear spread, straddle, and collar;

Option spreads and combinations can be useful option strategies. We first consider money spreads, in which the two options differ only by exercise price. The investor buys an option with a given expiration and exercise price and sells an option with the same expiration but a different exercise price. Of course, the options are on the same underlying asset. The term *spread* is used here because the payoff is based on the difference, or spread, between option exercise prices. For a bull or bear spread, the investor buys one call and writes another call option with a different exercise price, or the investor buys one put and writes another put with a different exercise price.<sup>17</sup> Someone might, for instance, buy a NOV 16 call and simultaneously write a NOV 17 call, or one might buy a SEP 17 put and write a SEP 15 put. An option combination typically uses both puts and calls. The most important option combination is the straddle, on which we focus in this reading. We will investigate spreads first.

### 7.1. Bull Spreads and Bear Spreads

Spreads are classified in two ways: by market sentiment and by the direction of the initial cash flows. A spread that becomes more valuable when the price of the underlying asset rises is a **bull spread**; a spread that becomes more valuable when the price of the underlying asset declines is a **bear spread**. Because the investor buys one option and sells another, there is typically an initial net cash outflow or inflow. If establishing the spread requires a cash payment by the investor, it is referred to as a debit spread. Debit spreads are effectively long because the long option value exceeds the short option value. If the spread initially results in a cash inflow to the investor, it is referred to as a credit spread. Credit spreads<sup>18</sup> are effectively short because the short option value exceeds the long option value. Any of these strategies can be created with puts or calls. The motivation for a spread is usually to place a directional bet, giving up part of the profit potential in exchange for a lower cost of the position. Some examples will help make this clear.

### 7.1.1. Bull Spread

Regardless of whether someone constructs a bull spread with puts or with calls, the strategy requires buying one option and writing another with a *higher* exercise price. Because the higher exercise price call is less expensive than the lower strike, a call bull spread involves an initial cash outflow (debit spread). A bull spread created from puts also requires the investor to write the higher-strike option and buy the lower-strike one. Because the higher-strike put is more expensive, a put bull spread involves an initial cash inflow (credit spread).

Let's consider a call bull spread. Suppose, for instance, an investor thought it likely that by the September option expiration, PBR would rise to around 17 from its current level of 15.84. Based on the price data in [Exhibit 6](#), what option strategy would capitalize on this anticipated price movement? If he were to buy the SEP 15 call for 1.64 and the stock rose to 17 at expiration, the call would be worth  $S_T - X = 17 - 15 = 2$ . If the price of the option was 1.64, the profit is 0.36. The maximum loss is the price paid for the option, or 1.64. If, instead, an investor bought the SEP 16 call for 0.97, at an expiration stock price of 17, the call would be worth 1.00 for a gain of 0.03. A spread could make more sense with the following option values. If he believes the stock will not rise above 17 by September expiration, it may make sense to "sell off" the part of the return distribution above that price. The investor would receive 0.51 for each SEP 17 call sold.

The value of the spread at expiration ( $V_T$ ) depends on the stock price at expiration  $S_T$ . For a bull spread, the investor buys the low strike option (struck at  $X_L$ ) and sells the high strike option (struck at  $X_H$ ), so that:

#### Equation (5)

$$V_T = \text{Max}(0, S_T - X_L) - \text{Max}(0, S_T - X_H).$$

Therefore, the value depends on the terminal stock price  $S_T$ :

$$V_T = 0 - 0 = 0 \text{ if } S_T \leq X_L$$

$$V_T = S_T - X_L - 0 = S_T - X_L \text{ if } X_L < S_T < X_H$$

$$V_T = S_T - X_L - (S_T - X_H) = X_H - X_L \text{ if } S_T \geq X_H$$

The profit is obtained by subtracting the initial outlay for the spread from the foregoing value of the spread at expiration. To determine the initial outlay, recall that a call option with a lower exercise price will be more expensive than a call option with a higher exercise price. Because we are buying the call with the lower exercise price (for  $c_L$ ) and selling the call with the higher exercise price (for  $c_H$ ), the call we buy will cost more than the call we sell ( $c_L >$



$c_H$ ). Hence, the spread will require a net outlay of funds. This net outlay is the initial value of the position,  $V_0 = c_L - c_H$ , which we call the net premium. The profit is:

### Equation (6)

$$\Pi = \text{Max}(0, S_T - X_L) - \text{Max}(0, S_T - X_H) - (c_L - c_H).$$

In this manner, we see that the profit is the profit from the long call,  $\text{Max}(0, S_T - X_L) - c_L$ , plus the profit from the short call,  $-\text{Max}(0, S_T - X_H) + c_H$ . Broken down into ranges, the profit is as follows:

$$\Pi = -c_L + c_H \text{ if } S_T \leq X_L$$

$$\Pi = S_T - X_L - c_L + c_H \text{ if } X_L < S_T < X_H$$

$$\Pi = X_H - X_L - c_L + c_H \text{ if } S_T \geq X_H$$

If  $S_T$  is below  $X_L$ , the strategy will lose a limited amount of money. When both options expire out of the money, the investor loses the net premium,  $c_L - c_H$ . The profit on the upside, if  $S_T$  is at least  $X_H$ , is also limited to the difference in strike prices minus the net premium.

Consider two alternatives for the call purchase leg of the bull spread: 1) buy the SEP 15 call or 2) buy the SEP 16 call instead. Which is preferred? With Alternative 1, the SEP 15 call costs 1.64. Writing the SEP 17 call brings in 0.51, so the net cost is  $1.64 - 0.51 = 1.13$ . Traders would refer to this position as a PBR SEP 15/17 bull call spread. The maximum profit would occur at or above the exercise price of 17 because all gains above this level belong to the owner of the PBR SEP 17 call. At an underlying price of 17 or higher, from the trader's perspective, the position is worth 2, which represents the price appreciation from 15 to 17 (i.e., the difference in strikes). The maximum profit is

$$\Pi = X_H - X_L - c_L + c_H = 17 - 15 - 1.64 + 0.51 = 0.87.$$

Another way to look at it is that at a price above 17, the trader exercises the long call, buying the stock at 15, and is forced to sell the stock at 17 to the holder of his short call.

With Alternative 2, the investor buys the SEP 16 call and pays 0.97 for it. Writing the SEP 17 call brings in 0.51, so the net cost would be  $0.97 - 0.51 = 0.46$ . At an underlying price of 17 or higher, the spread would be worth 1.00, so the maximum profit is

$$\Pi = X_H - X_L - c_L + c_H = 17 - 16 - 0.97 + 0.51 = 0.54.$$

**Exhibit 17** compares the profit and loss diagrams for these two alternatives.

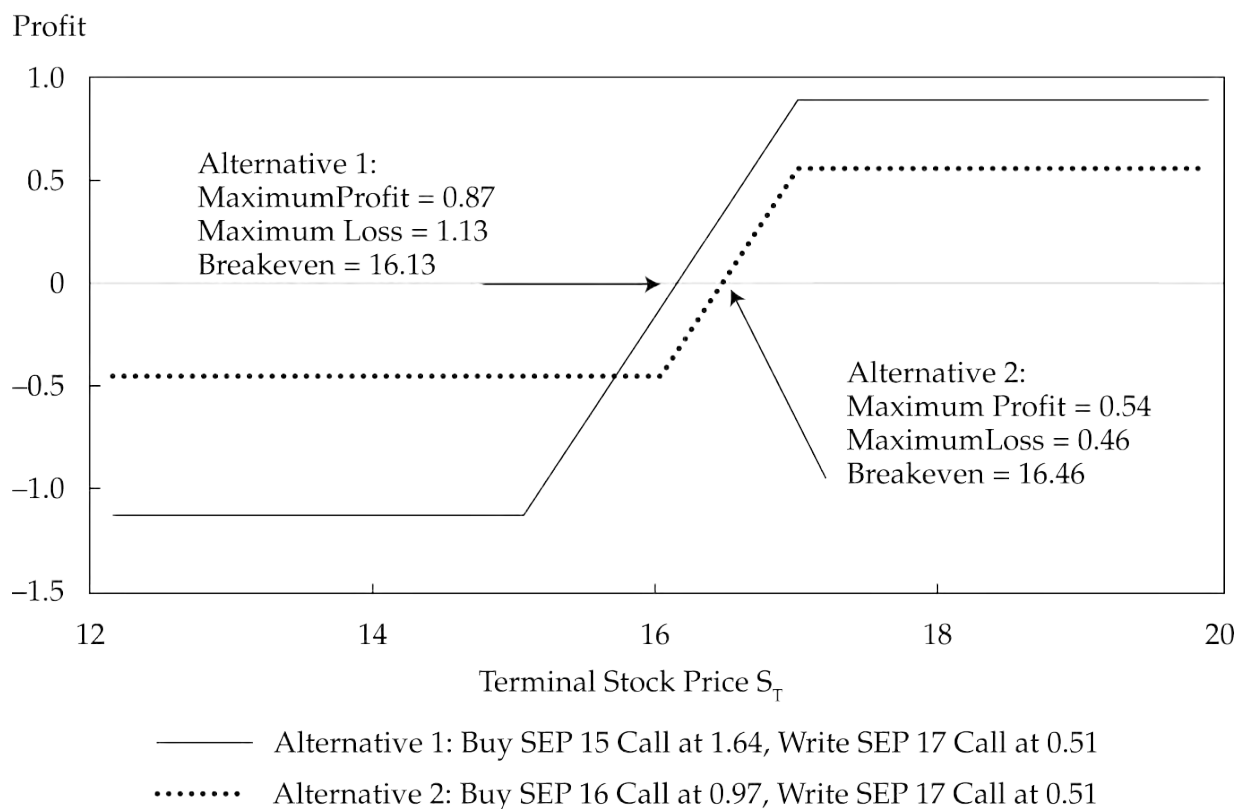


To determine the breakeven price with a spread, find the underlying asset price that will cause the exercise value of the two options combined to equal the initial cost of the spread. A spread has two exercise prices. There are also two option premiums. Mathematically, the breakeven price for a call bull spread can be derived from  $\Pi = S_T^* - X_L - c_L + c_H = 0$  and is

$$S_T^* = X_L + c_L - c_H,$$

which represents the lower exercise price plus the cost of the spread. In the examples here, Alternative 1 costs 1.13 (= 1.64 – 0.51). The breakeven  $S_T^* = X_L + c_L - c_H = 15 + 1.64 - 0.51 = 16.13$ . If at option expiration the stock is 16.13, the 15-strike option would be worth 1.13 and the 17-strike call would be worthless. The breakeven price  $S_T^*$  is 15.00 + 1.13 = 16.13, as [Exhibit 17](#) shows.

### Exhibit 17. Bull Spreads: Current PBR Stock Price = 15.84



Which of the alternatives is preferable? There is no clear-cut answer. As [Exhibit 17](#) shows, the maximum loss for alternative 1 is 1.64 – 0.51 = 1.13, compared with a maximum loss of 0.97 – 0.51 = 0.46 for Alternative 2. However, Alternative 1 is potentially more profitable for a move above 17 and has a lower breakeven price.

With Alternative 1, the breakeven point of 16.13 is less than 2% above the current level of 15.84, whereas with Alternative 2, reaching the breakeven point requires almost a 4% rise in the stock price. There is some additional information in [Exhibit 6](#) the investor may wish to consider. The SEP 15/17 spread involves buying the SEP15 call with implied volatility of 64.42% and selling the SEP 17 call option with implied volatility of 51.07%. The investor may believe the SEP 15 call being purchased is relatively expensive compared with the SEP 17 call being sold. The PBR SEP 16/17 involves buying a SEP 16 call at a cost of 0.97 with an implied volatility of 55.92%. The investor may believe the SEP 16 call represents a better value than the SEP 15 call and so may choose the PBR SEP 16/17 spread.

We can calculate the Greek values for the spread. For example, using [Exhibit 6](#), we see the theta of the PBR SEP 15/17 spread is  $-0.004 = -0.019 - (-0.015)$ , and the theta of the PBR SEP 16/17 is  $-0.003 = -0.018 - (-0.015)$ . Therefore, the SEP 16/17 should experience slightly less erosion of value resulting from time decay. The investor may also consider the delta and gamma that each spread would add to her PBR position. The delta of the PBR SEP 15/17 spread is  $+0.306 = 0.657 - 0.351$ , and the delta of the PBR SEP 16/17 spread is  $+0.165 = 0.516 - 0.351$ . From the current PBR price of 15.84, the long position in the PBR 15 call will make the SEP 15/17 PBR spread slightly more sensitive to an increase in share price than the SEP 16/17 spread. For the SEP 15/17, we have  $\text{gamma} = -0.034 = 0.125 - 0.159$  and for the SEP 16/17  $\text{gamma} = -0.003 = 0.156 - 0.159$ . The more negative gamma value for the SEP 15/17 spread means that the position delta will decrease at a faster rate than the SEP 16/17 spread as the price of PBR shares increase. By carefully selecting the expiration and exercise prices for the options for the spread, an investor can choose the risk–return mix that most closely matches her investment outlook.

### **7.1.2. Bear Spread**

With a bull spread, the investor buys the lower exercise price and writes the higher exercise price. It is the opposite with a bear spread: buy the higher exercise price and sell the lower. Because puts with higher exercise prices are (all else equal) more expensive, a put bear spread will result in an initial cash outflow (be a debit spread). For a call bear spread, the investor buys a higher exercise price call and sells the lower exercise price call. Because the higher exercise price call being purchased is less expensive than the lower strike being sold, a call bear spread will result in an initial cash inflow (credit spread).

If a trader believed PBR stock would be below 15 by the November expiration, one strategy would be to buy the PBR NOV 16 put at 1.96 and write the NOV 15 put at 1.46. This spread has a net cost of 0.50; this amount is the maximum loss, and it occurs at a PBR stock price of 16 or higher. The maximum gain is also 0.50, which occurs at a stock price of 15 or lower. (A useful way to see this result is to realize that reversing the signs of the trades leaves the horizontal axes in a diagram like [Exhibit 17](#) intact, but it flips the profit/loss and cost lines vertically! A debit from buying a spread must be consistent with the seller of the same spread

receiving a credit.) Finding the breakeven price uses the same logic as with a bull spread: find the underlying asset price at which the exercise value equals the initial cost. Let  $p_L$  represent the lower-strike put premium and  $p_H$  the higher-strike put premium. Mathematically, the value of this bear spread position at expiration is:

### Equation (7)

$$V_T = \text{Max}(0, X_H - S_T) - \text{Max}(0, X_L - S_T).$$

Broken down into ranges, we have the following relations:

$$V_T = X_H - S_T - (X_L - S_T) = X_H - X_L \text{ if } S_T \leq X_L$$

$$V_T = X_H - S_T - 0 = X_H - S_T \text{ if } X_L < S_T < X_H$$

$$V_T = 0 - 0 = 0 \text{ if } S_T \geq X_H$$

To obtain the profit, we subtract the initial outlay. Because we are buying the put with the higher exercise price and selling the put with the lower exercise price, the put we are buying is more expensive than the put we are selling. The initial value of the bear spread is  $V_0 = p_H - p_L$ . The profit is, therefore,  $V_T - V_0$ , which is:

### Equation (8)

$$\Pi = \text{Max}(0, X_H - S_T) - \text{Max}(0, X_L - S_T) - (p_H - p_L).$$

We see that the profit is that on the long put,  $\text{Max}(0, X_H - S_T) - p_H$ , plus the profit from the short put,  $-\text{Max}(0, X_L - S_T) + p_L$ . Broken down into ranges, the profit is as follows:

$$\Pi = X_H - X_L - p_H + p_L \text{ if } S_T \leq X_L$$

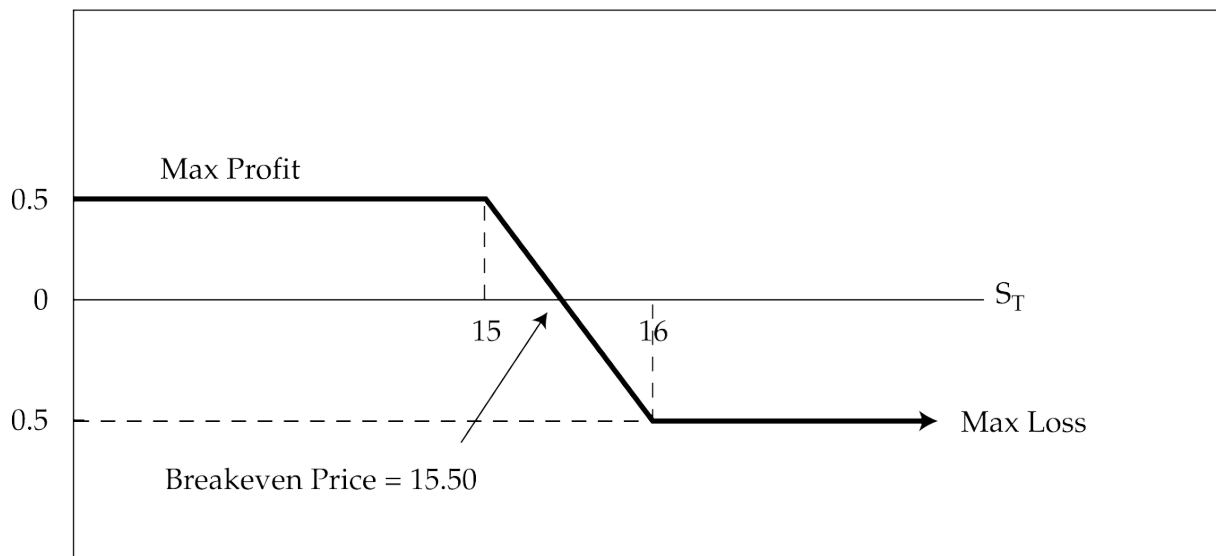
$$\Pi = X_H - S_T - p_H + p_L \text{ if } X_L < S_T < X_H$$

$$\Pi = -p_H + p_L \text{ if } S_T \geq X_H$$

The breakeven point,  $S_T^* = X_H - p_H + p_L$ , sets the profit equal to zero between the strike prices. In this example,  $16 - 1.96 + 1.46 = 15.50$ . That is, at a stock price of 15.50 on the expiration day, the 16-strike put would be worth 0.50 and the 15-strike put would be worthless. [Exhibit 18](#) shows the profit and loss for a NOV 15/16 bear spread.<sup>19</sup>

Profit

Buy Nov 16 Put at 1.96, Write Nov 15 Put at 1.46



Loss

### 7.1.3. Refining Spreads

It is not necessary that both legs of a spread be established at the same time or maintained for the same period. Options are very versatile, and positions can typically be quickly adjusted as market conditions change. Here are a few examples of different tactical adjustments an option trader might consider.

#### 7.1.3.1. Adding a Short Leg to a Long Position

Consider Carlos Aguila, a trader who in September paid a premium of 1.50 for a NOV 40 call when the underlying stock was selling for 37. A month later, in October, the stock has risen to 48. He observes the following premiums for one-month call options.

Strike	Premium
40	8.30
45	4.42
50	1.91

This position has become very profitable. The call he bought is now worth 8.30. He paid 1.50, so his profit at this point is  $8.30 - 1.50 = 6.80$ . He thinks the stock is likely to stabilize

around its new level and doubts that it will go much higher. Aguilera buys a call option with an exercise price of either 45 or 50, thereby converting the position into a bull spread. Looking first at the NOV 50 call, he notes that its payoff will more than cover the initial cost of the NOV 40 call. If he were to draw a profit and loss diagram would look like [Exhibit 19](#). To review, call the profit and loss diagram for the bull spread created by buying the NOV 40 call and writing the NOV 50 call:

- At stock prices of 50 or higher, the exercise value of the spread is 10.41 because both options would be in the money, and a call with an exercise price of 50 would always be worth 10 more at exercise than a call with an exercise price of 40. The initial cost of the call with an exercise price of 40 was 1.50, and there would be a 1.91 cash inflow after writing the call with an exercise price of 50. The profit is  $10 - 1.50 + 1.91 = 10.41$ .
- At stock prices of 40 or lower, the exercise value of the spread would be 0. The initial cost of the call with an exercise price of 40 was 1.50, and there would be a 1.91 cash inflow after writing the call with an exercise price of 50. The profit is  $0 - 1.50 + 1.91 = 0.41$ .
- Between the two strike prices (40 and 50), the exercise value of the spread increases as the stock price increases. For every unit increase up to the difference between the strike prices, the exercise value of this spread increases by 1.0.

For instance, if the stock price remains unchanged at 48, the exercise value of the spread is 8.00. The reason is because the call with an exercise price of 40 would be worth 8.00 at exercise, and the call with an exercise price of 50 would be worthless. The initial cost of the call with an exercise price of 40 was 1.50, and there would be a 1.91 cash inflow when the 50-strike call is written. The profit is  $8.00 - 1.50 + 1.91 = 8.41$ .

Now assume that he has written the NOV 50 call. Aguilera needs to evaluate the position in this new situation. No matter what happens to the stock price between 40 and 50, the position is profitable, relative to his purchase price of the call with an exercise price of 40. If the stock were to fall by any amount from its current level, Aguilera would experience an opportunity loss. His profit would decrease progressively if the price of the stock fell. Aguilera would be correct in saying that the bull spread will make writing the NOV 50 call only partially hedges against a decline in the price of the stock. The position can still lose about 96% of its maximum profit ( $0.41/10.41$ ) has been hedged.

**Exhibit 19. Spread Creation: Buy a Call with Exercise Price of 40 and Write a Call Later with Exercise Price of 50 at 1.91**















































































































































# Reading 9

## Swaps, Forwards, and Futures Strategies

by Barbara Valbuzzi, CFA

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### LEARNING OUTCOMES

The candidate should be able to:

- a. demonstrate how interest rate swaps, forwards, and futures can be used to modify a portfolio's risk and return;
- b. demonstrate how currency swaps, forwards, and futures can be used to modify a portfolio's risk and return;
- c. demonstrate how equity swaps, forwards, and futures can be used to modify a portfolio's risk and return;
- d. demonstrate the use of volatility derivatives and variance swaps;
- e. demonstrate the use of derivatives to achieve targeted equity and interest rate risk exposures;
- f. demonstrate the use of derivatives in asset allocation, rebalancing, and inferring market expectations.

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### 1. MANAGING INTEREST RATE RISK WITH SWAPS

- a. demonstrate how interest rate swaps, forwards, and futures can be used to modify a portfolio's risk and return;

There are many ways in which investment managers and investors can use swaps, forwards, futures, and volatility derivatives. The typical applications of these derivatives involve modifying investment positions for hedging purposes or for taking directional bets, creating or replicating desired payoffs, implementing asset allocation and portfolio rebalancing decisions, and even inferring current market expectations. The following table shows some common uses of these derivatives in portfolio management and the types of derivatives used by investors and portfolio managers.

Common Uses of Swaps, Forwards, and Futures	Typical Derivatives Used
Modifying Portfolio Returns and Risk Exposures (Hedging and Directional Bets)	Interest Rate, Currency, and Equity Swaps and Futures; Fixed-Income Futures; Variance Swaps
Creating Desired Payoffs	Forwards, Futures, Total Return Swaps
Performing Asset Allocation and Portfolio Rebalancing	Equity Index Futures, Government Bond Futures, Index Swaps
Inferring Market Expectations for Interest Rates, Inflation, and Volatility	Fed Funds Futures, Inflation Swaps, VIX Futures

It is important for an informed investment professional to understand how swaps, forwards, futures, and volatility derivatives can be used and their associated risk–return trade-offs. Therefore, the purpose of this reading is to illustrate ways in which these derivatives might be used in typical investment situations. Sections 2–4 of this reading show how swaps, forwards, and futures can be used to modify the risk exposure of an existing position. Sections 5–6 provide a discussion on derivatives on volatility. Sections 7–9 demonstrate a series of applications showing ways in which a portfolio manager might solve an investment problem with these derivatives. The reading concludes with a summary.

## 1.1. Changing Risk Exposures with Swaps, Futures, and Forwards

Financial managers can use swaps, forwards, and futures markets to quickly and efficiently alter the underlying risk exposure of their asset portfolios or anticipated investment transactions. This section covers a variety of common examples that use swaps, futures, and

forwards.

### 1.1.1. Managing Interest Rate Risk

#### 1.1.1.1. Interest Rate Swaps

An interest rate swap is an over-the-counter (OTC) contract between two parties that agree to exchange cash flows on specified payment dates—one based on a *variable* (floating) interest rate and the other based on a *fixed* rate (the “swap rate”)—determined at the time the swap is initiated. The swap tenor is when the swap is agreed to expire. Both interest rates are applied to the swap’s notional value to determine the size of each payment. Normally, the resulting two payments (one fixed, one floating) are in the same currency but will not be equal, so they are typically netted, with the party owing the greater amount paying the difference to the other party. In this manner, a party that currently has a fixed (floating) risk or other obligation can effectively convert it into a floating (fixed) one.

Interest rate swaps are among the most widely used instruments to manage interest rate risk. In particular, they are designed to manage the risk on cash flows arising from investors’ assets and liabilities. Interest rate swaps and futures can also be used to modify the risk and return profile of a portfolio. This is associated with managing a portfolio of bonds that generally involves controlling the portfolio’s duration. Although futures are commonly used to make duration changes, swaps can also be used, and we shall see how in this reading. Finally, interest rate swaps are used by financial institutions to hedge the interest rate risk exposure deriving from the issuance of financial instruments sold to clients. [Example 1](#) shows how an interest rate swap is used to convert floating-rate securities into fixed-rate securities. Here the firm initially expects continuing low interest rates, so it issues floating-rate bonds. But after concluding that rates are likely to increase, the firm seeks to convert its interest rate risk to a fixed obligation, even though doing so means making higher payments up front.

#### EXAMPLE 1

### Using an Interest Rate Swap to Convert Floating-Rate Securities into Fixed-Rate Securities

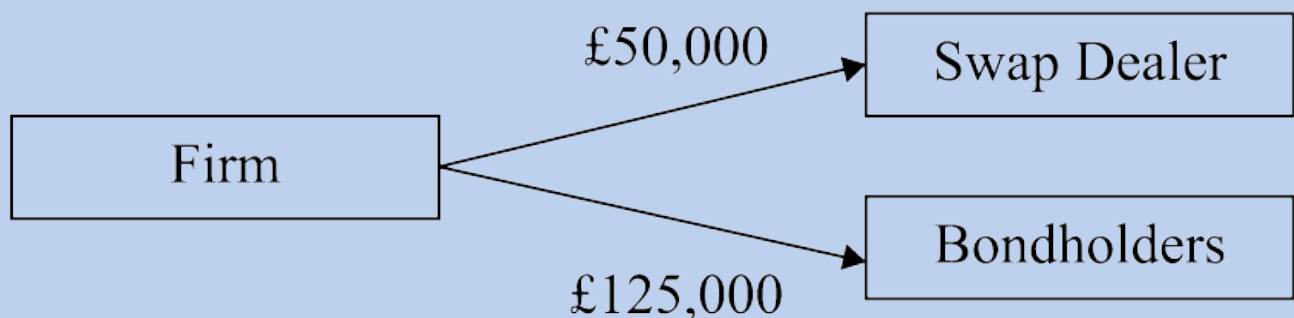
An investment firm has sold £20 million of three-year floating-rate bonds that pay a semiannual coupon equal to the six-month market reference rate plus 50 bps. A few days later, the firm’s outlook changes substantially, and it now expects higher rates in

the future. The firm enters into an interest rate swap with a tenor of approximately three years and semiannual payments, where the firm pays a fixed par swap rate of 1.25% and receives the six-month reference rate. The swap settlement dates are the same as the coupon payment dates on the floating-rate bonds. At the first swap settlement date, the six-month reference rate is 0.75%.

## Analysis:

At the first coupon payment and swap settlement date, the six-month reference rate is 0.75% (annualized). This means that on the swap the investment firm will make a net payment of £50,000 as follows:

- Receive based on the reference rate:  $0.75\% \times £20 \text{ million} \times (180/360) = £75,000$ .
- Pay based on the fixed rate:  $1.25\% \times £20 \text{ million} \times (180/360) = £125,000$ .
- Net payment *made* by the firm to swap dealer:  $£125,000 - £75,000 = £50,000$ .



At the same time, the first semiannual coupon payment on the securities will be  $(0.75\% + 0.50\%) \times £20 \text{ million} \times (180/360) = £125,000$ .

The total payment made by the investment firm on the securities and the swap is £175,000 ( $= £125,000 + £50,000$ ).

Now assume that as we move forward to the second coupon payment and swap settlement date, interest rates have increased and the six-month reference rate is 1.50%.

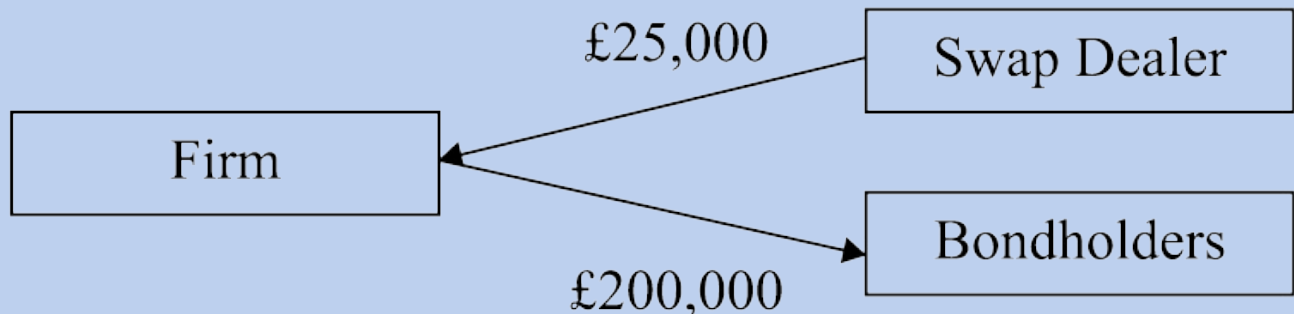
On the swap, the investment firm will receive a net payment of £25,000 as follows:

- Receive based on the new reference rate:  $1.50\% \times £20 \text{ million} \times (180/360) = £150,000$ .
- Pay based on the fixed rate:  $1.25\% \times £20 \text{ million} \times (180/360) = £125,000$ .
- Net payment *received* by the firm:  $£150,000 - £125,000 = £25,000$ .



The coupon payment on the securities will be  $(1.50\% + 0.50\%) \times £20 \text{ million} \times (180/360) = £200,000$ .

The total payment made by the investment firm on the securities and the swap is again £175,000 ( $= £200,000 - £25,000$ ).



The investment firm has effectively fixed its all-in borrowing costs. Since this fixed cost is synthesized by a combination of the underlying debt position and the derivative contract, it can be described as a synthetic fixed security.

Why should the investment firm decide to pay a fixed rate of 1.25%, on a semiannual basis, for the remaining life of the securities when the reference rate is only 0.75% today? The reason is that the firm's outlook is now for higher rates in the future, as expressed by market participants in the upward-sloping yield curve. An upward-sloping yield curve reflects that investors require higher risk premium compensation for holding longer-term securities.

The agreed-on fixed rate on the swap is based on the term structure of rates at the time the deal is initiated. If the term structure changes, the new fixed rate agreed on by the counterparties on a swap with the same residual time to maturity as the original one will be different from the original rate. This means that the market value of the swap will become positive or negative. In particular, the investment firm in [Example 1](#) has managed to fix the interest rate on future payments but has given away the opportunity to benefit from possible lower interest rates in the future. If the term structure of interest rates has a parallel shift downward, meaning that all rates across tenors decrease, the value of the swap will become negative from the perspective of the fixed-rate payer, depending on the new swap market fixed rate. The investment firm has managed to achieve the desired fixed profile of future cash flows, but it might incur a loss if the firm wants to unwind the interest rate swap before maturity. Alternatively, if rates rise, as now expected, the swap can be unwound at a profit by the same reasoning in reverse: The value of the swap becomes positive from the fixed-rate payer's view; fixed-rate payment paid is less than floating-rate payment received.

This explanation introduces the concepts of marking to market of the swap and how swaps can be used in fixed-income portfolio management with the objective to hedge the changes in

value of a portfolio with fixed cash flows.

When a bond portfolio is fully hedged, its value is immunized with respect to changes in yields. This can be stated as  $\Delta P = (N_S)(\Delta S)$ , where  $\Delta P$  is the change in the value of the bond portfolio and  $\Delta S$  is the change in the value of the swap for a given change in interest rates. The notional principal of the swap ( $N_S$ ) will be determined as  $N_S = \Delta P / \Delta S$ . To reduce changes in value of a fixed-rate portfolio, the manager will want to lower the overall duration by exchanging part of this fixed-rate income stream for a floating-rate stream. This can be done by entering an interest rate swap where the portfolio manager will pay the fixed rate and receive the floating rate.

It is important to keep in mind that most of the time, the hedging instrument and the asset or portfolio to be hedged are imperfect substitutes. The result is a market risk, called *basis risk* or *spread risk*—the difference between the market performance of the asset and the derivative instrument used to hedge it. When using an interest rate swap to hedge, it is possible that the changes in the underlying rate of the derivative contract, and thus in the value of the swap, do not perfectly mirror changes in the value of the bond portfolio.

Furthermore, the composition of the bond portfolio could bear additional market risks other than interest rate risk. For instance, suppose a portfolio of corporate bonds is hedged with an interest rate swap. In this case, even if interest rate risk is hedged, the investor is still exposed to credit spread risk.

The main underlying assumptions we will use are that the change in value of the bond portfolio can be approximated by using the concept of modified duration,<sup>1</sup> the yield curve is flat, and it is affected only by parallel shifts. Furthermore, we assume here that the portfolio and the derivative contract used to hedge are perfect substitutes.

A measure for the change in the value of the bond portfolio ( $\Delta P$ ) for a change in interest rates is given by the portfolio's modified duration,  $MDUR_P$ . The same measure calculated for the interest rate swap,  $MDUR_S$ , is used to determine the change in the value of the swap,  $\Delta S$ . The target modified duration for the combined portfolio is  $MDUR_T$ , and  $MV_P$  is the market value of the bond portfolio.

By properly choosing the notional value and the tenor of the swap, the portfolio manager can achieve a combination of the existing portfolio and the interest rate swap that sets the overall portfolio duration to the target duration:  $(MV_P)(MDUR_P) + (N_S)(MDUR_S) = (MV_P)(MDUR_T)$ .

The equivalence  $\Delta P = (N_S)(\Delta S)$  becomes  $(MV_P)(MDUR_T - MDUR_P) = (N_S)(MDUR_S)$ . To find the swap notional principal,  $N_S$ , we need to solve for the following formula:

### Equation (1)

$$N_S = \left( \frac{MDUR_T - MDUR_P}{MDUR_S} \right) (MV_P)$$

The modified duration of a swap ( $MDUR_S$ ) is the net of the modified durations of the equivalent positions in fixed- and floating-rate bonds. Thus, the position of the pay-fixed party in a pay-fixed, receive-floating swap has the modified duration of a floating-rate bond minus the modified duration of a fixed-rate bond, where the floating- and fixed-rate bonds have cash flows equivalent to the corresponding cash flows of the swap. A pay-fixed, receive-floating swap has a negative (positive) duration from the perspective of a fixed-rate payer (receiver), because the duration of a fixed-rate bond is positive and larger than the duration of a floating-rate bond, which is near zero. Moreover, the negative duration of this position to the fixed-rate payer/floating-rate receiver makes sense in that the position would be expected to benefit from rising interest rates.

## EXAMPLE 2

### Using an Interest Rate Swap to Achieve a Target Duration

Consider a portfolio manager with an investment portfolio of €50 million of fixed-rate German bonds with an average modified duration of 5.5. Because he fears that interest rates will rise, he wants to reduce the modified duration of the portfolio to 4.5, but he does not want to sell any of the securities. One way to do this would be to add a negative-duration position by entering into an interest rate swap where he pays the fixed rate and receives the floating rate. A two-year interest rate swap has an estimated modified duration of  $-2.00$  from the perspective of the fixed-rate payer.

Demonstrate how the manager can use this interest rate swap to achieve the target modified duration.

#### Solution:

The portfolio manager's goal is for the bonds and the swap to combine to create a portfolio with a market value of €50 million and a target modified duration of 4.5. This relationship can be expressed as follows:

$$€50,000,000(5.50) + (N_S)(MDUR_S) = €50,000,000(4.50),$$

where

$N_S$  = Interest rate swap's notional principal

$MDUR_S$  = Interest rate swap's modified duration, set equal to  $-2.00$

So, the notional principal of this interest rate swap that the manager should use is determined using Equation 1, as follows:

$$N_S = [(4.50 - 5.50)/(-2.00)] \times €50,000,000 = €25,000,000.$$

## 2. MANAGING INTEREST RATE RISK WITH FORWARDS, FUTURES AND FIXED-INCOME FUTURES

- a. demonstrate how interest rate swaps, forwards, and futures can be used to modify a portfolio's risk and return;

The market in short-term interest rate derivatives is large and liquid, and the instruments involved are forward rate agreements (FRAs) and interest rate futures. A forward rate agreement is an OTC derivative instrument that is used mainly to hedge a loan expected to be taken out in the near future or to hedge against changes in the level of interest rates in the future. In fact, with advanced settlement at maturity, an FRA will settle only the discounted difference between the interest rate agreed on in the contract and the actual rate prevailing at the time of settlement, applied on the notional amount of the contract. In general, managing short-term interest rate risk with an interest rate forward contract can also be done with an interest rate futures contract. Forwards, like swaps, are OTC instruments and are especially useful because they can be customized, but they do have counterparty risk. In contrast, exchange-traded interest rate futures contracts are standardized and guaranteed by a clearinghouse, so counterparty risk is virtually zero.<sup>2</sup>

Forward rate agreements and interest rate futures are widely used to hedge the risk associated with interest rates changing from the time a loan or a deposit is anticipated until it is actually implemented. **Example 3** demonstrates how interest rate futures are used to lock in an interest rate.

### EXAMPLE 3

## Using Interest Rate Futures to Lock in an

# Interest Rate

Amanda Wright, the chief investment officer (CIO) of a US-based philanthropic foundation is expecting a donation of \$30 million in two months' time from a member of the foundation's founding family. This significant donation will then be invested for three months and subsequently will be divided into smaller grants to be made to medical and educational institutions supported by the foundation. The current (i.e., spot) three-month reference rate is 2.40% (annualized). The CIO expects interest rates to fall, and she decides to hedge the rate on the deposit with Eurodollar futures.

To provide background information, Eurodollar futures are cash settled on the basis of the market reference rate for an offshore deposit having a principal value of \$1 million and a three-month maturity. These contracts are quoted in terms of the "IMM index"<sup>3</sup> that is equal to 100 less the annualized yield on the security. A 1 bp (0.01% or 0.0001) change in the value of the futures contract equates to a \$25.00 movement in the contract value. Thus, the basis point value (BPV) of a \$1 million face value, 90-day money market instrument is given by

$$BPV = \text{Face value} \times \left( \frac{\text{Days}}{360} \right) \times 0.01\% = \$1,000,000 \times \left( \frac{90}{360} \right) \times 0.01\% = \$25$$

## Analysis:

Wright buys 30 of the Eurodollar futures contracts at 97.60, locking in a forward rate of 2.40%. After two months, the donation is received and the CIO initiates the deposit at the then-lower spot rate of 2.10%. She unwinds the hedge at a futures price of 97.90, which is 30 bps higher than where the position was initiated.

The foundation will receive \$180,000 from the deposit plus the hedge, as follows:

1. Interest obtained on the deposit:  $2.10\% \times \$30 \text{ million} \times (90/360) = \$157,500$ .
2. Profit on the hedge is 30 bps ( $30 \times \$25 = \$750$ ), which for 30 contracts corresponds to \$22,500 ( $= \$750 \times 30$ ).

This corresponds to the return on an investment at the initial three-month reference rate of 2.40%, or  $2.40\% \times \$30 \text{ million} \times (90/360) = \$180,000$ . This calculation demonstrates that by buying the Eurodollar futures, Wright did indeed lock in a forward rate of 2.40%.

futures (also referred to as “bond futures”) contracts, which are longer dated, to hedge interest rate risk exposure. The choice will depend on the maturity of the bond or portfolio to be hedged. Since they are listed, interest rate futures have a limited number of maturities. Furthermore, the nearest months’ contracts have higher liquidity than the longer tenors. For these reasons, interest rate futures (e.g., Eurodollar futures) are commonly used to hedge short-term bonds, with up to two to three years remaining to maturity. When using interest rate futures to hedge a short-term bond, an effective and widely adopted technique to construct the hedge is to use a strip of futures contracts. Having measured the responsiveness of the bond to an interest rate change, it is now necessary to measure the sensitivity of each cash flow to changes in the relevant forward rate. Then, one can calculate the number of futures contracts needed to hedge the interest rate exposure for each cash flow. Fixed-income futures contracts remain, however, the preferred instrument to hedge bond positions, given that their liquidity is very high. This is especially true for US Treasury bond futures.

## 2.1. Fixed-Income Futures

Portfolio managers that want to hedge the duration risk of their bond portfolios usually use fixed-income futures. They are standardized forward contracts listed on an exchange that have as underlying a basket of deliverable bonds with remaining maturities within a predefined range. The most liquid contracts include T-note and T-bond futures listed on the Chicago Board of Trade or the Chicago Mercantile Exchange. Contracts expire in March, June, September, and December, and the underlying assets include Treasury bills, notes, and bonds. In Europe, the most liquid and most heavily traded fixed-income futures are traded on the Eurex, and these are the Euro-Bund (FGBL), Euro-Bobl (FGBM), and Euro-Schatz (FCBS).<sup>4</sup> These futures contracts have German federal government-issued bonds with different maturities as underlying. The Schatz is also known as the short bund futures contract because the maturities of the underlying bonds range from 21 to 27 months. In contrast, maturities of underlying bonds range from 4.5 years to 5.5 years for the Bobl futures contract and are even longer (between 10 years and 30 years) for the Bund futures contract.

Bond futures are used by hedgers to protect an existing bond portfolio against adverse interest rate movements and by arbitrageurs to gain from price differences in equivalent instruments.

A fixed-income futures contract has as its underlying reference assets a basket of deliverable bonds with a range of different coupon levels and maturity dates. Most futures contracts are closed before delivery or rolled into the next contract month. However, in the case of delivery, the futures contract seller has the obligation to deliver and the right to choose which security to deliver. For this reason, the duration of a futures contract is usually consistent with the forward behavior of the cheapest underlying deliverable bond. This is called the cheapest-to-deliver (CTD) bond, the eligible bond that the seller will most likely choose to

deliver under the futures contract if he decides to deliver (rather than close out the futures position). The price sensitivity of the bond futures will, therefore, reflect the duration of the CTD bond.

Within the underlying basket of bonds, the seller will deliver the CTD bond, the one that presents the greatest profit or smallest loss at delivery. To provide a guide for choosing the CTD bond, the concept of the conversion factor (CF) has been introduced. Given that the short side has the option of delivering any eligible security, a conversion factor invoicing system that allows for a less biased comparison in choosing among deliverable bonds has been established. In fact, the amount the futures contract seller receives at delivery will depend on the conversion factor that, when multiplied by the futures settlement price, will generate a price at which the deliverable bond would trade if its coupon were the notional coupon of the futures contract specification (e.g., 6% coupon and 20 years to maturity). The principal invoice amount at maturity is given in the following equation:<sup>5</sup>

### Equation (2)

Principal invoice amount =  
 $(\text{Futures settlement price}/100) \times CF \times \text{Contract size}.$

The cheapest-to-deliver bond is determined on the basis of duration, relative bond prices, and yield levels. In particular, a bond with a low (high) coupon rate, a long (short) maturity, and thus a long (short) duration will most likely be the CTD bond if the market yield is above (below) the notional yield of the fixed-income futures contract. The notional yield is usually in line with the prevailing interest rate.

The pricing discrepancy between the price of the cash security and that of the fixed-income futures is the basis. It is determined by the spot cash price less the futures price multiplied by the conversion factor. The possibility of physical delivery of the underlying asset guarantees convergence of futures and spot prices on the delivery date. In fact, the no-arbitrage condition requires the basis to be zero on the delivery date; otherwise, substantial arbitrage profits can be made. However, basis traders look for arbitrage opportunities by capitalizing on relatively small pricing differences. If the basis is negative, a trader would make a profit by “buying the basis”—that is, purchasing the bond and shorting the futures. In contrast, the trader would make a profit by “selling the basis” when the basis is positive; in this case, she would sell the bond and buy the futures. [Example 4](#) demonstrates how to determine the CTD bond for delivery under a Treasury bond futures contract.

## EXAMPLE 4

### Delivery on a Fixed-Income Futures Contract



A trader has sold 10-year US Treasury bond futures contracts expiring in June and now has the obligation to deliver and the right to choose which security to deliver (the CTD bond). The futures contract reference security is a US Treasury bond with 20 years to maturity and a coupon of 6%. The T-bond futures contract size is \$100,000. The futures contract settlement price is \$143.47. The trader now needs to determine which of the two bonds in the following table is cheapest to deliver.

	<b>Bond A</b>	<b>Bond B</b>
Cash Bond	T 4½ 02/15/36	T 5 05/15/37
Cash Dirty Price	\$120.75	\$128.50
Bond Purchase Value	\$120,750	\$128,500
Futures Settlement Price	143.47	143.47
Conversion Factor	0.8388	0.8883
Contract Size	\$100,000	\$100,000
Principal Invoice Amount	\$120,342.64	\$127,444.40
Delivery Gain/Loss	$-\$407.36 = \$120,342.64 - \$120,750$	$-\$1,055.60 = \$127,444.40 - \$128,500$

## Analysis:

The trader will try to maximize the difference between the amount received upon delivery, given by the futures contract settlement price (divided by 100) times the conversion factor times \$100,000, and the cost of acquiring the bond for delivery, given by its market price plus any accrued interest (i.e., the dirty price). Note that this example assumes no accrued interest.

The conversion factors for both bonds are less than 1 since both bonds have a coupon lower than 6%, the coupon for the futures contract standard. Bond A can be purchased for \$120,750 and Bond B for \$128,500, both per \$100,000 face value. These purchase prices are compared with the amounts received upon delivery. Principal invoice amounts are calculated using Equation 2, as follows:

Principal invoice amount =  $(\text{Futures settlement price}/100) \times CF \times \$100,000$ .

Bond A:  $143.47/100 \times 0.8388 \times \$100,000 = \$120,342.64$ .

Bond B:  $143.47/100 \times 0.8883 \times \$100,000 = \$127,444.40$ .



The cheapest to deliver is Bond A, the 4½% T-bond with a maturity date of 02/15/36, since the loss on delivering Bond A (\$407.36) is less than the loss on delivering Bond B (\$1,055.60).

Continuing with the previous analysis where we hedged a portfolio of fixed-rate securities, we now determine the hedge ratio (HR) expressed as the number of fixed-income futures contracts to be sold or purchased. The relation  $\Delta P = (HR)(\Delta F)$  is still valid; note that we saw it previously in the context of swaps as  $\Delta P = (N_s)(\Delta S)$ , where  $\Delta P$  is the change in the value of the bond portfolio and  $\Delta F$  is the change in the value of the fixed-income futures. The “ideal” hedge balances any change in value in the cash securities with an equal and opposite-sign change in the futures’ value.

With futures, however, we have to consider the cheapest-to-deliver bond price and the conversion factor. Because the basis of the CTD bond is generally closest to zero, any change in the futures price level ( $\Delta F$ ) will be a reflection of the change in the value of the CTD bond adjusted by its conversion factor. By considering the relative price movement of the bond futures contract to the cheapest-to-deliver bond, we have  $\Delta F = \Delta CTD/CF$ . By substituting into the equation  $\Delta P = (HR)(\Delta F)$ , the hedge ratio becomes

### Equation (3)

$$HR = \frac{\Delta P}{\Delta CTD}(CF)$$

In the case where the bond to hedge is the CTD, then a hedge ratio based on the conversion factor is likely to be quite effective (given that the price of a fixed-income futures contract tends to track closely with that of the cheapest-to-deliver bond).

However, for other securities with different coupons and maturities, the number of bond futures that are used to hedge against price changes of a fixed-rate bond is calculated on the basis of a duration-based hedge ratio. Moreover, the relationship between the bond’s price and its yield can also be stated in terms of basis point value and the portfolio’s target modified duration,  $MDUR_T$ , such that the portfolio’s target basis point value ( $BPV_T$ ) is

### Equation (4)

$$BPV_T = MDUR_T \times 0.01\% \times MV_P$$

In the special case where the objective is to completely hedge the portfolio,  $BPV_T = 0$ . The effect of the basis point value hedge ratio ( $BPVHR$ ) is then conceptualized as  $BPV_P + BPVHR \times BPV_F = 0$ . Thus,  $BPVHR = -BPV_P/BPV_F$ , which uses the basis point value of the

portfolio to be hedged ( $BPV_P$ ) and that of the futures contract ( $BPV_F$ ), where

**Equation (5)**

$$BPV_P = MDUR_P \times 0.01\% \times MV_P$$

and

**Equation (6)**

$$BPV_F = BPV_{CTD}/CF$$

In Equation 6, the numerator is  $BPV_{CTD}$ , the basis point value of the cheapest-to-deliver bond under the futures contract, and the denominator is  $CF$ , its conversion factor. The basis point value of the cheapest-to-deliver bond is determined, in a manner analogous to [Equations 4 and 5](#), as

**Equation (7)**

$$BPV_{CTD} = MDUR_{CTD} \times 0.01\% \times MV_{CTD}$$

where  $MV_{CTD} = (\text{CTD price}/100) \times \text{Futures contract size}$ .

Finally, for small changes in yield, by substituting into the equation  $BPVHR = -BPV_P/BPV_F$ , where  $BPV_F$  becomes  $BPV_{CTD}/CF$ , in the special case of complete hedging,  $BPVHR$  in terms of number of futures contracts is

**Equation (8)**

$$BPVHR = \frac{-BPV_P}{BPV_{CTD}} \times \text{Conversion factor}$$

## EXAMPLE 5

### Hedging Bond Holdings with Fixed-Income Futures

A portfolio manager is holding €50 million (principal) in German bunds (DBRs) and wants to fully hedge the value of the bond investment against a rise in interest rates. The portfolio has a modified duration of 9.50 and a market value of €49,531,000. Moreover, the manager wishes to fully hedge the bond portfolio (so,  $BPV_T = 0$ ) with a short

position in Euro-Bund futures with a price of 158.33. The cheapest-to-deliver bond is the DBR 0.25% 02/15/27 that has a price of 98.14, modified duration of 8.623, and conversion factor of 0.619489. The size of the futures contract is €100,000.

Determine the following:

1. The  $BPV_P$  of the portfolio to be hedged
2. The  $BPV_{CTD}$  of the futures contract hedging instrument
3. The number of Euro-Bund futures contracts to sell to fully hedge the portfolio

### Solution to 1:

The basis point value of the portfolio ( $BPV_P$ ), stated in terms of the change in value for a 1 bp (0.01%) change in yield, is calculated using Equation 5, as follows:

$$BPV_P = MDUR_P \times 0.01\% \times MV_P$$

Portfolio Principal	€50,000,000
Portfolio Market Value	€49,531,000
Modified Duration	9.50

$$BPV_P = 9.50 \times 0.0001 \times €49,531,000 = €47,054.45.$$

Thus, the portfolio to be hedged has a  $BPV_P$  of €47,054.45 per €50 million notional.

### Solution to 2:

The basis point value of the CTD bond underlying the futures contract ( $BPV_{CTD}$ ) is calculated using Equation 7, as follows:

$$BPV_{CTD} = MDUR_{CTD} \times 0.01\% \times MV_{CTD}$$

Futures Hedge	
Euro-Bund Futures Price	158.33
Contract Size	€100,000

### Cheapest-To-Deliver Bond

DBR 0¼ 02/15/27 Gov't.	
Modified Duration	8.623
Bond Price	98.14
Conversion Factor	0.619489

---

$$BPV_{CTD} = 8.623 \times 0.0001 \times [(98.14/100) \times \text{€}100,000] = \text{€}84.63.$$

So, the BPV of the CTD bond ( $BPV_{CTD}$ ) is €84.63.

### Solution to 3:

Using Equation 8 and the Solutions to 1 and 2, we have:

$$BPV_{HR} = \frac{-BPV_P}{BPV_{CTD}} \times CF = \frac{-\text{€}47,054.45}{\text{€}84.63} \times 0.619489 = -344.437 \approx -344$$

Therefore, the number of Euro-Bund futures to *sell* to fully hedge the portfolio is 344 contracts.

In the real world, however, the hedging results are imperfect because (1) the hedge is done with the cheapest-to-deliver bond, and since the CTD bond can change over the holding period, the duration of the futures contract can also change; (2) the relationship between interest rates and bond prices is not linear, owing to convexity; and (3) the term structure of interest rates often changes via non-parallel moves.

Reconsidering [Example 2](#) from before, in which the manager whose portfolio has a modified duration of 5.5 years wants to lower the duration to 4.5 years, the general principle is the same. What needs to be determined is the number of futures contracts that are required to reduce the portfolio's modified duration to the target level. In this more general case, where  $MDUR_T$  (and  $BPV_T$ ) is non-zero, stated in terms of basis point value and  $BPV_{HR}$ , we have  $BPV_P + BPV_{HR} \times BPV_F = BPV_T$ .

Solving for  $BPV_{HR}$  and substituting for  $BPV_F$ , we have the more general version of Equation 8:

### Equation (9)

$$\begin{aligned}
 BPV_{HR} &= \left( \frac{BPV_T - BPV_P}{BPV_F} \right) \\
 &= \left( \frac{BPV_T - BPV_P}{BPV_{CTD}/CF} \right) \\
 &= \left( \frac{BPV_T - BPV_P}{BPV_{CTD}} \right) \times CF
 \end{aligned}$$

## EXAMPLE 6

### Decreasing Portfolio Duration with Futures

Consider the portfolio manager from [Example 5](#) who now decides to decrease the portfolio's modified duration from 9.50 to 8.50. The yield curve is flat. Additionally, we have already demonstrated that given the portfolio's market value of €49,531,000, the  $BPV_P$  is €47,054.50. Finally, assume the CTD bond underlying the Euro-Bund futures is the same as before, DBR 0.25% 02/15/27, with a  $BPV_{CTD}$  of €84.63 and a conversion factor of 0.619489.

Determine the following:

1. The  $BPV_T$  of the portfolio to be hedged
2. The number of Euro-Bund futures contracts to sell to reduce the portfolio's modified duration to 8.50

#### Solution to 1:

Using Equation 4 with a  $MDUR_T$  of 8.50, the portfolio's target basis point value ( $BPV_T$ ) will be

$$BPV_T = 8.50 \times 0.0001 \times €49,531,000 = €42,101.35.$$

#### Solution to 2:

To achieve the target modified duration of 8.50, the portfolio manager must implement a short position in Euro-Bund futures. Using the same cheapest-to-deliver bond with a  $BPV_{CTD}$  of €84.63 and a conversion factor of 0.619489, the number of Euro-Bund futures to sell to decrease the portfolio's duration is calculated using Equation 9:

$$BPVHR = \left( \frac{€42,101.35 - €47,054.50}{€84.63} \right) \times 0.619489$$

$$= -36.26 \approx -36 \text{ futures contracts}$$

Therefore, the number of Euro-Bund futures to *sell* to achieve the target portfolio duration of 8.50 is 36 contracts.

## 3. MANAGING CURRENCY EXPOSURE

- b. demonstrate how currency swaps, forwards, and futures can be used to modify a portfolio's risk and return;

Currency swaps, forwards, and futures can be used to effectively alter currency risk exposures. Currency risk is the risk that the value of a current or future asset (liability) in a foreign currency will decrease (increase) when converted into the domestic currency.

### 3.1. Currency Swaps

A currency swap is similar to an interest rate swap, but it is different in two ways: (1) The interest rates are associated with different currencies, and (2) the notional principal amounts may or may not be exchanged at the beginning and end of the swap's life.<sup>6</sup>

Currency swaps help the parties in the swap to hedge against the risk of exchange rate fluctuations and to achieve better rate outcomes. In particular, a **cross-currency basis swap** exchanges notional principals because the goal of the transaction is to issue at a more favorable funding rate and swap the amount back to the currency of choice. Firms that need foreign-denominated cash can obtain the funding in their local currency and then swap the local currency for the required foreign currency using a cross-currency basis swap. The swap periodically sets interest rate payments, mostly floating for floating, separately in two different currencies. The net effect is to use a loan in a local currency to take out a loan in a foreign currency while avoiding any foreign exchange risk. In fact, the exchange rate is fixed, as illustrated in [Example 7](#).

#### EXAMPLE 7

# Cross-Currency Basis Swap

Consider a Canadian private equity (PE) firm that is executing a leveraged buyout (LBO) of a small, struggling US-based electronics manufacturer. The goal is to turn around the company by implementing new robotics technology for making servers and infrastructure devices for “bitcoin mining.” Exit from the LBO via initial public offering is expected in three years. To execute the LBO and provide working capital for US operations, the PE firm needs USD40 million. The rate on a US dollar loan is the semiannual US dollar reference floating rate plus 100 bps. The PE firm discovers that it can borrow more cheaply in the local Canadian market and decides to fund the LBO in Canadian dollars (CAD) by borrowing CAD50 million for three years at the semiannual Canadian dollar reference floating rate plus 65 bps. Then it contacts a New York-based dealer and requests a quote for a three-year cross-currency basis swap with semiannual interest payments to exchange the CAD50 million into US dollars. The three-year CAD–USD cross-currency basis swap is quoted at –15 bps at a rate of USD/CAD 0.8000 (expressed as US dollars per 1 Canadian dollar). The swap agreement provides that both parties pay the semiannual reference floating rate, but the Canadian dollar rate also includes a “basis.” Here the basis is the difference between interest rates in the cross-currency basis swap and those used to determine the forward exchange rates. If covered interest rate parity holds, a forward exchange rate is determined by the spot exchange rate and the interest rate differential between foreign and domestic currencies over the term of the forward rate. However, usually covered interest rate parity does not hold and thus gives rise to the basis.

The basis is quoted on the non-USD leg of the swap. “Paying” the basis would mean borrowing the other currency versus lending US dollars, whereas “receiving” the basis implies lending the other currency versus borrowing US dollars. The three-year CAD–USD cross-currency swap in this case is quoted at –15 bps. This means that the Canadian PE firm, the “lender” of the Canadian dollars in the swap, will receive the Canadian dollar reference rate, assumed to be 1.95%, minus 15 bps every six months in exchange for paying the US dollar reference rate for the US dollars it has “borrowed.” Given that the PE firm pays the Canadian dollar floating rate plus 65 bps on its bank loan, the effective spread paid becomes 80 bps ( $= 65\text{bps} + 15\text{bps}$ ). This compares with a spread of 100 bps if instead it borrowed in US dollars.

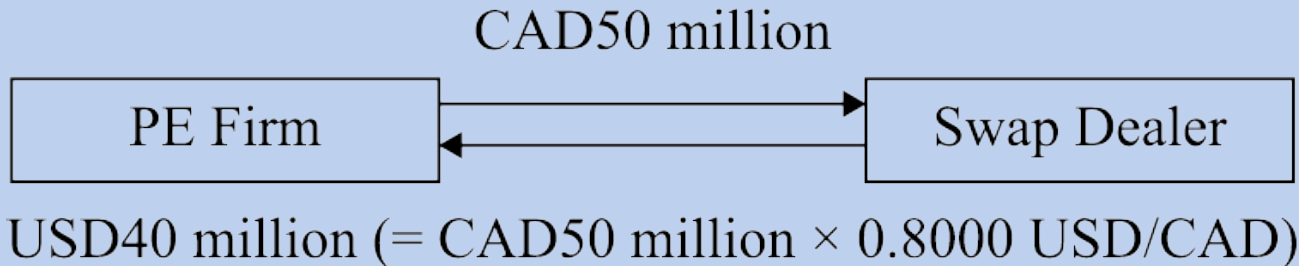
## Analysis:

We now examine the cash flows in the cross-currency basis swap, where  $N$  is the notional principal of the Canadian dollar leg of the swap and  $S_0$ , agreed at the start, is the spot exchange rate for all payments (at inception, on interest payment dates, and at maturity). For the Canadian PE firm, this means that

$N = \text{CAD}50 \text{ million}$  and  $S_0 = \text{USD}/\text{CAD } 0.8000$ .

### **Flows at the inception of the swap.**

At inception, the Canadian PE firm delivers Canadian dollars ( $N$ ) in exchange for US dollars (at a rate of  $N \times S_0$ ).



At each payment date, the PE firm makes a floating-rate payment in US dollars and receives a floating-rate payment in Canadian dollars that is passed on to the local Canadian lender. At maturity, the PE firm returns the USD40 million to the dealer and in return receives the CAD50 million, which it uses to pay off its lender.

### **Periodic payments.**

At each swap payment date, the Canadian PE firm receives interest on Canadian dollars ( $N$ ) in exchange for paying interest on US dollars ( $N \times S_0$ ). Importantly, the “basis” component (of  $-15$  bps) will be included along with the semiannual Canadian dollar reference floating rate.

Suppose that on the first settlement date the semiannual reference floating rate in Canadian dollars is  $1.95\%$  and the basis is  $-15$  bps. Therefore, the Canadian dollar rate on the swap is  $1.80\%$  ( $= 1.95\% - 15 \text{ bps}$ ), and we assume the US dollar rate is  $2.50\%$  (the semiannual reference floating rate). For the PE firm, the first of a sequence of periodic cash flows resulting from the swap amounts to:

$$\text{CAD}50 \text{ million} \times 1.80\% \times 180/360 = \text{CAD}450,000 \text{ (A)}$$



$$\text{CAD}50 \text{ million} \times 0.8000 \text{ USD}/\text{CAD} \times 2.50\% \times 180/360 = \text{USD}500,000 \text{ (B)}$$

The interest rate payment on the PE firm’s loan is  $\text{CAD}50 \text{ million} \times (1.95\% + 0.65\%) \times (180/360) = \text{CAD}650,000$ . Considering the CAD450,000 received on the swap (A), the PE firm’s net payment is CAD200,000.

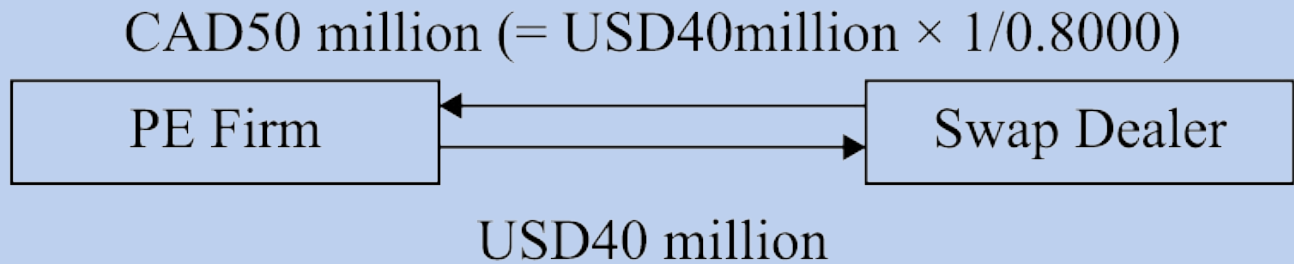
At USD/CAD 0.8000, this net payment of CAD200,000 corresponds to a payment of USD160,000, which when added to the USD500,000 paid on the swap (B) totals



USD660,000. Importantly, note that had the Canadian PE firm taken out the US loan instead, it would have paid periodically USD700,000 ( $= \text{USD40 million} \times [2.50\% + 1.0\%] \times [180/360]$ ).

### ***Flows at maturity.***

At the maturity of the swap (and after a successful exit from the LBO via a US IPO), the Canadian PE firm swaps back US dollars in exchange for Canadian dollars ( $\text{USD} \times 1/S_0$ ).



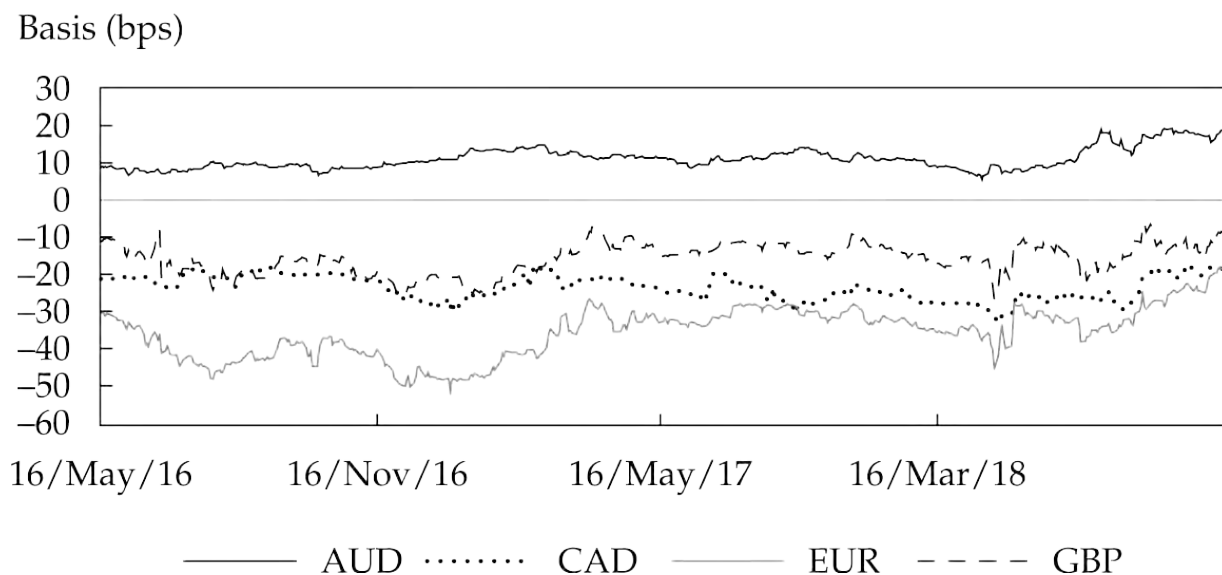
In this specific example, it is worth noting that the exchange rate was assumed not to change.

A common use of currency swaps by investors is in transactions meant to earn extra yield by investing in a foreign bond market and swapping the proceeds into the domestic currency. Given that the investment is hedged against the risk of exchange rate fluctuations, this corresponds to a synthetic domestic yield, but the repackaging allows the investor to earn a higher yield compared with the yield from direct purchase of the domestic asset, because of the level of the basis on the cross-currency swap. For example, during periods when demand for US dollars is strong relative to demand for Japanese yen (JPY), the US–Japan interest rate differential implied by the currency markets may be significantly wider than the actual interest rate differential. During such a period, a US investor might choose among the following two options: (1) Invest in short-term US Treasury bonds, or (2) use a cross-currency swap to lend an equivalent amount of US dollars and buy yen; buy short-term Japanese government debt; each period pay yen and receive US dollars on the swap; and at maturity swap an equivalent amount of yen back into US dollars. When the basis is largely negative, due to relatively weak (strong) demand for yen (US dollars) from swap market participants, the borrowing costs in yen (US dollars) are low (high), making the return from lending US dollars via a cross-currency swap particularly attractive. By choosing Option 2, the investor can earn more than he could from the investment in short-term US Treasury debt.

The rates on the cross-currency basis swaps will depend on the demand for US dollar funding, because when the US dollar reference floating rate is elevated, the counterparty receiving US dollars at initiation of the swap will be willing to receive a lower interest rate

on the non-dollar currency periodic payments. [Exhibit 1](#) shows the levels of the basis for one-year cross-currency swaps from May 2016 to April 2018 in the Australian dollar (AUD), the Canadian dollar (CAD), the euro (EUR), and the British pound (GBP) versus USD Libor (quoted as six-month USD Libor versus six-month AUD bank bills, six-month CAD Libor, six-month Euribor, and six-month GBP Libor, respectively). Cross-currency basis spreads vary over time and are driven by credit and liquidity factors, and supply and demand for cross-currency financing. As noted previously, relatively strong demand for US dollar financing against the foreign currency would require the US dollar “borrower” in the swap to accept a lower rate on the periodic foreign currency cash flows it receives—for example, the foreign periodic reference rate less the basis. As shown in [Exhibit 1](#), during the period covered this was the case for US dollar borrowers receiving periodic swap payments in all currencies shown except the Australian dollar.

**Exhibit 1. Historical Levels for One-Year Cross-Currency Swap Spreads (Basis) vs. Major Currencies (Six-Month Settlement)**



## 3.2. Currency Forwards and Futures

Currency forwards and futures are actively used to manage currency risk. These two financial instruments are used to hedge against undesired moves in the exchange rate by buying or selling a specified amount of foreign currency, at a defined time in the future and at an agreed-on price at contract initiation. Futures contracts are standardized and best meet dealers’ and investors’ needs to manage their portfolios’ currency risk. Corporations often use customized forward contracts to manage the risk of cash flows in foreign currencies because

they can be customized according to their needs.

For example, consider the general partner of a US-based venture capital (VC) firm that is calling down capital commitments for investment in “fintech” startups in Silicon Valley. It will receive in 30 days a payment of CAD50 million from a limited partner residing in Vancouver, British Columbia, and will immediately transfer the funds to its US dollar account. If the Canadian dollar were to depreciate versus the US dollar before the payment date, the US VC firm will receive fewer US dollars in exchange for the CAD50 million. To eliminate the foreign exchange risk associated with receiving this capital commitment, the firm can fix the price of the US dollars now via a forward contract in which it promises to sell CAD50 million for an agreed-on number of US dollars, based on the forward exchange rate, in 30 days.

## EXAMPLE 8

### Hedging Currency Risk with Futures

Consider the same US-based VC firm that is calling down capital commitments and will receive CAD50 million in 30 days. The general partner now decides to sell futures contracts to lock in the current USD/CAD rate. The hedge ratio is assumed to be equal to 1. The firm hedges its risk by selling Canadian dollar futures contracts with the closest expiry to the future Canadian dollar inflow.

Given a price for the Canadian dollar futures contract of USD/CAD 0.7838 (number of US dollars for 1 Canadian dollar) and a contract size of CAD100,000, determine how many Canadian dollar futures contracts the VC firm must sell to hedge its risk.

#### Solution:

To hedge the risk of the Canadian dollar depreciating against the US dollar, the VC firm must sell 500 futures contracts:

$$\frac{\text{CAD}50,000,000}{\text{CAD}100,000} = 500 \text{ contracts}$$

When the futures contracts expire, the VC firm will receive (pay) any depreciation (appreciation) in the Canadian dollar versus the US dollar compared with the futures contract price of USD0.7838/CAD.<sup>7</sup> If the changes in futures and spot prices are equal during the life of the futures contract, the hedge will be fully effective. A basis risk arises when the differential given by  $\text{Futures price}_t - \text{Spot price}_t$  is either positive or negative. In the absence of arbitrage, between the time when a hedging position is initiated and the time when it is liquidated, this spread may either widen or narrow to

zero.

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## 4. MANAGING EQUITY RISK

- c. demonstrate how equity swaps, forwards, and futures can be used to modify a portfolio's risk and return;

Investors can achieve or modify their equity risk exposures using equity swaps and equity forwards and futures. The asset underlying these financial instruments could be an equity index, a single stock, or a basket of stocks.

### 4.1. Equity Swaps

An equity swap is a derivative contract in which two parties agree to exchange a series of cash flows whereby one party pays a variable series that will be determined by a single stock, a basket of stocks, or an equity index and the other party pays either (1) a variable series determined by a different equity or rate or (2) a fixed series. An equity swap is used to convert the returns from an equity investment into another series of returns, which either can be derived from another equity series or can be a fixed rate. There are three main types of equity swaps:

- receive-equity return, pay-fixed;
- receive-equity return, pay-floating; and
- receive-equity return, pay-another equity return.

Because they are an OTC derivative instrument, each counterparty in the equity swap bears credit risk exposure to the other. For this reason, equity swaps are usually collateralized in order to reduce the credit risk exposure. At the same time, as equity swaps are created in the OTC market, they can be customized as desired by the counterparties.

A total return swap is a slightly modified equity swap; it also includes in the performance any dividends paid by the underlying stocks or index during the period until the swap maturity. The swap has a fixed tenor and may provide for one single payment at the end of the swap's

life, although more typically a series of periodic payments would be arranged instead. In another variation, at the time of each periodic payment, the notional amount could be reset or remain unchanged.

Equity swaps provide synthetic exposure to physical stocks. They are preferred by some investors over ownership of shares when access to a specific market is limited, when taxes are levied for owning physical stocks (e.g., stamp duty) but are not levied on swaps, the custodian fees are high, or the cost of monitoring the stock position is elevated (e.g., because of corporate actions). However, it is important to note that equity swaps require putting up collateral, are relatively illiquid contracts, and do not confer voting rights.

**Example 9** shows how an equity swap might be used by an institutional investor with a portfolio indexed to the performance of the S&P 500 Index. He believes the stock market will decline over the next six months and would like to temporarily hedge part of the market exposure of his portfolio. He can do this by entering into a six-month equity swap with one payment at termination, exchanging the total return on the S&P 500 for a floating rate. We will consider two scenarios: In the first scenario, in six months the underlying portfolio is up 5%; in the second, it is down 5%.

## EXAMPLE 9

### Six-Month Equity Swap

An institutional investor holds a \$100 million portfolio of US stocks indexed to the S&P 500. He expects the index will fall in the next six months and wants to reduce his market exposure by 30%. He enters into an equity swap with notional principal of \$30 million whereby he agrees to pay the return on the index and to receive the floating reference interest rate, assumed to be 2.25%, minus 25 bps—so, 2.00% per annum.

#### Scenario 1:

In the first scenario, the stock market has increased by 5%. Thus, at swap settlement the institutional investor has an obligation to pay  $5\% \times \$30 \text{ million}$ , or \$1.5 million, and would receive  $2\% \times 180/360 \times \$30 \text{ million}$ , or \$300,000. The two parties would net the payments and provide for a single payment of \$1.2 million, which the institutional investor would pay. Because the portfolio has gained \$5 million in this scenario, the profit and loss (P&L) on the combined position (including the original portfolio and the swap) is positive and equal to \$3.8 million.

**Scenario 1 Equity Portfolio Rises 5%**

US equity portfolio: $\$100 \text{ million} \times 5\% =$	<u>+\$5,000,000</u>
P&L on the stock portfolio:	<u>+\$5,000,000</u>
<i>Swap settlement:</i>	
Pay: $\$30 \text{ million} \times 5\% =$	-\$1,500,000
Receive: $\$30 \text{ million} \times 2\% \times 180/360 =$	<u>+\$300,000</u>
Net payment on the swap:	-\$1,200,000
P&L on the net position (70% of original exposure and 30% hedged):	
$\$5,000,000 - \$1,200,000 =$	<u><u>+\$3,800,000</u></u>

## Scenario 2:

In the second scenario, the stock market has decreased by 5%. So, it is slightly more complicated because the equity return that the institutional investor must pay is *negative*, which means he will receive money. He would receive \$1.5 million because the S&P 500 had a negative performance in addition to receiving the \$300,000. Because the portfolio has lost \$5 million in this case, the P&L on the combined position is -\$3.2 million. When the swap ends, the institutional investor returns to the same position in which he started, with the equity portfolio fully invested, and it is thereafter subject to full market risk once again.

### Scenario 2 Equity Portfolio Declines 5%

US equity portfolio: $\$100 \text{ million} \times -5\% =$	<u>-\$5,000,000</u>
P&L on the stock portfolio:	<u>-\$5,000,000</u>
<i>Swap settlement:</i>	
Receive (Pay negative return): $\$30 \text{ million} \times 5\% =$	+\$1,500,000
Receive: $\$30 \text{ million} \times 2\% \times 180/360 =$	<u>+\$300,000</u>
Net payment on the swap:	+\$1,800,000
P&L on the net position (70% of original exposure and 30% hedged):	
$-\$5,000,000 + \$1,800,000 =$	<u><u>-\$3,200,000</u></u>

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To test the reasonableness of the result, a portfolio comprising 70% equities and 30% money market instruments assumed to earn 2% (1% over the six months) would achieve a return of 3.8% ( $= 0.7 \times 5\% + 0.3 \times [2\%/2]$ ) or \$3.8 million on \$100 million in the bullish scenario (Scenario 1). In the bearish scenario (Scenario 2), the return would be -3.2% ( $= 0.7 \times -5\% + 0.3 \times [2\%/2]$ ) or -\$3.2 million on the initial \$100 million portfolio. The total return swap effectively removes the risk associated with 30% of the equity portfolio allocation and converts it into money market equivalent returns.

Consider now a private high-net-worth investor who holds a large, concentrated position in a particular company's stock that pays dividends on a regular basis. She expects that in the next six months the total return from the stock, including the dividends received, will be negative, so she wants to temporarily neutralize her long exposure. At the same time, she does not wish to lose ownership and her voting rights by selling the stock on an exchange.

This investor can enter into a total return swap requiring her to transfer the total performance of the stock (i.e., total return) to the counterparty of the swap, at prespecified dates for an agreed-on fee. Under the terms of the swap, she will pay to the counterparty the share price appreciation plus the dividends received over the life of the contract. If the stock price decreases, she will receive the share price depreciation but net of the dividends. At the same prespecified dates, the investor will receive in exchange from the counterparty an agreed-on floating-rate interest payment based on the swap notional.

Equity swaps that have a single stock as underlying can be cash settled or physically settled. If the swap is cash settled, on the termination date of the contract the equity swap receiver will receive (pay) the equity appreciation (depreciation) in cash. If the swap is physically settled, on the termination date the equity swap receiver will receive the quantity of single stock specified in the contract and pay the notional amount. Let us assume for example that a portfolio manager is the receiver in a six-month equity swap with notional principal of €4.5 million and no interim cash flows that requires physical settlement, at maturity, of 300,000 shares of the Italian insurer Generali. At maturity of the swap, the portfolio manager will receive 300,000 shares of Generali and will pay €4.5 million, which corresponds to a purchase price per share of €15 ( $= €4.5 \text{ million} / 300,000$ ). He will also pay the interest on the swap based on the agreed-on rate. Now let us also assume that at the swap's maturity the price of Generali is €16. This price implies a gain of €300,000 ( $= [€16 - €15] \times 300,000$ ) for the portfolio manager, assuming he sells the shares received in the swap at €16. If the same swap had cash settlement, instead of physical settlement, at maturity the portfolio manager would have received €300,000—given by €16 (the swap settlement price) less €15 (the agreed price on the swap) and multiplied by 300,000—against the payment of the interest on



the swap.

## 4.2. Equity Forwards and Futures

Equity index futures are an indispensable tool for many investment managers: They are a low-cost instrument to implement tactical allocation decisions, achieve portfolio diversification, and attain international exposure. They are standardized contracts listed on an exchange, and when the underlying is a stock index, only cash settlement is available at contract expiration.

Single stock futures are also available to investors to acquire the desired exposure to a specific stock. This exposure is also achievable with equity forwards, which are OTC contracts that are used when the counterparties need a customized agreement. The underlying of a single stock futures contract is one specified stock, and the investor can receive or pay its performance. At expiration, the contract could require cash settlement or physical settlement using the stock.

In [Example 9](#), rather than using an equity swap, the institutional investor could temporarily remove part of the market risk by selling S&P 500 Index futures. In the practical implementation of a stock index futures trade, we need to remember that the actual futures contract price is the quoted futures price times a designated multiplier. In determining the hedge ratio, the stock index futures price should be quoted on the same order of magnitude as the stock index.

For example, assume that a one-month futures contract on the S&P 500 is quoted at 2,700. Given the multiplier of \$250, the actual futures price is equal to \$675,000 ( $= 2,700 \times \$250$ ). We also assume that the portfolio to be hedged carries average market risk, meaning a beta of 1.0.<sup>8</sup> To hedge 30% of the \$100 million portfolio, the portfolio manager would want to sell 44 S&P 500 futures contracts, determined as follows:

$$\frac{\$30 \text{ million}}{2,700(\$250)} = 44.444 \approx 44 \text{ contracts}$$

Suppose the institutional investor sold the 44 futures at 2,700 and at expiration the S&P 500 rises by 0.5%. The cash settlement of the contract is at 2,713.5. Because the futures position is short and the index rose, there is a “loss” of 13.5 index points—each point being worth \$250—on 44 contracts, for a total cash outflow, paid by the institutional investor, of \$148,500:

$$-13.5 \text{ points per contract} \times \$250 \text{ per point} \times 44 \text{ contracts} = -\$148,500 \text{ (a loss).}$$

If the S&P 500 Index rose by 0.5%, the 30% of the portfolio that has been hedged would also



be expected to rise by the same amount, but there is a small difference due to rounding the number of futures contracts used for the hedge:

$$\$30,000,000 \times 0.5\% = \$150,000.$$

If instead the S&P 500 *fell* by 0.5%, the numbers would be the same, but the signs would change. The institutional investor would receive the “gain” because he had a short stock index futures position when the index fell, which would offset the loss on the hedged portion of his stock portfolio. In sum, the equity market risk is hedged away.

In the previous example, the beta of the portfolio was the same as the beta of the equity index futures. This situation usually does not occur, and in most hedging strategies, it is necessary to determine the exact “hedge ratio” in terms of the number of futures contracts. Consider that the investment manager wishes to change the beta of the equity portfolio,  $\beta_S$ , to a target beta of  $\beta_T$ . Because the value of the futures contract begins each day at zero, the dollar beta of the combination of stocks and futures, assuming the target beta is achieved, is  $\beta_T S$ , where  $S$  is the market value of the stock portfolio.<sup>9</sup> The number of futures contracts we shall use is  $N_f$ , which can be determined by setting the target dollar beta equal to the dollar beta of the stock portfolio ( $\beta_S S$ ) and the dollar beta of  $N_f$  futures ( $N_f \beta_f F$ ), where  $\beta_f$  is the beta of the futures and  $F$  is the value per futures contract:

$$\beta_T S = \beta_S S + N_f \beta_f F$$

We then solve for  $N_f$  and obtain

### Equation (10)

$$N_f = \left( \frac{\beta_T - \beta_S}{\beta_f} \right) \left( \frac{S}{F} \right)$$

Note that if the investor wants to increase the portfolio’s beta,  $\beta_T$  will exceed  $\beta_S$  and the sign of  $N_f$  will be positive, which means that she must buy futures. If she wants to decrease the beta,  $\beta_T$  will be less than  $\beta_S$ , the sign of  $N_f$  will be negative, and she must sell futures. This relationship should make sense: Selling futures will offset some of the risk of holding the stock, whereas buying futures will add risk.

In the special case in which the goal is to eliminate market risk,  $\beta_T$  would be set to zero and the formula would reduce to

$$N_f = - \left( \frac{\beta_S}{\beta_f} \right) \left( \frac{S}{F} \right)$$

In this case, the sign of  $N_f$  will always be negative, which makes sense, because in order to hedge away all the market risk, futures must be sold.

## EXAMPLE 10

# Increasing the Beta of a Portfolio with Futures

Paulo Bianchi is the manager of a fund that invests in UK defensive stocks, such as consumer staples producers and utilities. His firm's market outlook for the next quarter has become more positive, so Bianchi decides to increase the beta on the £40 million portfolio he manages from its current level of  $\beta_S = 0.85$  to  $\beta_T = 1.10$  for the next three months. He will execute this increase in equity market risk exposure using futures on the FTSE 100 Index. The futures contract price is currently £7,300, the contract's multiplier is £10 per index point (so each futures contract is worth £73,000), and its beta,  $\beta_f$  is 1.00.

At the end of the three-month period, the UK stock market has increased by 2%. The stock portfolio has increased in value to £40,680,000, calculated as  $£40,000,000 \times [1 + (0.02 \times 0.85)]$ . The FTSE 100 futures contract has risen to £74,460.

1. Determine the appropriate number of FTSE 100 Index futures Bianchi should buy to increase the portfolio's beta to 1.10.
2. Demonstrate how the effective beta of the portfolio of stocks and the FTSE 100 Index futures matched Bianchi's target beta of 1.10.

## Solution to 1:

Using Equation 10 and the preceding data, the appropriate number of futures contracts to buy to increase the portfolio's beta to 1.10 would be 137.

$$N_f = \left( \frac{\beta_T - \beta_S}{\beta_f} \right) \left( \frac{S}{F} \right) = \left( \frac{1.10 - 0.85}{1.00} \right) \left( \frac{£40,000,000}{£73,000} \right) = 136.99 \text{ (rounded to 137)}$$

## Solution to 2:

The profit on the futures contracts is  $137 \times (£74,460 - £73,000) = £200,020$ . Adding the profit from the futures to the value of the stock portfolio gives a total market value of  $£40,680,000 + £200,020 = £40,880,020$ . The rate of return for the combined position is

$$\frac{£40,880,020}{£40,000,000} - 1 = 0.0220, \text{ or } 2.2\%$$

Because the market went up by 2% and the overall gain was 2.2%, the effective beta of the portfolio was

$$\frac{0.0220}{0.020} = 1.10$$

Thus, the effective beta matched the target beta of 1.10.

## 4.3. Cash Equitization

Cash securitization (also known as “cash equitization” or “cash overlay”) is a strategy designed to boost returns by finding ways to “equitize” unintended cash holdings. By purchasing futures contracts, fund managers attempt to replicate the performance of the underlying market in which the cash would have been invested. Given the liquidity of the futures market, doing so would be relatively easy. An alternative solution could be to purchase calls and sell puts on the underlying asset with the same exercise price and expiry date.

In this case, we have a cash holding, implying  $\beta_S = 0$ , so the number of futures (with beta of  $\beta_f$ ) that would need to be purchased in a cash equitization transaction is given by

**Equation (11)**

$$N_f = \left( \frac{\beta_T}{\beta_f} \right) \left( \frac{S}{F} \right)$$

### EXAMPLE 11

## Cash Equitization

Akari Fujiwara manages a large equity fund denominated in Japanese yen that is indexed to the Nikkei 225 stock index. She determines that the current level of excess cash that has built up in the portfolio amounts to JPY140 million. She decides to purchase futures contracts to replicate the return on her fund’s target index, Nikkei 225

index futures currently trade at a price of JPY23,000 per contract, the contract multiplier is JPY1,000 per index point (so each futures contract is worth JPY23 million), and the beta,  $\beta_f$  is 1.00.

Determine the appropriate number of futures Fujiwara must buy to equitize her portfolio's excess cash position.

### Solution:

Using Equation 11, which assumes  $\beta_S = 0$ , the answer is found as follows:

$$N_f = \left( \frac{\beta_T}{\beta_f} \right) \left( \frac{S}{F} \right) = \left( \frac{1.00}{1.00} \right) \left( \frac{\text{JPY}140,000,000}{\text{JPY}23,000,000} \right) = 6.087 \text{ (rounded to 6)}$$

The appropriate number of futures to buy to equitize the portfolio's excess cash position, based on the data provided, would be six contracts.

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## 5. VOLATILITY DERIVATIVES: FUTURES AND OPTIONS

- d. demonstrate the use of volatility derivatives and variance swaps;

With the introduction of volatility futures and variance swaps, many investors now consider volatility an asset class in itself. In particular, long volatility exposure can be an effective hedge against a sell-off in a long equity portfolio, notably during periods of extreme market movements. Empirical studies have identified a negative correlation between volatility and stock index returns that becomes pronounced during stock market downturns. Importantly, variance swaps, which will be discussed in this section, have a valuable convexity feature—as realized volatility increases (decreases), the positive (negative) swap payoffs increase (decrease)—that makes them particularly attractive for hedging long equity portfolios. For example, some investors use strategies that systematically allocate to volatility futures or variance swaps to hedge the “tail” risk of their portfolios. Naturally, the counterparties are selling a kind of insurance; they expect such return tails will not materialize. The effectiveness of such hedges should be compared against more traditional “long volatility” hedging methods, such as implementing a rolling series of out-of-the-money put options or

futures. The roll aspect affects portfolio returns, so the term structure should be carefully considered. For example, if futures prices are in backwardation (contango), then overall returns to an investor with a long position in the futures would be enhanced (diminished) owing to positive (negative) roll return. The results are necessarily reversed for the holder of the short futures position. In sum, all these derivatives strategies should be assessed on the basis of their ability to reduce portfolio risk and improve returns. In contrast, a common investment strategy implemented by opportunistic investors involves being systematically short volatility, thereby attempting to capture the risk premium embedded in option prices. This strategy is most profitable under stable market conditions, but it can lead to large losses if market volatility rises unexpectedly.

## 5.1. Volatility Futures and Options

The CBOE Volatility Index, known as the VIX or the “fear index,” is a measure of investors’ expectations of volatility in the S&P 500 over the next 30 days. It is calculated and published by the Chicago Board Options Exchange (CBOE) and is based on the prices of S&P 500 Index options. The CBOE began publishing real-time VIX data in 1993, and in 2004, VIX futures were introduced. Investors cannot invest directly in the VIX but instead must use VIX futures contracts that offer investors a pure play on the level of expected stock market volatility, regardless of the direction of the S&P 500. Volatility futures allow investors to implement their views depending on their expectations about the timing and magnitude of a change in implied volatility. For example, in order for a long VIX futures position to protect an equity portfolio during a downturn, the stock market’s implied volatility, as derived from S&P 500 Index options, must increase by more than the consensus expectation of implied volatility prior to the sell-off.

A family of volatility indexes has also been introduced for European equity markets, and they are designed to reflect market expectations of near-term to long-term volatility. The most well known of these is the VSTOXX index, based on real-time option prices on the EURO STOXX 50 index. The family of volatility indexes also includes the VDAX-NEW Index, based on DAX stock index options.

Next, we discuss various shapes of the VIX futures term structure. The CBOE Futures Exchange (CFE) lists nine standard (monthly) VIX index futures contracts and six weekly expirations in VIX futures. Each weekly and monthly contract settles 30 calendar days prior to the subsequent standard S&P 500 Index option’s expiration. The weekly futures have lower volumes and open interest than the monthly futures contracts have. [Exhibit 2](#) presents the first six monthly VIX futures contracts at three different fixed points in time for all expiries; these are not consecutive days but, rather, are at intervals of about two months apart.

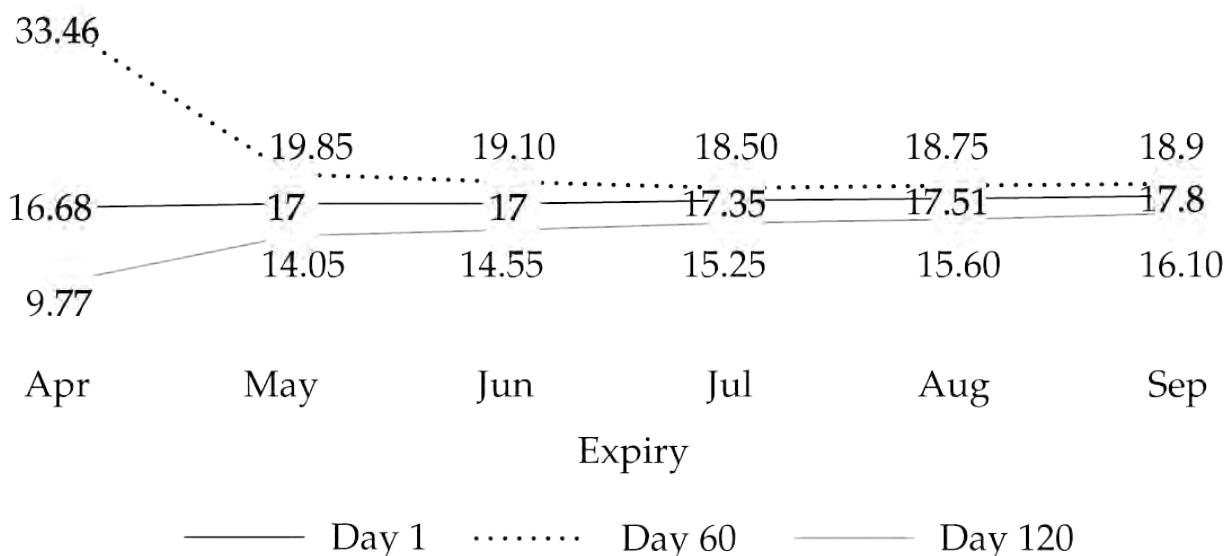
## Exhibit 2. VIX Futures Contracts

CBOE VIX Futures Expiry	Day 1	Day 60	Day 120
April	16.68	33.46	9.77
May	17.00	19.85	14.05
June	17.00	19.10	14.55
July	17.35	18.50	15.25
August	17.51	18.75	15.60
September	17.80	18.90	16.10

Exhibit 3 shows the shape of the VIX futures term structure corresponding to the data in Exhibit 2. The vertical axis shows the futures prices, and the horizontal scale indicates the month of expiration.

## Exhibit 3. Shapes of the VIX Futures Term Structure

VIX Future Prices



The shape of the VIX futures curve is always changing, reflecting the current volatility environment, investors' expectations regarding the future level of volatility, and the buying and selling activity in VIX futures contracts by market participants. Depending on the mix of

these factors, the VIX futures term structure can change from being positively sloped to flat or inverted in just a few months' time.

Day 1 illustrates what happens when volatility is expected to remain stable over the near to long term: The term structure of VIX futures is flat. Day 60 shows the VIX futures in backwardation. This situation typically is a signal that investors expect more volatility in the short term and thus require higher prices for shorter-term contracts than for longer-term ones. In contrast, Day 120 is an example of the VIX futures being in contango. The curve is upward sloped, and it is steep for VIX buyers, with nearly 4.3 volatility points between the April and May expiries. Higher longer-term VIX futures prices are interpreted as an expectation that the VIX will rise because of increasing long-term volatility.

The VIX futures converge to the spot VIX as expiration approaches, so the two must be equal at expiration. When the VIX futures curve is in contango (backwardation) and assuming volatility expectations remain unchanged, the VIX futures price will get "pulled" closer to the VIX spot price, and they will decrease (increase) in price as they approach expiration. Traders calculate the daily roll as the difference between the front-month VIX futures price and the VIX spot price, divided by the number of business days until the VIX futures contract settles. Assuming that the basis declines linearly until settlement, when the term structure is in contango (backwardation), the trader who is long in back-month VIX futures would realize roll-down losses (profits).

Importantly, VIX futures may not reflect the index, especially when the VIX experiences large spikes, because longer-maturity futures contracts are less sensitive to short-term VIX movements. Furthermore, establishing long positions in VIX futures can be very expensive over time. When the short end of the VIX futures curve is much steeper than the long end of the curve, the carrying costs created from the contract roll down are elevated.

This phenomenon is particularly evident for investors who cannot invest directly in futures but must invest in volatility funds that attempt to track the VIX. These funds have attracted interest and substantial money flows because they are easily accessed in the form of exchange-traded products (ETPs) and, in particular, exchange-traded notes (ETNs) that provide exposure to short- and medium-term VIX futures. Some of these products also provide leveraged exposure. When using these investment products to hedge against a rise in the VIX, the VIX futures term structure should be taken into consideration because volatility ETPs typically hold a mix of VIX futures that is adjusted daily to keep the average time to expiration of the portfolio constant. The daily rebalancing requires shorter-term futures to be sold and longer-dated futures to be purchased. When the VIX futures are in contango, the cost of rolling over hedges (i.e., negative carry) increases, thereby reducing profits and causing the ETP to underperform relative to the movement in the VIX. In contrast, "inverse" VIX ETPs offer investors the opportunity to profit from decreases in S&P 500 volatility. However, the purchase of these funds implies a directional positioning on volatility, and investors must accept the risk of large losses when volatility increases sharply.

In 2006, VIX options were introduced, providing an asymmetrical exposure to potential increases or decreases in anticipated volatility. VIX options are European style, and their prices depend on the prices of VIX futures with similar expirations because the market makers of VIX options typically hedge the risk of their option positions using VIX futures. To understand the use of VIX calls and puts, it is very important to recognize that the increases in the VIX (and VIX futures) are negatively correlated with the prices of equity assets. In particular, a trader or investor would purchase VIX call options when he expects that volatility will increase owing to a significant sell-off in the equity market. In contrast, VIX put options would be bought to profit from an expectation that volatility will decrease because of stable equity market conditions. Options on the VSTOXX index also exist, but they have lower volumes and open interest than those on the VIX.

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## 6. VOLATILITY DERIVATIVES: VARIANCE SWAPS

- d. demonstrate the use of volatility derivatives and variance swaps;

Variance swaps are instruments used by investors for taking directional bets on implied versus realized volatility for speculative or hedging purposes. The term “variance swap” refers to the fact that these instruments have a payoff analogous to that of a swap. In a variance swap, the buyer of the contract will pay the difference between the fixed *variance strike* agreed on in the contract and the *realized variance* (annualized) on the underlying over the period specified and applied to a variance notional. In variance swaps, there is no exchange of cash at the contract inception or during the life of the swap. The payoff at expiration of a long variance position will be positive (negative) when realized variance is greater (less) than the swap’s variance strike. If the payment amount is positive (negative), the swap seller (buyer) pays the swap buyer (seller). The payoff at settlement is found as follows:

### Equation (12)

$$\text{Settlement amount}_T = (\text{Variance notional})(\text{Realized variance} - \text{Variance strike})$$

The realized variance is calculated as follows, where  $R_i = \ln(P_{i+1}/P_i)$  and  $N$  is the number of days observed:

### Equation (13)



$$\text{Realized variance} = 252 \times \left[ \sum_{i=1}^{N-1} R_i^2 / (N - 1) \right]$$

Since most market participants are accustomed to thinking in terms of volatility, variance swap traders typically agree on the following two things: (1) a variance swap trade size expressed in **vega notional**,  $N_{vega}$  (not in variance notional), and (2) the strike ( $X$ ), which represents the expected future variance of the underlying, expressed as volatility (not variance). This approach is intuitive because the vega notional represents the average profit and loss of the variance swap for a 1% change in volatility from the strike. For example, when the vega notional is \$50,000, the profit and loss for one volatility point of difference between the realized volatility and the strike will be close to \$50,000.

We must bear in mind that this is an approximation because the variance swap payoff is convex and the profit and loss is not linear for changes in the realized volatility. Specifically, to calculate the exact payoff, the variance strike is the strike squared and the **variance notional**,  $N_{variance}$ , is defined and calculated as

#### Equation (14)

$$\text{Variance notional} = \frac{\text{Vega notional}}{2 \times \text{Strike price}}$$

Thus, given the realized volatility ( $\sigma$ ), we have the following equivalence:

#### Equation (15)

$$\text{Settlement amount}_T = N_{vega} \left( \frac{\sigma^2 - X^2}{2 \times \text{Strike price}} \right) = N_{variance} (\sigma^2 - X^2)$$

The strike on a variance swap is calculated on the basis of the implied volatility skew for a specific expiration, derived from calls and puts quoted in the market. As discussed previously, volatility skew is a plot of the differences in implied volatilities of a basket of options with the same maturity and underlying asset but with different strikes (and thus moneyness). As a rule of thumb, the strike of a variance swap typically corresponds to the implied volatility of the put that has 90% moneyness (calculated as the option's strike divided by the current level of the underlying).

The mark-to-market valuation of a variance swap at time  $t$  ( $\text{VarSwap}_t$ ) will depend on realized volatility from the swap's initiation to  $t$ ,  $\text{RealizedVol}(0,t)$ , and implied volatility at  $t$ ,  $\text{ImpliedVol}(t,T)$ , over the remaining life of the swap ( $T - t$ ).  $PV_t(T)$  is the present value at time  $t$  of \$1 received at maturity  $T$ . The value of a variance swap at time  $t$  is given by the following formula:<sup>10</sup>

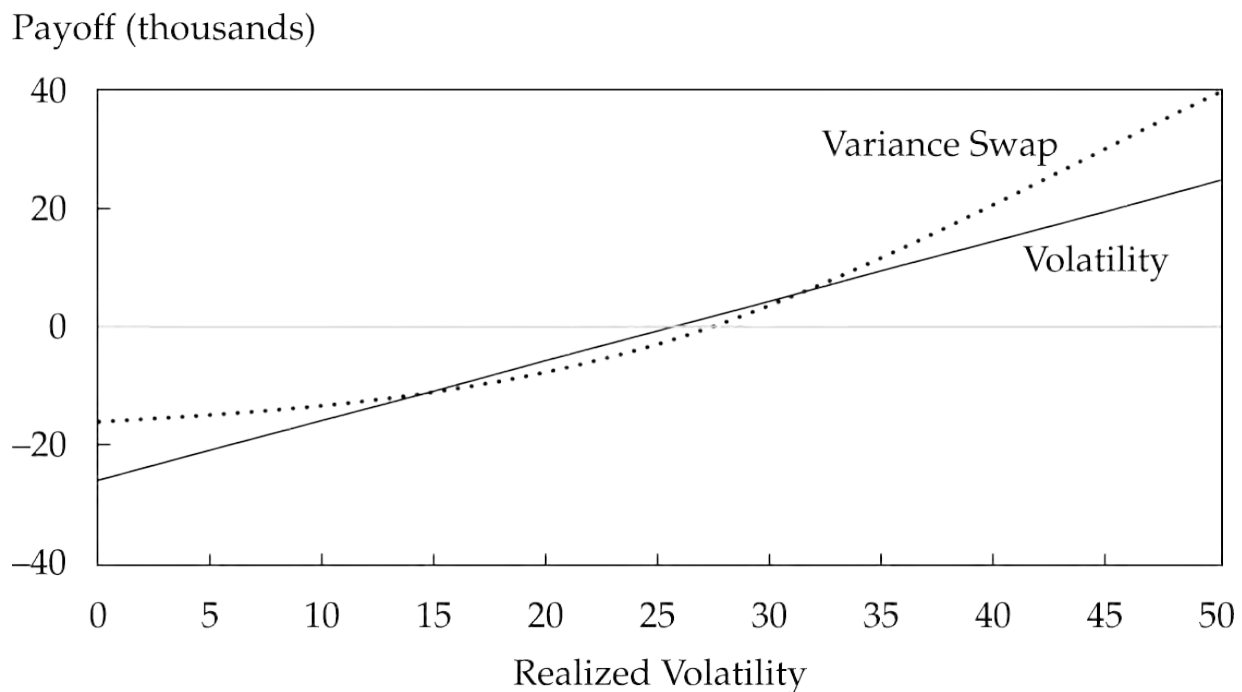
### Equation (16)

$$\text{VarSwap}_t = \text{Variance notional} \times PV_t(T) \times \left\{ \frac{t}{T} \times [\text{RealizedVol}(0,t)]^2 + \frac{T-t}{T} \times [\text{ImpliedVol}(t,T)]^2 - \text{Strike}^2 \right\}$$

Importantly, the sensitivity of a variance swap to changes in implied volatility diminishes over time.

A feature of variance swaps that makes them particularly interesting to investors is that their payoffs are convex in volatility, as seen [Exhibit 4](#). This convexity occurs because being long a variance swap is equivalent to be long a basket of options and short the underlying asset (typically by selling a futures contract). A long position in a variance swap is thus long gamma and has a convex payoff. This characteristic allows volatility sellers to sell variance swaps at a higher price than at-the-money options because the swap's convex payoff profile is attractive to investors who desire a long volatility position as a tail risk hedge.

#### Exhibit 4. The Payoff of a Variance Swap Is Convex in Volatility



#### EXAMPLE 12

# Variance Swap Valuation and Settlement

Olivia Santos trades strategies that systematically sell volatility on the S&P 500 Index. She sells \$50,000 vega notional of a one-year variance swap on the S&P 500 at a strike of 20% (quoted as annual volatility).

Now six months have passed, and the S&P 500 has experienced a realized volatility of 16% (annualized). On the same day, the fair strike of a new six-month variance swap on the S&P 500 is 19%.

Determine the following:

1. The current value of the variance swap sold by Santos (note that the annual interest rate is 2.5%)
2. The settlement amount at expiration of the swap if the one-year realized volatility is 18%

## Solution to 1:

Santos sold \$50,000 vega notional of a one-year variance swap on the S&P 500 with a strike (in volatility terms) of 20%. The value of the variance swap sold by Santos is found using Equation 16:

$$\text{VarSwap}_t = \text{Variance notional} \times PV_t(T) \times \left\{ \frac{t}{T} \times [\text{RealizedVol}(0,t)]^2 + \frac{T-t}{T} \times [\text{ImpliedVol}(t,T)]^2 - \text{Strike}^2 \right\}$$

Values for the inputs are as follows:

Volatility strike on existing swap = 20.

Variance strike on existing swap =  $20^2 = 400$ .

From Equation 14, Variance notional =  $\frac{\text{Vega notional}}{2 \times \text{Strike}} = \frac{\$50,000}{2 \times 20} = 1,250$ .

$\text{RealizedVol}(0,t)^2 = 16^2 = 256$ .

$\text{ImpliedVol}(t,T)^2 = 19^2 = 361$ .

$t = 6$  months.

$T = 12$  months.

$PV_t(T) = 1/[1 + (2.5\% \times 6/12)] = 0.987654$  (= Present Value Interest Factor for six months, where the annual rate is 2.5%).

The current value of the swap is

$$\begin{aligned}\text{VarSwap}_t &= 1,250 \times (0.987654) \times [(6/12) \times 256 + (6/12) \times 361 - 400] \\ &= -\$112,962.9263.\end{aligned}$$

Given that Santos is short the variance swap, the mark-to-market value is positive for her, and it equals \$112,963.

## Solution to 2:

The settlement amount is calculated using Equation 12 as follows:

$$\begin{aligned}\text{Settlement}_T &= \text{Variance notional} \times (\text{Realized variance} - \text{Variance strike}) = 1,250 \times \\ & (18^2 - 20^2) \\ &= -\$95,000\end{aligned}$$

If the payment amount is positive (negative), the swap seller (buyer) pays the swap buyer (seller). So, in this case, Santos would receive \$95,000 from the swap buyer.

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## 7. USING DERIVATIVES TO MANAGE EQUITY EXPOSURE AND TRACKING ERROR

- e. demonstrate the use of derivatives to achieve targeted equity and interest rate risk exposures;

Bernhard Steinbacher has a client with a holding of 100,000 shares in Tundra Corporation, currently trading for €14 per share. The client has owned the shares for many years and thus has a very low tax basis on this stock. Steinbacher wants to safeguard the value of the position since the client does not want to sell the shares. He cannot find exchange-traded

options on the stock. Steinbacher wants to present a way in which the client could protect the investment portfolio from a decline in Tundra's stock price.

Discuss a swap strategy that Steinbacher might recommend to his client.

## Solution:

A possible solution is to enter into an equity swap trading the Tundra stock return for the floating reference interest rate. Given Tundra's current share price of €14, the position is worth €1.4 million. Steinbacher can agree to exchange the *total return* on the shares (which includes the price performance and the dividends received) for the reference rate return on this sum of money. Now he needs to determine the time over which the protection is needed and must match the swap tenor to this period. After consulting with his client, Steinbacher decides on six months. The floating reference rate is 0.34%, expressed as an annual rate.

### Scenario A:

Over the six months, Tundra pays a €0.10 dividend and the share price rises 1%.

The total return on the stock is  $\frac{(14 \times 1.01) - 14 + 0.10}{14} = 1.71\%$ . For a six-month period, the reference rate return would be half the annual rate, or 0.17%. Tundra's total return *exceeds* the six-month reference rate return:  $(1.71\% - 0.17\%) \times €1.4 \text{ million} = €21,620$ , which is a positive amount, so Steinbacher's client would need to *pay* the swap counterparty.

### Scenario B:

Over the six months, Tundra pays a €0.10 dividend and the share price falls 1%.

The total return on the stock is  $\frac{(14 \times 0.99) - 14 + 0.10}{14} = -0.29\%$ . Tundra's total return is less than the six-month reference rate return:  $(-0.29\% - 0.17\%) \times €1.4 \text{ million} = -€6,380$ , which is a negative amount, so Steinbacher's client would *receive* the negative return and the reference rate return from the swap counterparty (meaning the client will receive a positive cash inflow of €6,380).

## 7.1. Cash Equitization

Georgia McMillian manages a fund invested in UK stocks that is indexed to the FTSE 100 Index. The fund has £250 million of total assets under management, including £20 million of cash reserves invested at the three-month British pound floating rate of 0.63% (annualized). McMillian does not have an expectation on the direction of UK stocks over the next quarter. However, she is keen to minimize tracking error risk, so she implements a cash equitization strategy attempting to replicate the performance of the FTSE 100 on the cash reserves. Futures on the FTSE 100 settling in three months currently trade at a price of £7,900, the contract's value is £10 per index point (so each futures contract is worth £79,000), and its beta,  $\beta_f$ , is 1.0.

McMillian engages in a synthetic index strategy to gain exposure on a notional amount of £20 million to the FTSE 100 by purchasing equity index futures. The number of futures she must purchase is given by the following:

$$N_f = \left( \frac{\beta_T}{\beta_f} \right) \left( \frac{S}{F} \right) = \left( \frac{1.0}{1.0} \right) \left( \frac{20,000,000}{79,000} \right) = 253.16 \approx 253$$

where the beta of the futures contract,  $\beta_f$ , and the target beta,  $\beta_T$ , are both equal to 1.0.

### ***Scenario: Three months later, the FTSE 100 Index has increased by 5%.***

Three months later, the FTSE 100 has increased by 5%, and the original value of £230 million invested in UK stocks has increased to £241.5 million. The price of the FTSE 100 Index futures contract has increased to £8,282.5. Interest on the cash invested at the three-month floating rate amounts to £31,500 ( $\text{£}20,000,000 \times 0.63\% \times 90/360$ ). McMillian bought the futures at £7,900, and the cash settlement of the contract at is £8,282.5. So, there is a “gain” of 382.5 index points, each point being worth £10, on 253 contracts for a total cash inflow of £967,725 (382.5 points per contract  $\times$  £10 per point  $\times$  253 contracts). Adding to the portfolio the profit from the futures and the cash reserves plus the interest earned on the cash gives a total market value for McMillian's portfolio of £262,499,225 ( $= \text{£}241,500,000 + \text{£}20,000,000 + \text{£}967,725 + \text{£}31,500$ ). The rate of return for the combined position is:

$$\frac{\text{£}262,499,225}{\text{£}250,000,000} - 1 = 0.05, \text{ or } 5\%$$

Importantly, without implementing this strategy, McMillian's return would have been slightly over 4.6%, calculated as  $(\text{£}230 \text{ million} / \text{£}250 \text{ million}) \times 5.0\% + (\text{£}20 \text{ million} / \text{£}250 \text{ million}) \times 0.63\% \times (90/360)$ . So, she accomplished her goal of minimizing tracking error by following this strategy.

## 8. USING DERIVATIVES IN ASSET ALLOCATION

- f. demonstrate the use of derivatives in asset allocation, rebalancing, and inferring market expectations.

### 8.1. Changing Allocations between Asset Classes Using Futures

Mario Rossi manages a €500 million portfolio that is allocated 70% to stocks and 30% to bonds. Over the next three-month horizon, he is bearish on eurozone stocks, except for German shares, and is bullish on Italian bonds. So, Rossi wants to reduce the overall allocation to stocks by 10%, to 60%, and achieve the same weight (30%) in Italian stocks (which have a beta of 1.1 with respect to the FTSE MIB Index) and German stocks (which have a beta of 0.9 with respect to the DAX index). He also wants to increase the overall allocation to Italian government bonds (BTPs) by 10%, to 40%. The bond portion of his portfolio has a modified duration of 6.45. In summary, as shown in [Exhibit 5](#), Rossi needs to remove €100 million of exposure to Italian stocks, add €50 million of exposure to German stocks, and add €50 million of exposure to Italian bonds in his portfolio.

**Exhibit 5. Summary of Rossi’s Original and New Asset Allocation**

	Original	New	
Stock Index	(€350 Million, 70%)	(€300 Million, 60%)	Transaction
FTSE MIB	€250 million (50%)	€150 million (30%)	Sell €100 million
DAX	€100 million (20%)	€150 million (30%)	Buy €50 million

	Original	New	
Bonds	(€150 Million, 30%)	(€200 Million, 40%)	Transaction
Italian BTPs	€150 million (30%)	€200 million (40%)	Buy €50 million

Rossi uses stock index futures and bond futures to achieve this objective. Once the notional

values to be traded are known, Rossi determines how many futures contracts to be purchased or sold to achieve the desired asset allocation. The FTSE futures contract has a price of 23,100 and a multiplier of €5, for a value of €115,500. The DAX futures contract has a price of 13,000 and a multiplier of €25, for a value of €325,000. Both futures contracts have a beta of 1. The BTP futures contract has a contract size of €100,000. The cheapest-to-deliver bond has a price of 101.19; a  $BPV_{CTD}$  (from Equation 7) of €99.10, calculated as  $[(121/100) \times €100,000]$ ; and a conversion factor of 0.913292.

1. Determine how many stock index and bond futures contracts to be purchased or sold to implement the desired asset allocation and whether he should use the futures contracts.
2. At the horizon date (three months later), the value of the Italian stock portfolio has fallen 5% whereas that of the German stock portfolio has increased 10%. The Italian futures price is 22,000, and the DAX futures price is 13,100. Determine the market value of the equity portfolio assuming the futures trades specified in Part 1 have been carried out (note that you can ignore transaction costs).
3. At the horizon date, the Italian bond yield curve has a parallel shift of 0.50%. Determine the change in market value of the bond portfolio assuming the futures trades specified in Part 1 have been carried out (note that you can ignore transaction costs).

## Solution to 1:

The market value of the Italian stocks is  $0.50(\text{€}500,000,000) = \text{€}250,000,000$ . Rossi wants to reduce the exposure to this market by 0.20( $\text{€}500,000,000$ ) =  $\text{€}100,000,000$ . The market value of the German stocks is  $0.20(\text{€}500,000,000) = \text{€}100,000,000$ . Rossi wants to increase the exposure to this market by 0.10( $\text{€}500,000,000$ ) =  $\text{€}50,000,000$ . He should purchase enough futures contracts on the FTSE MIB to reduce the exposure to Italian stocks by  $\text{€}100,000,000$  and to purchase enough futures on the DAX index to increase the exposure to German stocks by  $\text{€}50,000,000$ .

The number of stock index futures,  $N_f$ , is

$$N_f = \left( \frac{\beta_T - \beta_S}{\beta_f} \right) \left( \frac{S}{F} \right)$$

where  $\beta_T$  is the target beta of zero,  $\beta_S$  is the stock beta of 1.1,  $\beta_f$  is the beta of the futures contract,  $S$  is the market value of the stocks involved in the transaction, and  $F$  is the price of the futures contract.















































































# Reading 10

## Currency Management: An Introduction

by William A. Barker, PhD, CFA

*William A. Barker, PhD, CFA (Canada).*

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### LEARNING OUTCOMES

The candidate should be able to:

- a.** analyze the effects of currency movements on portfolio risk and return;
- b.** discuss strategic choices in currency management;
- c.** formulate an appropriate currency management program given financial market conditions and portfolio objectives and constraints;
- d.** compare active currency trading strategies based on economic fundamentals, technical analysis, carry-trade, and volatility trading;
- e.** describe how changes in factors underlying active trading strategies affect tactical trading decisions;
- f.** describe how forward contracts and FX (foreign exchange) swaps are used to adjust hedge ratios;
- g.** describe trading strategies used to reduce hedging costs and modify the risk–return characteristics of a foreign-currency portfolio;
- h.** describe the use of cross-hedges, macro-hedges, and minimum-variance-hedge ratios in portfolios exposed to multiple foreign currencies;
- i.** discuss challenges for managing emerging market currency exposures.

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# 1. INTRODUCTION

Globalization has been one of the most persistent themes in recent history, and this theme applies equally to the world of finance. New investment products, deregulation, worldwide financial system integration, and better communication and information networks have opened new global investment opportunities. At the same time, investors have increasingly shed their “home bias” and sought investment alternatives beyond their own borders.

The benefits of this trend for portfolio managers have been clear, both in terms of the broader availability of higher-expected-return investments as well as portfolio diversification opportunities. Nonetheless, investments denominated in foreign currencies also bring a unique set of challenges: measuring and managing foreign exchange risk. Buying foreign-currency denominated assets means bringing currency risk into the portfolio. Exchange rates are volatile and, at least in the short to medium term, can have a marked impact on investment returns and risks—*currency matters*. The key to the superior performance of global portfolios is the effective management of this currency risk.

This reading explores basic concepts and tools of currency management. Section 2 reviews some of the basic concepts of foreign exchange (FX) markets. The material in subsequent sections presumes an understanding of these concepts. Section 3 examines some of the basic mathematics involved in measuring the effects of foreign-currency investments on portfolio return and risk. Sections 4–6 discuss the *strategic* decisions portfolio managers face in setting the target currency exposures of the portfolio. The currency exposures that the portfolio can accept range from a fully hedged position to active management of currency risk. Sections 7–8 discuss some of the *tactical* considerations involving active currency management if the investment policy statement (IPS) extends some latitude for active currency management. A requisite to any active currency management is having a market view; so these sections include various methodologies by which a manager can form directional views on future exchange rate movements and volatility. Sections 9–12 cover a variety of trading tools available to implement both hedging and active currency management strategies. Although the generic types of FX derivatives tools are relatively limited—spot, forward, option, and swap contracts—the number of variations within each and the number of combinations in which they can be used is vast. Section 13 examines some of the issues involved in managing the currency exposures of emerging market currencies—that is, those that are less liquid than the major currencies.

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## 2. REVIEW OF FOREIGN EXCHANGE

# CONCEPTS

We begin with a review of the basic trading tools of the foreign exchange market: spot, forward, FX swap, and currency option transactions. The concepts introduced in this section will be used extensively in our discussion of currency management techniques in subsequent sections.

Most people think only of spot transactions when they think of the foreign exchange market, but in fact the spot market accounts for less than 40% of the average daily turnover in currencies.<sup>1</sup> Although cross-border *business* may be transacted in the spot market (making and receiving foreign currency payments), the *risk management* of these flows takes place in FX derivatives markets (i.e., using forwards, FX swaps, and currency options). So does the hedging of foreign currency assets and liabilities. It is unusual for market participants to engage in any foreign currency transactions without also managing the currency risk they create. Spot transactions typically generate derivative transactions. As a result, understanding these FX derivatives markets, and their relation to the spot market, is critical for understanding the currency risk management issues examined in this reading.

## 2.1. Spot Markets

In professional FX markets, exchange rate quotes are described in terms of the three-letter currency codes used to identify individual currencies. [Exhibit 1](#) shows a list of some of the more common currency codes.

### Exhibit 1. Currency Codes

USD	US dollar
EUR	Euro
GBP	British pound
JPY	Japanese yen
MXN	Mexican peso
CHF	Swiss franc
CAD	Canadian dollar
SEK	Swedish krona
AUD	Australian dollar

KRW	Korean won
NZD	New Zealand dollar
BRL	Brazilian real
RUB	Russian ruble
CNY	Chinese yuan
INR	Indian rupee
ZAR	South African rand

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An exchange rate is the number of units of one currency (called the *price currency*) that one unit of another currency (called the *base currency*) will buy. For example, in the notation we will use a USD/EUR rate of 1.3650 which means that one euro buys \$1.3650; equivalently, the price of one euro is 1.3650 US dollars. Thus, the euro here is the base currency and the US dollar is the price currency. The exact notation used to represent exchange rates can vary widely between sources, and occasionally the same exchange rate notation will be used by different sources to mean completely different things. The reader should be aware that the notation used here may not be the same as that encountered elsewhere. To avoid confusion, this reading will identify exchange rates using the convention of “P/B,” which refers to the price of one unit of the base currency “B” expressed in terms of the price currency “P.”

How the professional FX market quotes exchange rates—which is the base currency, and which is the price currency, in any currency pair—is not arbitrary but follows conventions that are broadly agreed on throughout the market. Generally, there is a hierarchy as to which currency will be quoted as the base currency in any given P/B currency pair:

1. Currency pairs involving the EUR will use the EUR as the base currency (for example, GBP/EUR).
2. Currency pairs involving the GBP, other than those involving the EUR, will use the GBP as the base currency (for example, CHF/GBP).
3. Currency pairs involving either the AUD or NZD, other than those involving either the EUR or GBP, will use these currencies as the base currency (for example, USD/AUD and NZD/AUD). The market convention between these two currencies is for a NZD/AUD quote.
4. All other currency quotes involving the USD will use USD as the base currency (for example, MXN/USD).

Readers are encouraged to familiarize themselves with the quoting conventions used in the professional FX market because they are the currency quotes that will be experienced in

practice. [Exhibit 2](#) lists some of the most commonly traded currency pairs in global FX markets and their market-standard quoting conventions. These market-standard conventions will be used for the balance of this reading.

## Exhibit 2. Select Market-Standard Currency Pair Quotes

Quote convention	Market name
USD/EUR	Euro-dollar
GBP/EUR	Euro-sterling
USD/GBP	Sterling-dollar
JPY/USD	Dollar-yen
USD/AUD	Aussie-dollar
CHF/USD	Dollar-Swiss
CAD/USD	Dollar-Canada
JPY/EUR	Euro-yen
CHF/EUR	Euro-Swiss
JPY/GBP	Sterling-yen

Another convention used in professional FX markets is that most spot currency quotes are priced out to four decimal places: for example, a typical USD/EUR quote would be 1.3500 and not 1.35. The price point at the fourth decimal place is commonly referred to as a “pip.” Professional FX traders also refer to what is called the “big figure” or the “handle,” which is the integer to the left side of the decimal place as well as the first two decimal places of the quote. For example, for a USD/EUR quote of 1.3568, 1.35 is the handle and there are 68 pips.

There are exceptions to this four decimal place rule. First, forward quotes—discussed later—will often be quoted out to five and sometimes six decimal places. Second, because of the relative magnitude of some currency values, some currency quotes will only be quoted out to two decimal places. For example, because it takes many Japanese yen to buy one US dollar, the typical spot quote for JPY/USD is priced out to only two decimal places (for example, 86.35 and not 86.3500).<sup>2</sup>

The spot exchange rate is usually for settlement on the second business day after the trade date, referred to as  $T + 2$  settlement.<sup>3</sup> In foreign exchange markets—as in other financial markets—market participants confront a two-sided price in the form of a bid price and an

offer price (also called an ask price) being quoted by potential counterparties. The **bid price** is the price, defined in terms of the price currency, at which the counterparty providing a two-sided price quote is willing to buy one unit of the **base** currency. Similarly, **offer price** is the price, in terms of the price currency, at which that counterparty is willing to sell one unit of the base currency. For example, given a price request from a client, a dealer might quote a two-sided price on the spot USD/EUR exchange rate of 1.3648/1.3652. This quote means that the dealer is willing to pay USD1.3648 to buy one euro (bid) and that the dealer will sell one euro (offer) for USD1.3652. The market width, usually referred to as dealer's spread or the bid–offer spread, is the difference between the bid and the offer. When transacting on a dealer's bid-offer two-sided price quote, a client is said to either “hit the bid” (selling the base currency) or “pay the offer” (buying the base currency).

An easy check to see whether the bid or offer should be used for a specific transaction is that the party *asking* the dealer for a price should be on the more expensive side of the market. For example, if one wants to buy 1 EUR, 1.3652 is more USD per EUR than 1.3648. Hence, paying the offer involves paying more USD. Similarly, when selling 1 EUR, hitting the bid at 1.3648 means less USD received than 1.3652.

## 2.2. Forward Markets

Forward contracts are agreements to exchange one currency for another on a future date at an exchange rate agreed on today.<sup>4</sup> In contrast to spot rates, forward contracts are any exchange rate transactions that occur with settlement longer than the usual  $T + 2$  settlement for spot delivery.

In professional FX markets, forward exchange rates are typically quoted in terms of “points.” The points on a forward rate quote are simply the difference between the forward exchange rate quote and the spot exchange rate quote; that is, the forward premium or discount, with the points scaled so that they can be related to the last decimal place in the spot quote. Forward points are adjustments to the spot price of the base currency, using our standard price/base (P/B) currency notation.

This means that forward rate quotes in professional FX markets are typically shown as the bid–offer on the spot rate and the number of forward points at each maturity.<sup>5</sup> For illustration purposes, assume that the bid–offer for the spot and forward points for the USD/EUR exchange rate are as shown in [Exhibit 3](#).

### Exhibit 3. Sample Spot and Forward Quotes (Bid–Offer)



<b>Maturity</b>	<b>Spot Rate or Forward Points</b>
Spot (USD/EUR)	1.3549/1.3651
One month	−5.6/−5.1
Three months	−15.9/−15.3
Six months	−37.0/−36.3
Twelve months	−94.3/−91.8

To convert any of these quoted forward points into a forward rate, one would divide the number of points by 10,000 (to scale down to the fourth decimal place, the last decimal place in the USD/EUR spot quote) and then add the result to the spot exchange rate quote.<sup>6</sup> But one must be careful about which side of the market (bid or offer) is being quoted. For example, suppose a market participant was *selling* the EUR forward against the USD. Given the USD/EUR quoting convention, the EUR is the base currency. This means the market participant must use the *bid* rates (i.e., the market participant will “hit the bid”) given the USD/EUR quoting convention. Using the data in [Exhibit 3](#), the three-month forward *bid* rate in this case would be based on the bid for both the spot and the forward points, and hence would be:

$$1.3549 + \left( \frac{-15.9}{10,000} \right) = 1.35331$$

This result means that the market participant would be selling EUR three months forward at a price of USD1.35331 per EUR. Note that the quoted points are already scaled to each maturity—they are not annualized—so there is no need to adjust them.

Although there is no cash flow on a forward contract until settlement date, it is often useful to do a mark-to-market valuation on a forward position before then to (1) judge the effectiveness of a hedge based on forward contracts (i.e., by comparing the change in the mark-to-market of the underlying asset with the change in the mark-to-market of the forward), and (2) to measure the profitability of speculative currency positions at points before contract maturity.

As with other financial instruments, the mark-to-market value of forward contracts reflects the profit (or loss) that would be realized from closing out the position at current market prices. To close out a forward position, it must be offset with an equal and opposite forward position using the spot exchange rate and forward points available in the market when the offsetting position is created. When a forward contract is initiated, the forward rate is such that no cash changes hands (i.e., the mark-to-market value of the contract at initiation is zero). From that moment onward, however, the mark-to-market value of the forward contract

will change as the spot exchange rate changes as well as when interest rates change in either of the two currencies.

Consider an example. Suppose that a market participant bought GBP10,000,000 for delivery against the AUD in six months at an “all-in” forward rate of 1.6100 AUD/GBP. (The all-in forward rate is simply the sum of the spot rate and the forward points, appropriately scaled to size.) Three months later, the market participant wants to close out this forward contract. To do that would require selling GBP10,000,000 three months forward using the AUD/GBP spot exchange rate and forward points in effect at that time. Assume the bid–offer for spot and forward points three months prior to the settlement date are as follows:

Spot rate (AUD/GBP)	1.6210/1.6215
Three-month points	130/140

To sell GBP (the base currency in the AUD/GBP quote) means calculating the *bid* side of the market. Hence, the appropriate all-in three-month forward rate to use is

$$1.6210 + 130/10,000 = 1.6340$$

Thus, the market participant originally bought GBP10,000,000 at an AUD/GBP rate of 1.6100 and subsequently sold them at a rate of 1.6340. These GBP amounts will net to zero at settlement date (GBP10 million both bought and sold), but the AUD amounts will not net to zero because the forward rate has changed. The AUD cash flow at settlement date will be equal to

$$(1.6340 - 1.6100) \times 10,000,000 = \text{AUD}240,000$$

This amount is a cash *inflow* because the market participant was long the GBP with the original forward position and the GBP subsequently appreciated (the AUD/GBP rate increased).

This cash flow is paid at settlement day, which is still three months away. To calculate the mark-to-market value on the dealer’s position, this cash flow must be discounted to the present. The present value of this amount is found by discounting the settlement day cash flow by the three-month discount rate. Because it is an AUD amount, the three-month AUD discount rate is used. If Libor is used and the three-month AUD Libor is 4.80% (annualized), the present value of this future AUD cash flow is then

$$\frac{\text{AUD}240,000}{1 + 0.048 \left[ \frac{90}{360} \right]} = \text{AUD}237,154$$

This is the mark-to-market value of the original long GBP10 million six-month forward contract when it is closed out three months prior to settlement.

To summarize, the process for marking-to-market a forward position is relatively straightforward:

1. Create an equal and offsetting forward position to the original forward position. (In the example earlier, the market participant is long GBP10 million forward, so the offsetting forward contract would be to sell GBP10 million.)
2. Determine the appropriate all-in forward rate for this new, offsetting forward position. If the base currency of the exchange rate quote is being sold (bought), then use the bid (offer) side of the market.
3. Calculate the cash flow at settlement day. This calculation will be based on the original contract size times the difference between the original forward rate and the rate calculated in Step 2. If the currency the market participant was originally long (short) subsequently appreciated (depreciated), then there will be a cash *inflow*. Otherwise, there will be a cash outflow. (In the earlier example, the market participant was long the GBP and it subsequently appreciated; this appreciation led to a cash inflow at the settlement day.)
4. Calculate the present value of this cash flow at the future settlement date. The currency of the cash flow and the discount rate must match. (In the example earlier, the cash flow at the settlement date is in AUD, so an AUD Libor rate is used to calculate the present value.)

Finally, we note that in the example, the mark-to-market value is given in AUD. It would be possible to translate this AUD amount into any other currency value using the current spot rate for the relevant currency pair. In the example above, this would be done by redenominating the mark-to-market in USD, by selling 240,000 AUD 90-days forward against the USD at the prevailing USD/AUD 90-day forward bid rate. This will produce a USD cash flow in 90 days. This USD amount can then be present-valued at the 90-day US rate to get the USD mark-to-market value of the AUD/GBP forward position. The day-count convention used here is an “actual/360” basis.

## 2.3 FX Swap Markets

An FX swap transaction consists of offsetting and simultaneous spot and forward transactions, in which the base currency is being bought (sold) spot and sold (bought) forward. These two transactions are often referred to as the “legs” of the swap. The two legs of the swap can either be of equal size (a “matched” swap) or one can be larger than the other

(a “mismatched” swap). FX swaps are distinct from currency swaps. Similar to currency swaps, FX swaps involve an exchange of principal amounts in different currencies at swap initiation that is reversed at swap maturity. Unlike currency swaps, FX swaps have no interim interest payments and are nearly always of much shorter term than currency swaps.

FX swaps are important for managing currency risk because they are used to “roll” forward contracts forward as they mature. For example, consider the case of a trader who *bought* GBP1,000,000 one month forward against the CHF in order to set up a currency hedge. One month later, the forward contract will expire. To maintain this long position in the GBP against the CHF, two days prior to contract maturity, given  $T + 2$  settlement, the trader must (1) sell GBP1,000,000 against the CHF spot, to settle the maturing forward contract; and (2) buy GBP1,000,000 against the CHF forward. That is, the trader is engaging in an FX swap (a matched swap in this case because the GBP currency amounts are equal).

If a trader wanted to adjust the size of the currency hedge (i.e., the size of the outstanding forward position), the forward leg of the FX swap can be of a different size than the spot transaction when the hedge is rolled. Continuing the previous example, if the trader wanted to increase the size of the long-GBP position by GBP500,000 as the outstanding forward contract expires, the transactions required would be to (1) sell GBP1,000,000 against the CHF spot, to settle the maturing forward contract; and (2) buy GBP1,500,000 against the CHF forward. This would be a mismatched swap.

The pricing of swaps will differ slightly depending on whether they are matched or mismatched swaps. If the amount of the base currency involved for the spot and forward legs of the swap are equal (a matched swap), then these are exactly offsetting transactions; one is a buy, the other a sell, and both are for the same amount. Because of this equality, a common *spot* exchange rate is typically applied to both legs of the swap transaction; it is standard practice to use the mid-market spot exchange rate for a matched swap transaction. However, the *forward* points will still be based on either the bid or offer, depending on whether the market participant is buying or selling the base currency forward. In the earlier example, the trader is *buying* the GBP (the base currency) forward and would hence pay the *offer* side of the market for forward points.

If the FX swap is mismatched, then pricing will need to reflect the difference in trade sizes between the two legs of the transaction. Continuing the example in which the trader increased the size of the long-GBP position by GBP500,000, this mismatched swap is equivalent to (1) a matched swap for a size of GBP1,000,000, and (2) an outright forward contract buying GBP500,000. Pricing for the mismatched swap must reflect this net GBP purchase amount. Because the matched swap would already price the forward points on the offer side of the market, typically this mismatched size adjustment would be reflected in the *spot* rate quoted as the base for the FX swap. Because a net amount of GBP is being *bought*, the spot quote would now be on the *offer* side of the CHF/GBP spot rate quote. (In addition, the trader would still pay the offer side of the market for the forward points.)

We will return to these topics later in the reading when discussing in more depth the use of forward contracts and FX swaps to adjust hedge ratios. (A **hedge ratio** is the ratio of the nominal value of the derivatives contract used as a hedge to the market value of the hedged asset.)

## 2.4. Currency Options

The final product type within FX markets is currency options. The market for currency options is, in many ways, similar to option markets for other asset classes, such as bonds and equities. As in other markets, the most common options in FX markets are call and put options, which are widely used for both risk management and speculative purposes. However, in addition to these vanilla options, the FX market is also characterized by active trading in exotic options. (“Exotic” options have a variety of features that make them exceptionally flexible risk management tools, compared with vanilla options.)

The risk management uses of both vanilla and exotic currency options will be examined in subsequent sections. Although daily turnover in FX options market is small in *relative* terms compared with the overall daily flow in global spot currency markets, because the overall currency market is so large, the *absolute* size of the FX options market is still very considerable.

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## 3. CURRENCY RISK AND PORTFOLIO RISK AND RETURN

- a. analyze the effects of currency movements on portfolio risk and return;

In this section, we examine the effect of currency movements on asset returns and portfolio risk. We then turn to how these effects help determine construction of a foreign asset portfolio.

### 3.1. Return Decomposition

In this section, we examine how international exposure affects a portfolio’s return. A **domestic asset** is an asset that trades in the investor’s **domestic currency** (or **home**

**currency**). From a portfolio manager's perspective, the domestic currency is the one in which portfolio valuation and returns are reported. *Domestic* refers to a relation between the currency denomination of the asset and the investor; it is not an inherent property of either the asset or the currency. An example of a domestic asset is a USD-denominated bond portfolio from the perspective of a US-domiciled investor. The return on a domestic asset is not affected by exchange rate movements of the domestic currency.

**Foreign assets** are assets denominated in currencies other than the investor's home currency. An example of a foreign asset is a USD-denominated bond portfolio from the perspective of a eurozone-domiciled investor (and for whom the euro is the home currency). The return on a foreign asset will be affected by exchange rate movements in the home currency against the **foreign currency**. Continuing with our example, the return to the eurozone-domiciled investor will be affected by the USD return on the USD-denominated bond as well as movements in the exchange rate between the home currency and the foreign currency, the EUR and USD respectively.

The return of the foreign asset measured in foreign-currency terms is known as the **foreign-currency return**. Extending the example, if the value of the USD-denominated bond increased by 10%, measured in USD, that increase is the foreign-currency return to the eurozone-domiciled investor. The **domestic-currency return** on a foreign asset will reflect both the foreign-currency return on that asset as well as percentage movements in the spot exchange rate between the home and foreign currencies. The domestic-currency return is multiplicative with respect to these two factors:

### Equation (1)

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

where  $R_{DC}$  is the domestic-currency return (in percent),  $R_{FC}$  is the foreign-currency return, and  $R_{FX}$  is the percentage change of the foreign currency against the domestic currency.

Returning to the example, the domestic-currency return for the eurozone-domiciled investor on the USD-denominated bond will reflect both the bond's USD-denominated return as well as movements in the exchange rate between the USD and the EUR. Suppose that the foreign-currency return on the USD-denominated bond is 10% and the USD appreciates by 5% against the EUR. In this case, the domestic-currency return to the eurozone investor will be:

$$(1 + 10\%)(1 + 5\%) - 1 = (1.10)(1.05) - 1 = 0.155 = 15.5\%$$

Although the concept is seemingly straightforward, the reader should be aware that **Equation 1** hides a subtlety that must be recognized. The term  $R_{FX}$  is defined as the percentage change in the foreign currency against the domestic currency. However, this change is *not* always the same thing as the percentage change in the spot rate using market standard P/B quotes (for

example, as shown in [Exhibit 2](#)). Specifically, it is not always the case that  $R_{FX} = \% \Delta S_{P/B}$ , where the term on the right side of the equal sign is defined in standard FX market convention (note that  $\% \Delta$  is percentage change).

In other words,  $R_{FX}$  is calculated as the change in the directly quoted exchange rate, where the domestic currency is defined as the investor's home currency. Because market quotes are not always in direct terms, analysts will need to convert to direct quotes before calculating percentage changes.

With this nuance in mind, what holds for the domestic-currency return of a single foreign asset also holds for the returns on a multi-currency portfolio of foreign assets, except now the portfolio weights must be considered. More generally, the domestic-currency return on a portfolio of multiple foreign assets will be equal to

### Equation (2)

$$R_{DC} = \sum_{i=1}^n \omega_i (1 + R_{FC,i}) (1 + R_{FX,i}) - 1$$

where  $R_{FC,i}$  is the foreign-currency return on the  $i$ -th foreign asset,  $R_{FX,i}$  is the appreciation of the  $i$ -th foreign currency against the domestic currency, and  $\omega_i$  are the portfolio weights of the foreign-currency assets (defined as the percentage of the aggregate domestic-currency value of the portfolio) and  $\sum_{i=1}^n \omega_i = 1$ . (Note that if short selling is allowed in the portfolio, some of the  $\omega_i$  can be less than zero.) Again, it is important that the exchange rate notation in this expression (used to calculate  $R_{FX,i}$ ) must be consistently defined with the domestic currency as the price currency.

Assume the following information for a portfolio held by an investor in India. Performance is measured in terms of the Indian rupee (INR) and the weights of the two assets in the portfolio, at the beginning of the period, are 80% for the GBP-denominated asset and 20% for the EUR-denominated asset, respectively. (Note that the portfolio weights are measured in terms of a common currency, the INR, which is the investor's domestic currency in this case.)

	One Year Ago	Today*
INR/GBP spot rate	84.12	85.78
INR/EUR spot rate	65.36	67.81
GBP-denominated asset value, in GBP millions	43.80	50.70
EUR-denominated asset value, in EUR millions	14.08	12.17

GBP-denominated asset value, in INR millions	3,684.46
EUR-denominated asset value, in INR millions	920.27
GBP-denominated assets, portfolio weight (INR)	80%
EUR-denominated assets, portfolio weight (INR)	20%

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\* Today's asset values are prior to rebalancing.

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The domestic-currency return ( $R_{DC}$ ) is calculated as follows:

$$R_{DC} = 0.80(1 + R_{FC,GBP})(1 + R_{FX,GBP}) + 0.20(1 + R_{FC,EUR})(1 + R_{FX,EUR}) - 1$$

Note that given the exchange rate quoting convention, the INR is the price currency in the P/B quote for both currency pairs. Adding the data from the table leads to:

$$R_{DC} = 0.80\left(\frac{50.70}{43.80}\right)\left(\frac{85.78}{84.12}\right) + 0.20\left(\frac{12.17}{14.08}\right)\left(\frac{67.81}{65.36}\right) - 1$$

This solves to 0.124 or 12.4%.

To get the *expected* future return on a foreign-currency asset portfolio, based on [Equation 2](#), the portfolio manager would need a market opinion for the expected price movement in each of the foreign assets ( $R_{A,i}$ ) and exchange rates ( $R_{FX,i}$ ) in the portfolio. There are typically correlations between all of these variables—correlations between the foreign asset price movements across countries, correlations between movements among various currency pairs, and correlations between exchange rate movements and foreign-currency asset returns. The portfolio manager would need to account for these correlations when forming expectations about future asset price and exchange rate movements.

## 3.2. Volatility Decomposition

Now we will turn to examining the effect of currency movements on the volatility of domestic-currency returns. [Equation 1](#) can be rearranged as

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1 = R_{FC} + R_{FX} + R_{FC}R_{FX}$$

When  $R_{FC}$  and  $R_{FX}$  are small, then the cross-term ( $R_{FC}R_{FX}$ ) is small, and as a result this equation can be approximated as

**Equation (3)**



$$R_{DC} \approx R_{FC} + R_{FX}$$

We return to the example in which the foreign-currency return on the USD-denominated bond was 10% and the USD appreciated by 5% against the EUR. In this example, the domestic-currency return for the Eurozone investor's holding in the USD-denominated bond was approximately equal to  $10\% + 5\% = 15\%$  (which is close to the exact value of 15.5%). We can combine the approximation of [Equation 3](#) with the statistical rule that:

#### Equation (4)

$$\sigma^2(\omega_x X + \omega_y Y) = \omega_x^2 \sigma^2(X) + \omega_y^2 \sigma^2(Y) + 2\omega_x \omega_y \sigma(X)\sigma(Y)\rho(X,Y)$$

where  $X$  and  $Y$  are random variables,  $\omega$  are weights attached to  $X$  and  $Y$ ,  $\sigma^2$  is variance of a random variable,  $\sigma$  is the corresponding standard deviation, and  $\rho$  represents the correlation between two random variables. Applying this result to the domestic-currency return approximation of [Equation 3](#) leads to:

#### Equation (5)

$$\sigma^2(R_{DC}) \approx \sigma^2(R_{FC}) + \sigma^2(R_{FX}) + 2\sigma(R_{FC})\sigma(R_{FX})\rho(R_{FC}, R_{FX})$$

This equation is for the variance of the domestic-currency returns ( $R_{DC}$ ), but risk is more typically defined in terms of standard deviation because mean and standard deviation are measured in the same units (percent, in this case). Hence, the total risk for domestic-currency returns—that is,  $\sigma(R_{DC})$ —is the square root of the results calculated in [Equation 5](#).

Note as well that because [Equation 5](#) is based on the addition of all three terms on the right side of the equal sign, exchange rate exposure will generally cause the variance of domestic-currency returns,  $\sigma^2(R_{DC})$ , to increase to more than that of the foreign-currency returns,  $\sigma^2(R_{FC})$ , considered on their own. That is, if there was no exchange rate risk, then it would be the case that  $\sigma^2(R_{DC}) = \sigma^2(R_{FC})$ . Using this as our base-case scenario, adding exchange rate risk exposure to the portfolio usually adds to domestic-currency return variance (the effect is indeterminate if exchange rate movements are negatively correlated with foreign asset returns).

These results on the variance of domestic-currency return can be generalized to a portfolio of foreign-currency assets. If we define the random variables  $X$  and  $Y$  in [Equation 4](#) in terms of the domestic-currency return ( $R_{DC}$ ) of two different foreign-currency investments, and the  $\omega_i$  as portfolio weights that sum to one, then the result is the variance of the domestic-currency returns for the overall foreign asset portfolio:

#### Equation (6)

$$\sigma^2(\omega_1 R_1 + \omega_2 R_2) \approx \omega_1^2 \sigma^2(R_1) + \omega_2^2 \sigma^2(R_2) + 2\omega_1 \omega_2 \sigma(R_1) \sigma(R_2) \rho(R_1, R_2)$$

where  $R_i$  is the domestic-currency return of the  $i$ -th foreign-currency asset. But as shown in [Equation 3](#), the domestic-currency return of a foreign-currency asset ( $R_{DC}$ ) is itself based on the sum of two random variables:  $R_{FC}$  and  $R_{FX}$ . This means that we would have to embed the variance expression shown in [Equation 5](#) in *each* of the  $\sigma^2(R_i)$  shown in [Equation 6](#) to get the complete solution for the domestic-currency return variance of the overall portfolio. (We would also have to calculate the correlations between *all* of the  $R_i$ .) These requirements would lead to a very cumbersome mathematical expression for even a portfolio of only two foreign-currency assets; the expression would be far more complicated for a portfolio with many foreign currencies involved.

Thus, rather than attempt to give the complete mathematical formula for the variance of domestic-currency returns for a multi-currency portfolio, we will instead focus on the key intuition behind this expression. Namely, that the domestic-currency risk exposure of the overall portfolio—that is,  $\sigma(R_{DC})$ —will depend not only on the variances of *each* of the foreign-currency returns ( $R_{FC}$ ) and exchange rate movements ( $R_{FX}$ ) but also on how each of these *interacts* with the others. Generally speaking, negative correlations among these variables will help reduce the overall portfolio's risk through diversification effects.

Note as well that the overall portfolio's risk exposure will depend on the portfolio weights ( $\omega_i$ ) used. If short-selling is allowed in the portfolio, some of these  $\omega_i$  can be negative as long as the total portfolio weights sum to one. So, for two foreign assets with a strong positive return correlation, short selling one can create considerable diversification benefits for the portfolio. (This approach is equivalent to trading movements in the price spread between these two assets.)

As before with the difference between realized and expected domestic-currency portfolio returns ( $R_{DC}$ ), there is a difference between realized and expected domestic-currency portfolio risk,  $\sigma(R_{DC})$ . For [Equation 6](#) to apply to the expected future volatility of the domestic-currency return of a multi-currency foreign asset portfolio, we would need to replace the observed, historical values of the variances and covariances in [Equation 6](#) with their expected future values. This can be challenging, not only because it potentially involves a large number of variables but also because historical price patterns are not always a good guide to future price behavior. Variance and correlation measures are sensitive to the time period used to estimate them and can also vary over time. These variance and correlation measures can either drift randomly with time, or they can be subject to abrupt movements in times of market stress. It should also be clear that these observed, historical volatility and correlation measures need not be the same as the forward-looking *implied* volatility (and correlation) derived from option prices. Although sometimes various survey or consensus forecasts can be used, these too can be sensitive to sample size and composition and are not

always available on a timely basis or with a consistent starting point. As with any forecast, they are also not necessarily an accurate guide to future developments; judgment must be used.

Hence, to calculate the expected future risk of the foreign asset portfolio, the portfolio manager would need a market opinion—however derived—on the variance of each of the foreign-currency asset returns ( $R_{FC}$ ) over the investment horizon as well the variance of future exchange rate movements ( $R_{FX}$ ) for each currency pair. The portfolio manager would also need a market opinion of how each of these future variables would interact with each other (i.e., their expected correlations). Historical price patterns can serve as a guide, and with computers and large databases, this modeling problem is daunting but not intractable. But the portfolio manager must always be mindful that historical risk patterns may not repeat going forward.

## EXAMPLE 1

### Portfolio Risk and Return Calculations

The following table shows current and future expected asset prices, measured in their domestic currencies, for both eurozone and Canadian assets (these can be considered “total return” indexes). The table also has the corresponding data for the CAD/EUR spot rate.

	Eurozone		Canada	
	Today	Expected	Today	Expected
Asset price	100.69	101.50	101.00	99.80
CAD/EUR	1.2925	1.3100		

1. What is the expected domestic-currency return for a eurozone investor holding the Canadian asset?
2. What is the expected domestic-currency return for a Canadian investor holding the eurozone asset?
3. From the perspective of the Canadian investor, assume that  $\sigma(R_{FC}) = 3\%$  (the expected risk for the foreign-currency asset is 3%) and the  $\sigma(R_{FX}) = 2\%$  (the expected risk of exchange rate movements is 2%). Furthermore, the expected correlation between movements in foreign-currency asset returns and movements

in the CAD/EUR rate is +0.5. What is the expected risk of the domestic-currency return  $[\sigma(R_{DC})]$ ?

### Solution to 1:

For the eurozone investor, the  $R_{FC} = (99.80/101.00) - 1 = -1.19\%$ . Note that, given we are considering the eurozone to be “domestic” for this investor and given the way the  $R_{FX}$  expression is defined, we will need to convert the CAD/EUR exchange rate quote so that the EUR is the *price* currency. This leads to  $R_{FX} = [(1/1.3100)/(1/1.2925)] - 1 = -1.34\%$ . Hence, for the eurozone investor,  $R_{DC} = (1 - 1.19\%)(1 - 1.34\%) - 1 = -2.51\%$ .

### Solution to 2:

For the Canadian investor, the  $R_{FC} = (101.50/100.69) - 1 = +0.80\%$ . Given that in the CAD/EUR quote the CAD is the price currency, for this investor the  $R_{FX} = (1.3100/1.2925) - 1 = +1.35\%$ . Hence, for the Canadian investor the  $R_{DC} = (1 + 0.80\%)(1 + 1.35\%) - 1 = 2.16\%$ .

### Solution to 3:

Because this is a single foreign-currency asset we are considering (not a portfolio of such assets), we can use [Equation 5](#):

$$\sigma^2(R_{DC}) \approx \sigma^2(R_{FC}) + \sigma^2(R_{FX}) + 2\sigma(R_{FC})\sigma(R_{FX})\rho(R_{FC}, R_{FX})$$

Inserting the relevant data leads to

$$\sigma^2(R_{DC}) \approx (3\%)^2 + (2\%)^2 + 2(3\%)(2\%)(0.50) = 0.0019$$

Taking the square root of this leads to  $\sigma(R_{DC}) \approx 4.36\%$ . (Note that the units in these expressions are all in percent, so in this case 3% is equivalent to 0.03 for calculation purposes.)

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## 4. STRATEGIC DECISIONS IN CURRENCY

# MANAGEMENT: OVERVIEW

## b. discuss strategic choices in currency management;

There are a variety of approaches to currency management, ranging from trying to avoid all currency risk in a portfolio to actively seeking foreign exchange risk in order to manage it and enhance portfolio returns.

There is no firm consensus—either among academics or practitioners—about the most effective way to manage currency risk. Some investment managers try to hedge all currency risk, some leave their portfolios unhedged, and others see currency risk as a potential source of incremental return to the portfolio and will actively trade foreign exchange. These widely varying management practices reflect a variety of factors including investment objectives, investment constraints, and beliefs about currency markets.

Concerning beliefs, one camp of thought holds that in the long run currency effects cancel out to zero as exchange rates revert to historical means or their fundamental values. Moreover, an efficient currency market is a zero-sum game (currency “A” cannot appreciate against currency “B” without currency “B” depreciating against currency “A”), so there should not be any long-run gains overall to speculating in currencies, especially after netting out management and transaction costs. Therefore, both currency hedging and actively trading currencies represent a cost to a portfolio with little prospect of consistently positive active returns.

At the other extreme, another camp of thought notes that currency movements can have a dramatic impact on short-run returns and return volatility and holds that there are pricing inefficiencies in currency markets. They note that much of the flow in currency markets is related to international trade or capital flows in which FX trading is being done on a need-to-do basis and these currency trades are just a spinoff of the other transactions. Moreover, some market participants are either not in the market on a purely profit-oriented basis (e.g., central banks, government agencies) or are believed to be “uninformed traders” (primarily retail accounts). Conversely, speculative capital seeking to arbitrage inefficiencies is finite. In short, marketplace diversity is believed to present the potential for “harvesting alpha” through active currency trading.

This ongoing debate does not make foreign-currency risk in portfolios go away; it still needs to be managed, or at least, recognized. Ultimately, each portfolio manager or investment oversight committee will have to reach their own decisions about how to manage risk and whether to seek return enhancement through actively trading currency exposures.

Fortunately, there are a well-developed set of financial products and portfolio management techniques that help investors manage currency risk no matter what their individual

objectives, views, and constraints. Indeed, the potential combinations of trading tools and strategies are almost infinite, and can shape currency exposures to custom-fit individual circumstance and market opinion. In this section, we explore various points on a spectrum reflecting currency exposure choices (a risk spectrum) and the guidance that portfolio managers use in making strategic decisions about where to locate their portfolios on this continuum. First, however, the implication of investment objectives and constraints as set forth in the investment policy statement must be recognized.

## 4.1. The Investment Policy Statement

The Investment Policy Statement (IPS) mandates the degree of discretionary currency management that will be allowed in the portfolio, how it will be benchmarked, and the limits on the type of trading policies and tools (e.g., such as leverage) that can be used.

The starting point for organizing the investment plan for any portfolio is the IPS, which is a statement that outlines the broad objectives and constraints of the beneficial owners of the assets. Most IPS specify many of the following points:

- the general objectives of the investment portfolio;
- the risk tolerance of the portfolio and its capacity for bearing risk;
- the time horizon over which the portfolio is to be invested;
- the ongoing income/liquidity needs (if any) of the portfolio; and
- the benchmark against which the portfolio will measure overall investment returns.

The IPS sets the guiding parameters within which more specific portfolio management policies are set, including the target asset mix; whether and to what extent leverage, short positions, and derivatives can be used; and how actively the portfolio will be allowed to trade its various risk exposures.

For most portfolios, currency management can be considered a sub-set of these more specific portfolio management policies within the IPS. The currency risk management policy will usually address such issues as the

- target proportion of currency exposure to be passively hedged;
- latitude for active currency management around this target;
- frequency of hedge rebalancing;

- currency hedge performance benchmark to be used; and
- hedging tools permitted (types of forward and option contracts, etc.).

Currency management should be conducted within these IPS-mandated parameters.

## 4.2. The Portfolio Optimization Problem

Having described the IPS as the guiding framework for currency management, we now examine the strategic choices that have to be made in deciding the benchmark currency exposures for the portfolio, and the degree of discretion that will be allowed around this benchmark. This process starts with a decision on the optimal foreign-currency asset and FX exposures.

Optimization of a multi-currency portfolio of foreign assets involves selecting portfolio weights that locate the portfolio on the efficient frontier of the trade-off between risk and expected return defined in terms of the investor's domestic currency. As a simplification of this process, consider the portfolio manager examining the expected return and risk of the multi-currency portfolio of foreign assets by using different combinations of portfolio weights ( $\omega_i$ ) that were shown in [Equations 2 and 6](#), respectively, which are repeated here:

$$R_{DC} = \sum_{i=1}^n \omega_i (1 + R_{FC,i}) (1 + R_{FX,i}) - 1$$

$$\sigma^2(\omega_1 R_1 + \omega_2 R_2) \approx \omega_1^2 \sigma^2(R_1) + \omega_2^2 \sigma^2(R_2) + 2\omega_1 \sigma(R_1) \omega_2 \sigma(R_2) \rho(R_1, R_2)$$

Recall that the  $R_i$  in the equation for variance are the  $R_{DC}$  for each of the foreign-currency assets. Likewise, recall that the  $R_{FX}$  term is defined such that the investor's "domestic" currency is the price currency in the P/B exchange rate quote. In other words, this calculation may require using the algebraic reciprocal of the standard market quote convention. These two equations together show the domestic-currency return and risk for a multi-currency portfolio of foreign assets.

When deciding on an optimal investment position, these equations would be based on the *expected* returns and risks for each of the foreign-currency assets; and hence, including the *expected* returns and risks for each of the foreign-currency exposures. As we have seen earlier, the number of market parameters for which the portfolio manager would need to have a market opinion grows geometrically with the complexity (number of foreign-currency exposures) in the portfolio. That is, to calculate the expected efficient frontier, the portfolio manager must have a market opinion for *each* of the  $R_{FC,i}$ ,  $R_{FX,i}$ ,  $\sigma(R_{FC,i})$ ,  $\sigma(R_{FX,i})$ , and



$\rho(R_{FC,i}, R_{FX,i})$ , as well as for each of the  $\rho(R_{FC,i}, R_{FC,j})$  and  $\rho(R_{FX,i}, R_{FX,j})$ . This would be a daunting task for even the most well-informed portfolio manager.

In a perfect world with complete (and costless) information, it would likely be optimal to *jointly* optimize all of the portfolio's exposures—over all currencies and all foreign-currency assets—simultaneously. In the real world, however, this can be a much more difficult task. Confronted with these difficulties, many portfolio managers handle asset allocation with currency risk as a two-step process: (1) portfolio optimization over fully hedged returns; and (2) selection of active currency exposure, if any. Derivative strategies can allow the various risk exposures in a portfolio to be “unbundled” from each other and managed separately. The same applies for currency risks. Because the use of derivatives allows the price risk ( $R_{FC,i}$ ) and exchange rate risk ( $R_{FX,j}$ ) of foreign-currency assets to be unbundled and managed separately, a starting point for the selection process of portfolio weights would be to assume a complete currency hedge. That is, the portfolio manager will choose the exposures to the foreign-currency assets first, and then decide on the appropriate currency exposures afterward (i.e., decide whether to relax the full currency hedge). These decisions are made to simplify the portfolio construction process.

If the currency exposures of foreign assets could be perfectly and costlessly hedged, the hedge would completely neutralize the effect of currency movements on the portfolio's domestic-currency return ( $R_{DC}$ ).<sup>7</sup> In [Equation 2](#), this would set  $R_{FX} = 0$ , meaning that the domestic-currency return is then equal to the foreign-currency return ( $R_{DC} = R_{FC}$ ). In [Equation 5](#), this would set  $\sigma^2(R_{DC}) = \sigma^2(R_{FC})$ , meaning that the domestic-currency return risk is equal to the foreign-currency return risk.

Removing the currency effects leads to a simpler, two-step process for portfolio optimization. First the portfolio manager could pick the set of portfolio weights ( $\omega_j$ ) for the foreign-currency assets that optimize the expected foreign-currency asset risk–return trade-off (assuming there is no currency risk). Then the portfolio manager could choose the desired currency exposures for the portfolio and decide whether and by how far to relax the constraint to a full currency hedge for each currency pair.

### 4.3. Choice of Currency Exposures

A natural starting point for the strategic decisions is the “currency-neutral” portfolio resulting from the two-step process described earlier. The question then becomes, How far along the risk spectrum between being fully hedged and actively trading currencies should the portfolio be positioned?



### 4.3.1. Diversification Considerations

The time horizon of the IPS is important. Many investment practitioners believe that in the long run, adding unhedged foreign-currency exposure to a portfolio does not affect expected long-run portfolio returns; hence in the long run, it would not matter if the portfolio was hedged. (Indeed, portfolio management costs would be reduced without a hedging process.) This belief is based on the view that in the long run, currencies “mean revert” to either some fair value equilibrium level or a historical average; that is, that the *expected*  $\% \Delta S = 0$  for a sufficiently long time period. This view typically draws on the expectation that purchasing power parity (PPP) and the other international parity conditions that link movements in exchange rates, interest rates, and inflation rates will eventually hold over the long run.

Supporting this view, some studies argue that in the long-run currencies will in fact mean revert, and hence that currency risk is lower in the long run than in the short run (an early example is [Froot 1993](#)). Although much depends on how long run is defined, an investor (IPS) with a very long investment horizon and few immediate liquidity needs—which could potentially require the liquidation of foreign-currency assets at disadvantageous exchange rates—might choose to forgo currency hedging and its associated costs. Logically, this would require a portfolio benchmark index that is also unhedged against currency risk.

Although the international parity conditions may hold in the long run, it can be a *very* long time—possibly decades. Indeed, currencies can continue to drift away from the fair value mean reversion level for much longer than the time period used to judge portfolio performance. Such time periods are also typically longer than the patience of the portfolio manager’s oversight committee when portfolio performance is lagging the benchmark. If this very long-run view perspective is not the case, then the IPS will likely impose some form of currency hedging.

Diversification considerations will also depend on the *asset composition* of the foreign-currency asset portfolio. The reason is because the foreign-currency asset returns ( $R_{FC}$ ) of different asset classes have different correlation patterns with foreign-currency returns ( $R_{FX}$ ). If there is a negative correlation between these two sets of returns, having at least some currency exposure may help portfolio diversification and moderate the domestic-currency return risk,  $\sigma(R_{DC})$ . (Refer to [Equation 5](#) in Section 3.)

It is often asserted that the correlation between foreign-currency returns and foreign-currency asset returns tends to be greater for fixed-income portfolios than for equity portfolios. This assertion makes intuitive sense: both bonds and currencies react strongly to movements in interest rates, whereas equities respond more to expected earnings. As a result, the implication is that currency exposures provide little diversification benefit to fixed-income portfolios and that the currency risk should be hedged. In contrast, a better argument can be made for carrying currency exposures in global equity portfolios.

To some degree, various studies have corroborated this relative advantage to currency hedging for fixed income portfolios. But the evidence seems somewhat mixed and depends on which markets are involved. One study found that the hedging advantage for fixed-income portfolios is not always large or consistent (Darnell 2004). Other studies (Campbell 2010; Martini 2010) found that the optimal hedge ratio for foreign-currency equity portfolios depended critically on the investor's domestic currency. (Recall that the hedge ratio is defined as the ratio of the nominal value of the hedge to the market value of the underlying.) For some currencies, there was no risk-reduction advantage to hedging foreign equities (the optimal hedge ratio was close to 0%), whereas for other currencies, the optimal hedge ratio for foreign equities was close to 100%.

Other studies indicate that the optimal hedge ratio also seems to depend on *market conditions* and longer-term trends in currency pairs. For example, Campbell, Serfaty-de Medeiros, and Viceira (2007) found that there were no diversification benefits from currency exposures in foreign-currency bond portfolios, and hence to minimize the risk to domestic-currency returns these positions should be fully hedged. The authors also found, however, that during the time of their study (their data spanned 1975 to 2005), the US dollar seemed to be an exception in terms of its correlations with foreign-currency asset returns. Their study found that the US dollar tended to appreciate against foreign currencies when global bond prices fell (for example, in times of global financial stress there is a tendency for investors to shift investments into the perceived safety of reserve currencies). This finding would suggest that keeping some exposure to the US dollar in a global bond portfolio would be beneficial. For non-US investors, this would mean under-hedging the currency exposure to the USD (i.e., a hedge ratio less than 100%), whereas for US investors it would mean over-hedging their foreign-currency exposures back into the USD. Note that some currencies—the USD, JPY, and CHF in particular—seem to act as a safe haven and appreciate in times of market stress. Keeping some of these currency exposures in the portfolio—having hedge ratios that are not set at 100%—can help hedge losses on riskier assets, especially for foreign currency equity portfolios (which are more risk exposed than bond portfolios).

Given this diversity of opinions and empirical findings, it is not surprising to see actual hedge ratios vary widely in practice among different investors. Nonetheless, it is still more likely to see currency hedging for fixed-income portfolios rather than equity portfolios, although actual hedge ratios will often vary between individual managers.

### **4.3.2. Cost Considerations**

The costs of currency hedging also guide the strategic positioning of the portfolio. Currency hedges are not a “free good” and they come with a variety of expenses that must be borne by the overall portfolio. Optimal hedging decisions will need to balance the benefits of hedging against these costs.

Hedging costs come mainly in two forms: trading costs and opportunity costs. The most immediate costs of hedging involve trading expenses, and these come in several forms:

- Trading involves dealing on the bid–offer spread offered by banks. Their profit margin is based on these spreads, and the more the client trades and “pays away the spread,” the more profit is generated by the dealer. Maintaining a 100% hedge and rebalancing frequently with every minor change in market conditions would be expensive. Although the bid–offer spreads on many FX-related products (especially the spot exchange rate) are quite narrow, “churning” the hedge portfolio would progressively add to hedging costs and detract from the hedge’s benefits.
- Some hedges involve currency options; a long position in currency options requires the payment of up-front premiums. If the options expire out of the money (OTM), this cost is unrecoverable.
- Although forward contracts do not require the payment of up-front premiums, they do eventually mature and have to be “rolled” forward with an FX swap transaction to maintain the hedge. Rolling hedges will typically generate cash inflows or outflows. These cash flows will have to be monitored, and as necessary, cash will have to be raised to settle hedging transactions. In other words, even though the currency hedge may *reduce* the volatility of the domestic mark-to-market value of the foreign-currency asset portfolio, it will typically *increase* the volatility in the organization’s cash accounts. Managing these cash flow costs can accumulate to become a significant portion of the portfolio’s value, and they become more expensive (for cash outflows) the higher interest rates go.
- One of the most important trading costs is the need to maintain an administrative infrastructure for trading. Front-, middle-, and back-office operations will have to be set up, staffed with trained personnel, and provided with specialized technology systems. Settlement of foreign exchange transactions in a variety of currencies means having to maintain cash accounts in these currencies to make and receive these foreign-currency payments. Together all of these various overhead costs can form a significant portion of the overall costs of currency trading.

A second form of costs associated with hedging are the opportunity cost of the hedge. To be 100% hedged is to forgo any possibility of favorable currency rate moves. If skillfully handled, accepting and managing currency risk—or any financial risk—can potentially add value to the portfolio, even net of management fees. (We discuss the methods by which this might be done in Sections 7–8.)

These opportunity costs lead to another motivation for having a strategic hedge ratio of less than 100%: regret minimization. Although it is not possible to accurately predict foreign exchange movements in advance, it is certainly possible to judge after the fact the results of the decision to hedge or not. Missing out on an advantageous currency movement because of

a currency hedge can cause *ex post* regret in the portfolio manager or client; so too can having a foreign-currency loss if the foreign-currency asset position was unhedged. Confronted with this *ex ante* dilemma of whether to hedge, many portfolio managers decide simply to “split the difference” and have a 50% hedge ratio (or some other rule-of-thumb number). Both survey evidence and anecdotal evidence show that there is a wide variety of hedge ratios actually used in practice by managers, and that these variations cannot be explained by more “fundamental” factors alone. Instead, many managers appear to incorporate some degree of regret minimization into hedging decisions (for example, see [Michenaud and Solnik 2008](#)).

All of these various hedging expenses—both trading and opportunity costs—will need to be managed. Hedging is a form of insurance against risk, and in purchasing any form of insurance the buyer matches their needs and budgets with the policy selected. For example, although it may be possible to buy an insurance policy with full, unlimited coverage, a zero deductible, and no co-pay arrangements, such a policy would likely be prohibitively expensive. Most insurance buyers decide that it is not necessary to insure against every outcome, no matter how minor. Some minor risks can be accepted and “self-insured” through the deductible; some major risks may be considered so unlikely that they are not seen as worth paying the extra premium. (For example, most ordinary people would likely not consider buying insurance against being kidnapped.)

These same principles apply to currency hedging. The portfolio manager (and IPS) would likely not try to hedge every minor, daily change in exchange rates or asset values, but only the larger adverse movements that can materially affect the overall domestic-currency returns ( $R_{DC}$ ) of the foreign-currency asset portfolio. The portfolio manager will need to balance the benefits and costs of hedging in determining both strategic positioning of the portfolio as well as any latitude for active currency management. However, around whatever strategic positioning decision taken by the IPS in terms of the benchmark level of currency exposure, hedging cost considerations alone will often dictate a *range* of permissible exposures instead of a single point. (This discretionary range is similar to the deductible in an insurance policy.)

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## 5. STRATEGIC DECISIONS IN CURRENCY MANAGEMENT: SPECTRUM OF CURRENCY RISK MANAGEMENT STRATEGIES

- b. discuss strategic choices in currency management;

The strategic decisions encoded in the IPS with regard to the trade-off between the benefits and costs of hedging, as well as the potential for incremental return to the portfolio from active currency management, are the foundation for determining specific currency management strategies. These strategies are arrayed along a spectrum from very risk-averse passive hedging, to actively seeking out currency risk in order to manage it for profit. We examine each in turn.

## 5.1. Passive Hedging

In this approach, the goal is to keep the portfolio's currency exposures close, if not equal to, those of a benchmark portfolio used to evaluate performance. Note that the benchmark portfolio often has no foreign exchange exposure, particularly for fixed-income assets; the benchmark index is a “local currency” index based only on the foreign-currency asset return ( $R_{FC}$ ). However, benchmark indexes that have some foreign exchange risk are also possible.

Passive hedging is a rules-based approach that removes almost all discretion from the portfolio manager, regardless of the manager's market opinion on future movements in exchange rates or other financial prices. In this case, the manager's job is to keep portfolio exposures as close to “neutral” as possible and to minimize tracking errors against the benchmark portfolio's performance. This approach reflects the belief that currency exposures that differ from the benchmark portfolio inject risk (return volatility) into the portfolio without any sufficiently compensatory return. Active currency management—taking positional views on future exchange rate movements—is viewed as being incapable of consistently adding incremental return to the portfolio.

But the hedge ratio has a tendency to “drift” with changes in market conditions, and even passive hedges need periodic rebalancing to realign them with investment objectives. Often the management guidance given to the portfolio manager will specify the rebalancing period—for example, monthly. There may also be allowance for intra-period rebalancing if there have been large exchange rate movements.

## 5.2. Discretionary Hedging

This approach is similar to passive hedging in that there is a “neutral” benchmark portfolio against which actual portfolio performance will be measured. However, in contrast to a strictly rules-based approach, the portfolio manager now has some limited discretion on how far to allow actual portfolio risk exposures to vary from the neutral position. Usually this discretion is defined in terms of percentage of foreign-currency market value (the portfolio's currency exposures are allowed to vary plus or minus  $x\%$  from the benchmark). For example,

a eurozone-domiciled investor may have a US Treasury bond portfolio with a mandate to keep the hedge ratio within 95% to 105%. Assuming no change in the foreign-currency return ( $R_{FC}$ ), but allowing exchange rates ( $R_{FX}$ ) to vary, this means the portfolio can tolerate exchange rate movements between the EUR and USD of up to 5% before the exchange rate exposures in the portfolio are considered excessive. The manager is allowed to manage currency exposures within these limits without being considered in violation of the IPS.

This discretion allows the portfolio manager at least some limited ability to express directional opinions about future currency movements—to accept risk in an attempt to earn reward—in order to add value to the portfolio performance. Of course, the portfolio manager’s actual performance will be compared with that of the benchmark portfolio.

### 5.3. Active Currency Management

Further along the spectrum between extreme risk aversion and purely speculative trading is active currency management. In principle, this approach is really just an extension of discretionary hedging: the portfolio manager is allowed to express directional opinions on exchange rates, but is nonetheless kept within mandated risk limits. The performance of the manager—the choices of risk exposures assumed—is benchmarked against a “neutral” portfolio. But for all forms of active management (i.e., having the discretion to express directional market views), there is no allowance for unlimited speculation; there are risk management systems in place for even the most speculative investment vehicles, such as hedge funds. These controls are designed to prevent traders from taking unusually large currency exposures and risking the solvency of the firm or fund.

In many cases, the difference between discretionary hedging and active currency management is one of emphasis more than degree. The primary duty of the discretionary hedger is to protect the portfolio from currency risk. As a secondary goal, within limited bounds, there is some scope for directional opinion in an attempt to enhance overall portfolio returns. If the manager lacks any firm market conviction, the natural neutral position for the discretionary hedger is to be flat—that is, to have no meaningful currency exposures. In contrast, the active currency manager is supposed to take currency risks and manage them for profit. The primary goal is to add alpha to the portfolio through successful trading. Leaving actual portfolio exposures near zero for extended periods is typically not a viable option.

### 5.4. Currency Overlay

Active management of currency exposures can extend beyond limited managerial discretion within hedging boundaries. Sometimes accepting and managing currency risk for profit can



be considered a portfolio objective. Active currency management is often associated with what are called **currency overlay programs**, although this term is used differently by different sources.

- In the most limited sense of the term, currency overlay simply means that the portfolio manager has outsourced managing currency exposures to a firm specializing in FX management. This could imply something as limited as merely having the external party implement a fully passive approach to currency hedges. If dealing with FX markets and managing currency hedges is beyond the professional competence of the investment manager, whose focus is on managing foreign equities or some other asset class, then hiring such external professional help is an option. Note that typically currency overlay programs involve external managers. However, some large, sophisticated institutional investors may have in-house currency overlay programs managed by a separate group of specialists within the firm.
- A broader view of currency overlay allows the externally hired currency overlay manager to take directional views on future currency movements (again, with the caveat that these be kept within predefined bounds). Sometimes a distinction is made between currency overlay and “foreign exchange as an asset class.” In this classification, currency overlay is limited to the currency exposures already in the foreign asset portfolio. For example, if a eurozone-domiciled investor has GBP- and CHF-denominated assets, currency overlay risks are allowed only for these currencies.
- In contrast, the concept of foreign exchange as an asset class does not restrict the currency overlay manager, who is free to take FX exposures in any currency pair where there is value-added to be harvested, regardless of the underlying portfolio. In this sense, the currency overlay manager is very similar to an FX-based hedge fund. To implement this form of active currency management, the currency overlay manager would have a *joint* opinion on a range of currencies, and have market views not only on the expected movements in the spot rates but also the likelihood of these movements (the variance of the expected future spot rate distribution) as well as the expected correlation between future spot rate movements. Basically, the entire portfolio of currencies is actively managed and optimized over all of the expected returns, risks, and correlations among all of the currencies in the portfolio.

We will focus on this latter form of currency overlay in this reading: active currency management conducted by external, FX-specialized sub-advisors to the portfolio.

It is quite possible to have the foreign-currency asset portfolio fully hedged (or allow some discretionary hedging internally) but then also to add an external currency overlay manager to the portfolio. This approach separates the hedging and alpha function mandates of the portfolio. Different organizations have different areas of expertise; it often makes sense to allocate managing the hedge (currency “beta”) and managing the active FX exposures (currency “alpha”) to those individuals with a comparative advantage in that function.

Adding this form of currency overlay to the portfolio (FX as an asset class) is similar in principle to adding any type of alternative asset class, such as private equity funds or farmland. In each case, the goal is the search for alpha. But to be most effective in adding value to the portfolio, the currency overlay program should add incremental returns (alpha) and/or greater diversification opportunities to improve the portfolio's risk–return profile. To do this, the currency alpha mandate should have minimum correlation with both the major asset classes and the other alpha sources in the portfolio.

Once this FX as an asset class approach is taken, it is not necessary to restrict the portfolio to a single overlay manager any more than it is necessary to restrict the portfolio to a single private equity fund. Different overlay managers follow different strategies (these are described in more detail in Sections 7–8). Within the overall portfolio allocation to “currency as an alternative asset class”, it may be beneficial to diversify across a range of active management styles, either by engaging several currency overlay managers with different styles or by applying a fund-of-funds approach, in which the hiring and management of individual currency overlay managers is delegated to a specialized external investment vehicle.

Whether managed internally or externally (via a fund of funds) it will be necessary to monitor, or benchmark, the performance of the currency overlay manager: Do they generate the returns expected from their stated trading strategy? Many major investment banks as well as specialized market-information firms provide a wide range of proprietary indexes that track the performance of the investible universe of currency overlay managers; sometimes they also offer sub-indexes that focus on specific trading strategies (for example, currency positioning based on macroeconomic fundamentals). However, the methodologies used to calculate these various indexes vary between suppliers. In addition, different indexes show different aspects of active currency management. Given these differences between indexes, there is no simple answer for which index is most suitable as a benchmark; much depends on the specifics of the active currency strategy.

## EXAMPLE 2

### Currency Overlay

Windhoek Capital Management is a South Africa-based investment manager that runs the Conservative Value Fund, which has a mandate to avoid all currency risk in the portfolio. The firm is considering engaging a currency overlay manager to help with managing the foreign exchange exposures of this investment vehicle. Windhoek does not consider itself to have the in-house expertise to manage FX risk.

Brixworth & St. Ives Asset Management is a UK-based investment manager, and runs the Aggressive Growth Fund. This fund is heavily weighted toward emerging market



equities, but also has a mandate to seek out inefficiencies in the global foreign exchange market and exploit these for profit. Although Brixworth & St. Ives manages the currency hedges for all of its investment funds in-house, it is also considering engaging a currency overlay manager.

1. Using a currency overlay manager for the Conservative Value Fund is *most likely* to involve:
  - A. joining the alpha and hedging mandates.
  - B. a more active approach to managing currency risks.
  - C. using this manager to passively hedge their foreign exchange exposures.
2. Using a currency overlay manager for the Aggressive Growth Fund is *most likely* to involve:
  - A. separating the alpha and hedging mandates.
  - B. a less discretionary approach to managing currency hedges.
  - C. an IPS that limits active management to emerging market currencies.
3. Brixworth & St. Ives is *more likely* to engage multiple currency overlay managers if:
  - A. their returns are correlated with asset returns in the fund.
  - B. the currency managers' returns are correlated with each other.
  - C. the currency managers' use different active management strategies.

### **Solution to 1:**

C is correct. The Conservative Value Fund wants to avoid all currency exposures in the portfolio and Windhoek believes that it lacks the currency management expertise to do this.

### **Solution to 2:**

A is correct. Brixworth & St. Ives already does the FX hedging in house, so a currency overlay is more likely to be a pure alpha mandate. This should not change the way that Brixworth & St. Ives manages its hedges, and the fund's mandate to seek out inefficiencies in the global FX market is unlikely to lead to a restriction to actively

manage only emerging market currencies.

### **Solution to 3:**

C is correct. Different active management strategies may lead to a more diversified source of alpha generation, and hence reduced portfolio risk. Choices A and B are incorrect because a higher correlation with foreign-currency assets in the portfolio or among overlay manager returns is likely to lead to less diversification.

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## **6. STRATEGIC DECISIONS IN CURRENCY MANAGEMENT: FORMULATING A CURRENCY MANAGEMENT PROGRAM**

- c. formulate an appropriate currency management program given financial market conditions and portfolio objectives and constraints;

We now try to bring all of these previous considerations together in describing how to formulate an appropriate currency management program given client objectives and constraints, as well as overall financial market conditions. Generally speaking, the *strategic* currency positioning of the portfolio, as encoded in the IPS, should be biased toward a more-fully hedged currency management program the more

- short term the investment objectives of the portfolio;
- risk averse the beneficial owners of the portfolio are (and impervious to *ex post* regret over missed opportunities);
- immediate the income and/or liquidity needs of the portfolio;
- fixed-income assets are held in a foreign-currency portfolio;
- cheaply a hedging program can be implemented;
- volatile (i.e., risky) financial markets are;<sup>8</sup> and
- skeptical the beneficial owners and/or management oversight committee are of the

expected benefits of active currency management.

The relaxation of any of these conditions creates latitude to allow a more proactive currency risk posture in the portfolio, either through wider tolerance bands for discretionary hedging, or by introducing foreign currencies as a separate asset class (using currency overlay programs as an alternative asset class in the overall portfolio). In the latter case, the more currency overlay is expected to generate alpha that is uncorrelated with other asset or alpha-generation programs in the portfolio, the more it is likely to be allowed in terms of strategic portfolio positioning.

## INVESTMENT POLICY STATEMENT

Kailua Kona Advisors runs a Hawaii-based hedge fund that focuses on developed market equities located outside of North America. Its investor base consists of local high-net-worth individuals who are all considered to have a long investment horizon, a high tolerance for risk, and no immediate income needs. In its prospectus to investors, Kailua Kona indicates that it actively manages both the fund's equity and foreign-currency exposures, and that the fund uses leverage through the use of loans as well as short-selling.

Exhibit 4 presents the hedge fund's currency management policy included in the IPS for this hedge fund.

### Exhibit 4. Hedge Fund Currency Management Policy: An Example

<b>Overall Portfolio Benchmark:</b>	MSCI EAFE Index (local currency)
<b>Currency Exposure Ranges:</b>	Foreign-currency exposures, based on the USD market value of the equities actually held by the fund at the beginning of each month, will be hedged back into USD within the following tolerance ranges of plus or minus: <ul style="list-style-type: none"><li>■ EUR: 20%</li><li>■ GBP: 15%</li><li>■ JPY: 10%</li><li>■ CHF: 10%</li><li>■ AUD: 10%</li></ul>

- SEK: 10%

Other currency exposures shall be left unhedged.

**Rebalancing:** The currency hedges will be rebalanced at least monthly, to reflect changes in the USD-denominated market value of portfolio equity holdings.

**Hedging  
Instruments:**

- Forward contracts up to 12 months maturity;
- European put and call options can be bought or written, for maturities up to 12 months; and
- Exotic options of up to 12 months maturity can be bought or sold.

**Reporting:** Management will present quarterly reports to the board detailing net foreign-currency exposures and speculative trading results. Speculative trading results will be benchmarked against a 100% hedged currency exposure.

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With this policy, Kailua Kona Advisors is indicating that it is willing to accept foreign-currency exposures within the portfolio but that these exposures must be kept within pre-defined limits. For example, suppose that at the beginning of the month the portfolio held EUR10 million of EUR-denominated assets. Also suppose that this EUR10 million exposure, combined with all the other foreign-currency exposures in the portfolio, matches Kailua Kona Advisors' desired portfolio weights by currency (as a US-based fund, these desired percentage portfolio allocations across all currencies will be based in USD).

The currency-hedging guidelines indicate that the hedge (for example, using a short position in a USD/EUR forward contract) should be between EUR8 million and EUR12 million, giving some discretion to the portfolio manager on the size of the net exposure to the EUR. At the beginning of the next month, the USD values of the foreign assets in the portfolio are measured again, and the process repeats. If there has been either a large move in the foreign-currency value of the EUR-denominated assets and/or a large move in the USD/EUR exchange rate, it is possible that Kailua Kona Advisors' portfolio exposure to EUR-denominated assets will be too far away from the desired percentage allocation.<sup>9</sup> Kailua Kona Advisors will then need to either buy or sell EUR-denominated assets. If movements in the EUR-denominated value of the assets or in the USD/EUR exchange rate are large enough, this asset rebalancing may have to be done before month's end. Either way, once the asset rebalancing is done, it establishes the new EUR-

denominated asset value on which the currency hedge will be based (i.e., plus or minus 20% of this new EUR amount).

If the portfolio is not 100% hedged—for example, continuing the Kailua Kona illustration, if the portfolio manager only hedges EUR9 million of the exposure and has a residual exposure of being long EUR1 million—the success or failure of the manager’s tactical decision will be compared with a “neutral” benchmark. In this case, the comparison would be against the performance of a 100% fully hedged portfolio—that is, with a EUR10 million hedge.

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## 7. ACTIVE CURRENCY MANAGEMENT: BASED ON ECONOMIC FUNDAMENTALS, TECHNICAL ANALYSIS AND THE CARRY TRADE

- d. compare active currency trading strategies based on economic fundamentals, technical analysis, carry-trade, and volatility trading;
- e. describe how changes in factors underlying active trading strategies affect tactical trading decisions;

The previous section discussed the *strategic* decisions made by the IPS on locating the currency management practices of the portfolio along a risk spectrum ranging from a very conservative approach to currency risk to very active currency management. In this section, we consider the case in which the IPS has given the portfolio manager (or currency overlay manager) at least some limited discretion for actively managing currency risk within these mandated strategic bounds. This then leads to *tactical* decisions: which FX exposures to accept and manage within these discretionary limits. In other words, tactical decisions involve active currency management.

A market view is a prerequisite to any form of active management. At the heart of the trading decision in FX (and other) markets, lies a view on future market prices and conditions. This market opinion guides all decisions with respect to currency risk exposures, including whether currency hedges should be implemented and, if so, how they should be managed.

In what follows, we will explore some of the methods used to form directional views about the FX market. However, a word of caution that cannot be emphasized enough: *There is no*

*simple formula, model, or approach that will allow market participants to precisely forecast exchange rates (or any other financial prices) or to be able to be confident that any trading decision will be profitable.*

## 7.1. Active Currency Management Based on Economic Fundamentals

This section sets out a broad framework for developing a view about future exchange rate movements based on underlying fundamentals. In contrast to other methods for developing a market view (which are discussed in subsequent sections), at the heart of this approach is the assumption that, in a flexible exchange rate system, exchange rates are determined by logical economic relationships and that these relationships can be modeled.

The simple economic framework is based on the assumption that in the long run, the real exchange rate will converge to its “fair value,” but short- to medium-term factors will shape the convergence path to this equilibrium.<sup>10</sup>

Recall that the real exchange rate reflects the ratio of the real purchasing power between two countries; that is, the once nominal purchasing power in each country is adjusted by its respective price level as well as the spot exchange rate between the two countries. The long-run equilibrium level for the real exchange rate is determined by purchasing power parity or some other model of an exchange rate’s fair value, and serves as the anchor for longer-term movements in exchange rates.

Over shorter time frames, movements in real exchange rates will also reflect movements in the real interest rate differential between countries. Recall that the real interest rate ( $r$ ) is the nominal interest rate adjusted by the expected inflation rate, or  $r = i - \pi^e$ , where  $i$  is the nominal interest rate and  $\pi^e$  is the expected inflation rate over the same term as the nominal and real interest rates. Movements in risk premiums will also affect exchange rate movements over shorter-term horizons. The riskier a country’s assets are perceived to be by investors, the more likely they are to move their investments out of that country, thereby depressing the exchange rate. Finally, the framework recognizes that there are two currencies involved in an exchange rate quote (the price and base currencies) and hence movements in exchange rates will reflect movements in the *differentials* between these various factors.

As a result, all else equal, the base currency’s real exchange rate should appreciate if there is an upward movement in

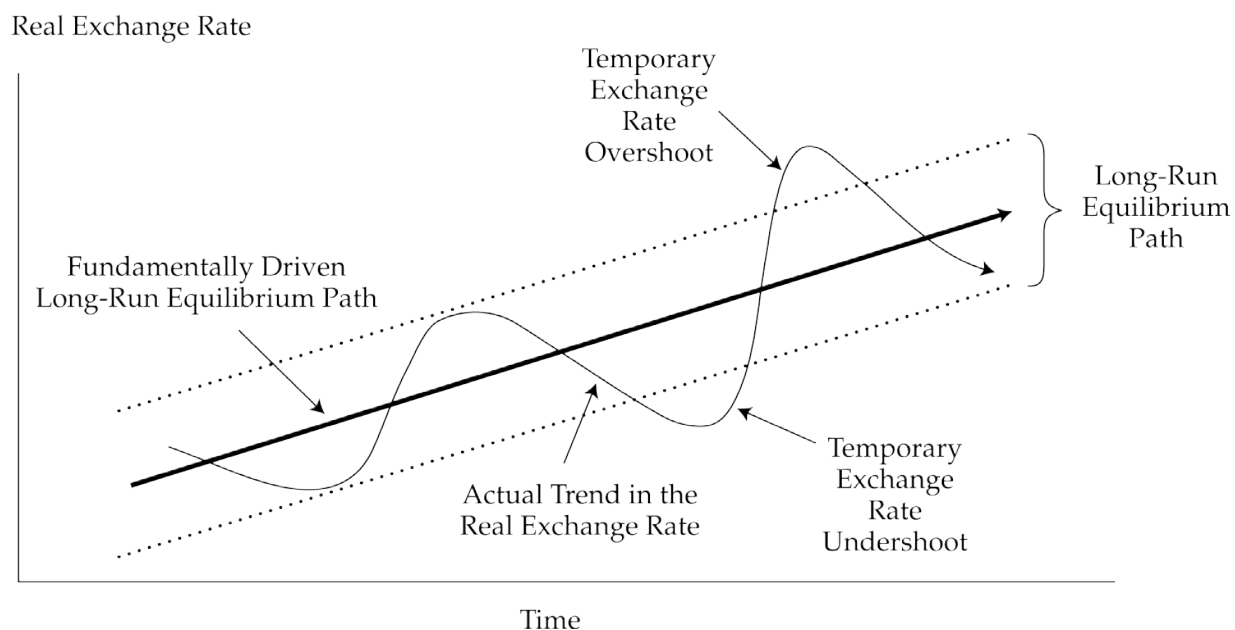
- its long-run equilibrium real exchange rate;
- either its real or nominal interest rates, which should attract foreign capital;

- expected foreign inflation, which should cause the foreign currency to depreciate; and
- the foreign risk premium, which should make foreign assets less attractive compared with the base currency nation's domestic assets.

The real exchange rate should also increase if it is currently below its long-term equilibrium value. All of this makes intuitive sense.

In summary, the exchange rate forecast is a mix of long-term, medium-term, and short-term factors. The long-run equilibrium real exchange rate is the anchor for exchange rates and the point of long-run convergence for exchange rate movements. Movements in the short- to medium-term factors (nominal interest rates, expected inflation) affect the timing and path of convergence to this long-run equilibrium. A stylized depiction of the price dynamics generated by this interaction between short-, medium-, and longer-term pricing factors is shown in [Exhibit 5](#).

### Exhibit 5. Interaction of Long-term and Short-term Factors in Exchange Rates



Source: Based on [Rosenberg \(2002\)](#), page 32.

It needs to be stressed that it can be very demanding to model how each of these separate effects—nominal interest rate, expected inflation, and risk premium differentials—change over time and affect exchange rates. It can also be challenging to model movements in the long-term equilibrium real exchange rate. A broad variety of factors, such as fiscal and

monetary policy, will affect all of these variables in our simple economic model.<sup>11</sup>

## 7.2. Active Currency Management Based on Technical Analysis

Another approach to forming a market view is based on technical analysis. This approach is based on quite different assumptions compared with modeling based on economic fundamentals. Whereas classical exchange rate economics tends to view market participants as rational, markets as efficient, and exchange rates as driven by underlying economic factors, technical analysis ignores economic analysis. Instead, technical analysis is based on three broad themes.<sup>12</sup>

First, market technicians believe that in a liquid, freely traded market the historical price data can be helpful in projecting future price movements.<sup>13</sup> The reason is because many traders have already used any useful data external to the market to generate their trading positions, so this information is already reflected in current prices. Therefore, it is not necessary to look outside of the market to form an opinion on future price movements. This means it is not necessary to examine interest rates, inflation rates, or risk premium differentials (the factors in our fundamentally based model) because exchange rates already incorporate these factors.

Second, market technicians believe that historical patterns in the price data have a tendency to repeat, and that this repetition provides profitable trade opportunities. These price patterns repeat because market prices reflect human behavior and human beings have a tendency to react in similar ways to similar situations, even if this repetitive behavior is not always fully rational. For example, when confronted with an upward price trend, many market participants eventually come to believe that it will extrapolate (an attitude of “irrational exuberance” or “this time it is different”). When the trend eventually breaks, a panicked position exit can cause a sharp overshoot of fair value to the downside. Broadly speaking, technical analysis can be seen as the study of market psychology and how market participant emotions—primarily greed and fear—can be read from the price data and used to predict future price moves.

Third, technical analysis does not attempt to determine where market prices *should* trade (fair value, as in fundamental analysis) but where they *will* trade. Because these price patterns reflect trader emotions, they need not reflect—at least immediately—any cool, rational assessment of the underlying economic or fundamental situation. Although market prices may eventually converge to fair value in the long run, the long run can be a very long time indeed. In the meanwhile, there are shorter-term trading opportunities available in trading the technical patterns in the price data.

Combined, these three principles of technical analysis define a discipline dedicated to



identifying patterns in the historical price data, especially as it relates to identifying market trends and market turning points. (Technical analysis is less useful in a trendless market.) Technical analysis tries to identify when markets have become **overbought** or **oversold**, meaning that they have trended too far in one direction and are vulnerable to a trend reversal, or correction. Technical analysis also tries to identify what are called **support levels** and **resistance levels**, either within ongoing price trends or at their extremities (i.e., turning points). These support and resistance levels are price points on dealers' order boards where one would expect to see clustering of bids and offers, respectively. At these exchange rate levels, the price action is expected to get "sticky" because it will take more order flow to pierce the wall of either bids or offers. But once these price points are breached, the price action can be expected to accelerate as **stops** are triggered. (Stops, in this sense, refer to stop-loss orders, in which traders leave resting bids or offers away from the current market price to be filled if the market reaches those levels. A stop-loss order is triggered when the price action has gone against a trader's position, and it gets the trader out of that position to limit further losses.)

Technical analysis uses visual cues for market patterns as well as more quantitative technical indicators. There is a wide variety of technical indexes based on market prices that are used in this context. Some technical indicators are as simple as using moving averages of past price points. The 200-day moving average of daily exchange rates is often seen as an important indicator of likely support and resistance. Sometimes two moving averages are used to establish when a price trend is building momentum. For example, when the 50-day moving average crosses the 200-day moving average, this is sometimes seen as a price "break out" point.

Other technical indicators are based on more complex mathematical formulae. There is an extremely wide variety of these more mathematical indicators, some of them very esoteric and hard to connect intuitively with the behavior of real world financial market participants.

In summary, many FX active managers routinely use technical analysis—either alone or in conjunction with other approaches—to form a market opinion or to time position entry and exit points. Even though many technical indicators lack the intellectual underpinnings provided by formal economic modeling, they nonetheless remain a prominent feature of FX markets.

## 7.3. Active Currency Management Based on the Carry Trade

The **carry trade** is a trading strategy of borrowing in low-yield currencies and investing in high-yield currencies. The term "carry" is related to what is known as the cost of carry—that is, of carrying or holding an investment. This investment has either an implicit or explicit

cost (borrowing cost) but may also produce income. The net cost of carry is the difference between these two return rates.

If technical analysis is based on ignoring economic fundamentals, then the carry trade is based on exploiting a well-recognized violation of one of the international parity conditions often used to describe these economic fundamentals: uncovered interest rate parity. Recall that uncovered interest rate parity asserts that, *on a longer-term average*, the return on an unhedged foreign-currency asset investment will be the same as a domestic-currency investment. Assuming that the base currency in the P/B quote is the low-yield currency, stated algebraically uncovered interest rate parity asserts that

$$\% \Delta S_{H/L} \approx i_H - i_L$$

where  $\% \Delta S_{H/L}$  is the percentage change in the  $S_{H/L}$  spot exchange rate (the low-yield currency is the base currency),  $i_H$  is the interest rate on the high-yield currency and  $i_L$  is the interest rate on the low-yield currency. If uncovered interest rate parity holds, the yield spread *advantage* for the high-yielding currency (the right side of the equation) will, on average, be matched by the *depreciation* of the high-yield currency (the left side of the equation; the low-yield currency is the base currency and hence a positive value for  $\% \Delta S_{H/L}$  means a depreciation of the high-yield currency). According to the uncovered interest rate parity theorem, it is this offset between (1) the yield advantage and (2) the currency depreciation that equates, on average, the unhedged currency returns.

But in reality, the historical data show that there are persistent deviations from uncovered interest rate parity in FX markets, at least in the short to medium term. Indeed, high-yield countries often see their currencies *appreciate*, not depreciate, for extended periods of time. The positive returns from a combination of a favorable yield differential plus an appreciating currency can remain in place long enough to present attractive investment opportunities.

This persistent violation of uncovered interest rate parity described by the carry trade is often referred to as the **forward rate bias**. An implication of uncovered interest rate parity is that the forward rate should be an unbiased predictor of future spot rates. The historical data, however, show that the forward rate is not the center of the distribution for future spot rates; in fact, it is a *biased* predictor (for example, see [Kritzman 1999](#)). Hence the name “forward rate bias.” With the forward rate premium or discount defined as  $F_{P/B} - S_{P/B}$  the “bias” in the forward rate bias is that the premium typically overstates the amount of appreciation of the base currency, and the discount overstates the amount of depreciation. Indeed, the forward discount or premium often gets even the *direction* of future spot rate movements wrong.

The carry trade strategy (borrowing in low-yield currencies, investing in high-yield currencies) is equivalent to a strategy based on trading the forward rate bias. Trading the forward rate bias involves buying currencies selling at a forward discount, and selling currencies trading at a forward premium. This makes intuitive sense: It is desirable to buy

low and sell high.

To show the equivalence of the carry trade and trading the forward rate bias, recall that covered interest rate parity (which is enforced by arbitrage) is stated as

$$\frac{F_{P/B} - S_{P/B}}{S_{P/B}} = \frac{(i_P - i_B)\left(\frac{t}{360}\right)}{1 + i_B\left(\frac{t}{360}\right)}$$

This equation shows that when the base currency has a lower interest rate than the price currency (i.e., the right side of the equality is positive) the base currency will trade at a forward premium (the left side of the equality is positive). That is, being low-yield currency and trading at a forward premium is synonymous. Similarly, being a high-yield currency means trading at a forward discount. Borrowing in the low-yield currency and investing in the high-yield currency (the carry trade) is hence equivalent to selling currencies that have a forward premium and buying currencies that have a forward discount (trading the forward rate bias). We will return to these concepts in Section 9 when we discuss the roll yield in hedging with forward contracts. [Exhibit 6](#) summarizes several key points about the carry trade.

**Exhibit 6. The Carry Trade: A Summary**

	Buy/Invest	Sell/Borrow
Implementing the carry trade	High-yield currency	Low-yield currency
Trading the forward rate bias	Forward discount currency	Forward premium currency

The gains that one can earn through the carry trade (or equivalently, through trading the forward rate bias) can be seen as the risk premiums earned for carrying an unhedged position—that is, for absorbing currency risk. (In efficient markets, there is no extra reward without extra risk.) Long periods of market stability can make these extra returns enticing to many investors, and the longer the yield differential persists between high-yield and low-yield currencies, the more carry trade positions will have a tendency to build up. But these high-yield currency advantages can be erased quickly, particularly if global financial markets are subject to sudden bouts of stress. This is especially true because the carry trade is a *leveraged* position: borrowing in the low-yielding currency and investing in the high-yielding currency.

These occasional large losses mean that the return distribution for the carry trade has a pronounced negative skew.

This negative skew derives from the fact that the **funding currencies** of the carry trade (the low-yield currencies in which borrowing occurs) are typically the safe haven currencies, such as the USD, CHF, and JPY. In contrast, the **investment currencies** (the high-yielding currencies) are typically currencies perceived to be higher risk, such as several emerging market currencies. Any time global financial markets are under stress there is a flight to safety that causes rapid movements in exchange rates, and usually a panicked unwinding of carry trades. As a result, traders running carry trades often get caught in losing positions, with the leverage involved magnifying their losses. Because of the tendency for long periods of relatively small gains in the carry trade to be followed by brief periods of large losses, the carry trade is sometimes characterized as “picking up nickels in front of a steamroller.” One guide to the riskiness of the carry trade is the volatility of spot rate movements for the currency pair; all else equal, lower volatility is better for a carry trade position.

We close this section by noting that although the carry trade can be based on borrowing in a single funding currency and investing in a single high-yield currency, it is more common for carry trades to use multiple funding and investment currencies. The number of funding currencies and investment currencies need not be equal: for example, there could be five of one and three of the other. Sometimes the portfolio weighting of exposures between the various funding and investment currencies are simply set equal to each other. But the weights can also be optimized to reflect the trader’s market view of the expected movements in each of the exchange rates, as well as their individual risks ( $\sigma[\% \Delta S]$ ) and the expected correlations between movements in the currency pairs. These trades can be dynamically rebalanced, with the relative weights among both funding and investment currencies shifting with market conditions.

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## 8. ACTIVE CURRENCY MANAGEMENT: BASED ON VOLATILITY TRADING

- d. compare active currency trading strategies based on economic fundamentals, technical analysis, carry-trade, and volatility trading;
- e. describe how changes in factors underlying active trading strategies affect tactical trading decisions;

Another type of active trading style is unique to option markets and is known as volatility

trading (or simply “vol trading”).<sup>14</sup> To explain this trading style, we will start with a quick review of some option basics.

The derivatives of the option pricing model show the sensitivity of the option’s premium to changes in the factors that determine option value. These derivatives are often referred to as the “Greeks” of option pricing. There is a very large number of first, second, third, and cross-derivatives that can be taken of an option pricing formula, but the two most important Greeks that we will consider here are the following:

- **Delta:** The sensitivity of the option premium to a small change in the price of the underlying<sup>15</sup> of the option, typically a financial asset. This sensitivity is an indication of *price* risk.
- **Vega:** The sensitivity of the option premium to a small change in implied volatility. This sensitivity is an indication of *volatility* risk.

The most important concept to grasp in terms of volatility trading is that the use of options allows the trader, through a variety of trading strategies, to *unbundle* and isolate all of the various risk factors (the Greeks) and trade them separately. Once an initial option position is taken (either long or short), the trader has exposure to *all* of the various Greeks/risk factors. The unwanted risk exposures, however, can then be hedged away, leaving *only* the desired risk exposure to express that specific directional view.

**Delta hedging** is the act of hedging away the option position’s exposure to delta, the price risk of the underlying (the FX spot rate, in this case). Because delta shows the sensitivity of the option price to changes in the spot exchange rate, it thus defines the option’s hedge ratio: The size of the offsetting hedge position that will set the *net* delta of the combined position (option plus delta hedge) to zero. Typically implementing this delta hedge is done using either forward contracts or a spot transaction (spot, by definition, has a delta of one, and no exposure to any other of the Greeks; forward contracts are highly correlated with the spot rate). For example, if a trader was long a call option on USD/EUR with a nominal value of EUR1 million and a delta of +0.5, the delta hedge would involve a short forward position in USD/EUR of EUR0.5 million. That is, the size of the delta hedge is equal to the option’s delta times the nominal size of the contract. This hedge size would set the net delta of the overall position (option and forward) to zero.<sup>16</sup> Once the delta hedge has set the net delta of the position to zero, the trader then has exposure *only* to the other Greeks, and can use various trading strategies to position in these (long or short) depending on directional views.

Although one could theoretically trade *any* of the other Greeks, the most important one traded is vega; that is, the trader is expressing a view on the future movements in implied volatility, or in other words, is engaged in volatility trading. Implied volatility is not the same as realized, or observed, historical volatility, although it is heavily influenced by it. By engaging in volatility trading, the trader is expressing a view about the future volatility of

exchange rates *but not their direction* (the delta hedge set the net zero).

One simple option strategy that implements a volatility trade is a combination of both an at-the-money (ATM) put and an ATM call of these options. Because their deltas are  $-0.5$  and  $+0.5$ , respectively, the net position is zero; that is, the long straddle is delta neutral. This position is useful in volatile markets, when either the put or the call go sufficiently in the money to offset the upfront cost of the two option premiums paid. Similarly, a short straddle will stay relatively stable. In this case, the payout on any option that goes in the money offsets the twin premiums the seller has collected; the rest is net profit for the seller. A strangle option structure is a **strangle** position for which a long position in out-of-the-money (OTM) puts and calls with the same expiry date and the same delta (we elaborate more on this subject later). Because OTM calls and puts have a lower cost of the position is cheaper—but conversely, it also does not pass the OTM strike levels. As a result, the risk–reward for a strangle is less than that for a straddle.

The interesting thing to note is that by using delta-neutral trading, volatility has been turned into a product that can be actively traded like any other financial asset class, such as equities, commodities, fixed-income products, and currencies. Volatility is not constant nor are its movements completely random. Instead volatility is driven by a variety of underlying factors—both fundamental and technical—leading to significant price movements. An opinion on. Movements in volatility are cyclical, and typically characterized by periods of relative stability punctuated by sharp upward spikes in volatility. These spikes are often the result of periodic bouts of stress (usually the result of some dramatic event). Speculative vol traders—for example, among currency overlay managers—often run a net-short volatility. The reason is because most options expire out of the money, so the option writer then gets to keep the option premium without delivering the underlying currency pair. The amount of the option premium can be considered a constant payment, earned by the option writer for absorbing volatility risk. This is the income under “normal” market conditions. Ideally, these traders would like to be in a long position and be long volatility ahead of volatility spikes, but this is notoriously difficult to time. Most hedgers typically run options that are net-long volatility because they are buying protection from unanticipated price movements. The option means being exposed to the time decay of the option’s value, which is the cost of paying insurance premiums for the protection against exchange rate movements.

We can also note that just as there are *currency overlay* programs that manage a portfolio’s currency exposures (as discussed in Section 5) there are *volatility overlay* programs for actively trading the portfolio’s exposures to movements in volatility. Just as currency overlay programs manage the portfolio’s currency delta (movements in spot exchange rates), volatility overlay programs manage the portfolio’s volatility delta (movements in volatility).































































































































































































# Study Session 5

## Fixed-Income Portfolio Management (1)

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Fixed-income securities represent a significant portion of all available financial assets and are included in most investor portfolios.

This study session begins by explaining the role played by fixed-income securities in portfolios and then introduces the two primary types of fixed-income mandates (liability-based and total return). A model for decomposing expected bond returns, which identifies the driving forces behind expected returns, is presented. Fixed-income portfolio risk measures such as duration and convexity are addressed, and the effects of liquidity, leverage, and taxes on fixed-income portfolios are discussed. The session reviews alternatives to direct bond investments such as mutual funds and exchange-traded funds as well as fixed-income derivatives and their role in a portfolio. Next, liability-driven and index-based strategies are examined in greater detail. Coverage includes approaches, risks, and challenges associated with both immunization of single and multiple liabilities and the indexation and laddering of a fixed-income portfolio. Primary risk factors associated with an index, enhanced indexing and benchmark selection are also covered in this session.

## READING ASSIGNMENTS

- Reading 11** Overview of Fixed-Income Portfolio Management  
by Bernd Hanke, PhD, CFA, and Brian J. Henderson, PhD, CFA
- Reading 12** Liability-Driven and Index-Based Strategies  
by James F. Adams, PhD, CFA, and Donald J. Smith, PhD

# Reading 11

## Overview of Fixed-Income Portfolio Management

by Bernd Hanke, PhD, CFA, and Brian J. Henderson, PhD, CFA

*Bernd Hanke, PhD, CFA, is at Global Systematic Investors LLP (United Kingdom). Brian J. Henderson, PhD, CFA, is at the George Washington University (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss roles of fixed-income securities in portfolios and how fixed-income mandates may be classified;
- b.** describe fixed-income portfolio measures of risk and return as well as correlation characteristics;
- c.** describe bond market liquidity, including the differences among market sub-sectors, and discuss the effect of liquidity on fixed-income portfolio management;
- d.** describe and interpret a model for fixed-income returns;
- e.** discuss the use of leverage, alternative methods for leveraging, and risks that leverage creates in fixed-income portfolios;
- f.** discuss differences in managing fixed-income portfolios for taxable and tax-exempt investors.

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## 1. INTRODUCTION

Investors often seek regular income from their investments as well as a predetermined date when their capital will be returned. Fixed-income investments offer both.

Fixed-income instruments include a broad range of publicly traded securities (such as commercial paper, notes, and bonds traded through exchanges as well as OTC) and non-publicly traded instruments (such as loans and private placements). Individual loans or fixed-income obligations may be bundled into a pool of assets supporting such instruments as asset-backed securities and covered bonds. Fixed-income portfolio managers combine these diverse instruments across issuers, maturities, and jurisdictions to meet the various needs of investors. We discuss the different roles of fixed-income securities in portfolios and explain the two main types of fixed-income mandates—liability-based mandates and total return mandates—as well as bond market liquidity. We also provide an overview of portfolio measures, instruments, and vehicles used in fixed-income portfolio management and introduce a model of how a bond position's total expected return can be decomposed.

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## 2. ROLES OF FIXED-INCOME SECURITIES IN PORTFOLIOS

### **a. discuss roles of fixed-income securities in portfolios and how fixed-income mandates may be classified**

Fixed-income securities serve important roles in investment portfolios, including diversification, regular cash flows, and possible inflation hedging. We will briefly review the roles in turn.

### **2.1. Diversification Benefits**

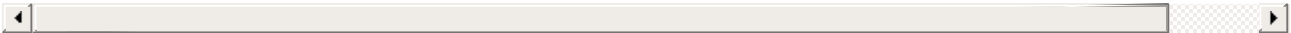
Fixed-income investments can provide diversification benefits when combined with other asset classes in a portfolio. Recall that a major reason portfolios can effectively reduce risk is that combining securities whose returns are not perfectly correlated (i.e., a correlation coefficient of less than +1.0) provides risk diversification. Lower correlations are associated with higher diversification benefits and lower risk. The challenge in diversifying risk is to find assets with correlations much lower than +1.0.

Correlations of fixed-income and equity securities vary, but adding fixed-income exposure to portfolios that include equity securities is usually an effective way to obtain diversification

benefits. Fixed-income investments may also provide risk reduction because of their low correlations with other asset classes, such as real estate and commodities. [Exhibit 1](#) shows the correlation between the S&P 500 Index and various fixed-income categories based on total returns (monthly) over a 20-year period ending in December 2019.

**Exhibit 1. Total Return Correlations between US Fixed Income and Equities**

	Fixed-Income Indexes						
	US Aggregate	10Y US Treasury	US Corporate Bonds	Global Aggregate	US TIPS	US High Yield	Emerg Mark (US)
S&P 500	-0.09	-0.30	0.20	0.15	0.02	0.63	0.5



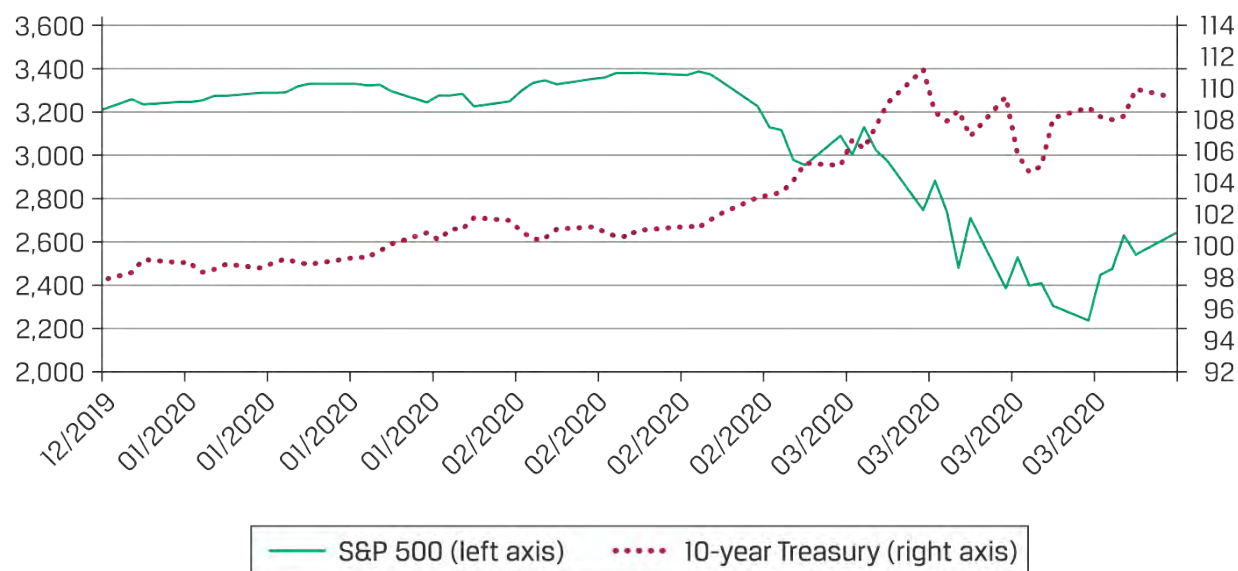
Note: Bloomberg Barclays Indices are shown.

Source: Bloomberg.



[Exhibit 2](#) shows the divergent performance of US equities and bonds from the end of 2019 to the end of March 2020. For example, bonds outperformed equities amid the fears over the global COVID-19 pandemic in Q1 2020.

**Exhibit 2. Returns of S&P 500 vs. 10-Year Treasuries, 12 December 2019–31 March 2020**



Note: Daily data; constant-maturity 10-year Treasuries used.

Within the fixed-income asset class, the correlation between fixed-income indexes will be driven largely by the interest rate component (i.e., duration) and by geography. Rate changes can explain a significant amount of movement in fixed-income securities prices. The credit component or credit spread will likely result in diversification given differences in sectors, credit quality, and geography. For example, investment-grade securities may exhibit less correlation with below-investment-grade securities and with emerging market securities and equities. The rate component of the return can be isolated by calculating correlations using excess returns (this is more meaningful when evaluating returns across fixed-income sectors). [Exhibit 3](#) shows correlations on an excess return basis between various fixed-income indexes.

### Exhibit 3. Excess Return Correlations of Barclays Bloomberg Indexes over a 20-Year Period

	US Aggregate	US Corporate	Global Aggregate	US High Yield	Emerging Market (USD)
US Aggregate	1.00				
US Corporate	0.93	1.00			
Global Aggregate	0.88	0.86	1.00		
US High Yield	0.86	0.84	0.76	1.00	

Emerging Market (USD)	0.79	0.76	0.74	0.80	1.00
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*Notes:* Bloomberg Barclays Indices shown. Based on monthly data over 20 years ending December 2019.

*Source:* Bloomberg.

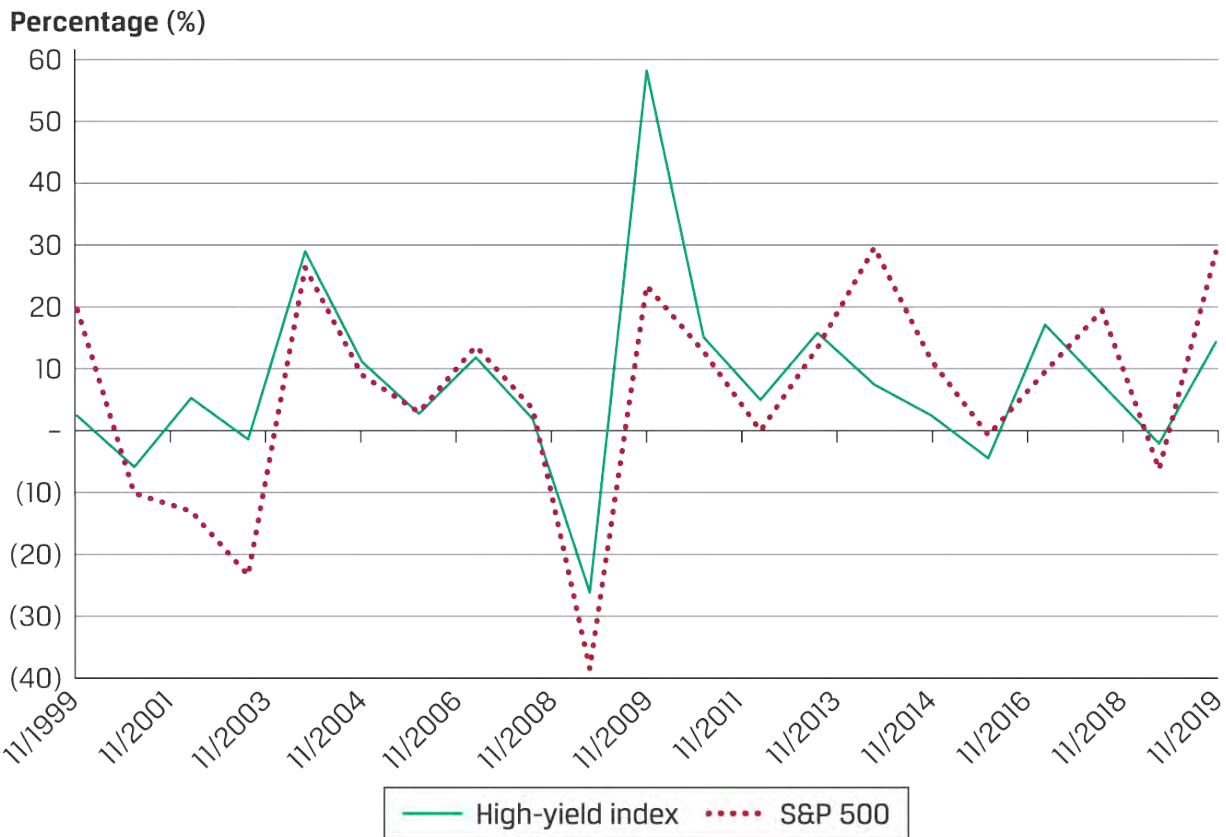
Importantly, correlations are not constant over time. During a long historical period, the average correlation of returns between two asset classes may be low, but in any particular period, the correlation can differ from the average correlation. During periods of market stress, investors may exhibit a “flight to quality” by buying safer assets, such as government bonds (increasing their prices), and selling riskier assets, such as equity securities and high-yield bonds (lowering their prices). These actions may decrease the correlation between government bonds and equity securities, as well as between government bonds and high-yield bonds. At the same time, the correlation between riskier assets, such as equity securities and high-yield bonds, may increase.

Note that similar to correlations, volatility (standard deviation) of asset class returns may also vary over time. If interest rate volatility increases, bonds, particularly those with long maturities, can exhibit higher near-term volatility relative to the average volatility over a long historical period. The standard deviation of returns for lower-credit-quality (high-yield) bonds can rise significantly during times of financial stress, because as credit quality declines and the probability of default increases, investors often view these bonds as being more similar to equities.

**Exhibit 4** shows the annual returns of the S&P 500 versus the Bloomberg Barclays US Corporate High Yield Index over a 20-year period ending in December 2019. It illustrates how the fixed-income sector and equities can behave in a similar way. Recall that both asset classes are strongly linked to the issuer’s business performance and fundamentals. Over the 20-year period, the average return was 7.96% and 6.26% for the high-yield index and the S&P 500, respectively, and the standard deviation was 15.54% and 17.02%, respectively. The correlation was 0.69.

#### **Exhibit 4. Relationship between S&P 500 and High-Yield Returns**





## 2.2. Benefits of Regular Cash Flows

Fixed-income investments typically produce regular cash flows for a portfolio. Regular cash flows allow investors—both individual and institutional—to meet known future obligations, such as tuition payments, pension obligations, and payouts on life insurance policies. In these cases, future liabilities can be estimated with some reasonable certainty. Fixed-income securities are often acquired and “dedicated” to funding those future liabilities. In dedicated portfolios, fixed-income securities are selected with cash flows matching the timing and magnitude of projected future liabilities.

It is important to note that reliance on regular cash flows assumes that no credit event (such as an issuer missing a scheduled interest or principal payment) or other market event (such as a decrease in interest rates that causes an increase in prepayments of mortgages underlying mortgage-backed securities) will occur. These events may cause actual cash flows of fixed-income securities to differ from expected cash flows. If any credit or market event occurs or is forecasted to occur, a portfolio manager may need to adjust the portfolio.

## 2.3. Inflation-Hedging Potential

Some fixed-income securities can provide a hedge for inflation. Bonds with floating-rate coupons can protect interest income from inflation because the market reference rate should adjust for inflation over time. The principal payment at maturity is unadjusted for inflation. Inflation-linked bonds provide investors with valuable inflation-hedging benefits by paying a return that is directly linked to an index of consumer prices and adjusting the principal for inflation. The return on inflation-linked bonds, therefore, includes a real return plus an additional component that is tied directly to the inflation rate. All else equal, inflation-linked bonds typically exhibit lower return volatility than conventional bonds and equities do because the volatility of the returns on inflation-linked bonds depends on the volatility of *real*, rather than *nominal*, interest rates. The volatility of real interest rates is typically lower than the volatility of nominal interest rates that drive the returns of conventional bonds and equities.

Many governments in developed countries and some in developing countries have issued inflation-linked bonds, as have financial and non-financial corporate issuers. For investors with long investment horizons, especially institutions facing long-term liabilities (for example, defined benefit pension plans and life insurance companies), inflation-linked bonds are particularly useful.

Adding inflation-indexed bonds to diversified portfolios of bonds and equities typically results in superior risk-adjusted real portfolio returns. This improvement occurs because inflation-linked bonds can effectively represent a separate asset class, since they offer returns that differ from those of other asset classes and add to market completeness. Introducing inflation-linked bonds to an asset allocation strategy can result in a superior mean–variance-efficient frontier.

## EXAMPLE 1

### Adding Fixed-Income Securities to a Portfolio

Mary is anxious about the level of risk in her portfolio because of a recent period of increased equity market volatility. Most of her wealth is invested in a diversified global equity portfolio.

She contacts two wealth management firms (Firm A and Firm B) for advice. In her conversations with each adviser, she expresses her desire to reduce her portfolio's risk and to have a portfolio that generates a cash flow stream with consistent purchasing power over her 15-year investment horizon.

The correlation coefficient of Mary's diversified global equity portfolio with a diversified fixed-coupon bond portfolio is  $-0.10$  and with a diversified inflation-linked

bond portfolio is 0.10. The correlation coefficient between a diversified fixed-coupon bond portfolio and a diversified inflation-linked bond portfolio is 0.65.

The adviser from Firm A suggests diversifying half of her investment assets into nominal fixed-coupon bonds. The adviser from Firm B also suggests diversification but recommends that Mary invest 25% of her investment assets in fixed-coupon bonds and 25% in inflation-linked bonds.

Evaluate the advice given to Mary by each adviser on the basis of her stated desires regarding portfolio risk reduction and cash flow stream. Recommend which advice Mary should follow, making sure to discuss the following concepts in your answer:

- a. Diversification benefits
- b. Cash flow benefits
- c. Inflation-hedging benefits

## **Solution:**

### ***Advice from Firm A:***

Diversifying into fixed-coupon bonds would offer substantial diversification benefits in lowering overall portfolio volatility (risk) given the negative correlation of  $-0.10$ . The portfolio's volatility, measured by standard deviation, would be lower than the weighted sum of standard deviations of the diversified global equity portfolio and the diversified fixed-coupon bond portfolio. The portfolio will generate regular cash flows because it includes fixed-coupon bonds. This advice, however, does not address Mary's desire to have the cash flows maintain purchasing power over time and thus serve as an inflation hedge.

### ***Advice from Firm B:***

Diversifying into both fixed-coupon bonds and inflation-linked bonds offers additional diversification benefits beyond that offered by fixed-coupon bonds only. The correlation between diversified global equities and inflation-linked bonds is only 0.10. The correlation between nominal fixed-coupon bonds and inflation-linked bonds is 0.65, which is also less than 1.0. The portfolio will generate regular cash flows because of the inclusion of fixed-coupon and inflation-linked bonds. Adding the inflation-linked bonds helps at least partially address Mary's desire for consistent purchasing power over her investment horizon.

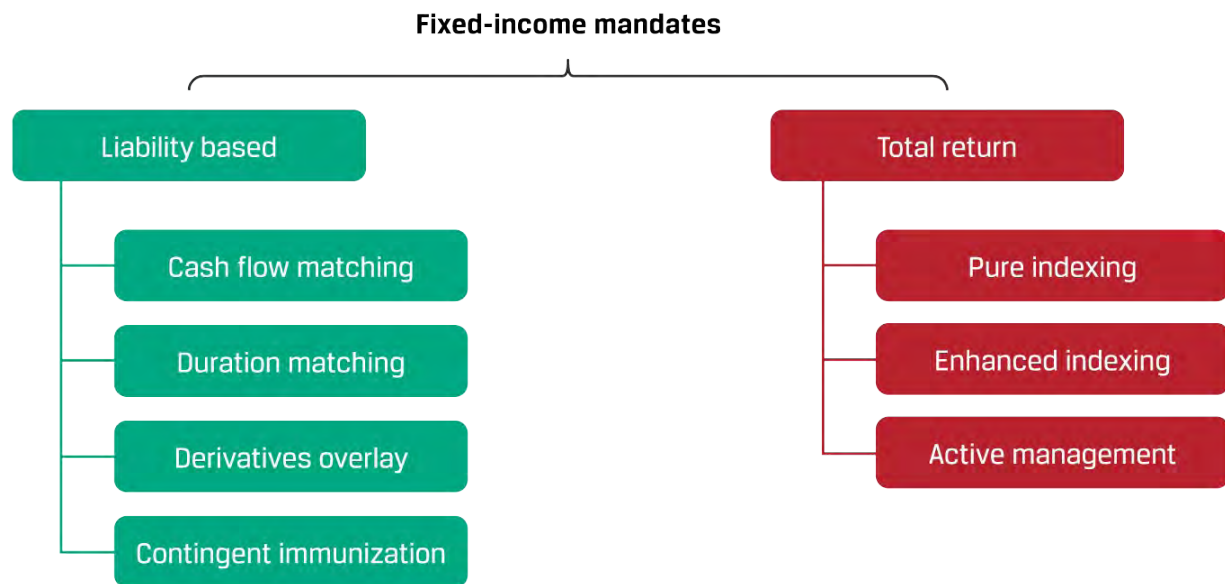
### ***Which Advice to Choose:***

On the basis of her stated desires and the analysis given, Mary should follow the advice provided by Firm B.

### 3. CLASSIFYING FIXED-INCOME MANDATES

The previous section covered the roles of fixed-income securities in portfolios and the benefits these securities provide. When investment mandates include an allocation to fixed income, investors need to decide how to add fixed-income securities to portfolios. Fixed-income mandates can be broadly classified into liability-based mandates and total return mandates. [Exhibit 5](#) provides a broad overview of the different types of mandates, splitting the universe into two broad categories—liability-based mandates and total return mandates.

**Exhibit 5. Fixed-Income Mandates**



#### 3.1. Liability-Based Mandates

**Liability-based mandates** are investments that take an investor's future obligations into

consideration. Liability-based mandates are managed to match or cover expected liability payments (future cash outflows) with future projected cash inflows. As such, they are also referred to as asset/liability management (ALM) or mandates that use liability-driven investments (LDIs). These types of mandates are structured in a way to ensure that a liability or a stream of liabilities (e.g., a company's pension liabilities or those projected by insurance companies) can be covered and that any risk of shortfalls or deficient cash inflows is minimized. **Cash flow matching** is an immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives. **Duration matching** is an immunization approach that is based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates. The mandates may use futures contracts (such as in a derivatives overlay) and, as in the case of **contingent immunization**—a hybrid approach that combines immunization with an active management approach when assets exceed the present value of liabilities—may allow for active bond portfolio management. Such liability-based mandates, which will be covered in detail later, are important because of their extensive use by such entities as pension plans and insurance companies.

## 3.2. Total Return Mandates

Total return mandates are generally managed to either track or outperform a market-weighted fixed-income benchmark, such as the Bloomberg Barclays Global Aggregate Bond Index. They are used by many types of investors, including individuals, foundations, endowments, sovereign wealth funds, and defined contribution retirement plans. Liability-based and total return mandates exhibit common features, such as the goal to achieve the highest risk-adjusted returns (or perhaps highest yields to maturity) given a set of constraints. The two types of mandates, however, have fundamentally different objectives. A common total return approach is **pure indexing**. It attempts to replicate a bond index as closely as possible and is sometimes referred to as “full replication.” Under this approach, the targeted **active return** (portfolio return minus benchmark return, also known as “tracking difference”) and **active risk** (annualized standard deviation of active returns, also known as the benchmark **tracking risk** or **tracking error**) are both zero. In practice, even if the active risk is zero, the realized portfolio return will almost always be lower than the corresponding index return because of trading costs and management fees. We will explain the limitations of this approach later, in our coverage of index-based strategies.

An **enhanced indexing approach** maintains a close link to the benchmark but seeks to generate some outperformance relative to the benchmark. As with the pure indexing approach, in practice, enhanced indexing allows small deviations in portfolio holdings from the benchmark index but tracks the benchmark's primary risk factor exposures very closely (particularly duration). Unlike the pure indexing approach, however, minor risk factor

mismatches (e.g., sector or quality bets) are used in enhanced indexing.

**Active management** allows larger risk factor mismatches relative to a benchmark index. These mismatches may cause significant return differences between the active portfolio and the underlying benchmark. Most notably, portfolio managers may take views on portfolio duration that differ markedly from the duration of the underlying benchmark. To take advantage of potential opportunities in changing market environments, active managers may incur significant portfolio turnover—often considerably higher than the underlying benchmark’s turnover. Active portfolio managers normally charge higher management fees than pure or enhanced indexing managers charge.

Exhibit 6 summarizes the key features of the total return approaches.

**Exhibit 6. Total Return Approaches: Key Features**

	<b>Pure Indexing</b>	<b>Enhanced Indexing</b>	<b>Active Management</b>
Objective	Match benchmark return and risk as closely as possible	Modest outperformance (generally 20–30 bps) of benchmark while active risk is kept low (typically around 50 bps or lower)	Higher outperformance (generally around 50 bps or more) of benchmark and higher active risk levels
Portfolio weights	Ideally the same as benchmark or only slight mismatches	Small deviations from underlying benchmark	Significant deviations from underlying benchmark
Target risk factor profile	Aims to match risk factors exactly	Most primary risk factors are closely matched (in particular, duration)	Large risk factor deviations from benchmark (in particular, duration; note that some active strategies do not take large risk factor deviations and focus on high idiosyncratic risk)
Turnover	Similar to underlying	Slightly higher than underlying	Considerably higher than underlying benchmark

### 3.3. Fixed-Income Mandates with ESG Considerations

Some fixed-income mandates include a requirement that environmental, social, and governance (ESG) factors be considered during the investment process. When considering these factors, an analyst or portfolio manager may look for evidence of whether the portfolio contains companies whose operations are favorable or unfavorable in the context of ESG and whether such companies’ actions and resource management practices reflect a sustainable business model. For example, the analyst or portfolio manager may consider whether a company’s activities involved significant environmental damage, instances of unfair labor practices, or lapses in corporate governance integrity. For companies that do not fare favorably in an ESG analysis, investors may assume that these companies are more likely to encounter future ESG-related incidents that could cause serious reputational and financial damage to the company. Such incidents could impair a company’s credit quality and result in a decline in both the price of the company’s bonds and the performance of a portfolio containing those bonds.

#### EXAMPLE 2

### The Characteristics of Different Total Return Approaches

A consultant for a large corporate pension plan is looking at three funds (Funds X, Y, and Z) as part of the pension plan’s global fixed-income allocation. All three funds use the Bloomberg Barclays Global Aggregate Bond Index as a benchmark. [Exhibit 7](#) provides characteristics of each fund and the index. Identify the approach (pure indexing, enhanced indexing, or active management) that is *most likely* used by each fund and support your choices by referencing the information in [Exhibit 7](#).

**Exhibit 7. Characteristics of Funds X, Y, and Z and the Bloomberg Barclays Global Aggregate Bond Index**

Risk and Return Characteristics	Fund X	Fund Y	Fund Z	Bloomberg Barclays Global Aggregate Bond Index
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Average maturity (years)	8.61	8.35	9.45	8.34
Modified duration (years)	6.37	6.35	7.37	6.34
Average yield to maturity (%)	1.49	1.42	1.55	1.43
Convexity	0.65	0.60	0.72	0.60
<b>Quality</b>				
AAA	41.10	41.20	40.11	41.24
AA	15.32	15.13	14.15	15.05
A	28.01	28.51	29.32	28.78
BBB	14.53	14.51	15.23	14.55
BB	0.59	0.55	1.02	0.35
Not rated	0.45	0.10	0.17	0.05
<b>Maturity Exposure</b>				
0–3 years	21.43	21.67	19.20	21.80
3–5 years	23.01	24.17	22.21	24.23
5–10 years	32.23	31.55	35.21	31.67
10+ years	23.33	22.61	23.38	22.30
<b>Country Exposure</b>				
United States	42.55	39.44	35.11	39.56
Japan	11.43	18.33	13.33	18.36
France	7.10	6.11	6.01	6.08
United Kingdom	3.44	5.87	4.33	5.99
Germany	6.70	5.23	4.50	5.30
Italy	4.80	4.01	4.43	4.07
Canada	4.44	3.12	5.32	3.15
Other	19.54	17.89	26.97	17.49

*Notes:* Quality, maturity exposure, and country exposure are shown as a percentage of the total for each fund and the index. Weights do not always sum to 100 because of rounding. Historical data used as of February 2016.

*Source:* Barclays Research.



## Solution:

Fund X most likely uses an enhanced indexing approach. Fund X's modified duration and convexity are very close to those of the benchmark but still differ slightly. The average maturity of Fund X is slightly longer than that of the benchmark, whereas Fund X's average yield to maturity is slightly higher than that of the benchmark. Fund X also has deviations in quality, maturity exposure, and country exposures from the benchmark, providing further evidence of an enhanced indexing approach. Some of these deviations are meaningful; for example, Fund X has a relatively strong underweighting in Japan.

Fund Y most likely uses a pure indexing approach because it provides the closest match to the Bloomberg Barclays Global Aggregate Bond Index. The risk and return characteristics are almost identical for Fund Y and the benchmark. Furthermore, quality, maturity exposure, and country exposure deviations from the benchmark are very minor.

Fund Z most likely uses an active management approach because risk and return characteristics, quality, maturity exposure, and country exposure differ markedly from the index. The difference can be seen most notably with the mismatch in modified duration (7.37 for Fund Z versus 6.34 for the benchmark). Other differences between Fund Z and the index exist, but a sizable duration mismatch provides the strongest evidence of an active management approach.

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## 4. FIXED-INCOME PORTFOLIO MEASURES

- b. describe fixed-income portfolio measures of risk and return as well as correlation characteristics**

We first provide a brief review of fixed-income risk and return measures introduced in earlier lessons ([Exhibit 8](#)).

### Exhibit 8. Bond Risk and Return Measures

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**Macaulay duration**

Macaulay duration is a weighted average of the time to receipt of the bond's promised payments, where the weights are the

<b>(MacDur)</b>	shares of the full price that correspond to each of the bond's promised future payments.
<b>Modified duration (ModDur)</b>	The Macaulay duration statistic divided by one plus the yield per period, which estimates the percentage price change (including accrued interest) for a bond given a change in its yield to maturity.
<b>Effective duration (EffDur)</b>	The sensitivity of the bond's price to a change in a benchmark yield curve (i.e., using a parallel shift in the benchmark yield curve ( $\Delta$ Curve)). Effective duration is essential to the measurement of the interest rate risk of a complex bond where future cash flows are uncertain.
<b>Key rate duration (KeyRatDur, also called <i>partial duration</i>)</b>	A measure of a bond's sensitivity to a change in the benchmark yield curve at a specific maturity point or segment. Key rate durations help identify "shaping risk" for a bond or a portfolio—that is, its sensitivity to changes in the shape of the benchmark yield curve (e.g., the yield curve becoming steeper or flatter or showing more or less curvature).
<b>Empirical duration</b>	A measure of interest rate sensitivity that is determined from market data—that is, run a regression of bond price returns on changes in a benchmark interest rate (for example, the price returns of a 10-year euro-denominated corporate bond could be regressed on changes in the 10-year German bund or the 10-year Euribor swap rate).
<b>Money duration</b>	A measure of the price change in units of the currency in which the bond is denominated. Money duration can be stated per 100 of par value or in terms of the bond's actual position size in the portfolio. Commonly called "dollar duration" in the United States.
<b>Price value of a basis point (PVBP)</b>	<p>An estimate of the change in a bond's price given a 1 bp change in yield to maturity. PVBP "scales" money duration so that it can be interpreted as money gained or lost for each basis point change in the reference interest rate.</p> <p>Also referred to in North America as the "dollar value of an 0.01" (pronounced <i>oh-one</i>) and abbreviated as DV01. It is calibrated to a bond's par value of 100; for example, a DV01 of \$0.08 is equivalent to 8 cents per 100 points. (The terms PVBP and DV01 are used interchangeably; we will generally use PVBP, but DV01 has the same meaning).</p> <p>A related statistic to PVBP, sometimes called "basis point value" (or BPV), is the money duration times 0.0001 (1 bp).</p>

<b>Convexity</b>	<p>A second-order effect that describes a bond's price behavior for larger yield movements. It captures the extent to which the yield/price relationship deviates from a linear relationship.</p> <p>If a bond has positive convexity, the expected return of the bond will be higher than the return of an identical-duration, lower-convexity bond if interest rates change.</p> <p>This price behavior is valuable to investors, and therefore, a bond with higher convexity might be expected to have a lower yield to maturity than a similar-duration bond with less convexity.</p> <p>Nominal convexity calculations assume that the cash flows do not change when yields to maturity change.</p>
<b>Effective convexity (EffCon)</b>	<p>A curve convexity statistic that measures the secondary effect of a change in a benchmark yield curve. A pricing model is used to determine the new prices when the benchmark curve is shifted upward (PV+) and downward (PV-) by the same amount (<math>\Delta</math>Curve), holding other factors constant.</p>

**Exhibit 8** provides a reminder of convexity and why it is valuable. It is likely to be even more valuable when interest rate volatility is expected to increase. This dynamic tends to drive changes in the shape of the yield curve: As convexity becomes more valuable, investors will bid up prices on the longer-maturity bonds (which have more convexity), and the long end of the curve may decline or even invert (or invert further), increasing the curvature of the yield curve. A helpful heuristic for understanding convexity is that for zero-coupon (option free) bonds, the following are true:

- Macaulay durations increase linearly with maturity: A 30-year zero-coupon bond has three times the duration of a 10-year zero-coupon bond. Convexity is approximately proportional to duration squared; therefore, a 30-year zero-coupon bond has about nine times the convexity of a 10-year zero-coupon bond.
- Coupon-paying bonds have more convexity than zero-coupon bonds of the same duration: A 30-year coupon-paying bond with a duration of approximately 18 years has more convexity than an 18-year zero-coupon bond. The more widely dispersed a bond's cash flows are around the duration point, the more convexity it will exhibit. For this reason, a zero-coupon bond has the lowest convexity of all bonds of a given duration.

## SCALING CONVENTIONS

Convexity statistics must always be interpreted carefully because there is no convention for how they should be presented. When calculating the impact of convexity in approximating returns, the proper accounting for the scaling of convexity is important. Note that some data vendors report the convexity statistic divided by 100, whereas other applications may use the “raw” number.

## 4.1. Portfolio Measures of Risk and Return

Building on the measures of risk and return that apply to individual fixed-income securities, we now provide an overview of measures of risk and return applicable to portfolios of fixed-income securities. We will then illustrate their use in fixed income in a portfolio management scenario and refer to them in the subsequent coverage of liability-driven investing and total return strategies.

*Bond portfolio duration* is the sensitivity of a portfolio of bonds to small changes in interest rates. Recall that it can be calculated as the weighted average of time to receipt of the aggregate cash flows or, more commonly, as the weighted average of the individual bond durations of the portfolio.

*Modified duration of a bond portfolio* indicates the percentage change in the market value given a change in yield to maturity. If the modified duration of a portfolio is 15, then for a 100 bp increase or decrease in yield to maturity, the market value of the portfolio is expected to decrease or increase by about 15%. Modified duration of a portfolio comprising  $j$  fixed-income securities can be estimated as

### Equation (1)

$$\text{AvgModDur} = \sum_{j=1}^J \text{ModDur}_j \left( \frac{\text{MV}_j}{\text{MV}} \right),$$

where MV stands for market value of the portfolio and  $\text{MV}_j$  is the market value of a specific bond.

*Convexity of a bond portfolio* can be a valuable tool when positioning a portfolio. Importantly, it is a second-order effect; it operates behind duration in importance and can largely be ignored for small yield changes. When convexity is added with the use of derivatives, however, it can be extremely important to returns. This effect will be demonstrated later. Negative convexity may also be an important factor in a bond's or a portfolio's returns. For bonds with short option positions embedded in their structures (such

as mortgage-backed securities or callable bonds) or portfolios with short option positions, the convexity effect may be large. For a portfolio comprising  $j$  fixed-income securities, it can be estimated as

### Equation (2)

$$\text{AvgConvexity} = \sum_{j=1}^J \text{Convexity}_j \left( \frac{\text{MV}_j}{\text{MV}} \right).$$

Adding convexity to a portfolio is not costless. Portfolios with higher convexity are most often characterized by lower yields to maturity. Investors will be willing to pay for increased convexity when they expect yields to change by more than enough to cover the amount given up in yield to maturity. Convexity is more valuable when yields to maturity are more volatile. A portfolio's convexity can be altered by shifting the maturity/duration distribution of bonds in the portfolio, by adding individual bonds with the desired convexity properties, or by using derivatives.

*Effective duration and convexity of a portfolio* are the relevant summary statistics when future cash flows of bonds in a portfolio are contingent on interest rate changes.

### Equation (3)

$$\text{Effectiveduration}(\text{EffDur}) = \frac{(\text{PV}_-) - (\text{PV}_+)}{2(\Delta\text{Curve})(\text{PV}_0)}.$$

### Equation (4)

$$\text{Effective convexity}(\text{EffCon}) = \frac{(\text{PV}_-) + (\text{PV}_+) - 2(\text{PV}_0)}{(\Delta\text{Curve})^2 (\text{PV}_0)}.$$

**Spread duration** is a useful measure for determining a portfolio's sensitivity to changes in credit spreads. Duration indicates the percentage price effect of an interest rate change on a bond, and spread duration measures the effect of a change in yield spread on a bond's price. Spread duration provides the approximate percentage increase (decrease) in bond price expected for a 1% decrease (increase) in credit spread.

**Duration times spread (DTS)** is a modification of the spread duration definition to incorporate the empirical observation that spread changes across the credit spectrum tend to occur on a *proportional percentage* basis rather than being based on *absolute* basis point changes. This measure, reviewed in detail in a later lesson, weights the spread duration by a factor equal to the current credit spread, increasing the magnitude of expected price changes for a given change in spread.

*Portfolio dispersion* captures the variance of the times to receipt of cash flows with respect to the duration. It is used in measuring interest rate immunization for liabilities. Whereas Macaulay duration is the weighted *average* of the times to receipt of cash flows, dispersion is the weighted *variance*. It measures the extent to which the payments are spread out around the duration. Convexity is affected by the dispersion of cash flows. Higher cash flow dispersion leads to an increase in convexity.

## 4.2. Correlations between Fixed-Income Sectors

Correlation characteristics refer to the interplay between benchmark rates, spreads, and such factors as currencies. Correlations between fixed-income sectors within a market are likely to be higher than those across markets given country-specific factors, such as central bank policy, economic growth, and inflation. In developed economies, investment-grade securities with a low probability of default are highly correlated with interest rate changes in the sovereign yield curve. Below-investment-grade securities are affected more by changes in spread than by changes in general interest rates and often exhibit stronger correlations with equity markets. Recall that correlations between interest rates and spreads can often be negative. As the economy worsens, interest rates fall and spreads widen, and the reverse occurs when the economy improves. Correlations for global government bonds will be partly driven by changes in interest rates but also by changes in local currency exchange rates.

## 4.3. Use of Measures of Risk and Return in Portfolio Management

We now provide an overview of how portfolio measures may be used by fund managers to reflect their views.

### 4.3.1. *Portfolio Duration in Total Return Mandates*

Total return mandates that are actively managed often use a top-down approach to establish the large risk factors in a portfolio combined with a bottom-up approach of individual security selection. The analytics discussed earlier can be used to measure and manage the macroeconomic risk factors in the portfolio. Portfolio managers develop or use a forecast of the direction of the economy and an assessment of the current business, political, and regulatory environment to develop themes that can be reflected in the portfolio. On the basis of expectations for changes in interest rates and the shape of the yield curve, portfolio managers can adjust the duration of a portfolio to reflect their view. For example, if the portfolio manager expects interest rates to rise and the yield curve to steepen, she would

reduce the exposure of the portfolio to longer-dated bonds relative to the benchmark, which would reduce portfolio duration. If her view materialized as expected, all else equal, the fund would outperform the benchmark, resulting in active excess returns.

### **4.3.2. Managing Credit Exposure Using Spread Duration**

Portfolio managers often use the spread duration measures introduced earlier to gauge the portfolio's sensitivity to changes in credit spreads. A portfolio manager expecting credit spreads to narrow may wish to increase the spread duration in an actively managed portfolio. The manager may face constraints, such as a target duration, rating-based restrictions, or limits to derivatives use, as part of the investment mandate. A second way to increase the portfolio credit exposure is to reduce the average credit rating of the portfolio; for example, reduce A rated names and increase BBB rated credits. In this case, the duration times spread measure may be a more appropriate measure of portfolio value changes. These active portfolio management tools are addressed in more detail in a later lesson on credit strategies.

The single bond risk and return measures discussed previously at an aggregate level will determine the large risk factors for the portfolio. The portfolio manager will select securities as part of the portfolio construction process to achieve a targeted level of tracking error or active risk relative to a benchmark. The contribution to duration, convexity, spread duration, and DTS of a single bond to the portfolio is weighted by the market value of the position relative to the total market value of the portfolio. The portfolio manager will select a diversified universe of holdings to construct the portfolio in the manner he believes will optimize expected return and risk.

### **4.3.3. Relative Value Concept**

**Relative value** is a key concept in the active management of fixed-income portfolios that describes the selection of the most attractive individual securities to populate the portfolio with, using ranking and comparing. Portfolio managers analyze and rank securities on the basis of such considerations as valuation, issuer fundamentals, and market technical conditions (supply and demand). This analysis is carried out across sectors, issuers, and individual securities to select securities with the most attractive risk and return profiles. The portfolio manager will establish a time horizon over which the relative value analysis is applied. The single bond characteristics can be used to express an active position relative to the benchmark. For example, each bond has a distinct key rate duration (KeyRateDur) profile. If the portfolio manager wants to establish a bullet or barbell position as part of the active risk decision, bonds with a specific KeyRateDur profile will be selected. Similarly, the portfolio manager can select securities that in aggregate have more/less DTS than the benchmark if she is bullish/bearish on corporate bond spreads. The selection of the most attractive individual securities to populate the portfolio will apply relative value analysis to

compare and rank securities. In the context of the efficient frontier, those securities that offer the most expected return for a given level of risk would offer the best relative value.

The positioning of the portfolio reflects the portfolio manager's total return expectations for the market and relative returns versus the benchmark, given his views with regard to both the direction of interest rates and credit spread changes. Diversification considerations ensure that idiosyncratic risks are within acceptable risk parameters.

### EXAMPLE 3

1. Which of the following best describes a measure of sensitivity to changes in yields to maturity for a portfolio of bonds with cash flows contingent on interest rate changes?
  - A. Portfolio dispersion
  - B. Modified duration
  - C. Effective duration
2. Which of the following is a true statement about portfolio dispersion?
  - A. It can be described as the variance of time to the receipt of cash flows.
  - B. The higher the dispersion, the lower the convexity of the portfolio.
  - C. It determines the portfolio's sensitivity to changes in credit spreads.

### Solutions:

1. C is correct. Effective duration is particularly relevant in scenarios where the cash flows from the bonds held in a portfolio are contingent on changes in interest rates.
2. A is correct. Dispersion measures the variance of the time to receive cash flows from the fixed-income securities held.

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## 5. BOND MARKET LIQUIDITY



**c. describe bond market liquidity, including the differences among market sub-sectors, and discuss the effect of liquidity on fixed-income portfolio management**

A liquid security is one that may be transacted quickly with little effect on the security's price. Fixed-income securities vary greatly in their liquidity.

Compared with equities, fixed-income markets are generally less liquid. The global fixed-income universe contains many individual bonds with varying features. Many issuers have multiple bonds outstanding with their own unique maturity dates, coupon rates, early redemption features, and other specific features.

An important structural feature affecting liquidity is that fixed-income markets are typically over-the-counter dealer markets. Search costs (the costs of finding a willing counterparty) exist in bond markets because investors may have to locate desired bonds. In addition, when either buying or selling, investors may have to obtain quotes from various dealers to obtain the most advantageous pricing. With limited, although improving, sources for transaction prices and quotes, bond markets are ordinarily less transparent than equity markets. Liquidity, search costs, and price transparency are closely related to the type of issuer and its credit quality. An investor is likely to find that bonds of a highly creditworthy government issuer are more liquid, have greater price transparency, and have lower search costs than bonds of, for example, a corporate issuer with lower credit quality.

Bond liquidity is typically highest immediately after issuance. For example, an on-the-run bond issue (the most recently issued bonds) of a highly creditworthy sovereign entity is typically more liquid than a bond with similar features—including maturity—that was issued previously (an off-the-run bond). On-the-run bonds also trade at narrow bid–ask spreads. This difference in liquidity is typically present even if the off-the-run bond was issued only one or two months earlier. One reason for this phenomenon is that soon after bonds are issued, dealers normally have a supply of the bonds in inventory, but as time goes by and bonds are traded, many are purchased by buy-and-hold investors. Once in the possession of such investors, those bonds are no longer available for trading.

Recall that liquidity typically affects bond yields to maturity. Bond investors require higher yields for investing in illiquid securities relative to otherwise identical securities that are more liquid. The higher yield to maturity compensates investors for the costs they may encounter if they try to sell illiquid bonds prior to maturity. These costs include the opportunity costs associated with the delays in finding trading counterparties, as well as the bid–ask spread (which is a direct loss of wealth). The incremental yield to maturity investors require for holding illiquid bonds instead of liquid bonds is referred to as a *liquidity premium*. The magnitude of the liquidity premium normally varies depending on such factors as the issuer, the issue size, and time to maturity. For example, when a 10-year US Treasury bond shifts from on-the-run to off-the-run status, it typically trades at a yield to maturity several basis points above that of the new on-the-run bond.

## 5.1. Liquidity among Bond Market Sub-Sectors

Bond market liquidity varies across sub-sectors. These sub-sectors can be categorized by such key features as issuer type, credit quality, issue size, and maturity. The global bond market includes sovereign government bonds, non-sovereign government bonds, government-related bonds, corporate bonds, and securitized bonds (such as asset-backed securities and commercial mortgage-backed securities). Sovereign government bonds are typically more liquid than corporate and non-sovereign government bonds. Their superior liquidity relates to their large issuance size, use as benchmark bonds, acceptance as collateral in the repo market, and well-recognized issuers. Sovereign government bonds of countries with high credit quality and large issuance are typically more liquid than bonds of lower-credit-quality countries.

Corporate bonds are issued by many different companies and represent a wide spectrum of credit quality. For corporate bonds with low credit quality, it can be difficult to find a counterparty dealer with the securities in inventory or willing to take them into inventory. Bonds of infrequent issuers are often less liquid than the bonds of issuers with many outstanding issues because market participants are less familiar with companies that seldom issue debt. In addition, smaller issues are generally less liquid than larger issues because small bond issues are typically excluded from major bond indexes with minimum issue size requirements.

## 5.2. The Effects of Liquidity on Fixed-Income Portfolio Management

Liquidity concerns influence fixed-income portfolio management in multiple ways, including pricing, portfolio construction, and consideration of alternatives to bonds (such as derivatives).

### 5.2.1. Pricing

Sources for pricing of recent bond transactions—notably corporate bonds—are not always readily available. Note that price transparency is improving in some bond markets. In the United States, the Financial Industry Regulatory Authority's Trade Reporting and Compliance Engine (TRACE) and the Municipal Securities Rulemaking Board's Electronic Municipal Market Access (EMMA) are electronic systems that help increase transparency in corporate and municipal bond markets, and similar initiatives play a similar role elsewhere for corporate bonds traded on market exchanges, increasing pricing transparency. In most bond markets, however, the lack of transparency in corporate bond trading presents a

challenge.

Because many bonds do not trade or trade infrequently, using recent transaction prices to represent current value is not practical. Reliance on last traded prices, which may be out of date and may not incorporate current market conditions, could result in costly trading decisions. The determinants of corporate bond value, including interest rates, credit spreads, and liquidity premiums, change frequently. One solution to the pricing problem is to use matrix pricing that makes use of observable liquid benchmark yields of similar maturity and duration as well as benchmark spreads of bonds with comparable times to maturity, credit quality, and sector or security type to estimate the current market yield and price.

### **5.2.2. Portfolio Construction**

Investors' liquidity preferences directly influence portfolio construction. In constructing a portfolio, investors must consider the important trade-off between yield to maturity and liquidity. As mentioned previously, illiquid bonds typically have higher yields to maturity; a buy-and-hold investor seeking higher returns will often prefer less liquid bonds with higher yields to maturity. In contrast, investors who prefer greater liquidity will likely sacrifice returns and choose more liquid bonds with lower yields to maturity. Some investors may restrict their portfolio holdings to bonds within a certain maturity range. This restriction reduces the need to sell bonds to generate needed cash inflows. In such cases, the investors that anticipate their liquidity needs may give up the higher yield to maturity typically available to longer-term bonds. In addition to avoiding longer-term bonds, investors with liquidity concerns may also avoid small issues and private placements of corporate bonds.

A challenge in bond portfolio construction relates to the dealer market. Bond dealers often carry an inventory of bonds because buy and sell orders do not arrive simultaneously. A dealer is not certain how long bonds will remain in its inventory. Less liquid bonds are likely to remain in inventory longer than liquid bonds. A dealer provides bid–ask quotes (prices at which it will buy and sell) on bonds of its choice. Some illiquid bonds will not have quotes, particularly bid quotes, from any dealer. A number of different factors determine the bid–ask spread. Riskier bonds often have higher bid–ask spreads because of dealers' aversion to hold those bonds in inventory. Because bond dealers must finance their inventories, the dealers incur costs in both obtaining funding and holding those bonds. Dealers seek to cover their costs and make a profit through the bid–ask spread, and therefore, the spread will be higher for illiquid bonds that are likely to remain in inventory longer.

A bond's bid–ask spread is also a function of the bond's complexity and how easily market participants can analyze the issuer's creditworthiness. Bid–ask spreads in government bonds are generally lower than spreads in corporate bonds or structured financial instruments, such as asset-backed securities. Conventional (plain vanilla) corporate bonds normally have lower spreads than corporate bonds with non-standard or complex features, such as embedded

options. Bonds of large, high-credit-quality corporations that have many outstanding bond issues are the most liquid among corporate bonds, and thus they have relatively low bid–ask spreads compared with smaller, less creditworthy companies.

Illiquidity directly increases bid–ask spreads of bonds, which increases the cost of trading. Higher transaction costs reduce the benefits of active portfolio decisions and may decrease portfolio managers’ willingness to adjust their portfolios to take advantage of opportunities that present themselves. As an example to quantify trading costs, if a corporate bond with a 15-year duration is being quoted by dealers with a 10 bp bid–ask spread, the cost impact to the portfolio is approximately 1.50% ( $0.0010 \times 15 \times 100 = 1.50\%$ ). The portfolio manager would buy the bond at \$100, and when the portfolio is priced (typically at bid or the midpoint between the bid and the ask), the bond would have a value of \$98.50, reducing total portfolio return. This is the price that would be realized if the bond were sold, holding other factors constant. To mitigate trading costs, investors can participate in the primary or new issue market where bonds are typically issued at a discount to the price at which a similar issue trades in the secondary market.

## KNOWLEDGE CHECK

Rank the following instruments from the usually most liquid to the least liquid:

- Low-credit-quality corporate bond
- Recently issued on-the-run sovereign bond issued by a high-credit-quality government
- High-credit-quality corporate bond
- Sovereign bond issued a year ago by a high-credit-quality government

### Solution:

- Recently issued on-the-run sovereign bond issued by a high-credit-quality government
- Sovereign bond issued a year ago by a high-credit-quality government
- High-credit-quality corporate bond
- Low-credit-quality corporate bond

### 5.2.3. Alternatives to Direct Investment in Bonds

Because transacting in fixed-income securities may present challenges resulting from low liquidity in many segments of the fixed-income market, fund managers may use alternative methods to establish bond market exposures. The methods we outline are applicable across different fixed-income mandates. We will take a more in-depth look at the ones particularly relevant to passive and liability-driven mandates later as part of our coverage dedicated to such mandates. Next, we provide an overview of the most common methods—specifically, mutual funds, exchange-traded funds (ETFs), exchange-traded derivatives, and OTC derivatives. In considering direct versus indirect investments, the asset manager must weigh the ongoing fees associated with such instruments as mutual funds and ETFs against the bid–offer cost of direct investment in the underlying securities.

*ETFs and mutual funds.* These products provide an alternative to transacting in individual bonds. They are more liquid than the underlying securities. Mutual funds are pooled investment vehicles whose shares or units represent a proportional share in the ownership of the assets in an underlying portfolio. In the case of open-end mutual funds, new shares may be redeemed or issued at the fund’s net asset value (NAV) established at the end of each trading day based on the fund’s valuation of all existing assets minus liabilities, divided by the total number of shares outstanding. Bond mutual fund investors enjoy the advantage of being able to redeem holdings at the fund’s NAV rather than needing to sell illiquid positions. The benefit from economies of scale is usually the overriding factor for smaller investors in their choice of a bond mutual fund over direct investment. Because bonds often trade at a minimum lot size of USD1 million or higher per bond, successful replication of a broad index or construction of a diversified actively managed portfolio could easily require hundreds of millions of dollars in investments. Therefore, the greater diversification across fixed-income markets achievable by a larger fund may be well worth the additional cost in terms of an upfront load in some instances and an annual management fee.

Although investors benefit from increased diversification, the fund must outline its stated investment objectives and periodic fees, but actual security holdings are available only on a retroactive basis. Unlike the underlying securities, bond mutual funds have no maturity date; the fund manager continuously purchases and sells bonds to track index performance, and monthly interest payments fluctuate on the basis of fund holdings.

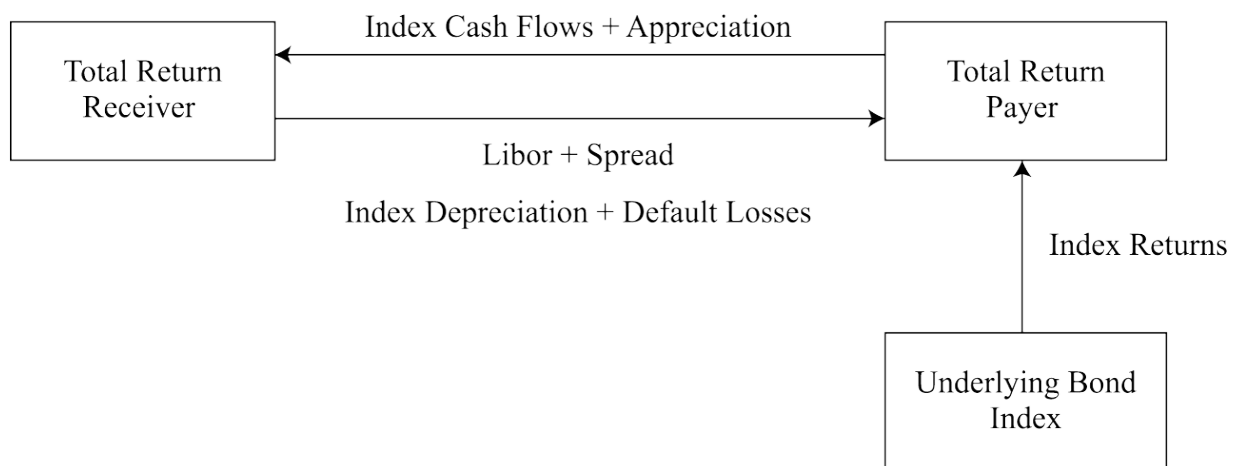
Exchange-traded funds share some mutual fund characteristics but have more tradability features. Investors benefit from greater bond ETF liquidity versus mutual funds given their availability to be purchased or sold throughout the trading day.

*Exchange traded derivatives.* Futures and options on futures provide exposure to underlying bonds. Being exchange traded, they involve financial instruments with standardized terms, documentation, and pricing traded on an organized exchange. Exchange-traded products also include interest rate products and options for interest rate–related ETFs.

*OTC derivatives.* Interest rate swaps are the most widely used OTC derivative worldwide and entail customized arrangements between two counterparties that reference an underlying market price or index. Some interest rate swaps are liquid, with multiple swap dealers posting competitive two-way quotes. In addition to interest rate swaps, fixed-income portfolio managers use inflation swaps, total return swaps, and credit swaps to alter their portfolio exposure. Because they trade over the counter, swaps may be tailored to an investor's specific needs.

A total return swap (TRS), a common over-the-counter portfolio derivative strategy, combines elements of interest rate swaps and credit derivatives. Similar to an interest rate swap, a total return swap involves the periodic exchange of cash flows between two parties for the life of the contract. Unlike an interest rate swap, in which counterparties exchange a stream of fixed cash flows versus a floating-rate benchmark such as the MRR (the market reference rate) to transform fixed assets or liabilities to a variable exposure, a TRS has a periodic exchange based on a reference obligation that is an underlying equity, commodity, or bond index. [Exhibit 9](#) outlines the most basic TRS structure. The **total return receiver** receives both the cash flows from the underlying index and any appreciation in the index over the period in exchange for paying the MRR plus a predetermined spread. The **total return payer** is responsible for paying the reference obligation cash flows and return to the receiver but will also be compensated by the receiver for any depreciation in the index or default losses incurred by the portfolio.

### Exhibit 9. Total Return Swap Mechanics



The TRS transaction is an over-the-counter derivative contract based on an ISDA (International Swaps and Derivatives Association) master agreement. This contract

specifies a notional amount, periodic cash flows, and final maturity, as well as the credit and other legal provisions related to the transaction. The historical attractiveness of using TRS stemmed from the efficient risk transfer on the reference obligation from one counterparty to another on a confidential basis without requiring the full cash outlay associated with the mutual fund or ETF purchase. In fact, another way to think of the TRS is as a synthetic secured financing transaction in which the investor (the total return receiver) benefits from more-advantageous funding terms faced by a dealer (typically the total return payer) offering to facilitate the transaction.

The potential for both a smaller initial cash outlay and lower swap bid–offer costs compared with the transaction costs of direct purchase or use of a mutual fund or ETF are the most compelling reasons to consider a TRS to add fixed-income exposure.

That said, several considerations may offset these benefits in a number of instances:

- The investor does not legally own the underlying assets but, rather, has a combined synthetic long position in both the market and the credit risk of the index that is contingent on the performance of the total return payer. The total return receiver must both perform the necessary credit due diligence on its counterparty and face the rollover risk at maturity of having the ability to renew the contract with reasonable pricing and business terms in the future.
- Structural changes to the market and greater regulatory oversight, particularly capital rules affecting dealers, have raised the cost and increased the operational burden of these transactions because of the need to collateralize mark-to-market positions frequently and within shorter timeframe.

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## 6. A MODEL FOR FIXED-INCOME RETURNS

### **d. describe and interpret a model for fixed-income returns**

Investors often have views on future changes in the yield curve and structure or restructure their portfolios accordingly. Investment strategies should be evaluated in terms of expected returns rather than just yields to maturity. A bond's yield to maturity provides an incomplete measure of its expected return. Instead, expected fixed-income returns consist of a number of different components in addition to yield to maturity. Examining these components leads to a better understanding of the driving forces behind expected returns—on individual bonds and



fixed-income portfolios. The focus is on *expected* as opposed to *realized* returns, which may be decomposed in a similar manner.

## 6.1. Decomposing Expected Returns

Decomposing expected fixed-income returns allows an investor to differentiate among several important return components. At the most general level, expected returns, denoted as  $E(R)$ , can be decomposed (approximately) in the following manner:

$E(R) \approx$  Coupon income

+/- Rolldown return

+/-  $E(\Delta \text{Price due to investor's view of benchmark yield})$

+/-  $E(\Delta \text{Price due to investor's view of yield spreads})$

+/-  $E(\Delta \text{Price due to investor's view of currency value changes}),$

where  $E(. . .)$  represents effects on expected returns based on expectations of the item in parentheses and  $\Delta$  represents “change.” The decomposition holds only approximately and ignores taxes (note that some of the material on decomposing expected returns has been adapted from Hanke and Seals [2010]).

### 6.1.1. Coupon Income

Coupon income is the income that an investor receives from coupon payments relative to the bond's price and interest on reinvestment income. Assuming there is no reinvestment income, coupon income equals a bond's annual current yield.

Coupon income (or Current yield) = Annual coupon payment/Current bond price.

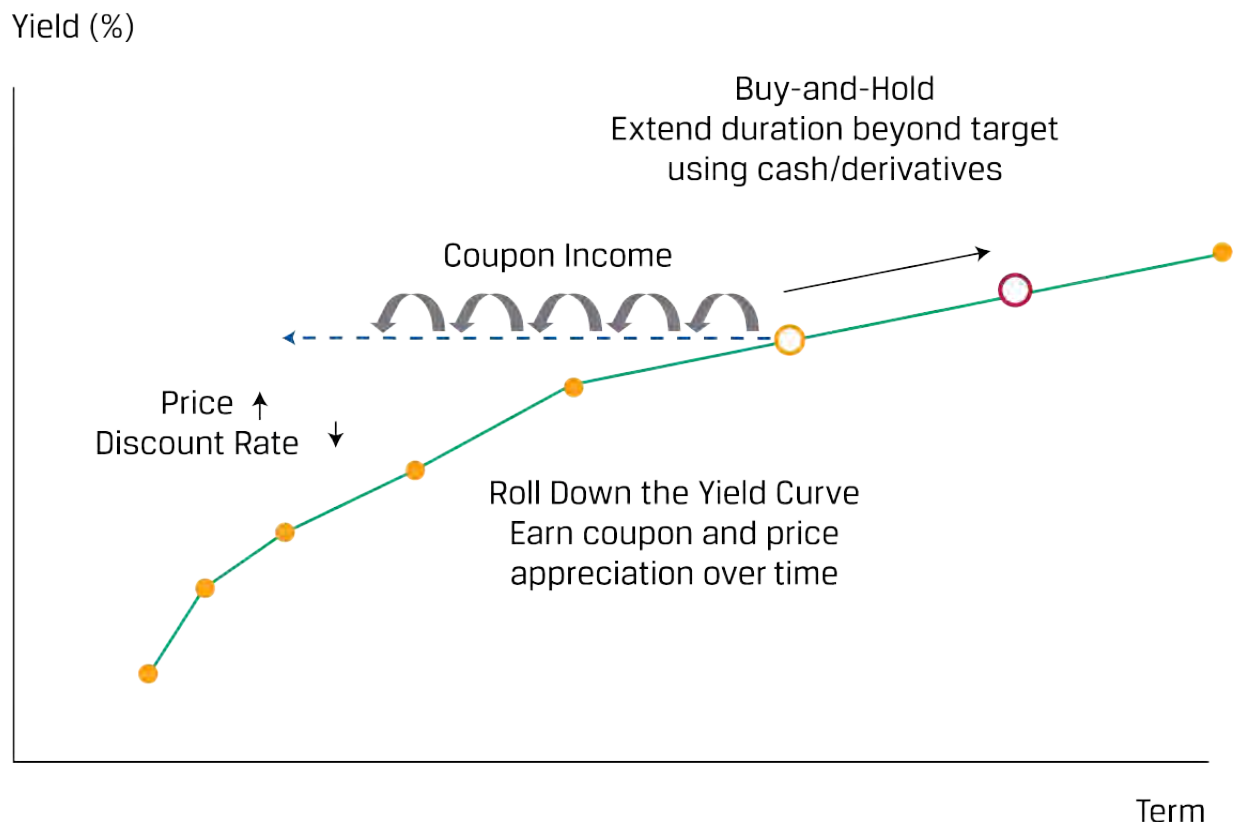
### 6.1.2. Rolldown Return

The rolldown return, sometimes referred to as “rolldown and carry return,” results from the bond “rolling down” the yield curve as the time to maturity decreases (see [Exhibit 10](#)), assuming zero interest rate volatility. Bond prices change as time passes even if the market discount rate remains the same. As time passes, a bond's price typically moves closer to par. This price movement is illustrated by the constant-yield price trajectory, which shows the “pull to par” effect on the price of a bond trading at a premium or a discount to par value. If



the issuer does not default, the price of a bond approaches par value as its time to maturity approaches zero.

### Exhibit 10. Rolling down the Yield Curve Effect



The rolldown return equals the bond's percentage price change assuming an unchanged yield curve over the strategy horizon. Bonds trading at a premium to their par value will experience capital losses during their remaining life, and bonds trading at a discount relative to their par value will experience capital gains during their remaining life.

To compute the rolldown return, the bond has to be revalued at the end of the strategy horizon assuming an unchanged yield curve. Then the rolldown return is as follows:

#### Equation (5)

Rolldown return

$$= \frac{(\text{Bond price}_{\text{End-of-horizon period}} - \text{Bond price}_{\text{Beginning-of-horizon period}})}{\text{Bond price}_{\text{Beginning-of-horizon period}}}$$

The sum of the coupon income and the rolldown return may be referred to as the bond's

*rolling yield.*

### 6.1.3. Views of Benchmark Yields

The expected change in price based on investor's views of benchmark yields to maturity and the term structure of yield volatility reflects an investor's expectation of changes in yields to maturity and yield volatility over the investment horizon. This expected change is zero if the investor expects yield curves and yield volatility to remain unchanged. Assuming the investor does expect a change in the yield curve, this expected return component is computed as follows:

$E(\text{Change in price based on investor's views of yields and yield volatility})$

#### Equation (6)

$$= (-\text{ModDur} \times \Delta\text{Yield}) + [\frac{1}{2} \times \text{Convexity} \times (\Delta\text{Yield})^2],$$

where ModDur is the modified duration of a bond,  $\Delta\text{Yield}$  is the expected change in yield to maturity, and Convexity reflects the second-order effect of the price–yield relationship. Note that for bonds with embedded options, the duration and convexity measures used should be effective duration and effective convexity. Also, in contrast to fixed-coupon bonds, floating-rate notes have a modified duration that is largely due to spread changes, as described in detail later.

### 6.1.4. Views of Yield Spreads

The expected change in price based on investor's views of yield spreads reflects an investor's expectation of changes in market credit spreads over the investment horizon. When economic or credit conditions are improving, spreads are typically said to tighten, thereby reducing the required yield to maturity on the bond. Deteriorating conditions would conversely result in higher required yields to maturity. This component of expected return reflects general market conditions rather than any spread changes due to issuer-specific (or idiosyncratic) risk and is computed as follows:

$E(\Delta\text{Price based on investor's views of yield spreads})$

#### Equation (7)

$$= (-\text{ModDur} \times \Delta\text{Yield}) + [\frac{1}{2} \times \text{Convexity} \times (\Delta\text{Yield})^2].$$

Yield spreads can also fluctuate on the basis of idiosyncratic risk. Credit migration refers to credit quality changes that may result in an issuer downgrade or upgrade. This can result in either lower spreads for higher ratings or higher spreads for lower ratings affecting the expected return on bonds. Higher-quality credits tend to have low probabilities of default but can experience changes in bond prices due to an anticipated or actual migration. The price impact is calculated in the same way as noted previously for market changes in yield to maturity. Note that investors face price declines on non-defaulted bonds if spreads widen. Yearly default rates can vary significantly and are more severe for speculative-grade (high-yield) issues.

### 6.1.5. Views of Currency Value Changes

If an investor holds bonds denominated in a currency other than her home currency, she also needs to factor in any expected fluctuations in the currency exchange rate or expected currency gains or losses over the investment horizon. The magnitude and direction of the change in the exchange rate can be based on a variety of factors, including the manager's own view, results from surveys, or a quantitative model output. It can also be based on the exchange rate that can be locked in over the investment horizon using currency forwards.

Return measured in functional currency terms (domestic currency returns of foreign currency assets) can be shown as  $R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$  for a single asset or

#### Equation (8)

$$R_{DC} = \sum_{i=1}^n \omega_i (1 + R_{FC,i})(1 + R_{FX,i}) - 1$$

for a portfolio, where  $R_{DC}$  and  $R_{FC}$  are the domestic and foreign currency returns expressed as a percentage,  $R_{FX}$  is the percentage change of the domestic currency versus the foreign currency, and  $\omega_i$  is the respective portfolio weight of each foreign currency asset (in domestic currency terms), with the sum of  $\omega_i$  equal to 1. In the context of the return decomposition framework,  $R_{DC}$  simply combines the third factor,  $E(\Delta\text{Price due to investor's view of benchmark yield})$ , and the fifth factor,  $(+/- E(\Delta\text{Functional currency value}))$ , in the expected fixed-income return model.

#### EXAMPLE 4

# Decomposing Expected Returns

Ann Smith works for a US investment firm in its London office. She manages the firm's British pound-denominated corporate bond portfolio. Her department head in New York City has asked Smith to make a presentation on next year's total expected return of her portfolio in US dollars and the components of this return. [Exhibit 11](#) shows information on the portfolio and Smith's expectations for the next year. Expected return (for the bond portfolio) and its components are on an annualized basis, and any potential coupons are assumed to be paid annually. Calculate the total expected return of Smith's bond portfolio, assuming no reinvestment income.

## Exhibit 11. Portfolio Characteristics and Expectations

Notional principal of portfolio (in millions)	£100
Average bond coupon payment (per £100 par value)	£2.75
Coupon frequency	Annual
Investment horizon	1 year
Current average bond price	£97.12
Expected average bond price in one year (assuming an unchanged yield curve)	£97.27
Average bond convexity in one year	18
Average bond modified duration in one year	3.70
Expected average benchmark yield-to-maturity change	0.26%
Expected change in spread (spread expected to narrow in this scenario)	-0.10%
Expected currency losses (£ depreciation versus US\$)	0.50%

## Solution:

The portfolio's coupon income is 2.83%. The portfolio has an average coupon of £2.75 on a £100 notional principal and currently trades at £97.11. The coupon income over a one-year horizon is  $2.83\% = £2.75/£97.11$ .

In one year's time, assuming an unchanged yield curve and zero interest rate volatility, the rolldown return is  $0.17\% = (£97.27 - £97.11)/£97.11$ .

The rolling yield, which is the sum of the coupon income and the rolldown return, is  $3.00\% = 2.83\% + 0.17\%$ .

The expected change in price based on Smith's views of benchmark yields to maturity is  $-0.96\%$ , calculated as follows: The bond portfolio has a modified duration of 3.70 and a convexity statistic of 18. Smith expects an average benchmark yield-to-maturity change of  $0.26\%$ . Smith expects to incur a decrease in prices and a reduction in return based on her rate view. The expected change in price based on Smith's views of yields to maturity and yield spreads is thus  $-0.0096 = (-3.70 \times 0.0026) + [\frac{1}{2} \times 18 \times (0.0026)^2]$ . So the expected reduction in return based on Smith's rate view is  $0.96\%$ .

Smith expects an impact from the  $0.1\%$  change (narrowing in this scenario) in spread in her well-diversified investment-grade bond portfolio. The impact on the expected return is, therefore,  $0.37\% = [-3.70 \times (-0.0010)] + [1/2 \times 18 \times (-0.0010)^2]$ .

Smith expects the British pound, the foreign currency in which her bond position is denominated, to depreciate by an annualized 50 bps (or  $0.5\%$ ) over the investment horizon against the US dollar, the home country currency. The expected currency loss to the portfolio is thus  $0.50\%$ .

The total expected return on Smith's bond position is  $1.91\%$ , as summarized in [Exhibit 12](#).

### Exhibit 12. Return Component Calculations

Return Component	Formula	Calculation
Coupon income	Annual coupon payment/Current bond price	$\text{£}2.75/\text{£}97.11 = 2.83\%$
+ Rolldown return	$\frac{(\text{Bond price}_{\text{End-of-horizon period}} - \text{Bond price}_{\text{Beginning-of-horizon period}})}{\text{Bond price}_{\text{Beginning-of-horizon period}}}$	$(\text{£}97.21 - \text{£}97.11) / \text{£}97.11 = 0.17\%$
= Rolling yield	Coupon income + Rolldown return	$2.83\% + 0.17\% = 3.00\%$
+/- E( $\Delta$ Price*) based on Smith's	$(-\text{ModDur} \times \Delta\text{Yield}) + [\frac{1}{2} \times \text{Convexity} \times (\Delta\text{Yield})^2]$	$(-3.70 \times 0.0026) + [\frac{1}{2} \times 18 \times (0.0026)^2] = -0.0096 = -0.96\%$

benchmark yield view)		−0.96%
+/−	$(-\text{ModDur} \times \Delta\text{Spread})$	(−3.70
E( $\Delta\text{Price}$ due to investor's view of credit spreads)	$+ [\frac{1}{2} \times \text{Convexity} \times (\Delta\text{Spread})^2]$	0.0010 [1/2 × (−0.00 = 0.37
+/−	Given	−0.50%
E(Currency gains or losses)		
<b>= Total expected return</b>		<b>1.91%</b>

\*Note that the change in price in the context of this example refers to the change in portfolio value.

## 6.2. Estimation of the Inputs

In the model for fixed-income returns discussed earlier, some of the individual expected return components can be more easily estimated than others. The easiest component to estimate is the coupon income. The return model's most uncertain individual components are the investor's views of changes in benchmark yields and yield spreads and expected currency movements. These components are normally based on purely qualitative (subjective) criteria, a quantitative model (including surveys), or a mixture of the two. Although a quantitative approach may seem more objective, there are a number of quantitative models that can be used, each with different methodologies associated with the underlying calculations.

## 6.3. Limitations of the Expected Return Decomposition

The return decomposition just described is an approximation; only duration and convexity

are used to summarize the price–yield relationship. In addition, the model implicitly assumes that all intermediate cash flows of the bond are reinvested at the yield to maturity, which results in different coupon reinvestment rates for different bonds.

The model also ignores other factors, such as local richness/cheapness effects and potential financing advantages. Local richness/cheapness effects are deviations of individual maturity segments from the fitted yield curve, which was obtained using a curve estimation technique. Yield curve estimation techniques produce relatively smooth curves, and there are likely slight deviations from the curve in practice. There may be financing advantages to certain maturity segments in the repo market. The repo market provides a form of short-term borrowing for dealers in government securities who sell government bonds to other market participants overnight and buy them back, typically on the following day. In most cases, local richness/cheapness effects and financing advantages tend to be relatively small and are thus not included in the expected return decomposition model.

## EXAMPLE 5

### Components of Expected Return

Kevin Tucker manages a global bond portfolio. At a recent investment committee meeting, Tucker discussed his portfolio's domestic (very high-credit-quality) government bond allocation with another committee member. The other committee member argued that if the yield curve is expected to remain unchanged, the only determinants of a domestic government bond's expected return are its coupon payment and its price.

Explain why the other committee member is incorrect, including a description of the additional expected return components that need to be included.

#### **Solution:**

A bond's coupon payment and its price allow only its coupon income to be computed. Coupon income is an incomplete measure of a bond's expected return. For domestic government bonds, in addition to coupon income, the rolldown return needs to be considered. The rolldown return results from the fact that bonds are pulled to par as the time to maturity decreases, even if the yield curve is expected to remain unchanged over the investment horizon. Currency gains and losses would also need to be considered in a global portfolio. Because the portfolio consists of government bonds with very high credit quality, the view on yield spreads is less relevant for Tucker's analysis. For government and corporate bonds with lower credit quality, however, yield spreads would also need to be considered as additional return components.

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## 7. LEVERAGE

- e. **discuss the use of leverage, alternative methods for leveraging, and risks that leverage creates in fixed-income portfolios**

Leverage is the use of borrowed capital to increase the magnitude of portfolio positions, and it is an important tool for fixed-income portfolio managers. By using leverage, fixed-income portfolio managers may be able to increase portfolio returns relative to what they can achieve in unleveraged portfolios.

Managers often have mandates that place limits on the types of securities they may hold. Simultaneously, managers may have return objectives that are difficult to achieve, especially during low-interest rate environments. Through the use of leverage, a manager can increase his investment exposure and may be able to increase the returns to fixed-income asset classes that typically have low returns. The increased return potential, however, comes at the cost of increased risk: If losses occur, these would be higher than in unleveraged positions.

### 7.1. Using Leverage

Leverage increases portfolio returns if the securities in the portfolio have returns higher than the cost of borrowing. In an unleveraged portfolio, the return on the portfolio ( $r_p$ ) equals the return on invested funds ( $r_I$ ). When the manager uses leverage, however, the invested funds exceed the portfolio's equity by the amount that is borrowed.

The leveraged portfolio return,  $r_p$ , can be expressed as the total investment gains per unit of invested capital:

#### Equation (9)

$$r_p = \frac{\text{Portfolio return}}{\text{Portfolio equity}} = \frac{r_I \times (V_E + V_B) - (V_B \times r_B)}{V_E},$$

where

$V_E$  = Value of the portfolio's equity



$V_B$  = Borrowed funds

$r_B$  = Borrowing rate (cost of borrowing)

$r_I$  = Return on the invested funds (investment returns)

$r_P$  = Return on the levered portfolio

The numerator represents the total return on the portfolio assets,  $r_I \times (V_E + V_B)$ , minus the cost of borrowing,  $V_B \times r_B$ , divided by the portfolio's equity.

The leveraged portfolio return can be decomposed further to better identify the effect of leverage on returns:

$$\begin{aligned} r_P &= \frac{r_I \times (V_E + V_B) - (V_B \times r_B)}{V_E} \\ &= \frac{(r_I \times V_E) + [V_B \times (r_I - r_B)]}{V_E} \\ &= r_I + \frac{V_B}{V_E}(r_I - r_B). \end{aligned}$$

This expression decomposes the leveraged portfolio return into the return on invested funds and a portion that accounts for the effect of leverage. If  $r_I > r_B$ , then the second term is positive because the rate of return on invested funds exceeds the borrowing rate; in this case, leverage increases the portfolio's return. If  $r_I < r_B$ , then the second term is negative because the rate of return on invested funds is less than the borrowing rate; in this case, the use of leverage decreases the portfolio's return. The degree to which the leverage increases or decreases portfolio returns is proportional to the use of leverage (amount borrowed),  $V_B/V_E$ , and the amount by which investment return differs from the cost of borrowing,  $r_I - r_B$ .

## 7.2. Methods for Leveraging Fixed-Income Portfolios

Fixed-income portfolio managers have a variety of tools available to create leveraged portfolio exposures—notably, the use of financial derivatives and borrowing via collateralized money markets. Derivatives and borrowing are explicit forms of leverage. Other forms of leverage, such as the use of structured financial instruments, are more implicit. We provide a description of the most common ones.

### 7.2.1. Futures Contracts

Futures contracts embed significant leverage because they permit the counterparties to gain exposure to a large quantity of the underlying asset without having to actually transact in the underlying. Futures contracts can be obtained for a modest investment that comes in the form of a margin deposit. A futures contract's notional value equals the current value of the underlying asset multiplied by the multiplier, or the quantity of the underlying asset controlled by the contract.

The futures leverage is the ratio of the futures exposure (in excess of the margin deposit) normalized by the amount of margin required to control the notional amount. We can calculate the futures leverage using the following equation:

#### Equation (10)

$$\text{Leverage}_{\text{Futures}} = \frac{\text{Notional value} - \text{Margin}}{\text{Margin}}.$$

### 7.2.2. Swap Agreements

An interest rate swap can be viewed as a portfolio of bonds. In an interest rate swap, the fixed-rate payer is effectively short a fixed-rate bond and long a floating-rate bond. When interest rates increase, the value of the swap to the fixed-rate payer increases because the present value of the fixed-rate liability decreases and the floating-rate payments received increase. The fixed-rate receiver in the interest rate swap agreement effectively has a long position in a fixed-rate bond and a short position in a floating-rate bond. If interest rates decline, the value of the swap to the fixed-rate receiver increases because the present value of the fixed-rate asset increases and the floating-rate payments made decrease.

Because interest rate swaps are economically equivalent to a long–short bond portfolio, they provide leveraged exposure to bonds; the only capital required to enter into swap agreements is collateral required by the counterparties. Collateral for interest rate swap agreements has historically occurred between the two (or more) counterparties in the transaction.

Increasingly, collateral for interest rate and other swaps occurs through central clearinghouses.

### 7.2.3. Repurchase Agreements

**Repurchase agreements** (repos) are an important source of short-term financing for fixed-income security dealers and other financial institutions, as evidenced by the trillions of dollars of repo transactions that take place annually. In a repurchase agreement, a security

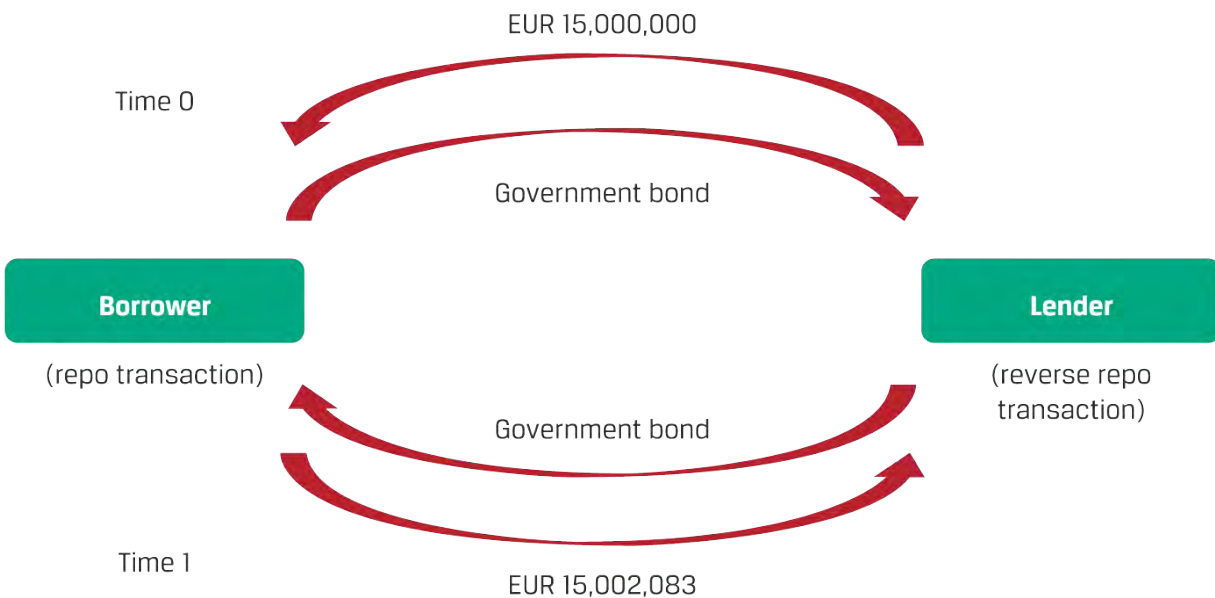
owner agrees to sell a security for a specific cash amount while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price. Repos are thus effectively collateralized loans. When discussing a repo, the transaction normally refers to the borrower's standpoint; from the standpoint of the lender (such as a money market fund), these agreements are referred to as **reverse repos**. **Exhibit 13** illustrates the transaction.

The interest rate on a repurchase agreement, called the **repo rate**, is the difference between the security's selling price and its repurchase price. For example, consider a dealer wishing to finance a EUR15 million bond position with a repurchase agreement. The dealer enters into an overnight repo at a repo rate of 5%. We can compute the price at which she agrees to repurchase this bond after one day as the EUR15 million value today plus one day of interest. The interest amount is computed as follows:

$$\text{Dollar interest} = \text{Principal amount} \times \text{Repo rate} \times (\text{Term of repo in days}/360)$$

Continuing with the example, the dollar interest is EUR2,083.33 = EUR15 million  $\times$  5%  $\times$  (1/360). Thus, the dealer will repurchase the bond the next day for EUR15,002,083.33.

### Exhibit 13. Repo and Reverse Repo



The term, or length, of a repurchase agreement is measured in days. Overnight repos are common, although they are often rolled over to create longer-term funding. A repo agreement may be cash driven or security driven. Cash-driven transactions feature one party that owns bonds and wants to borrow cash, as in the foregoing example. Cash-driven transactions usually feature “general collateral”—securities commonly accepted by investors and dealers,

such as Treasury bonds. In a security-driven transaction, the lender typically seeks a particular security. The motives may be for hedging, arbitrage, or speculation.

Credit risk is a concern in a repo agreement, in particular for the counterparty that lends capital. Protection against a default by the borrower is provided by the underlying collateral bonds. Additional credit protection comes from the “haircut,” the amount by which the collateral’s value exceeds the repo principal amount. For example, haircuts for high-quality government bonds typically range from 1% to 3% and are higher for other types of bonds. The size of the haircut serves to not only protect the lender against a potential default by the borrower but also to limit the borrower’s net leverage capacity. Generally, the size of the haircut increases as the price volatility of the underlying collateral increases.

Repos are categorized as bilateral repos or tri-party repos, depending on the way they are settled. Bilateral repos are conducted directly between two institutions, and settlement is typically conducted as “delivery versus payment,” meaning that the exchanges of cash and collateral occur simultaneously through a central custodian (for example, the Depository Trust Company in the United States). Bilateral repos are usually used for security-driven transactions. Tri-party repo transactions involve a third party that provides settlement and collateral management services. Most cash-motivated repo transactions against general collateral are conducted as tri-party repo transactions.

#### **7.2.4. Security Lending**

Security lending is another form of collateralized lending and is closely linked to the repo market. The primary motive of security lending transactions is to facilitate short sales, which involve the sale of securities the seller does not own. A short seller must borrow the securities he has sold short in order to deliver them upon trade settlement. Another motive for security lending transactions is financing, or collateralized borrowing. In a financing-motivated security loan, a bond owner lends the bond to another investor in exchange for cash.

Security lending transactions are collateralized by cash or high-credit-quality bonds. In the United States, most transactions feature cash collateral, although in many other countries, highly rated bonds are used as collateral. Typically, security lenders require collateral valued in excess of the value of the borrowed securities when bonds are used as collateral. For example, if high-quality government bonds are used as collateral, the lender may require bonds valued at 102% of the value of the borrowed securities. The extra 2% functions in the same way as the haircut in the repo market, providing extra protection against borrower default. The collateral required will increase if lower-quality bonds are used as collateral.

In security lending transactions with cash collateral, the security borrower typically pays the security lender, typically a long-only investment fund, a fee equal to a percentage of the

value of the securities loaned. For securities that are readily available for lending, that fee is small. The security lender earns an additional return by reinvesting the cash collateral. In cases where the security loan is initiated for financing purposes, the lending fee is typically negative, indicating that the security lender pays the security borrower a fee in exchange for its use of the cash.

When bonds are posted as collateral, the income earned on the collateral usually exceeds the security lending rate; the security lender (who is in possession of the bonds as collateral) usually repays the security borrower a portion of the interest earned on the bond collateral. The term **rebate rate** refers to the portion of the collateral earnings rate that is repaid to the security borrower by the security lender. This relationship can be expressed as follows:

$$\text{Rebate rate} = \text{Collateral earnings rate} - \text{Security lending rate}.$$

When securities are difficult to borrow, typically because there is high demand to short those securities, the rebate rate may be negative, which means the fee for borrowing the securities is greater than the return earned on the collateral. In this case, the security borrower pays a fee to the security lender in addition to forgoing the interest earned on the collateral.

There are important differences between repurchase agreements and security lending transactions. Unlike repurchase agreements, security lending transactions are typically open-ended. The security lender may recall the securities at any time, forcing the borrower to deliver the bonds by buying them back or borrowing from another lender. Similarly, the borrower may deliver the borrowed securities back to the lender at any time, forcing the lender, or its agent, to return the collateral (cash or bonds) and search for another borrower.

## 7.3. Risks of Leverage

Leverage alters the risk–return properties of an investment portfolio. A heavily leveraged portfolio may incur significant losses even when portfolio assets suffer only moderate valuation declines.

Leverage can lead to forced liquidations. If the value of the portfolio decreases, the portfolio's equity relative to borrowing levels is reduced and the portfolio's leverage increases. Portfolio assets may be sold in order to pay off borrowing and reduce leverage. If portfolio assets are not liquidated, then the overall leverage increases, corresponding to higher levels of risk. Decreases in portfolio value can lead to forced liquidations even if market conditions are unfavorable for selling—for example, during crisis periods. The term “fire sale” refers to forced liquidations at prices that are below fair value as a result of the seller's need for immediate liquidation. Reducing leverage, declining asset values, and forced sales have the potential to create spiraling effects that can result in severe declines in values and reduction in market liquidity.

Additionally, reassessments of counterparty risk typically occur during extreme market conditions, such as during the 2008–09 financial crisis. During periods of financial crisis, counterparties to short-term financing arrangements, such as credit lines, repurchase agreements, and security lending agreements, may withdraw their financing. These withdrawals undermine the ability of leveraged market participants to maintain their investment exposures. Thus, leveraged investors may be forced to reduce their investment exposure at exactly the worst time—that is, when prices are depressed.

## EXAMPLE 6

### Using Leverage in a Fixed-Income Portfolio

Arturo manages a mutual fund that is benchmarked to the Global Aggregate Bond Index. He currently has a bullish view of the global economy and believes corporate bond spreads are attractive. He is bearish on US Treasury interest rates given his economic growth forecast and expects rates to increase. The fund's US corporate bond holdings have a duration of seven years. He believes the best opportunities are in emerging market securities, and in particular, he is bullish on Brazilian rates, expecting them to decrease. The fund has experienced strong inflows recently and is fully invested. Arturo is evaluating tools to potentially increase the fund's total return by creating leveraged fixed-income exposures.

Given Arturo's plan to leverage exposures in his fund, discuss how he would achieve his objectives and identify the strategy risks.

#### **Solution:**

The mutual fund is fully invested and, therefore, Arturo needs to use leverage to potentially increase his returns. His bearish view on US Treasury interest rates would require that he reduce the fund's seven-year duration contributed by the US corporate bond holdings. He can sell the number of futures contracts on US Treasuries whose notional value and associated duration would offset the duration of the corporate bonds to his new target duration. Doing so would allow him to retain exposure (spread duration) to the corporate bonds whose spreads may contract as the economy grows while shedding the interest rate exposure, since he believes rates will rise, adversely affecting bond prices.

Arturo's bullish view on Brazilian rates can be expressed by entering into a receive fixed-rate, pay floating-rate swap on Brazilian rates. The fund will effectively have the equivalent of a fixed-rate bond that will appreciate in price if his view materializes and Brazilian interest rates fall.

Both the short US Treasury futures and long Brazilian interest leveraged since the only capital used is the collateral required risk to the leveraged strategy is that if Arturo's view on either incorrect, losses are magnified. This may also require position sold to cover the losses, which may occur at an inopportune time sold off.

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## 8. FIXED-INCOME PORTFOLIO TAXATION

### f. discuss differences in managing fixed-income portfolios for different investors

A tax-exempt investor's objective is to achieve the highest possible return net of fees and transaction costs. A prudent taxable investor needs to consider taxes on both expected and realized net investment returns.

The investment management industry has traditionally made investment decisions based on pretax returns as though investors are tax exempt (such as pension funds; see Rogers [2006]). The majority of the world's investable assets are owned by taxable investors, who are concerned with after-tax, rather than pretax, returns.

Taxes may differ among investor types, among countries, and on different types of assets, such as interest or capital gains. In many countries, pension fund corporations generally have to pay tax on their investments. Many countries offer an allowance for tax-sheltered investments that individuals can use in retirement. These types of tax shelters generally offer either an exemption from tax on capital gains or deferral of taxes until an investor draws money from the shelter (see Figure 8.1). Such shelters allow returns to accrue on a pretax basis until retirement, when substantial benefits are realized. In a fixed-income context for taxable investors, interest income (interest income) are typically taxed at the investor's normal income tax rate, but, however, may be taxed at a lower effective rate than an investor's marginal rate. In some countries, income from special types of fixed-income securities issued by a sovereign government, a non-sovereign government, or various international organizations may be taxed at a lower effective rate or even not taxed.

Specific tax rules vary among jurisdictions. Any discussion of how to manage investment returns—and, therefore, on how portfolios should optimally be managed—must take into account the specific tax rules of the relevant jurisdictions.











































# Reading 12

## Liability-Driven and Index-Based Strategies

by James F. Adams, PhD, CFA, and Donald J. Smith, PhD

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### LEARNING OUTCOMES

The candidate should be able to:

- a.** describe liability-driven investing;
  - b.** evaluate strategies for managing a single liability;
  - c.** compare strategies for a single liability and for multiple liabilities, including alternative means of implementation;
  - d.** describe construction, benefits, limitations, and risk–return characteristics of a laddered bond portfolio;
  - e.** evaluate liability-based strategies under various interest rate scenarios and select a strategy to achieve a portfolio’s objectives;
  - f.** explain risks associated with managing a portfolio against a liability structure;
  - g.** discuss bond indexes and the challenges of managing a fixed-income portfolio to mimic the characteristics of a bond index;
  - h.** compare alternative methods for establishing bond market exposure passively;
  - i.** discuss criteria for selecting a benchmark and justify the selection of a benchmark.
-

# 1. INTRODUCTION

Fixed-income instruments make up nearly three-quarters of all global financial assets available to investors. It is thus not surprising that bonds are a critical component of most investment portfolios. In our coverage of structured and passive total return fixed-income investment strategies, we explain that “passive” does not simply mean “buy and hold.” The primary strategies discussed—immunization and indexation—can entail frequent rebalancing of the bond portfolio. We also note that “passive” stands in contrast to “active” fixed-income strategies that are based on the asset manager’s particular view on interest rate and credit market conditions.

We explain liability-driven investing by demonstrating how to best structure a fixed-income portfolio when considering both the asset and liability sides of the investor’s balance sheet. It is first important to have a thorough understanding of both the timing and relative certainty of future financial obligations. Because it is rare to find a bond investment whose characteristics perfectly match one’s obligations, we introduce the idea of structuring a bond portfolio to match the future cash flows of one or more liabilities that have bond-like characteristics. Asset–liability management (ALM) strategies are based on the concept that investors incorporate both rate-sensitive assets and liabilities into the portfolio decision-making process. When the liabilities are given and assets are managed, liability-driven investing (LDI), a common type of ALM strategy, may be used to ensure adequate funding for an insurance portfolio, a pension plan, or an individual’s budget after retirement. The techniques and risks associated with LDI are introduced using a single liability and then are expanded to cover both cash flow and duration-matching techniques and multiple liabilities. This strategy, known as immunization, may be viewed simply as a special case of interest rate hedging.

We then turn our attention to index-based investment strategies, through which investors gain a broader exposure to fixed-income markets, rather than tailoring investments to match a specific liability profile. We explain the advantages of index-based investing, such as diversification, but we also note that the depth and breadth of bond markets make both creating and tracking an index more challenging than in the equity markets. We also explore a variety of alternatives in matching a bond index, from full replication to enhanced indexing using primary risk factors. Finally, we explain that it is critical to select a benchmark that is most relevant to a specific investor based on factors such as the targeted duration profile and risk appetite.

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## 2. LIABILITY-DRIVEN INVESTING

### **a. describe liability-driven investing**

Let us start with the example of a 45-year-old investor who plans to retire at age 65 and who would like to secure a stable stream of income thereafter. It is quite probable that he currently has a diversified portfolio that includes bonds, equities, and possibly other asset classes. Our focus here is on the fixed-income portion of his overall portfolio. We will assume that the investor builds the bond portfolio (immediately) and will add to it each year. Upon retirement, he plans to sell the bonds and buy an annuity that will pay a fixed benefit for his remaining lifetime. This investor's initial 20-year time horizon is critical to identifying and measuring the impact on retirement income arising from future interest rate volatility, and it forms the initial frame of reference for understanding and dealing with interest rate risk.

More generally, the frame of reference is in the form of a balance sheet of rate-sensitive assets and liabilities. In the example of the 45-year-old investor, the asset is the growing bond portfolio and the liability is the present value of the annuity that the investor requires to satisfy the fixed lifetime benefit.

## **2.1. Liability-Driven Investing vs. Asset-Driven Liabilities**

Liability-driven investing (LDI) and asset-driven liabilities (ADL) are special cases of ALM. The key difference is that with ADL, the assets are given and the liabilities are structured to manage interest rate risk; whereas with LDI, which is much more common, the liabilities are given and the assets are managed. As an example of LDI, a life insurance company acquires a liability portfolio based on the insurance policies underwritten by its sales force. Another example involves the future employee benefits promised by a defined benefit pension plan, which create a portfolio of rate-sensitive liabilities. In each circumstance, the liabilities are defined and result from routine business and financial management decisions. The present value of those liabilities depends on current interest rates (as well as other factors). A life insurance or pension manager will use the estimated interest rate sensitivity of plan liabilities as a starting point when making investment portfolio decisions. This process often requires building a model for the liabilities.

With ADL, the asset side of the balance sheet results from a company's underlying businesses, and the debt manager seeks a liability structure to reduce interest rate risk. One example might be a leasing company with short-term contracts that chooses to finance itself with short-term debt. The company is aiming to match the maturities of its assets and liabilities to minimize risk. Alternatively, a manufacturing company might identify that its operating revenues are highly correlated with the business cycle. Monetary policy is typically

managed so there is positive correlation between interest rates and the business cycle. Central banks lower policy rates when the economy is weak and raise them when it is strong. Therefore, this company has a natural preference for variable-rate liabilities so that operating revenue and interest expense rise and fall together.

## 2.2. Types of Liabilities

An LDI strategy starts with analyzing the size and timing of the entity's liabilities. [Exhibit 1](#) shows a classification scheme for this analysis.

**Exhibit 1. Classification of Liabilities**

Liability Type	Amount of Cash Outlay	Timing of Cash Outlay	Examples	
Type I	Known	Known	Traditional fixed-income bond with no embedded options	MacDur, ModDur, money duration, and the PVBP can be used to measure the interest rate sensitivity
Type II	Known	Uncertain	Callable and putable bonds Term life insurance policy (timing of death unknown)	Effective duration needed to estimate interest rate sensitivity. Calculated using a model for: <ul style="list-style-type: none"> <li>Uncertain amount and/or timing of the cash flows</li> <li>Initial assumption about the yield curve</li> </ul>
Type III	Uncertain	Known	Floating rate note – interest payments depend on future interest rates Inflation-protected securities – amounts of interest and principal payments tied to inflation	
Type IV	Uncertain	Uncertain	Property and casualty insurance (weather events difficult to predict)	

Note that effective duration is needed with Types II, III, and IV liabilities, based on initial assumptions about the yield curve. Then, the yield curve is shifted up and down to obtain new estimates for the present value of the liabilities. We demonstrate this process later for the sponsor of a defined benefit pension plan, which is another example of an entity with Type IV liabilities.

## EXAMPLE 1

Modern Mortgage, a savings bank, decides to establish an ALCO (asset–liability committee) to improve risk management and coordination of its loan and deposit rate-setting processes. Modern’s primary assets are long-term, fixed-rate, monthly payment, fully amortizing residential mortgage loans. The mortgage loans are prime quality and have loan-to-value ratios that average 80%. The loans are pre-payable at par value by the homeowners at no fee. Modern also holds a portfolio of non-callable, fixed-income government bonds (considered free of default risk) of varying maturities to manage its liquidity needs. The primary liabilities are demand and time deposits that are fully guaranteed by a government deposit insurance fund. The demand deposits are redeemable by check or debit card. The time deposits have fixed rates and maturities ranging from 90 days to three years and are redeemable before maturity at a small fee. The banking-sector regulator in the country in which Modern operates has introduced a new capital requirement for savings banks. In accordance with the requirement, contingent convertible long-term bonds are issued by the savings bank and sold to institutional investors. The key feature is that if defaults on the mortgage loans reach a certain level or the savings bank’s capital ratio drops below a certain level, as determined by the regulator, the bonds convert to equity at a specified price per share.

As a first step, the ALCO needs to identify the types of assets and liabilities that comprise its balance sheet using the classification scheme in [Exhibit 1](#). Type I has certain amounts and dates for its cash flows; Type II has known amounts but uncertain dates; Type III has specified dates but unknown amounts; and Type IV has uncertain amounts and dates.

Specify and explain the classification scheme for the following:

1. Residential mortgage loans
2. Government bonds
3. Demand and time deposits
4. Contingent convertible bonds

### Solution to 1:

Residential mortgage loans are Type IV assets to the savings bank. The timing of interest and principal cash flows is uncertain because of the prepayment option held by the homeowner. This type of call option is complex. Homeowners might elect to prepay for many reasons, including sale of the property as well as the opportunity to refinance if interest rates come down. Therefore, a prepayment model is needed to project the

timing of future cash flows. Default risk also affects the projected amount of the cash flow for each date. Even if the *average* loan-to-value ratio is 80%, indicating high-quality mortgages, some loans could have higher ratios and be more subject to default, especially if home prices decline.

### **Solution to 2:**

Fixed-rate government bonds are Type I assets because the coupon and principal payment dates and amounts are determined at issuance.

### **Solution to 3:**

Demand and time deposits are Type II liabilities from the savings bank's perspective. The deposit amounts are known, but the depositor can redeem the deposits prior to maturity, creating uncertainty about timing.

### **Solution to 4:**

The contingent convertible bonds are Type IV liabilities. The presence of the conversion option makes both the amount and timing of cash flows uncertain.

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## **3. INTEREST RATE IMMUNIZATION: MANAGING THE INTEREST RATE RISK OF A SINGLE LIABILITY**

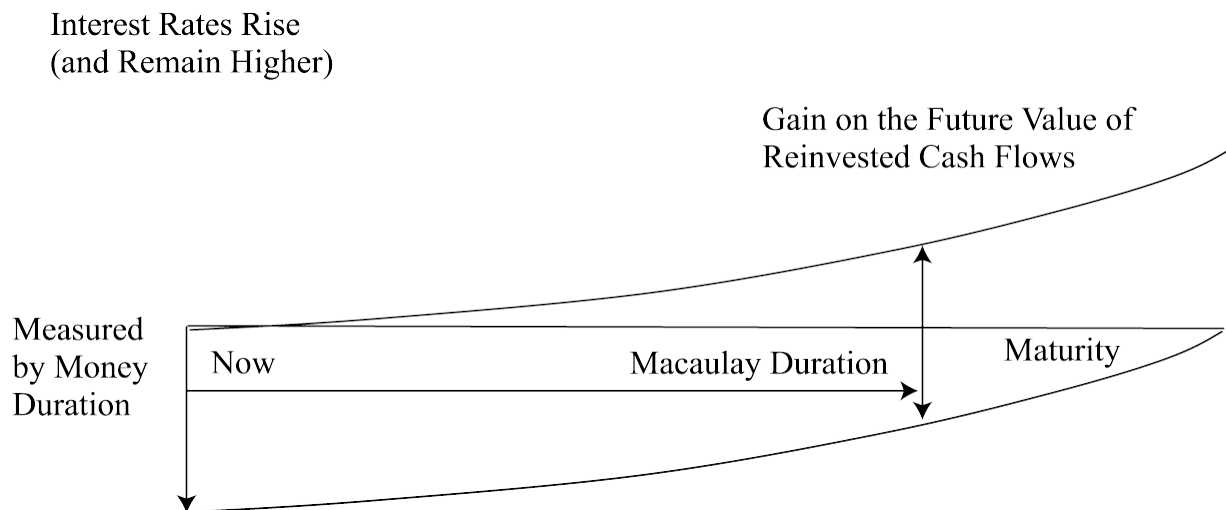
### **b. evaluate strategies for managing a single liability**

Liability-driven investing in most circumstances is used to manage the interest rate risk on multiple liabilities. In this section, we focus on only a single liability to demonstrate the techniques and risks of the classic investment strategy known as interest rate **immunization**. Immunization is the process of structuring and managing a fixed-income bond portfolio to minimize the variance in the realized rate of return over a known time horizon. This variance arises from the volatility of future interest rates. Default risk is neglected at this point because the portfolio bonds are assumed to have default probabilities that approach zero.

The most obvious way to immunize the interest rate risk on a single liability is to buy a zero-coupon bond that matures on the obligation's due date. The bond's face value matches the liability amount. There is no cash flow reinvestment risk because there are no coupon payments to reinvest, and there is no price risk because the bond is held to maturity. Any interest rate volatility over the bond's lifetime is irrelevant in terms of the asset's ability to pay off the liability. The problem is that in many financial markets, zero-coupon bonds are not available. Nevertheless, the perfect immunization provided by a zero-coupon bond sets a standard to measure the performance of immunizing strategies using coupon-bearing bonds.

[Exhibit 2](#) and [Exhibit 3](#) illustrate the connection between immunization and the duration of a traditional coupon-bearing fixed-income bond.

### Exhibit 2. Immunization with a Single Bond: Rate Rise Scenario



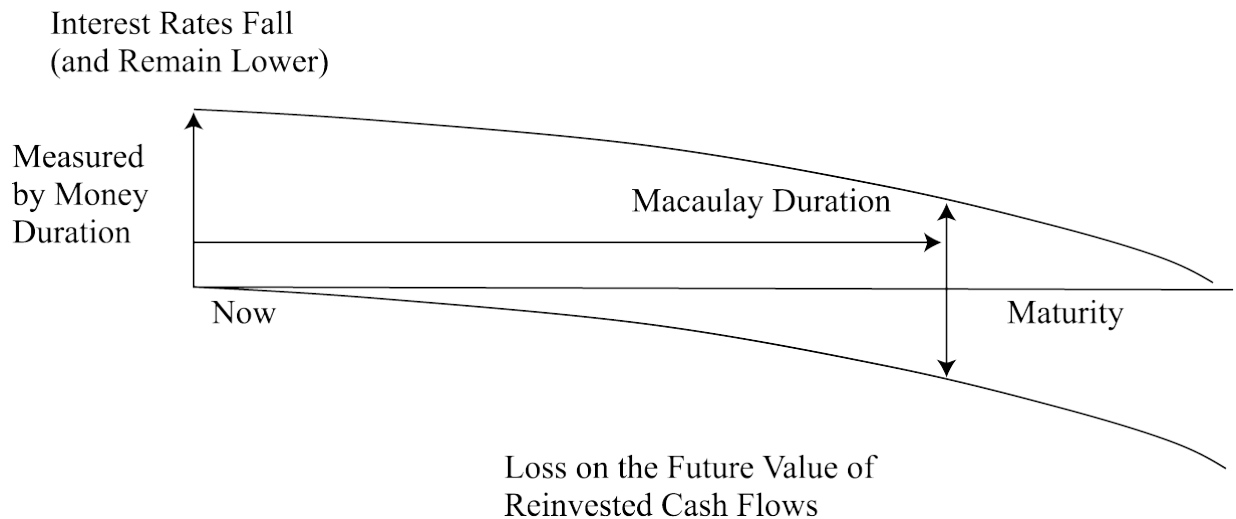
Assume that the bond is currently priced at par value. Then, an instantaneous, one-time, upward (parallel) shift occurs in the yield curve. The bond's value falls. That drop in value is estimated by the money duration of the bond. Recall that the money duration is the bond's modified duration statistic multiplied by the price. Subsequently, the bond price will be "pulled to par" as the maturity date nears (assuming no default, of course). But another factor is at work. Assuming interest rates remain higher, the future value of reinvested coupon payments goes up. It is shown by the rising line as more and more payments are received and reinvested at the higher interest rates.

The key detail to note in [Exhibit 2](#) is that at some point in time, the two effects—the price effect and the coupon reinvestment effect—cancel each other out. The remarkable result is that this point in time turns out to be the bond's Macaulay duration (for a zero-coupon bond, its Macaulay duration is its maturity). Therefore, an investor having an investment horizon



equal to the bond's Macaulay duration is effectively protected, or immunized, from interest rate risk in that price, and coupon reinvestment effects offset for either higher or lower rates. Exhibit 3 shows the same effect for an immediate downward shift in interest rates.

### Exhibit 3. Immunization: Interest Rate Fall Scenario



## 3.1. A Numerical Example of Immunization

We now show that the strategy of matching the Macaulay duration to the investment horizon works for a bond portfolio as well as for an individual security. Suppose that some entity has a single liability of EUR 250 million due 15 February 2027. Further assume that the current date is 15 February 2021, so the investment horizon is six years. The asset manager for the entity seeks to build a three-bond portfolio to earn a rate of return sufficient to pay off the obligation.

### 3.1.1. Portfolio Features

Exhibit 4 reports the prices, yields, risk statistics (Macaulay duration and convexity), and par values for the chosen portfolio. The portfolio's current market value is EUR 200,052,250 (= EUR 47,117,500 + EUR 97,056,750 + EUR 55,878,000). The semi-annual coupon payments on the bonds occur on 15 February and 15 August of each year (note that we have chosen to use bonds that pay coupons semi-annually, which is not always the case). The price is per 100 of par value, and the yield to maturity is on a street-convention semi-annual bond basis (meaning an annual percentage rate having a periodicity of two). Both the Macaulay duration and the convexity are annualized. (Note that in practice, some bond data vendors report the

convexity statistic divided by 100.)

#### Exhibit 4. The Bond Portfolio to Immunize the Single Liability

	2.5-Year Bond	7-Year Bond	10-Year Bond
Coupon rate	1.50%	3.25%	5.00%
Maturity date	15 August 2023	15 February 2028	15 February 2031
Price	100.25	99.75	100.50
Yield to maturity	1.3979%	3.2903%	4.9360%
Par value	47,000,000	97,300,000	55,600,000
Market value	47,117,500	97,056,750	55,878,000
Macaulay duration	2.463	6.316	7.995
Convexity	7.253	44.257	73.747
Allocation	23.55%	48.52%	27.93%

Exhibit 5 shows the cash flows and calculations used to obtain the relevant portfolio statistics. The third column aggregates the coupon and principal payments received for each date from the three bonds.

#### Exhibit 5. Portfolio Statistics

Time	Date	Cash Flow	PV of Cash Flow	Weight	Time × Weight	Dispersion	(
0	15-Feb-21	-200,052,250					
1	15-Aug-21	3,323,625	3,262,282	0.0163	0.0163	1.9735	
2	15-Feb-22	3,323,625	3,202,071	0.0160	0.0320	1.6009	
3	15-	3,323,625	3,142,971	0.0157	0.0471	1.2728	

	Aug-22					
4	15-Feb-23	3,323,625	3,084,962	0.0154	0.0617	0.9871
5	15-Aug-23	50,323,625	45,847,871	0.2292	1.1459	11.2324
6	15-Feb-24	2,971,125	2,656,915	0.0133	0.0797	0.4782
7	15-Aug-24	2,971,125	2,607,877	0.0130	0.0913	0.3260
8	15-Feb-25	2,971,125	2,559,744	0.0128	0.1024	0.2048
9	15-Aug-25	2,971,125	2,512,500	0.0126	0.1130	0.1131
10	15-Feb-26	2,971,125	2,466,127	0.0123	0.1233	0.0493
11	15-Aug-26	2,971,125	2,420,610	0.0121	0.1331	0.0121
12	15-Feb-27	2,971,125	2,375,934	0.0119	0.1425	0.0000
13	15-Aug-27	2,971,125	2,332,082	0.0117	0.1515	0.0116
14	15-Feb-28	100,271,125	77,251,729	0.3862	5.4062	1.5434
15	15-Aug-28	1,390,000	1,051,130	0.0053	0.0788	0.0473
16	15-Feb-	1,390,000	1,031,730	0.0052	0.0825	0.0825

	29					
17	15-Aug-29	1,390,000	1,012,688	0.0051	0.0861	0.1265
18	15-Feb-30	1,390,000	993,997	0.0050	0.0894	0.1788
19	15-Aug-30	1,390,000	975,651	0.0049	0.0927	0.2389
20	15-Feb-31	56,990,000	39,263,380	0.1963	3.9253	12.5585
			200,052,250	1.0000	12.0008	33.0378

For instance, EUR 3,323,625 is the sum of the coupon payments for the first four dates:

$$(1.50\% \times 0.5 \times \text{EUR } 47,000,000) + (3.25\% \times 0.5 \times \text{EUR } 97,300,000) + (5.00\% \times 0.5 \times \text{EUR } 55,600,000) = \text{EUR } 352,500 + \text{EUR } 1,581,125 + \text{EUR } 1,390,000 = \text{EUR } 3,323,625$$

On 15 August 2023, the principal of EUR 47,000,000 is redeemed so that the total cash flow is EUR 50,323,625. The next eight cash flows represent the coupon payments on the second and third bonds, and so forth.

The internal rate of return on the cash flows in column 3 for the 20 semi-annual periods, including the portfolio's initial market value on 15 February 2021, is 1.8804%. Annualized on a semi-annual bond basis, the portfolio's cash flow yield is 3.7608% ( $= 2 \times 1.8804\%$ ). This yield is significantly higher than the market value-weighted average of the individual bond yields-to-maturity presented in [Exhibit 4](#), which equals 3.3043%.

$$(1.3979\% \times 0.2355) + (3.2903\% \times 0.4852) + (4.9360\% \times 0.2793) = 3.3043\%.$$

This difference arises because of the steepness in the yield curve. The key point is that the goal of the immunization strategy is to achieve a rate of return close to 3.76%, not 3.30%.

The fourth column in [Exhibit 5](#) shows the present values for each of the aggregate cash flows, calculated using the internal rate of return per period (1.8804%) as the discount rate. For example, the combined payment of EUR100,271,125 due on 15 February 2028 has a

present value of EUR77,251,729. [Note: Calculations are carried out on a spreadsheet that preserves precision. For readability and to avoid clutter, the exhibits and text report rounded results. For example, the following calculation gives 77,251,498 with the numbers shown on the left hand-side, but it gives 77,251,729, the amount shown on the right hand-side, when the precise semi-annual cash flow yield, 1.0188037819%, is used.]

$$\frac{100,271,125}{(1.018804)^{14}} = 77,251,729.$$

The sum of the present values in column 4 of Exhibit 5 is EUR200,052,250, the current market value for the bond portfolio.

### 3.1.2. Portfolio Duration

The sixth column of Exhibit 5 is used to obtain the portfolio's Macaulay duration. This duration statistic is the weighted average of the times to the receipt of cash flow, whereby the share of total market value for each date is the weight. Column 5 shows the weights, which are the PV of each cash flow divided by the total PV of EUR200,052,250. The times to receipt of cash flow (the times from column 1) are multiplied by the weights and then summed. For example, the contribution to total portfolio duration for the second cash flow on 15 February 2022 is 0.0320 (= 2 × 0.0160). The sum of column 6 is 12.0008. That is the Macaulay duration for the portfolio in terms of semi-annual periods. Annualized, it is 6.0004 (= 12.0008/2). It is now clear why the asset manager for the entity chose this portfolio: The portfolio Macaulay duration matches the investment horizon of six years.

In practice, it is common to estimate the portfolio duration using the market value-weighted average of the individual durations for each bond. [Exhibit 4](#) shows those individual durations and the allocation percentages for each bond. The average Macaulay duration is (2.463 × 0.2355) + (6.316 × 0.4852) + (7.995 × 0.2793) = 5.8776.

The difference, as with the cash flow yield and the market value-weighted average yield, arises because the yield curve is not flat. When the yield curve is upwardly sloped, average duration (5.8776) is less than the portfolio duration (6.0004). This difference in duration statistics is important because using the average duration in building the immunizing portfolio instead of the portfolio duration would introduce model risk to the strategy, as we will see later.

### 3.1.3. Portfolio Dispersion

The sum of the seventh column in [Exhibit 5](#) is the portfolio dispersion statistic. Recall that whereas Macaulay duration is the weighted *average* of the times to receipt of cash flow,

dispersion is the weighted *variance*. It measures the extent to which the payments are spread out around the duration. For example, the contribution to total portfolio dispersion for the fifth cash flow on 15 August 2023 is 11.2324:  $(5 - 12.0008)^2 \times 0.2292 = 11.2324$ .

This portfolio's dispersion is 33.0378 in terms of semi-annual periods. Annualized, it is 8.2594 ( $= 33.0378/4$ ). The Macaulay duration statistic is annualized by dividing by the periodicity of the bonds (two payments per year); dispersion (and convexity, which follows) is annualized by dividing by the periodicity squared (i.e.,  $2^2 = 4$  for semi-annual payment bonds).

### 3.1.4. Portfolio Convexity

The portfolio convexity is calculated with the eighth column. It is the sum of the times to the receipt of cash flow, multiplied by those times plus one, multiplied by the shares of market value for each date (weight), and all divided by one plus the cash flow yield squared. For example, the contribution to the sum for the 14th payment on 15 February 2028 is 81.0931 ( $= 14 \times 15 \times 0.3862$ ). The sum of the column is 189.0580. The convexity in semi-annual periods is 182.1437:

$$\frac{189.0580}{(1.018804)^2} = 182.1437.$$

The annualized convexity for the portfolio is 45.5359 ( $= 182.1437/4$ ). This result is slightly higher than the market value-weighted average of the individual convexity statistics (for each bond) reported in [Exhibit 4](#):

$$(7.253 \times 0.2355) + (44.257 \times 0.4852) + (73.747 \times 0.2793) = 43.7786.$$

As with the average yield and duration, this difference results from the slope of the yield curve. The convexity statistic can be used to improve the estimate for the change in portfolio market value following a change in interest rates than is provided by duration alone. That is, convexity is the second-order effect, whereas duration is the first-order effect.

There is an interesting connection among the portfolio convexity, Macaulay duration, dispersion, and cash flow yield in immunized portfolio convexity, also known as the “portfolio convexity statistic”:

#### Equation (1)

$$\text{Immunized Portfolio Convexity} = \frac{\text{MacDur}^2 + \text{MacDur} + \text{Dispersion}}{(1 + \text{Cash flow yield})^2}.$$

In terms of semi-annual periods, the Macaulay duration for this portfolio is 12.0008, the dispersion is 33.0378, and the cash flow yield is 1.8804%.

$$\text{Immunized Portfolio Convexity} = \frac{12.0008^2 + 12.0008 + 33.0378}{(1.018804)^2} = 182.1437.$$

The portfolio dispersion and convexity statistics are used to assess the structural risk to the interest rate immunization strategy. Structural risk arises from the potential for shifts and twists to the yield curve. This risk is discussed later.

### 3.1.5. *Investment Horizon and Immunization*

We now demonstrate how matching the Macaulay duration for the portfolio to the investment horizon leads to interest rate immunization. The first three columns of Exhibit 6 are identical to the ones in Exhibit 5.

The fourth column shows the values of the cash flows as of the horizon date of 15 February 2027, assuming that the cash flow yield remains unchanged at 3.7608%. For instance, the future value of the EUR3,323,625 in coupon payments received on 15 August 2021 is EUR4,079,520:

$$3,323,625 \times \left(1 + \frac{0.037608}{2}\right)^{11} = 4,079,520.$$

The value of the last cash flow for EUR56,990,000 on 15 February 2031 is EUR49,099,099 as of the horizon date of 15 February 2027:

$$\frac{56,990,000}{\left(1 + \frac{0.037608}{2}\right)^8} = 49,099,099.$$

We assume that all of the payments received before the horizon date are reinvested at the cash flow yield. All of the payments received after the horizon date are sold at their discounted values. The sum of the fourth column in Exhibit 6 is EUR250,167,000, which is more than enough to pay off the EUR250 million liability. The six-year holding period rate of return (ROR), also called the horizon yield, is 3.7608%. It is based on the original market value and the total return and is the solution for ROR:

$$200,052,250 = \frac{250,167,000}{\left(1 + \frac{\text{ROR}}{2}\right)^{12}}, \text{ ROR} = 0.037608.$$

The holding period rate of return equals the cash flow yield for the portfolio. This equivalence is the multi-bond version of the well-known result for a single bond: The realized rate of return matches the yield to maturity only if coupon payments are reinvested at that same yield and if the bond is held to maturity or sold at a point on the constant-yield price trajectory.

### Exhibit 6. Interest Rate Immunization

Time	Date	Cash Flow	Total Return at 3.7608%	Total Return at 2.7608%	Total Return at 4.7608%
0	15-Feb-21	-200,052,250			
1	15-Aug-21	3,323,625	4,079,520	3,864,613	4,305,237
2	15-Feb-22	3,323,625	4,004,225	3,811,992	4,205,138
3	15-Aug-22	3,323,625	3,930,319	3,760,088	4,107,366
4	15-Feb-23	3,323,625	3,857,777	3,708,891	4,011,868
5	15-Aug-23	50,323,625	57,333,230	55,392,367	59,332,093
6	15-Feb-24	2,971,125	3,322,498	3,225,856	3,421,542
7	15-Aug-24	2,971,125	3,261,175	3,181,932	3,341,989
8	15-Feb-25	2,971,125	3,200,984	3,138,607	3,264,286
9	15-	2,971,125	3,141,904	3,095,871	3,188,390



	Aug-25				
10	15-Feb-26	2,971,125	3,083,914	3,053,718	3,114,258
11	15-Aug-26	2,971,125	3,026,994	3,012,138	3,041,850
12	15-Feb-27	2,971,125	2,971,125	2,971,125	2,971,125
13	15-Aug-27	2,971,125	2,916,287	2,930,670	2,902,045
14	15-Feb-28	100,271,125	96,603,888	97,559,123	95,662,614
15	15-Aug-28	1,390,000	1,314,446	1,333,991	1,295,282
16	15-Feb-29	1,390,000	1,290,186	1,315,827	1,265,166
17	15-Aug-29	1,390,000	1,266,373	1,297,911	1,235,750
18	15-Feb-30	1,390,000	1,242,999	1,280,238	1,207,018
19	15-Aug-30	1,390,000	1,220,058	1,262,806	1,178,955
20	15-Feb-31	56,990,000	49,099,099	51,070,094	47,213,270
			250,167,000	250,267,858	250,265,241

### 3.1.6. A Drop in the Cash Flow Yield Scenario

The fifth column in [Exhibit 6](#) repeats the calculations for the assumption of an instantaneous, one-time, 100 bp drop in the cash flow yield on 15 February 2021. The future values of all cash flows received are now lower because they are reinvested at 2.7608% instead of 3.7608%. For example, the payment of EUR50,323,625 on 15 August 2023, which contains the principal redemption on the 2.5-year bond, grows to only EUR55,392,367:

$$50,323,625 \times \left(1 + \frac{0.027608}{2}\right)^7 = 55,392,367.$$

The value of the last cash flow is now higher because it is discounted at the lower cash flow yield:

$$\frac{56,990,000}{\left(1 + \frac{0.027608}{2}\right)^8} = 51,070,094.$$

The important result is that the total return as of the horizon date is EUR250,267,858, demonstrating that the cash flow reinvestment effect is balanced by the price effect, as illustrated for a single bond in [Exhibit 2](#). The holding-period rate of return is 3.7676%:

$$200,052,250 = \frac{250,267,858}{\left(1 + \frac{\text{ROR}}{2}\right)^{12}}, \text{ROR} = 0.037676.$$

### 3.1.7. An Increase in the Cash Flow Yield Scenario

To complete the example, the sixth column in [Exhibit 6](#) reports the results for an instantaneous, one-time, 100 bp jump in the cash flow yield, up to 4.7608% from 3.7608%. In this case, the future values of the reinvested cash flows are higher and the discounted values of cash flows due after the horizon date are lower. Nevertheless, the total return of EUR250,265,241 for the six-year investment horizon is enough to pay off the liability. The horizon yield is 3.7674%:

$$200,052,250 = \frac{250,265,241}{\left(1 + \frac{\text{ROR}}{2}\right)^{12}}, \text{ROR} = 0.037674.$$

This numerical exercise demonstrates interest rate immunization using a portfolio of fixed-income bonds. The total returns and holding period rates of return are virtually the same—in

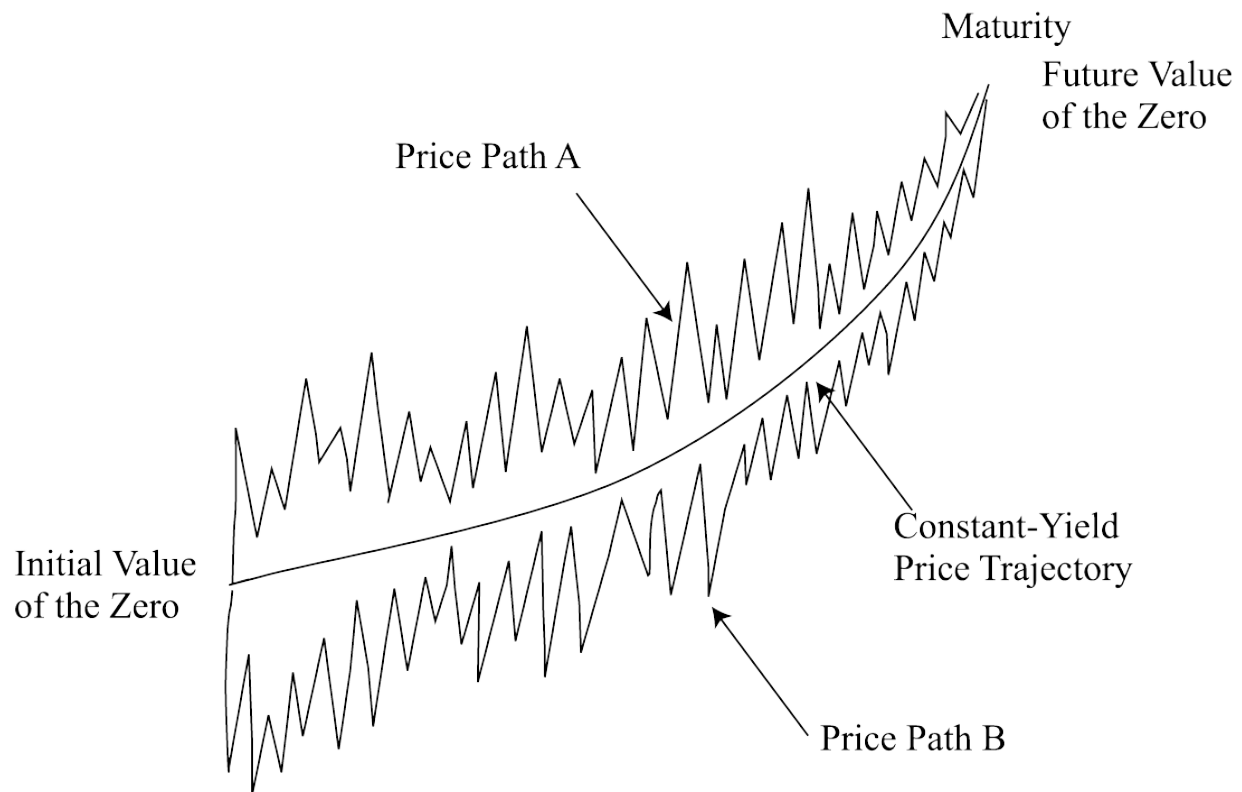
fact, slightly higher because of convexity—whether the cash flow yield goes up or down.

### **3.1.8. Immunization and Rebalancing**

**Exhibit 5** is somewhat misleading, however, because it suggests that immunization is a buy-and-hold passive investment strategy. It suggests that the entity will (a) hold on the horizon date of 15 February 2027 the same positions in what then will be one-year, 3.25% and four-year, 5% bonds and (b) sell the bonds on that date. This suggestion is misleading because the portfolio must be frequently rebalanced to stay on its target duration. As time passes, the portfolio's Macaulay duration changes but not in line with the change in the remainder of the investment horizon. For example, after five years, the investment horizon as of 15 February 2026 is just one remaining year. The portfolio Macaulay duration at that time needs to be 1.000. The asset manager will have had to execute some trades by then, substantially reducing the holdings in what is then the five-year, 5% bond.

**Exhibit 7** offers another way to illustrate interest rate immunization. An immunization strategy is essentially “zero replication.” We know that the perfect bond to lock in the six-year holding period rate of return is a six-year zero-coupon bond having a face value that matches the EUR250 million liability. The idea is to originally structure and then manage over time a portfolio of coupon-bearing bonds that replicates the period-to-period performance of the zero-coupon bond. Therefore, immunization is essentially just an interest rate hedging strategy. As the yield on the zero-coupon bond rises and falls, there will be unrealized losses and gains. In **Exhibit 7**, this is illustrated by the zero-coupon bond's value moving below and above the constant-yield price trajectory. Two paths for the zero-coupon yield are presented: Path A for generally lower rates (and higher values) and Path B for higher rates (and lower values). Regardless, the market value of the zero-coupon bond will be “pulled to par” as maturity nears.

#### **Exhibit 7. Interest Rate Immunization as Zero Replication**



Immunizing with coupon-bearing bonds entails continuously matching the portfolio Macaulay duration with the Macaulay duration of the zero-coupon bond over time and as the yield curve shifts, even though the zero-coupon bond could be hypothetical and not exist in reality. Also, in order to fully match the liability, the bond portfolio's initial market value has to match or exceed the present value of the zero-coupon bond. The Macaulay duration of that, perhaps hypothetical, zero-coupon bond always matches the investment horizon. Immunization will be achieved if any ensuing change in the cash flow yield on the bond portfolio is equal to the change in the yield to maturity on the zero-coupon bond. That equivalence will ensure that the change in the bond portfolio's market value is close to the change in the market value of the zero-coupon bond. Therefore, at the end of the six-year investment horizon, the bond portfolio's market value should meet or exceed the face value of the zero-coupon bond, regardless of the path for interest rates over the six years.

### 3.1.9. Immunization and Shifts in the Yield Curve

The key assumption to achieve immunization is the statement that “any ensuing change in the cash flow yield on the bond portfolio is equal to the change in the yield to maturity on the zero-coupon bond.” A *sufficient*, but not *necessary*, condition for that statement is a parallel (or shape-preserving) shift to the yield curve whereby all yields change by the same amount. *Sufficient* means that if the yield curve shift is parallel, the change in the bond portfolio's cash flow yield will equal the change in yield to maturity of the zero-coupon bond, which is

enough to ensure immunization. To achieve immunization, however, it is not *necessary* that the yield curve shifts in a parallel manner. That is, in some cases, the immunization property can prevail even with non-parallel yield curve movements, such as an upward and steepening shift (sometimes called a “bear steepener”), an upward and flattening shift (a “bear flattener”), a downward and steepening shift (a “bull steepener”), or a downward and flattening shift (a “bull flattener”).

**Exhibits 8** and 9 demonstrate this observation. Exhibit 8 presents three different upward yield curve shifts. The first is a parallel shift of 102.08 bps for each of the three bond yields. The second is a steepening shift of 72.19 bps for the 2.5-year bond, 94.96 bps for the 7-year bond, and 120.82 bps for the 10-year bond. The third is a flattening shift, whereby the yields on the three bonds increase by 145.81 bps, 109.48 bps, and 79.59 bps, respectively. The key point is that each of these yield curve shifts results in the same 100 bp increase in the cash flow yield from 3.7608% to 4.7608%. Moreover, each shift in the yield curve produces virtually the same reduction in the portfolio’s market value.

#### **Exhibit 8. Some Upward Yield Curve Shifts That Achieve Interest Rate Immunization**

	<b>Change in 2.5-Year Yield</b>	<b>Change in 7-Year Yield</b>	<b>Change in 10-Year Yield</b>	<b>Change in Cash Flow Yield</b>	<b>Change in Market Value</b>
Upward and parallel	+102.08 bps	+102.08 bps	+102.08 bps	+100 bps	–11,340,537
Upward and steepening	+72.19 bps	+94.96 bps	+120.82 bps	+100 bps	–11,340,195
Upward and flattening	+145.81 bps	+109.48 bps	+79.59 bps	+100 bps	–11,340,183

**Exhibit 9** shows the results for three downward shifts in the yield curve. The first is a parallel shift of 102.06 bps. The second and third are downward and steepening (–129.00 bps, –104.52 bps, and –92.00 bps for the 2.5-year, 7-year, and 10-year bonds) and downward and flattening (–55.76 bps, –86.32 bps, and –134.08 bps). Each shift results in the same 100 bp decrease in the cash flow yield from 3.7608% to 2.7608% and virtually the same increase in the market value of the portfolio.

## Exhibit 9. Some Downward Yield Curve Shifts That Achieve Interest Rate Immunization

	Change in 2.5-Year Yield	Change in 7-Year Yield	Change in 10-Year Yield	Change in Cash Flow Yield	Change in Market Value
Downward and parallel	−102.06 bps	−102.06 bps	−102.06 bps	−100 bps	12,251,212
Downward and steepening	−129.00 bps	−104.52 bps	−92.00 bps	−100 bps	12,251,333
Downward and flattening	−55.76 bps	−86.32 bps	−134.08 bps	−100 bps	12,251,484

Notice that the interest rate immunization property shown in [Exhibit 6](#) rests only on the change in the cash flow yield going up or down by 100 bps. It is not necessary to assume that the change in the value of the immunizing portfolio arises only from a parallel shift in the yield curve. In the same manner, the immunization property illustrated in [Exhibit 7](#) requires only that the change in the value of the immunizing portfolio, one that has a Macaulay duration matching the investment horizon, is close to the change in the value of the zero-coupon bond that provides perfect immunization. [Exhibits 8](#) and [9](#) demonstrate that some non-parallel as well as parallel shifts can satisfy those conditions. Of course, there are many other non-parallel shifts for which those conditions are not met.

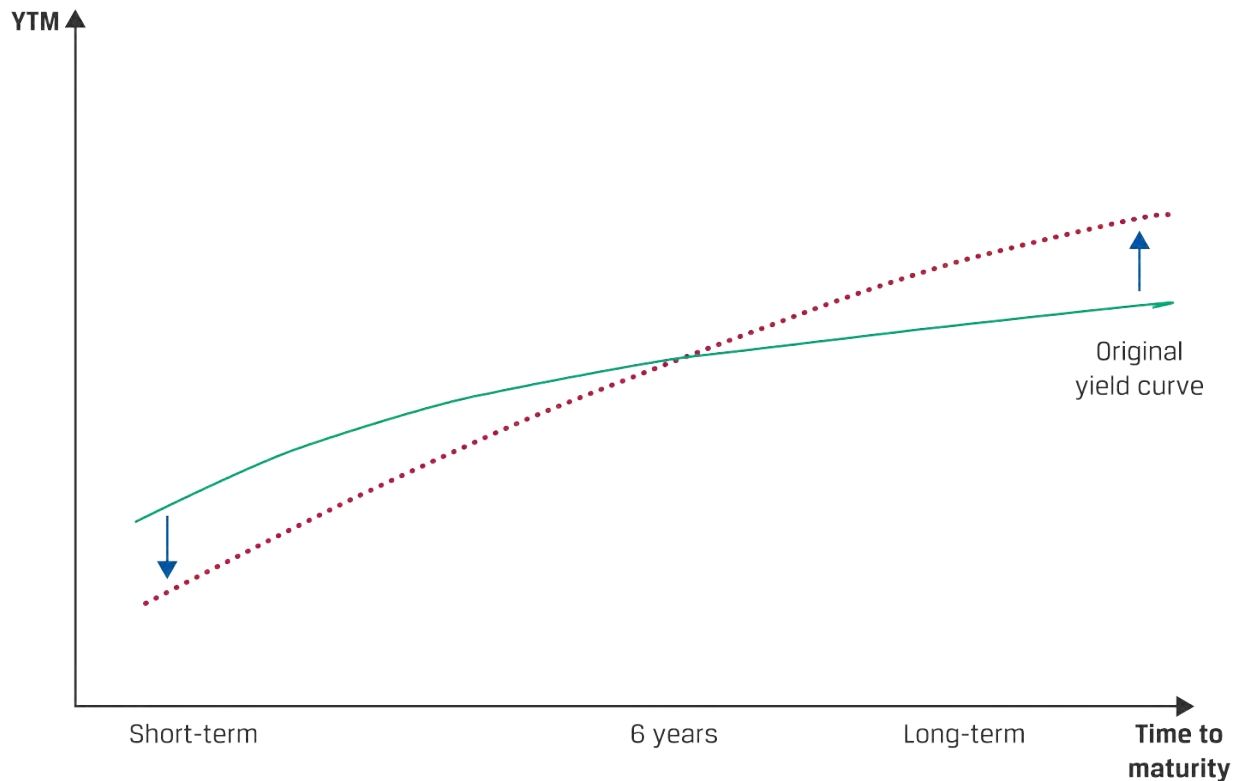
In general, the interest rate risk to an immunization strategy is that the change in the cash flow yield on the portfolio is not the same as on the ideal zero-coupon bond. This difference can occur with twists to the shape of the yield curve, in addition to some non-parallel shifts.

[Exhibits 10](#) and [11](#) portray two such twists. To exaggerate the risk, assume that the immunizing portfolio has a “barbell” structure in that it is composed of half short-term bonds and half long-term bonds. The portfolio Macaulay duration for the barbell is six years. The zero-coupon bond that provides perfect immunization has a maturity (and Macaulay duration) also of six years.

[Exhibit 10](#) shows a steepening twist to the yield curve. The twist is assumed to occur at the six-year point to indicate that the value of the zero-coupon bond does not change. Short-term

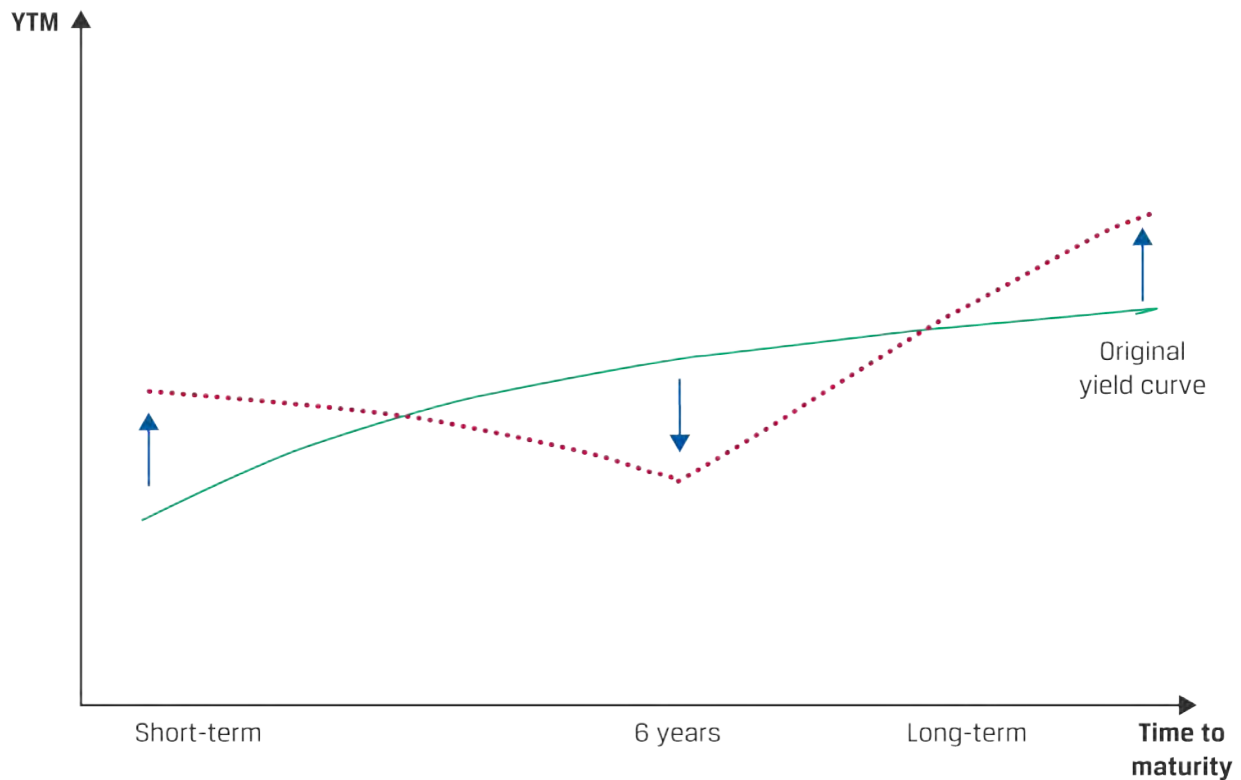
yields go down and long-term yields go up by approximately the same amount. The value of the barbell portfolio goes down because the losses on the long-term positions exceed the gains on the short-term holdings as a result of the difference in duration between the holdings and the equivalence in the assumed changes in yield. Therefore, this portfolio does not track the value of the zero-coupon bond for such a scenario.

### Exhibit 10. Immunization Risk and Steepening Twist



**Exhibit 11** illustrates a dramatic twist in the shape of the yield curve. Short-term and long-term yields go up while the six-year yields go down. This type of twist is a butterfly movement, in this case a “positive butterfly.” (In a “negative butterfly” twist, short-term and long-term yields go down and intermediate-term yields go up.) The immunizing portfolio decreases in value as its yields go up and the zero-coupon bond goes up in value. Again, for this particular scenario, the portfolio does not track the change in the value of the bond that provides perfect immunization. Fortunately for those entities that pursue interest rate immunization, these types of twists are rare. Most yield curve shifts are generally parallel, with some steepening and flattening, especially for maturities beyond a few years.

### Exhibit 11. Immunization Risk and a Butterfly Yield Curve Movement



### 3.1.10. Structural Risk in Immunization Strategy

Exhibits 10 and 11 also illustrate how to reduce **structural risk** to an immunizing strategy. Structural risk arises from portfolio design, particularly the choice of the portfolio allocations. The risk is that yield curve twists and non-parallel shifts lead to changes in the cash flow yield that do not match the yield to maturity of the zero-coupon bond that provides for perfect immunization. Structural risk is reduced by minimizing the dispersion of the bond positions, going from a barbell design to more of a bullet portfolio that concentrates the component bonds' durations around the investment horizon. At the limit, a zero-coupon bond that matches the date of the single obligation has, by design, no structural risk.

**Equation 1** (immunized portfolio convexity) indicates that minimizing portfolio dispersion is the same as minimizing the portfolio convexity for a given Macaulay duration and cash flow yield. An advantage to using convexity to measure the extent of structural risk is that the portfolio statistic can be approximated by the market value-weighted average of the individual bonds' convexities. A problem with estimating portfolio dispersion using the weighted average of dispersion statistics for individual bonds is that it can be misleading. Consider a portfolio of all zero-coupon bonds of varying maturities. Each individual bond has zero dispersion (because it has only one payment), so the market value-weighted average is also zero. Clearly, the portfolio overall can have significant (non-zero) dispersion.

In summary, the characteristics of a bond portfolio structured to immunize a single liability



are that it:

- has an initial market value that equals or exceeds the present value of the liability;
- has a portfolio Macaulay duration that matches the liability's due date;
- minimizes the portfolio convexity statistic.

This portfolio must be regularly rebalanced over the horizon to maintain the target duration, because the portfolio Macaulay duration changes as time passes and as yields change. The portfolio manager needs to weigh the trade-off between incurring transaction costs from rebalancing and allowing some duration gap. This and other risks to immunization—for instance, those arising from the use of interest rate derivatives to match the duration of assets to the investment horizon—are covered later.

## EXAMPLE 2

An institutional client asks a fixed-income investment adviser to recommend a portfolio to immunize a single 10-year liability. It is understood that the chosen portfolio will need to be rebalanced over time to maintain its target duration. The adviser proposes two portfolios of coupon-bearing government bonds because zero-coupon bonds are not available. The portfolios have the same market value. The institutional client's objective is to minimize the variance in the realized rate of return over the 10-year horizon. The two portfolios have the following risk and return statistics:

	<b>Portfolio A</b>	<b>Portfolio B</b>
Cash flow yield	7.64%	7.65%
Macaulay duration	9.98	10.01
Convexity	107.88	129.43

These statistics are based on aggregating the interest and principal cash flows for the bonds that constitute the portfolios; they are not market value-weighted averages of the yields, durations, and convexities of the individual bonds. The cash flow yield is stated on a semi-annual bond basis, meaning an annual percentage rate having a periodicity of two; the Macaulay durations and convexities are annualized.

Indicate the portfolio that the investment adviser should recommend, and explain the reasoning.

**Solution:**

The adviser should recommend Portfolio A. First, notice that the cash flow yields of both portfolios are virtually the same and that both portfolios have Macaulay durations very close to 10, the horizon for the liability. It would be wrong and misleading to recommend Portfolio B because it has a “higher yield” and a “duration closer to the investment horizon of 10 years.” In practical terms, a difference of 1 bp in yield is not likely to be significant, nor is the difference of 0.03 in annual duration.

Given the fact that the portfolio yields and durations are essentially the same, the choice depends on the difference in convexity. The difference between 129.43 and 107.88, however, is meaningful. In general, convexity is a desirable property of fixed-income bonds. All else being equal (meaning the same yield and duration), a more convex bond gains more if the yield goes down and loses less if the yield goes up than a less convex bond.

The client’s objective, however, is to minimize the variance in the realized rate of return over the 10-year horizon. That objective indicates a conservative immunization strategy achieved by building the duration-matching portfolio and minimizing the portfolio convexity. Such an approach minimizes the dispersion of cash flows around the Macaulay duration and makes the portfolio closer to the zero-coupon bond that would provide perfect immunization; see [Equation 1](#).

The structural risk to the immunization strategy is the potential for non-parallel shifts and twists to the yield curve, which lead to changes in the cash flow yield that do not track the change in the yield on the zero-coupon bond. This risk is minimized by selecting the portfolio with the lower convexity (and dispersion of cash flows).

Note that default risk is neglected in this discussion because the portfolio consists of government bonds that presumably have default probabilities approaching zero.

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## 4. INTEREST RATE IMMUNIZATION: MANAGING THE INTEREST RATE RISK OF MULTIPLE LIABILITIES

- c. compare strategies for a single liability and for multiple liabilities, including alternative means of implementation

#### **d. describe construction, benefits, limitations, and risk–return characteristics of a laddered bond portfolio**

The principle of interest rate immunization applies to multiple liabilities in addition to a single liability. For now, we continue to assume that these are Type I cash flows in that the scheduled amounts and payment dates are known to the asset manager. In particular, we assume that the same three bonds from [Exhibits 4 and 5](#), which were assets in the single-liability immunization, are now themselves liabilities to be immunized. This assumption allows us to use the same portfolio statistics as in the previous section. The entity in the examples that follow seeks to immunize the cash flows in column 3 (the cash flow column) of [Exhibit 5](#) from Dates 1 through 20, and so it needs to build a portfolio of assets that will allow it to pay those cash flows. The present value of the (now) corporate debt liabilities is EUR200,052,250. The cash flow yield is 3.76%; the Macaulay duration is 6.00; and the convexity is 45.54. We use the portfolio statistics rather than the market value-weighted averages because they better summarize Type I liabilities.

In this section, we discuss several approaches to manage these liabilities:

- *Cash flow matching*, which entails building a dedicated portfolio of zero-coupon or fixed-income bonds to ensure that there are sufficient cash inflows to pay the scheduled cash outflows (a related concept, the so-called “laddered portfolio,” also falls into the cash flow matching category of approaches);
- *Duration matching*, which extends the ideas of the previous section to a portfolio of debt liabilities;
- *Derivatives overlay*, in particular using futures contracts on government bonds in the immunization strategy; and
- *Contingent immunization*, which allows for active bond portfolio management as long as the surplus is above a designated threshold.

### **4.1. Cash Flow Matching**

A classic strategy to eliminate the interest rate risk arising from multiple liabilities is to build a dedicated asset portfolio of high-quality fixed-income bonds that, as closely as possible, matches the amount and timing of the scheduled cash outflows. “Dedicated” means that the bonds are placed in a held-to-maturity portfolio. A natural question is, if the entity has enough cash to build the dedicated bond portfolio, why not just use that cash to buy back and retire the liabilities? The answer is that the buyback strategy is difficult and costly to implement if the bonds are widely held by buy-and-hold institutional and retail investors. Most corporate bonds are rather illiquid, so buying them back on the open market is likely to

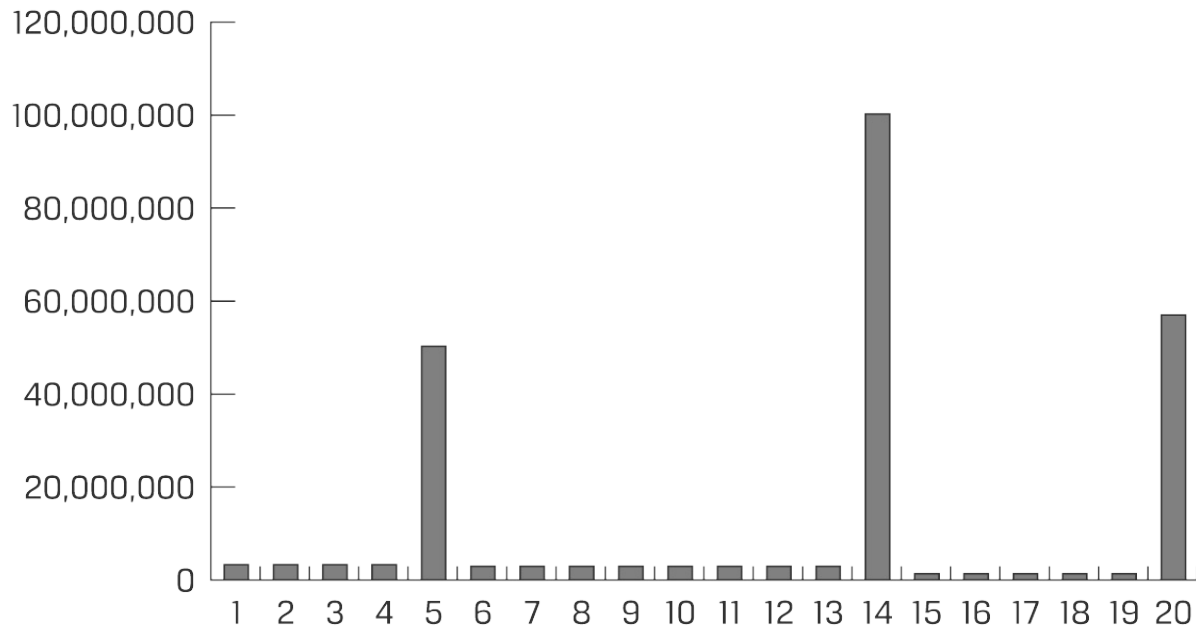
drive up the purchase price. Cash flow matching can be a better use of the available cash assets.

A corporate finance motivation for cash flow matching is to improve the company's credit rating. The entity has sufficient cash assets to retire the debt liabilities, and dedicating the bonds effectively accomplishes that objective. Under some circumstances, a corporation might even be able to remove both the dedicated asset portfolio and the debt liabilities from its balance sheet through the process of **accounting defeasance**. Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities, such as US Treasury notes, to repay the liability.

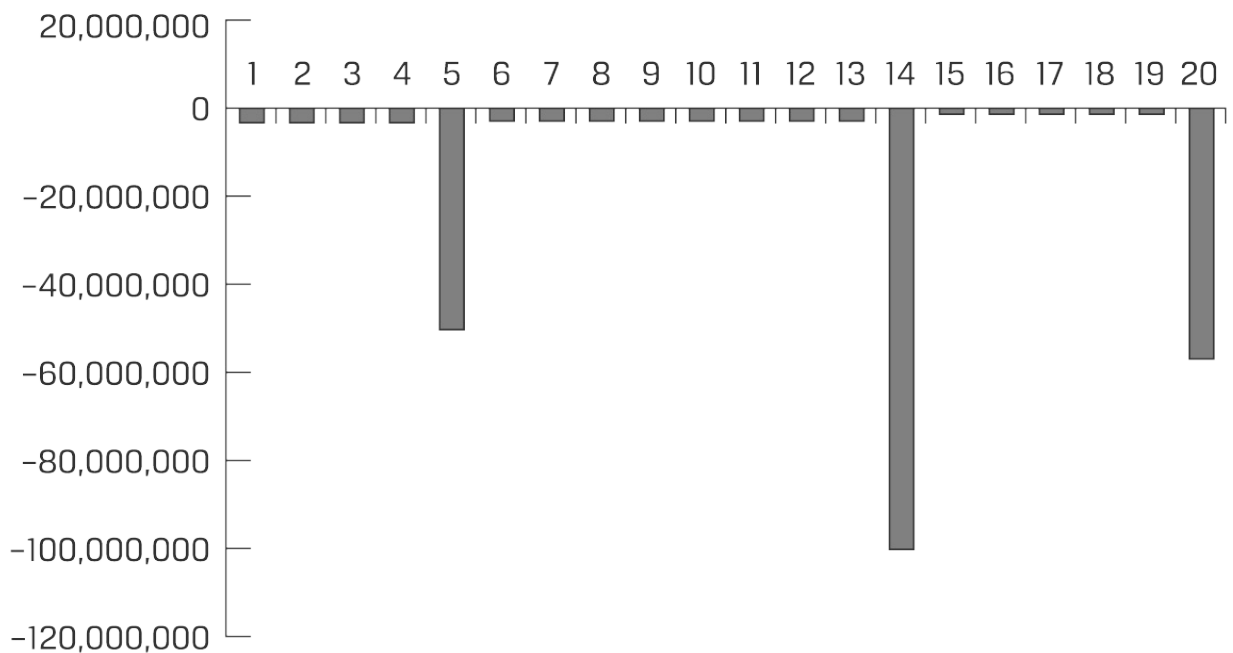
Panel A in [Exhibit 12](#) illustrates the dedicated cash flow matching asset portfolio. These assets could be zero-coupon bonds or traditional fixed-income securities. Panel B represents the amount and timing of the debt liabilities. The amounts come from the third column in [Exhibit 5](#) and are the sum of the coupon and principal payments on the three debt securities.

## Exhibit 12. Cash Flow Matching

### A. Dedicated assets



### B. Debt liabilities



A concern when implementing this strategy is the *cash-in-advance constraint*. That means securities are not sold to meet obligations; instead, sufficient funds must be available on or before each liability payment date to meet the obligation. The design of traditional bonds—a fixed coupon rate and principal redemption at maturity—is a problem if the liability stream, unlike in [Exhibit 12](#), is a level payment annuity. That scenario could lead to large cash holdings between payment dates and, therefore, cash flow reinvestment risk, especially if

yields on high-quality, short-term investments are low (or worse, negative).

### EXAMPLE 3

Alfred Simonsson is assistant treasurer at a Swedish lumber company. The company has sold a large tract of land and now has sufficient cash holdings to retire some of its debt liabilities. The company's accounting department assures Alfred that its external auditors will approve of a defeasement strategy if Swedish government bonds are purchased to match the interest and principal payments on the liabilities. Following is the schedule of payments due on the debt as of June Year 1 that the company plans to defease:

June Year 2	SEK 3,710,000
June Year 3	SEK 6,620,000
June Year 4	SEK 4,410,000
June Year 5	SEK 5,250,000

The following Swedish government bonds are available. Interest on the bonds is paid annually in May of each year.

Coupon Rate	Maturity Date
2.75%	May Year 2
3.50%	May Year 3
4.75%	May Year 4
5.50%	May Year 5

How much in par value for each government bond will Alfred need to buy to defease the debt liabilities, assuming that the minimum denomination in each security is SEK 10,000?

### Solution:

The cash flow matching portfolio is built by starting with the last liability of SEK 5,250,000 in June Year 5. If there were no minimum denomination, that liability could be funded with the 5.50% bonds due May Year 5 having a par value of SEK 4,976,303 ( $= \text{SEK } 5,250,000 / 1.0550$ ). To deal with the constraint, however, Alfred buys SEK

4,980,000 in par value. That bond pays SEK 5,253,900 ( $= \text{SEK } 4,980,000 \times 1.0550$ ) at maturity. This holding also pays SEK 273,900 ( $= \text{SEK } 4,980,000 \times 0.0550$ ) in coupon interest in May Year 2, 3, and 4.

Then move to the June Year 4 obligation, which is SEK 4,136,100 after subtracting the SEK 273,900 received on the 5.50% bond:  $\text{SEK } 4,410,000 - \text{SEK } 273,900 = \text{SEK } 4,136,100$ . Alfred buys SEK 3,950,000 in par value of the 4.75% bond due May Year 4. That bond pays SEK 4,137,625 ( $= \text{SEK } 3,950,000 \times 1.0475$ ) at maturity and SEK 187,625 in interest in May Year 2 and Year 3.

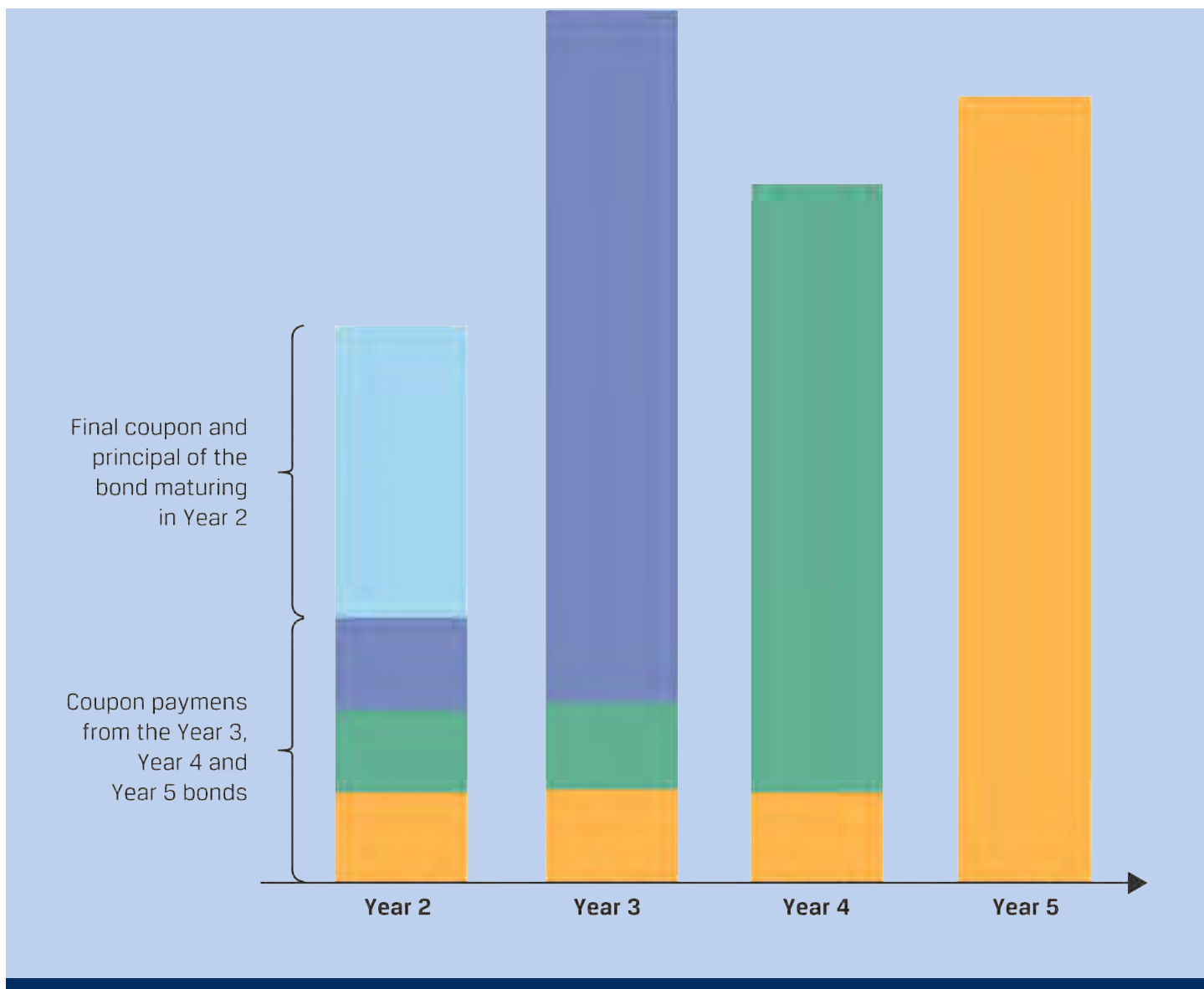
The net obligation in June Year 3 is SEK 6,158,475 ( $= \text{SEK } 6,620,000 - \text{SEK } 273,900 - \text{SEK } 187,625$ ) after subtracting the interest received on the longer-maturity bonds. The company can buy SEK 5,950,000 in par value of the 3.50% bond due May Year 3. At maturity, this bond pays SEK 6,158,250 ( $= \text{SEK } 5,950,000 \times 1.0350$ ). The small shortfall of SEK 225 ( $= \text{SEK } 6,158,475 - \text{SEK } 6,158,250$ ) can be made up because the funds received in May are reinvested until June. This bond also pays SEK 208,250 in interest in May Year 2.

Finally, Alfred needs to buy SEK 2,960,000 in par value of the 2.75% bond due May Year 2. This bond pays SEK 3,041,400 ( $= \text{SEK } 2,960,000 \times 1.0275$ ) in May Year 2. The final coupon and principal, plus the interest on the 5.50%, 4.75%, and 3.50% bonds, total SEK 3,711,175 ( $= \text{SEK } 3,041,400 + \text{SEK } 273,900 + \text{SEK } 187,625 + \text{SEK } 208,250$ ). That amount is used to pay off the June Year 2 obligation of SEK 3,710,000. Note that the excess could be kept in a bank account to cover the Year 3 shortfall.

In sum, Alfred buys the following portfolio:

Bond	Par Value
2.75% due May Year 2	SEK 2,960,000
3.50% due May Year 3	SEK 5,950,000
4.75% due May Year 4	SEK 3,950,000
5.50% due May year 5	SEK 4,980,000

The following chart illustrates the cash flow matching bond portfolio: Each bar represents the par amount of a bond maturing in that year plus coupon payments from bonds maturing in later years.

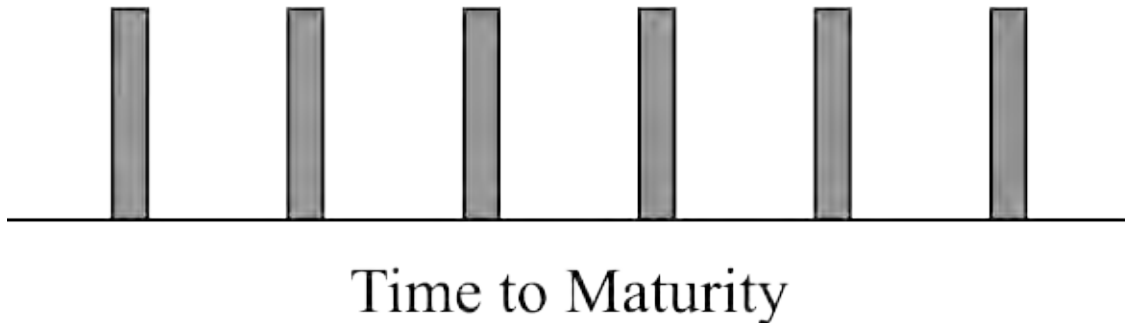


## 4.2. Laddered Portfolios

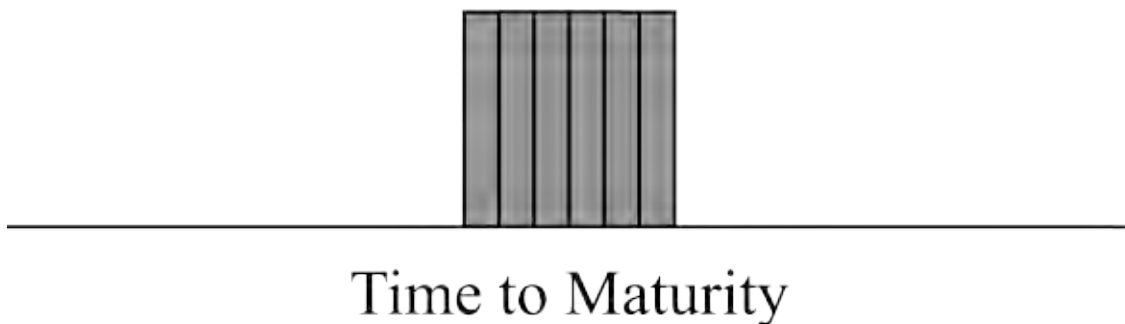
A popular fixed-income investment strategy in the wealth management industry is to build a “laddered” portfolio for clients. [Exhibit 13](#) illustrates this approach, along with two other maturity-based strategies—a “bullet” portfolio and a “barbell” portfolio. The laddered portfolio spreads the bonds’ maturities and par values more or less evenly along the yield curve. The bullet portfolio concentrates the bonds at a particular point on the yield curve, whereas the barbell portfolio places the bonds at the short-term and long-term ends of the curve. In principle, each can have the same portfolio duration statistic and approximately the same change in value for a parallel shift in the yield curve. A non-parallel shift or a twist in the curve, however, leads to very different outcomes for the bullet and barbell structures. An obvious advantage to the laddered portfolio is protection from shifts and twists—the cash flows are essentially “diversified” across the time spectrum.



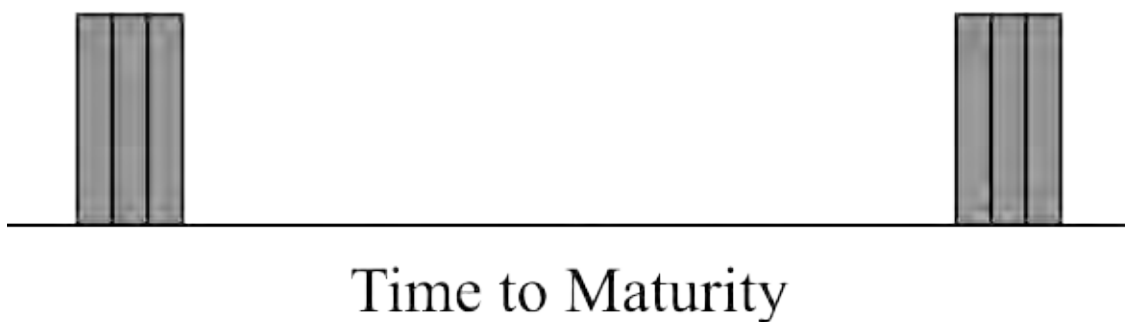
### *A. Laddered Portfolio*



### *B. Bullet Portfolio*



### *C. Barbell Portfolio*



### 4.2.1. Benefits of Using Laddered Portfolios

This “diversification” over time provides the investor a balanced position between the two sources of interest rate risk—cash flow reinvestment and market price volatility. Bonds mature each year and are reinvested at the longer-term end of the ladder, typically at higher rates than short-term securities. Over time, the laddered portfolio likely includes bonds that were purchased at high interest rates as well as low interest rates. Investors familiar with “dollar cost averaging” will see the similarity. In addition, reinvesting funds as bonds mature maintains the duration of the overall portfolio.

Another attractive feature to the laddered portfolio apparent in [Exhibit 13](#) is in convexity. Convexity, technically, is the second-order effect on the value of an asset or liability given a change in the yield to maturity. Importantly, it is affected by the dispersion of cash flows, as indicated in [Equation 1](#), repeated here:

$$\text{Immunized Portfolio Convexity} = \frac{\text{MacDur}^2 + \text{MacDur} + \text{Dispersion}}{(1 + \text{Cash flow yield})^2}.$$

If the three portfolios have the same duration (and cash flow yield), then the barbell clearly has the highest convexity and the bullet the lowest. The laddered portfolio will tend to have relatively high convexity because its cash flows by design are spread over the time line. Compared with the barbell, the laddered portfolio has much less cash flow reinvestment risk.

In practice, perhaps the most desirable aspect of the laddered portfolio is in liquidity management. This aspect is particularly relevant if the bonds are not actively traded, as is the case for many corporate securities. As time passes, there is always a bond that is close to redemption. Its duration will be low so that its price is fairly stable even in a time of interest rate volatility. If the client needs immediate cash, the soon-to-mature bond makes for high-quality collateral on a personal loan or, for an institution, a repo contract. As the bonds mature, the final coupon and principal can be deployed for consumption or reinvested in a long-term bond at the back of the ladder.

### 4.2.2. Using ETFs to Build Laddered Portfolios

Another way for a wealth manager to build a laddered portfolio for a client is to use fixed-maturity corporate bond exchange-traded funds (ETFs). These ETFs have a designated year of maturity and credit risk profile—for instance, 2024 investment-grade corporate bonds. The passively managed, low-cost ETF seeks to replicate the performance of an index of, for instance, 50 held-to-maturity investment-grade corporate bonds that mature in 2021. As discussed in previous sections, the ETF manager can use a stratified sampling approach to track the index.

Suppose that in 2021, the wealth manager buys for the client roughly equal positions in the 2022 through 2029 fixed-maturity corporate bond ETFs. These purchases create a laddered portfolio that should provide the same benefits as holding the bonds directly—price stability in the soonest-to-mature ETF and greater convexity than holding more of a bullet portfolio. Moreover, the ETFs should be more liquid than positions in the actual bonds.

But laddered portfolios are not without limitations. For many investors, the decision to build a laddered bond portfolio should be weighed against buying shares in a fixed-income mutual fund, especially if the portfolio consists of a limited number of corporate bonds. Clearly, the mutual fund provides greater diversification of default risk. Moreover, actual bonds can entail a much higher cost of acquisition. If the entire investment needs to be liquidated, the mutual fund shares can be redeemed more quickly than the bonds can be sold, and likely at a better price.

#### EXAMPLE 4

Mr. Zheng is a Shanghai-based wealth adviser. A major client of his, the Wang family, holds most of its assets in residential property and equity investments and relies on regular cash flows from those holdings. Zheng recommends that the Wang family also have a laddered portfolio of Chinese government bonds. He suggests the following portfolio, priced for settlement on 1 January 2021:

Coupon Rate	Payment Frequency	Maturity	Flat Price	Yield (s.a.)	Par Value (CNY)	Market Value (CNY)
3.22%	Annual	26-Mar-22	101.7493	1.758%	10 Million	10,422,826
3.14%	Annual	8-Sept-24	102.1336	2.508%	10 Million	10,312,292
3.05%	Annual	22-Oct-26	101.4045	2.764%	10 Million	10,199,779
2.99%	Semi-annual	15-Oct-29	101.4454	2.803%	10 Million	10,208,611
					40 Million	41,143,508

The yields to maturity on the first three bonds have been converted from a periodicity of one to two in order to report them on a consistent semi-annual bond basis, as indicated by “(s.a.).” The total market value of the portfolio is CNY 41,143,508. The cash flow

yield for the portfolio is 2.661%, whereas the market value-weighted average yield is 2.455%.

Most important for his presentation to the senior members of the Wang family is the schedule for the 30 cash flows:

1	26-Mar-21	322,000	16	8-Sep-24	10,314,000
2	15-Apr-21	149,500	17	15-Oct-24	149,500
3	8-Sep-21	314,000	18	22-Oct-24	305,000
4	15-Oct-21	149,500	19	15-Apr-25	149,500
5	22-Oct-21	305,000	20	15-Oct-25	149,500
6	26-Mar-22	10,322,000	21	22-Oct-25	305,000
7	15-Apr-22	149,500	22	15-Apr-26	149,500
8	8-Sep-22	314,000	23	15-Oct-26	149,500
9	15-Oct-22	149,500	24	22-Oct-26	10,305,000
10	22-Oct-22	305,000	25	15-Apr-27	149,500
11	15-Apr-23	149,500	26	15-Oct-27	149,500
12	8-Sep-23	314,000	27	15-Apr-28	149,500
13	15-Oct-23	149,500	28	15-Oct-28	149,500
14	22-Oct-23	305,000	29	15-Apr-29	149,500
15	15-Apr-24	149,500	30	15-Oct-29	10,149,500

Indicate the main points that Zheng should emphasize in this presentation about the laddered portfolio to senior members of the Wang family.

### Solution:

Zheng should emphasize three features of the portfolio:

- 1. High credit quality.** Given that the family already has substantial holdings in residential property and equity, which are subject to price volatility and risk, investments in government bonds provide the Wang family with holdings in a very low-risk asset class.
- 2. Liquidity.** The schedule of payments shows that coupon payments are received each year. These funds can be used for any cash need, including household expenses. The large principal payments can be reinvested in longer-term

government bonds at the back of the ladder.

3. **Yield curve diversification.** The bond investments are spread out along four segments of the government bond yield curve. If they were concentrated at a single point, the portfolio would have the risk of higher yields at that point. By spreading out the maturities in the ladder formation, the portfolio has the benefit of diversification.

## 4.3. Duration Matching

- e. **evaluate liability-based strategies under various interest rate scenarios and select a strategy to achieve a portfolio's objectives**

Duration matching to immunize multiple liabilities is based on similar principles to those covered earlier in relation to a single liability. A portfolio of fixed-income bonds is structured and managed to track the performance of the zero-coupon bonds that would perfectly lock in the rates of return needed to pay off the corporate debt liabilities identified in [Exhibit 5](#). Recall that in the case of a single liability, the immunization strategy is to match the portfolio Macaulay duration with the investment horizon. Also, the initial investment needs to match (or exceed) the present value of the liability. These two conditions can be combined to prescribe that the money duration of the immunizing portfolio matches the money duration of the debt liabilities. Money duration, or “dollar duration,” is the portfolio modified duration multiplied by the market value (recall that modified duration is the portfolio Macaulay duration divided by one plus the cash flow yield per period). With multiple liabilities, matching money durations is useful because the market values and cash flow yields of the assets and liabilities are not necessarily equal.

The money duration for the debt liabilities is EUR 1,178,237,935:

$$\left[ \frac{\text{Portfolio MacDur}}{\left( 1 + \frac{\text{Annualized CF Yield}}{2} \right)} \right] \times \text{PV of Debt liabilities}$$
$$= \left[ \frac{6.0004}{\left( 1 + \frac{0.037608}{2} \right)} \right] \times 200,052,250 = 1,178,237,935.$$

The term in brackets is the annualized modified duration for the bond portfolio. To keep the numbers manageable, we use the basis point value (BPV) measure for money duration. This measure is the money duration multiplied by 1 bp. The BPV is EUR 117,824 (= EUR 1,178,237,935  $\times$  0.0001). For each 1 bp change in the cash flow yield, the market value changes by approximately EUR 117,824. It is an approximation because convexity is not included. A closely related risk measure is the present value of a basis point (PVBP), also called the PV01 (present value of an “01,” meaning 1 bp) and, in North America, the DV01 (dollar value of an “01”).

**Exhibit 14** shows the three bonds purchased by the asset manager on 15 February 2021. The total cash outlay on that date is EUR 202,224,094 (= EUR 41,772,719 + EUR 99,750,000 + EUR 60,701,375 = the market values of the three bonds). **Exhibit 15** presents the table used to calculate the cash flow yield and the risk statistics. The annualized cash flow yield is 3.5822%. It is the internal rate of return on the cash flows in the second column of **Exhibit 15**, multiplied by two. The annualized Macaulay duration for the portfolio is 5.9308 (= 11.8615/2), and the modified duration is 5.8264 (= 5.9308/[1 + 0.035822/2]). The annualized dispersion and convexity statistics are 12.3048 (= 49.2194/4) and 48.6846 (= {201.7767/[1 + 0.035822/2]<sup>2</sup>}/4), respectively. Notice that the first few cash flows for the assets in **Exhibit 15** are less than the liability payments in **Exhibit 5**. That disparity indicates that some of the bonds held in the asset portfolio will need to be sold to meet the obligations.

#### Exhibit 14. The Bond Portfolio to Immunize the Multiple Liabilities

	1.5-Year Bond	6-Year Bond	11.5-Year Bond
Coupon rate	1.00%	2.875%	4.50%
Maturity date	15 August 2022	15 February 2027	15 August 2032
Price	99.875	99.75	100.25
Yield to maturity	1.0842%	2.9207%	4.4720%
Par value	41,825,000	100,000,000	60,550,000
Market value	41,772,719	99,750,000	60,701,375
Macaulay duration	1.493	5.553	9.105
Convexity	2.950	34.149	96.056
Allocation	20.657%	49.326%	30.017%

#### Exhibit 15. Portfolio Statistics

<b>Time</b>	<b>Date</b>	<b>Cash Flow</b>	<b>PV of Cash Flow</b>	<b>Weight</b>	<b>Time × Weight</b>	<b>Dispersion</b>
0	15-Feb-21	−202,224,094				
1	15-Aug-21	3,009,000	2,956,054	0.0146	0.0146	1.7245
2	15-Feb-22	3,009,000	2,904,040	0.0144	0.0287	1.3966
3	15-Aug-22	44,834,000	42,508,728	0.2102	0.6306	16.5068
4	15-Feb-23	2,799,875	2,607,951	0.0129	0.0516	0.7970
5	15-Aug-23	2,799,875	2,562,062	0.0127	0.0633	0.5965
6	15-Feb-24	2,799,875	2,516,981	0.0124	0.0747	0.4276
7	15-Aug-24	2,799,875	2,472,692	0.0122	0.0856	0.2890
8	15-Feb-25	2,799,875	2,429,183	0.0120	0.0961	0.1791
9	15-Aug-25	2,799,875	2,386,440	0.0118	0.1062	0.0966
10	15-Feb-26	2,799,875	2,344,449	0.0116	0.1159	0.0402
11	15-Aug-26	2,799,875	2,303,196	0.0114	0.1253	0.0085
12	15-	102,799,875	83,075,901	0.4108	4.9297	0.0079

	Feb-27					
13	15-Aug-27	1,362,375	1,081,607	0.0053	0.0695	0.0069
14	15-Feb-28	1,362,375	1,062,575	0.0053	0.0736	0.0240
15	15-Aug-28	1,362,375	1,043,878	0.0052	0.0774	0.0508
16	15-Feb-29	1,362,375	1,025,510	0.0051	0.0811	0.0869
17	15-Aug-29	1,362,375	1,007,465	0.0050	0.0847	0.1315
18	15-Feb-30	1,362,375	989,738	0.0049	0.0881	0.1844
19	15-Aug-30	1,362,375	972,323	0.0048	0.0914	0.2450
20	15-Feb-31	1,362,375	955,214	0.0047	0.0945	0.3129
21	15-Aug-31	1,362,375	938,406	0.0046	0.0974	0.3875
22	15-Feb-32	1,362,375	921,894	0.0046	0.1003	0.4686
23	15-Aug-32	61,912,375	41,157,805	0.2035	4.6811	25.2505
			202,224,094	1.0000	11.8615	49.2194

The market value of the immunizing fixed-income bonds is EUR 202,224,094. That amount



is higher than the value of the liabilities, which is EUR 200,052,250. The reason for the difference in market values as of 15 February 2021 is the difference in the cash flow yields. The high-quality assets needed to immunize the corporate liabilities have a cash flow yield of 3.5822%, which is lower than the cash flow yield of 3.7608% on the debt obligations. The assets grow at a lower rate and, therefore, need to start at a higher level. If we discount the debt liabilities scheduled in the third column of [Exhibit 5](#) at 3.5822%, the present value is EUR 202,170,671, indicating that initially, the immunizing portfolio is slightly overfunded. Importantly, the asset portfolio BPV is EUR 117,824 ( $= 202,224,094 \times 5.8264 \times 0.0001$ ), matching the BPV for the debt liabilities.

There is another meaningful difference in the structure of the asset and liability portfolios. Although the money durations are the same, the dispersion and convexity statistics for the assets are greater than for the liabilities—12.30 compared with 8.26 for dispersion, and 48.68 compared with 45.54 for convexity. This difference is required to achieve immunization for multiple liabilities. (Mathematically, in the optimization problem, to minimize the difference in the change in the values of assets and liabilities, the first derivative leads to matching money duration [or BPV] and the second derivative to having higher dispersion.) Intuitively, this condition follows from the general result that, for equal durations, a more convex portfolio generally outperforms a less convex portfolio (higher gains if yields fall, lower losses if yields rise). But, as in the case of immunizing a single liability, the dispersion of the assets should be as low as possible subject to being greater than or equal to the dispersion of the liabilities to mitigate the effect of non-parallel shifts in the yield curve. Note that from [Equation 1](#), higher dispersion implies higher convexity when the Macaulay durations and cash flow yields are equal.

### **4.3.1. Duration Matching—Parallel Shift Example**

Some numerical examples are useful to illustrate that immunization of multiple liabilities is essentially an interest rate risk hedging strategy. The idea is that changes in the market value of the asset portfolio closely match changes in the debt liabilities whether interest rates rise or fall. [Exhibits 16](#) through [19](#) demonstrate this dynamic.

First, we allow the yield curve to shift upward in a parallel manner. The yields on the bonds in [Exhibit 14](#) go up instantaneously by 25 bps on 15 February 2021, immediately after the asset portfolio is purchased. That increase results in a drop in market value of EUR 2,842,408. The yields on the debt liabilities in [Exhibit 5](#) also go up by 25 bps, dropping the market value by EUR 2,858,681. The difference is EUR 16,273, a small amount given that the size of portfolios exceeds EUR 200 million. This scenario implicitly assumes no change in the corporate entity's credit risk.

	<b>Immunizing Assets</b>	<b>Debt Liabilities</b>	<b>Difference</b>
ΔMarket value	–2,842,408	–2,858,681	16,273
ΔCash flow yield	0.2437%	0.2449%	–0.0012%
ΔPortfolio BPV	–2,370	–2,207	–163

Next, we shift the yield curve downward by 25 bps. Both the asset and liability portfolios gain market value by almost the same amount. The difference is only EUR 12,504.

#### **Exhibit 17. Immunizing Multiple Liabilities: Downward Parallel Shift**

<b>Downward Parallel Shift</b>	<b>Immunizing Assets</b>	<b>Debt Liabilities</b>	<b>Difference</b>
ΔMarket value	2,900,910	2,913,414	–12,504
ΔCash flow yield	–0.2437%	–0.2449%	0.0012%
ΔPortfolio BPV	2,429	2,256	173

The driving factor behind the success of the strategy given these upward and downward shifts is that the portfolio durations are matched and changes in the cash flow yields are very close: 24.37 bps for the assets and 24.49 bps for the liabilities. In [Exhibit 17](#), the asset portfolio rises slightly less than the liabilities when the yield curve shifts down in a parallel manner by 25 bps. Hence, the loss is EUR 12,504 despite the greater convexity of the assets. That disparity is explained by the slightly higher decrease in the cash flow yield on the liabilities. As explained in the previous section, a parallel shift is a sufficient but not necessary condition for immunization. Although not shown in the exhibits, an upward non-parallel shift of 15.9 bps in the 1.5-year bond, 23.6 bps in the 6-year bond, and 27.5 bps in the 11.5-year bond leads to virtually the same change in market value (EUR 2,842,308) as the 25 bp parallel shift. Those particular changes are chosen because they result in the same change in the cash flow yield of 24.37 bps.

#### **4.3.2. Duration Matching—Yield Curve Twist Scenario**

The structural risk to the immunization strategy is apparent in [Exhibit 18](#). This scenario is

the steepening twist in which short-term yields on high-quality bonds go down while long-term yields go up. The 1.5-year yield is assumed to drop by 25 bps. The 6-year yield remains the same, and the 11.5-year yield goes up by 25 bps. These changes lead to a loss of EUR 1,178,071 in the asset portfolio as the cash flow yield increases by 10.04 bps. The maturities of the debt liabilities differ from those of the assets. For simplicity, we assume that those yields change in proportion to the differences in maturity around the six-year pivot point for the twist. The 2.5-year yield drops by 19.44 bps ( $= 25 \text{ bps} \times 3.5/4.5$ ), the 7-year yield goes up by 4.55 bps ( $= 25 \text{ bps} \times 1/5.5$ ), and the 10-year goes up by 18.18 bps ( $= 25 \text{ bps} \times 4/5.5$ ). The market value of the liabilities drops by only EUR 835,156 because the cash flow yield increases by only 7.11 bps. The value of the assets goes down by more than the liabilities—the difference is EUR 342,915. The steepening twist to the shape of the yield curve is the source of the loss.

### Exhibit 18. Immunizing Multiple Liabilities: Steepening Twist

	Immunizing Assets	Debt Liabilities	Difference
ΔMarket value	−1,178,071	−835,156	−342,915
ΔCash flow yield	0.1004%	0.0711%	0.0293%
ΔPortfolio BPV	−984	−645	−339

The results of the fourth scenario show that a flattening twist can lead to a comparable gain if long-term high-quality yields fall while short-term yields rise (Exhibit 19). We make the same assumptions about proportionate changes in the yields. In this case, the cash flow yield of the assets goes down more and the market value rises higher than the debt liabilities. Clearly, an entity that pursues immunization of multiple liabilities hopes that steepening twists are balanced out by flattening twists and that most yield curve shifts are more or less parallel.

### Exhibit 19. Immunizing Multiple Liabilities: Flattening Twist

	Immunizing Assets	Debt Liabilities	Difference
ΔMarket value	1,215,285	850,957	364,328
ΔCash flow yield	−0.1027%	−0.0720%	−0.0307%
ΔPortfolio BPV	1,016	658	358

The above illustrations (in Exhibits 16-19) also report the changes in the portfolio BPVs for the assets and liabilities. Before the yield curve shifts and twists, the BPVs are matched at EUR 117,824. Afterward, there is a small money duration mismatch. In theory, the asset manager needs to rebalance the portfolio immediately. In practice, the manager likely waits until the mismatch is large enough to justify the transaction costs in selling some bonds and buying others. Another method to rebalance the portfolio is to use interest rate derivatives.

## EXAMPLE 5

A Japanese corporation recently sold one of its lines of business and would like to use the cash to retire the debt liabilities that financed those assets. Summary statistics for the multiple debt liabilities, which range in maturity from three to seven years, are market value, JPY 110.4 billion; portfolio modified duration, 5.84; portfolio convexity, 46.08; and BPV, JPY 64.47 million.

An investment bank working with the corporation offers three alternatives to accomplish the objective:

- 1. Bond tender offer.** The corporation would buy back the debt liabilities on the open market, paying a premium above the market price. The corporation currently has a single-A rating and hopes for an upgrade once its balance sheet is improved by retiring the debt. The investment bank anticipates that the tender offer would have to be at a price commensurate with a triple-A rating to entice the bondholders to sell. The bonds are widely held by domestic and international institutional investors.
- 2. Cash flow matching.** The corporation buys a portfolio of government bonds that matches, as closely as possible, the coupon interest and principal redemptions on the debt liabilities. The investment bank is highly confident that the corporation's external auditors will agree to accounting defeasement because the purchased bonds are government securities. That agreement will allow the corporation to remove both the defeasing asset portfolio and the liabilities from the balance sheet.
- 3. Duration matching.** The corporation buys a portfolio of high-quality corporate bonds that matches the duration of the debt liabilities. Interest rate derivatives contracts will be used to keep the duration on its target as time passes and yields change. The investment bank thinks it is very unlikely that the external auditors will allow this strategy to qualify for accounting defeasement. The corporation can explain to investors and the rating agencies in the management section of its annual report, however, that it is aiming to "effectively defease" the debt. To carry out this

strategy, the investment bank suggests three different portfolios of investment-grade corporate bonds that range in maturity from 2 years to 10 years. Portfolio A has a market value of about JPY 115 billion, which is sufficient to pay off the liabilities.

	Portfolio A	Portfolio B
Modified duration	5.60	5.61
Convexity	42.89	50.11
BPV (in millions)	JPY 64.50	JPY 64.51

After some deliberation and discussion with the investment bank and its auditors, the corporation's CFO chooses Strategy 3, duration matching.

1. Indicate the likely trade-offs that led the corporate CFO to choose the duration matching strategy over the tender offer and cash flow matching strategies.
2. Indicate the portfolio that the corporation should choose to implement the duration matching strategy.

### Solution to 1:

The likely trade-offs are between removing the debt liabilities either by directly buying the bonds from investors or by accounting for cash flow matching, and the cost of the strategy. The tender offer of bonds at a triple-A price, which would likely be considerably higher than the current price. Cash flow matching entails buying even more expensive bonds. The duration-matching strategy can be implemented at a lower cost because the portfolio consists of less expensive investment-grade bonds. The lowest-cost strategy, even though the debt liabilities will remain

### Solution to 2:

The corporation should recommend Portfolio B. Portfolio C closely matches the modified duration (as well as the convexity) of the liabilities. If the market values of the assets and liabilities differ, however, even if the money durations, in particular the BPVs. The choice then comes between A and B. Although both have BPVs close to the liabilities, it is important to note that B's BPV is "closer."

The important difference between Portfolios A and B lies in the

































































































































































# GLOSSARY

## A

### **Absolute return benchmark**

A minimum target return that an investment manager is expected to beat.

### **Accounting defeasance**

Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

### **Accumulation phase**

Phase where the government predominantly contributes to a sovereign wealth pension reserve fund.

### **Active management**

A portfolio management approach that allows risk factor mismatches relative to a benchmark index causing potentially significant return differences between the active portfolio and the underlying benchmark.

### **Active return**

Portfolio return minus benchmark return.

### **Active risk**

The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

### **Active risk budgeting**

Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

## **Active share**

A measure of how similar a portfolio is to its benchmark. A manager who precisely replicates the benchmark will have an Active Share of zero; a manager with no holdings in common with the benchmark will have an Active Share of one.

## **Activist short selling**

A hedge fund strategy in which the manager takes a short position in a given security and then publicly presents his/her research backing the short thesis.

## **After-tax excess return**

Calculated as the after-tax return of the portfolio minus the after-tax return of the associated benchmark portfolio.

## **Agency trade**

A trade in which the broker is engaged to find the other side of the trade, acting as an agent. In doing so, the broker does not assume any risk for the trade.

## **Alpha decay**

In a trading context, alpha decay is the erosion or deterioration in short term alpha after the investment decision has been made.

## **Alternative trading systems**

(ATS) Non-exchange trading venues that bring together buyers and sellers to find transaction counterparties. Also called *multilateral trading facilities (MTF)*.

## **Anchoring and adjustment**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anchoring and adjustment bias**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anomalies**

Apparent deviations from market efficiency.

## **Arithmetic attribution**

An attribution approach which explains the arithmetic difference between the portfolio return and its benchmark return. The single-period attribution effects sum to the excess return, however, when combining multiple periods, the sub-period attribution effects will not sum to the excess return.

## **Arrival price**

In a trading context, the arrival price is the security price at the time the order was released to the market for execution.

## **Asset location**

The type of account an asset is held within, e.g., taxable or tax deferred.

## **Asset-only**

With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

## **Asset swap spread (ASW)**

The spread over MRR on an interest rate swap for the remaining life of the bond that is equivalent to the bond's fixed coupon.

## **Asset swaps**

Convert a bond's fixed coupon to MRR plus (or minus) a spread.

## **Authorized participants**

Institutional investors who create and redeem ETF shares using an OTC primary market with an ETF sponsor.

## **Availability bias**

An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

# **B**

## **Back-fill bias**

The distortion in index or peer group data which results when returns are reported to a database only after they are known to be good returns.

## **Barbell**

A fixed-income investment strategy combining short- and long-term bond positions.

## **Base**

With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in “one unit of a currency.”

## **Base-rate neglect**

A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

## **Basis risk**

The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

## **Bear flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in short-term bond yields-to-maturity.

## **Bear spread**

An option strategy that becomes more valuable when the price of the underlying asset declines, so requires buying one option and writing another with a *lower* exercise price. A put bear spread involves buying a put with a higher exercise price and selling a put with a lower exercise price. A bear spread can also be executed with calls.

## **Bear steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in long-term bond yields-to-maturity.

## **Behavioral finance macro**

A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.



## **Behavioral finance micro**

A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

## **Bequest**

The transferring, or bequeathing, of assets in some other way upon a person's death. Also referred to as a testamentary bequest or testamentary gratuitous transfer.

## **Best-in-class**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *positive screening*.

## **Bid price**

In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

## **Breadth**

The number of truly independent decisions made each year.

## **Buffering**

Establishing ranges around breakpoints that define whether a stock belongs in one index or another.

## **Bull flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in long-term bond yields-to-maturity.

## **Bull spread**

An option strategy that becomes more valuable when the price of the underlying asset rises, so requires buying one option and writing another with a *higher* exercise price. A call bull spread involves buying a call with a lower exercise price and selling a call with a higher exercise price. A bull spread can also be executed with puts.

## **Bull steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in short-term bond yields-to-maturity.

## **Bullet**

A fixed-income investment strategy that focuses on the intermediate term (or “belly”) of the yield curve.

## **Business cycle**

Fluctuations in GDP in relation to long-term trend growth, usually lasting 9-11 years.

## **Butterfly spread**

A measure of yield curve shape or curvature equal to double the intermediate yield-to-maturity less the sum of short- and long-term yields-to-maturity.

## **Butterfly strategy**

A common yield curve shape strategy that combines a long or short bullet position with a barbell portfolio in the opposite direction to capitalize on expected yield curve shape changes.

# **C**

## **Calendar rebalancing**

Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

## **Calendar spread**

A strategy in which one sells an option and buys the same type of option but with different expiration dates, on the same underlying asset and with the same strike. When the investor buys the more distant (near-term) call and sells the near-term (more distant) call, it is a long (short) calendar spread.

## **Canada model**

Characterized by a high allocation to alternatives. Unlike the endowment model, however, the Canada model relies more on internally managed assets. The innovative features of the Canada model are the: a) reference portfolio, b) total portfolio approach, and c) active management.

## **Capital gain or loss**

For tax purposes equals the selling price (net of commissions and other trading costs) of the asset less its tax basis.

## **Capital market expectations**

(CME) Expectations concerning the risk and return prospects of asset classes.

## **Capital needs analysis**

See *capital sufficiency analysis*.

## **Capital sufficiency analysis**

The process by which a wealth manager determines whether a client has, or is likely to accumulate, sufficient financial resources to meet his or her objectives; also known as *capital needs analysis*.

## **Capture ratio**

A measure of the manager's gain or loss relative to the gain or loss of the benchmark.

## **Carhart model**

A four factor model used in performance attribution. The four factors are: market (RMRF), size (SMB), value (HML), and momentum (WML).

## **Carry trade**

A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

## **Carry trade across currencies**

A strategy seeking to benefit from a positive interest rate differential across currencies by combining a short position (or borrowing) in a low-yielding currency and a long position (or lending) in a high-yielding currency.

## **Cash drag**

Tracking error caused by temporarily uninvested cash.

## **Cash flow matching**

Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives.

## **Cash-secured put**

An option strategy involving the writing of a put option and simultaneously depositing an amount of money equal to the exercise price into a designated account (this strategy is also called a fiduciary put).

## **CDS curve**

Plot of CDS spreads across maturities for a single reference entity or group of reference entities in an index.

## **Cell approach**

See *stratified sampling*.

## **Charitable gratuitous transfers**

Asset transfers to not-for-profit or charitable organizations. In most jurisdictions charitable donations are not subject to a gift tax and most jurisdictions permit income tax deductions for charitable donations.

## **Charitable remainder trust**

A trust setup to provide income for the life of named-beneficiaries. When the last named-beneficiary dies any remaining assets in this trust are distributed to the charity named in the trust, hence the term *charitable remainder* trust.

## **Closet indexer**

A fund that advertises itself as being actively managed but is substantially similar to an index fund in its exposures.

## **Cognitive cost**

The effort involved in processing new information and updating beliefs.

## **Cognitive dissonance**

The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

## **Cognitive errors**

Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

## **Collar**

An option position in which the investor is long shares of stock and then buys a put with an exercise price below the current stock price and writes a call with an exercise price above the current stock price. Collars allow a shareholder to acquire downside protection through a protective put but reduce the cash outlay by writing a covered call.

## **Completion overlay**

A type of overlay that addresses an indexed portfolio that has diverged from its proper exposure.

## **Completion portfolio**

Is an index-based portfolio that when added to a given concentrated asset position creates an overall portfolio with exposures similar to the investor's benchmark.

## **Conditional value at risk**

(CVaR) Also known as expected loss The average portfolio loss over a specific time period conditional on that loss exceeding the value at risk (VaR) threshold.

## **Confirmation bias**

A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

## **Conjunction fallacy**

An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

## **Conservatism bias**

A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

## **Contingent immunization**

Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

## **Controlled foreign corporation (CFC)**

A company located outside a taxpayer's home country in which the taxpayer has a controlling interest as defined under the home country law.

## **Covered call**

An option strategy in which a long position in an asset is combined with a short position in a call on that asset.

## **Covered interest rate parity**

The relationship among the spot exchange rate, the forward exchange rate, and the interest rate in two currencies that ensures that the return on a hedged (i.e., covered) foreign risk-free investment is the same as the return on a domestic risk-free investment. Also called *interest rate parity*.

## **Credit cycle**

The expansion and contraction of credit over the business cycle, which translates into asset price changes based on default and recovery expectations across maturities and rating categories.

## **Credit default swap (CDS) basis**

Yield spread on a bond, as compared to CDS spread of same tenor.

## **Credit loss rate**

The realized percentage of par value lost to default for a group of bonds equal to the bonds' default rate multiplied by the loss severity.

## **Credit migration**

The change in a bond's credit rating over a certain period.

## **Credit valuation adjustment (CVA)**

The present value of credit risk for a loan, bond, or derivative obligation.

## **Cross-currency basis swap**

An interest rate swap involving the periodic exchange of floating payments in one currency for another based upon respective market reference rates with an initial and final exchange of notional principal.

## **Cross hedge**

A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

## **Cross-sectional consistency**

A feature of expectations setting which means that estimates for all classes reflect the same underlying assumptions and are generated with methodologies that reflect or preserve important relationships among the asset classes, such as strong correlations. It is the internal consistency across asset classes.

## **Cross-sectional momentum**

A managed futures trend following strategy implemented with a cross-section of assets (within an asset class) by going long those that are rising in price the most and by shorting those that are falling the most. This approach generally results in holding a net zero (market-neutral) position and works well when a market's out- or underperformance is a reliable predictor of its future performance.

## **Currency overlay**

A type of overlay that helps hedge the returns of securities held in foreign currency back to the home country's currency.

## **Currency overlay programs**

A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

## **Custom security-based benchmark**

Benchmark that is custom built to accurately reflect the investment discipline of a particular investment manager. Also called a *strategy benchmark* because it reflects a manager's particular strategy.

## **D**

## **Decision price**

In a trading context, the decision price is the security price at the time the investment decision was made.

### **Decision-reversal risk**

The risk of reversing a chosen course of action at the point of maximum loss.

### **Decumulation phase**

Phase where the government predominantly withdraws from a sovereign wealth pension reserve fund.

### **Dedicated short-selling**

A hedge fund strategy in which the manager takes short-only positions in equities deemed to be expensively priced versus their deteriorating fundamental situations. Short exposures may vary only in terms of portfolio sizing by, at times, holding higher levels of cash.

### **Default intensity**

POD over a specified time period in a reduced form credit model.

### **Default risk**

Likelihood that a borrower will default or fail to meet its obligation to make full and timely payments of principal and interest according to the terms of a debt obligation.

### **Deferred annuity**

An annuity that enables an individual to purchase an income stream that will begin at a later date.

### **Defined benefit**

A retirement plan in which a plan sponsor commits to paying a specified retirement benefit.

### **Defined contribution**

A retirement plan in which contributions are defined but the ultimate retirement benefit is not specified or guaranteed by the plan sponsor.

### **Delay cost**



The (trading related) cost associated with not submitting the order to the market in a timely manner.

## **Delta**

The change in an option's price in response to a change in price of the underlying, all else equal.

## **Delta hedging**

Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

## **Demand deposits**

Accounts that can be drawn upon regularly and without notice. This category includes checking accounts and certain savings accounts that are often accessible through online banks or automated teller machines (ATMs).

## **Diffusion index**

An index that measures how many indicators are pointing up and how many are pointing down.

## **Direct market access**

(DMA) Access in which market participants can transact orders directly with the order book of an exchange using a broker's exchange connectivity.

## **Disability income insurance**

A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

## **Discount margin**

The discount (or required) margin is the yield spread versus the MRR such that the FRN is priced at par on a rate reset date.

## **Discretionary portfolio management**

An arrangement in which a wealth manager has a client's pre-approval to execute investment decisions.

## **Discretionary trust**

A trust that enables the trustee to determine whether and how much to distribute based on a beneficiary's general welfare.

## **Disposition effect**

As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

## **Dividend capture**

A trading strategy whereby an equity portfolio manager purchases stocks just before their ex-dividend dates, holds these stocks through the ex-dividend date to earn the right to receive the dividend, and subsequently sells the shares.

## **Domestic asset**

An asset that trades in the investor's domestic currency (or home currency).

## **Domestic currency**

The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

## **Domestic-currency return**

A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

## **Double taxation**

A term used to describe situations in which income is taxed twice. For example, when corporate earnings are taxed at the company level and then that portion of earnings paid as dividends is taxed again at the investor level.

## **Drawdown**

A decline in value (represented by a series of negative returns only) following a peak fund valuation.

## **Drawdown duration**

The total time from the start of the drawdown until the cumulative drawdown recovers to zero.

## **Due diligence**

Investigation and analysis in support of an investment action, decision, or recommendation.

## **Duration matching**

Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

## **Duration times spread**

Weighting of spread duration by credit spread in order to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage, rather than absolute, basis.

## **Duration Times Spread (DTS)**

Weighting of spread duration by credit spread to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage rather than absolute basis.

## **Dynamic asset allocation**

A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

## **Dynamic hedge**

A hedge requiring adjustment as the price of the hedged asset changes.

# **E**

## **Earnings risk**

The risk associated with the earning potential of an individual.

## **Econometrics**

The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

## **Economic balance sheet**

A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet*.

## **Economic indicators**

Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

## **Economic net worth**

The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

## **Effective federal funds (FFE) rate**

The fed funds rate actually transacted between depository institutions, not the Fed's target federal funds rate.

## **Emotional biases**

Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

## **Empirical duration**

Estimation of the price-yield relationship using historical bond market data in statistical models.

## **Endowment bias**

An emotional bias in which people value an asset more when they hold rights to it than when they do not.

## **Endowment model**

Characterized by a high allocation to alternative investments (private investments and hedge funds), significant active management, and externally managed assets.

## **Enhanced indexing approach**

Maintains a close link to the benchmark but attempts to generate a modest amount of outperformance relative to the benchmark.

## **Enhanced indexing strategy**

Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

## **Equity monetization**

A group of strategies that allow investors to receive cash for their concentrated stock positions without an outright sale. These transactions are structured to avoid triggering the capital gains tax.

## **Estate**

Consists of all of the property a person owns or controls, which may consist of financial assets (e.g., bank accounts, stocks, bonds, business interests), tangible personal assets (e.g., artwork, collectibles, vehicles), immovable property (e.g., residential real estate, timber rights), and intellectual property (e.g., royalties).

## **Estate planning**

The process of preparing for the disposition of one's estate upon death and during one's lifetime.

## **Estate tax**

Levied on the total value of a deceased person's assets and paid out of the estate before any distributions to beneficiaries.

## **Evaluated pricing**

*See matrix pricing.*

## **Excess return**

Used in various senses appropriate to context: 1) The difference between the portfolio return and the benchmark return; 2) The return in excess of the risk-free rate.

## **Excess spread**

Credit spread return measure that incorporates both changes in spread and expected credit losses for a given period.

## **Exchange fund**

A partnership in which each of the partners have each contributed low cost-basis stock to the fund. Used in the United States as a mechanism to achieve a tax-free exchange of a concentrated asset position.

## **Execution cost**

The difference between the (trading related) cost of the real portfolio and the paper portfolio, based on shares and prices transacted.

## **Exhaustive**

An index construction strategy that selects every constituent of a universe.

## **Expected shortfall**

The average loss conditional on exceeding the VaR cutoff; sometimes referred to as *conditional VaR* or *expected tail loss*.

## **Expected tail loss**

See *expected shortfall*.

## **Extended portfolio assets and liabilities**

Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

# **F**

## **Factor-model-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

## **Family constitution**

Typically a non-binding document that sets forth an agreed-upon set of rights, values, and responsibilities of the family members and other stakeholders. Used by many wealth- and business-owning families as the starting point of conflict resolution

procedures.

## **Family governance**

The process for a family's collective communication and decision making designed to serve current and future generations based on the common values of the family.

## **Financial capital**

The tangible and intangible assets (excluding human capital) owned by an individual or household.

## **Fixed trust**

Distributions to beneficiaries of a fixed trust are specified in the trust document to occur at certain times or in certain amounts.

## **Forced heirship**

Is the requirement that a certain proportion of assets must pass to specified family members, such as a spouse and children.

## **Foreign assets**

Assets denominated in currencies other than the investor's home currency.

## **Foreign currency**

Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

## **Foreign-currency return**

The return of the foreign asset measured in foreign-currency terms.

## **Forward rate bias**

An empirically observed divergence from interest rate parity conditions that active investors seek to benefit from by borrowing in a lower-yield currency and investing in a higher-yield currency.

## **Foundation**

A legal entity available in certain jurisdictions. Foundations are typically set up to hold assets for a specific charitable purpose, such as to promote education or for

philanthropy. When set up and funded by an individual or family and managed by its own directors, it is called a *private foundation*. The term *family foundation* usually refers to a private foundation where donors or members of the donors' family are actively involved.

## **Framing**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Framing bias**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Fulcrum securities**

Partially-in-the-money claims (not expected to be repaid in full) whose holders end up owning the reorganized company in a corporate reorganization situation.

## **Full replication approach**

When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

## **Fund-of-funds**

A fund of hedge funds in which the fund-of-funds manager allocates capital to separate, underlying hedge funds (e.g., single manager and/or multi-manager funds) that themselves run a range of different strategies.

## **Funding currencies**

The low-yield currencies in which borrowing occurs in a carry trade.

# **G**

## **G-spread**

Yield spread for a fixed-rate bond over a government benchmark.

## **Gamblers' fallacy**



A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

## **Gamma**

The change in an option's delta for a change in price of the underlying, all else equal.

## **General account**

Account holding assets to fund future liabilities from traditional life insurance and fixed annuities, the products in which the insurer bears all the risks—particularly mortality risk and longevity risk.

## **Generation-skipping tax**

Taxes levied in some jurisdictions on asset transfers (gifts) that skip one generation such as when a grandparent transfers assets to their grandchildren. (see related Gift Tax).

## **Gift tax**

Depending on the tax laws of the country, assets gifted by one person to another during the giftor's lifetime may be subject to a gift tax.

## **Goals-based**

With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

## **Goals-based investing**

An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

## **Green bonds**

Fixed-income instruments issued by private or public sector borrowers that directly fund ESG initiatives.

## **Grinold–Kroner model**

An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

# H

## **Halo effect**

An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

## **Hard-catalyst event-driven approach**

An event-driven approach in which investments are made in reaction to an already announced corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) in which security prices related to the event have yet to fully converge.

## **Hazard rate**

The conditional POD, or the likelihood that default will occur given that it has not already occurred in a prior period.

## **Health insurance**

A type of insurance used to cover health care and medical costs.

## **Health risk**

The risk associated with illness or injury.

## **Hedge ratio**

The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

## **Herding**

When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

## **High-water mark**

A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

## **Hindsight bias**

A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

### **Holdings-based attribution**

A “buy and hold” attribution approach which calculates the return of portfolio and benchmark components based upon the price and foreign exchange rate changes applied to daily snapshots of portfolio holdings.

### **Holdings-based style analysis**

A bottom-up style analysis that estimates the risk exposures from the actual securities held in the portfolio at a point in time.

### **Holistic balance sheet**

*See economic balance sheet.*

### **Home bias**

A preference for securities listed on the exchanges of one’s home country.

### **Home-country bias**

The favoring of domestic over non-domestic investments relative to global market value weights.

### **Home currency**

*See domestic currency.*

### **Human capital**

An implied asset; the net present value of an investor’s future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital*.

## **I**

### **I-spread (interpolated spread)**

Yield spread measure using swaps or constant maturity Treasury YTM as a benchmark.

## **Illusion of control**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Illusion of control bias**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Immediate annuity**

An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

## **Immunization**

An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

## **Impact investing**

Investment approach that seeks to achieve targeted social or environmental objectives along with measurable financial returns through engagement with a company or by direct investment in projects or companies.

## **Implementation shortfall**

(IS) The difference between the return for a notional or paper portfolio, where all transactions are assumed to take place at the manager's decision price, and the portfolio's actual return, which reflects realized transactions, including all fees and costs.

## **Implied volatility**

The outlook for the future volatility of the underlying asset's price. It is the value (i.e., standard deviation of underlying's returns) that equates the model (e.g., Black–Scholes–Merton model) price of an option to its market price.

## **Implied volatility surface**

A three-dimensional plot, for put and call options on the same underlying asset, of days to expiration ( $x$ -axis), option strike prices ( $y$ -axis), and implied volatilities ( $z$ -axis). It

simultaneously shows the volatility skew (or smile) and the term structure of implied volatility.

### **Incremental VaR (or partial VaR)**

The change in the minimum portfolio loss expected to occur over a given time period at a specific confidence level resulting from increasing or decreasing a portfolio position.

### **Information coefficient**

Formally defined as the correlation between forecast return and actual return. In essence, it measures the effectiveness of investment insight.

### **Inheritance tax**

Paid by each individual beneficiary of a deceased person's estate on the value of the benefit the individual received from the estate.

### **Input uncertainty**

Uncertainty concerning whether the inputs are correct.

### **Interaction effect**

The attribution effect resulting from the interaction of the allocation and selection decisions.

### **Intertemporal consistency**

A feature of expectations setting which means that estimates for an asset class over different horizons reflect the same assumptions with respect to the potential paths of returns over time. It is the internal consistency over various time horizons.

### **Intestate**

A person who dies without a valid will or with a will that does not dispose of their property are considered to have died intestate.

### **Intrinsic value**

The difference between the spot exchange rate and the strike price of a currency option.

### **Investment currencies**

The high-yielding currencies in a carry trade.

## **Investment policy statement**

A written planning document that describes a client's investment objectives and risk tolerance over a relevant time horizon, along with the constraints that apply to the client's portfolio.

## **Investment style**

A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

## **Irrevocable trust**

The person whose assets are used to create the trust gives up the right to rescind the trust relationship and regain title to the trust assets.

# **K**

## **Key person risk**

The risk that results from over-reliance on an individual or individuals whose departure would negatively affect an investment manager.

## **Key rate duration**

A method of measuring interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

## **Knock-in/knock-out**

Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

# **L**

## **Leading economic indicators**

A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

## **Liability-based mandates**

Mandates managed to match or cover expected liability payments (future cash outflows) with future projected cash inflows.

## **Liability-driven investing**

An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

## **Liability driven investing (LDI) model**

In the LDI model, the primary investment objective is to generate returns sufficient to cover liabilities, with a focus on maximizing expected surplus return (excess return of assets over liabilities) and managing surplus volatility.

## **Liability glide path**

A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

## **Liability insurance**

A type of insurance used to manage liability risk.

## **Liability-relative**

With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

## **Liability risk**

The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

## **Life-cycle finance**

A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

## **Life insurance**

A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

## **Life settlement**

The sale of a life insurance contract to a third party. The valuation of a life settlement typically requires detailed biometric analysis of the individual policyholder and an understanding of actuarial analysis.

## **Limited-life foundations**

A type of foundation where founders seek to maintain control of spending while they (or their immediate heirs) are still alive.

## **Liquidity budget**

The portfolio allocations (or weightings) considered acceptable for the liquidity categories in the liquidity classification schedule (or time-to-cash table).

## **Liquidity classification schedule**

A liquidity management classification (or table) that defines portfolio liquidity “buckets” or categories based on the estimated time it would take to convert assets in that particular category into cash.

## **Longevity risk**

The risk of outliving one’s financial resources.

## **Loss-aversion bias**

A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

## **Loss severity**

Also known as loss given default (LGD). The amount of loss if a default occurs, usually expressed as a percentage in annual terms.

# **M**

## **Macro attribution**

Attribution at the sponsor level.

## **Manager peer group**



See *manager universe*.

## **Manager universe**

A broad group of managers with similar investment disciplines. Also called *manager peer group*.

## **Matrix pricing**

An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

## **Matrix pricing (or evaluated pricing)**

Methodology for pricing infrequently traded bonds using bonds from similar issuers and actively traded government benchmarks to establish a bond's fair value.

## **Mental accounting bias**

An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

## **Micro attribution**

Attribution at the portfolio manager level.

## **Minimum-variance hedge ratio**

A mathematical approach to determining the optimal cross hedging ratio.

## **Mission-related investing**

Aims to direct a significant portion of assets in excess of annual grants into projects promoting a foundation's mission.

## **Model uncertainty**

Uncertainty as to whether a selected model is correct.

## **Mortality table**

A table that indicates individual life expectancies at specified ages.

## **Multi-class trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and involves buying and selling different classes of shares of the same company, such as voting and non-voting shares.

### **Multi-manager fund**

Can be of two types—one is a multi-strategy fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund; the second type is a fund of hedge funds (or fund-of-funds) in which the manager allocates capital to separate, underlying hedge funds that themselves run a range of different strategies.

### **Multi-strategy fund**

A fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund.

### **Multilateral trading facilities**

(MTF) See *Alternative trading systems (ATS)*.

## **N**

### **Negative butterfly**

An increase in the butterfly spread due to lower short- and long-term yields-to-maturity and a higher intermediate yield-to-maturity.

### **Negative screening**

An ESG implementation approach that excludes certain sectors or companies that deviate from an investor's accepted standards.

### **Non-deliverable forwards**

Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

### **Nonstationarity**

A characteristic of series of data whose properties, such as mean and variance, are not constant through time. When analyzing historical data it means that different parts of a

data series reflect different underlying statistical properties.

## **Norway model**

Characterized by an almost exclusive reliance on public equities and fixed income (the traditional 60/40 equity/bond model falls under the Norway model), with largely passively managed assets and with very little to no allocation to alternative investments.

## **O**

### **OAS duration**

The change in bond price for a given change in OAS.

### **Offer price**

The price at which a counterparty is willing to sell one unit of the base currency.

### **Opportunity cost**

The (trading related) cost associated with not being able to transact the entire order at the decision price.

### **Option-adjusted spread (OAS)**

A generalization of the Z-spread yield spread calculation that incorporates bond option pricing based on assumed interest rate volatility.

### **Optional stock dividends**

A type of dividend in which shareholders may elect to receive either cash or new shares.

### **Options on bond futures contracts**

Instruments that involve the right, but not the obligation, to enter into a bond futures contract at a pre-determined strike (bond price) on a future date in exchange for an up-front premium.

### **Overbought**

When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

## **Overconfidence bias**

A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

## **Overlay**

A derivative position (or positions) used to adjust a pre-existing portfolio closer to its objectives.

## **Oversold**

The opposite of overbought; see *overbought*.

# **P**

## **Packeting**

Splitting stock positions into multiple parts.

## **Pairs trading**

An equity market-neutral strategy that capitalizes on the misalignment in prices of pairs of similar under- and overvalued equities. The expectation is the differential valuations or trading relationships will revert to their long-term mean values or their fundamentally-correct trading relationships, with the long position rising and the short position declining in value.

## **Parameter uncertainty**

Uncertainty arising because a quantitative model's parameters are estimated with error.

## **Participant/cohort option**

Pools the DC plan member with a cohort that has a similar target retirement date.

## **Participant-switching life-cycle options**

Automatically switch DC plan members into a more conservative asset mix as their age increases. There may be several automatic de-risking switches at different age targets.

## **Passive investment**

In the fixed-income context, it is investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

## **Passive management**

A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

## **Percent-range rebalancing**

An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

## **Performance attribution**

Attribution, including return attribution and risk attribution; often used as a synonym for return attribution.

## **Permanent life insurance**

A type of life insurance that provides lifetime coverage.

## **Portfolio overlay**

An array of derivative positions managed separately from the securities portfolio to achieve overall intended portfolio characteristics.

## **Position delta**

The overall or portfolio delta. For example, the position delta of a covered call, consisting of long 100 shares and short one at-the-money call, is +50 (= +100 for the shares and -50 for the short ATM call).

## **Positive butterfly**

A decrease in the butterfly spread due to higher short- and long-term yields-to-maturity and a lower intermediate yield-to-maturity.

## **Positive screening**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *best-in-class*.

## **Post-liquidation return**

Calculates the return assuming that all portfolio holdings are sold as of the end date of the analysis and that the resulting capital gains tax that would be due is deducted from the ending portfolio value.

## **Potential capital gain exposure (PCGE)**

Is an estimate of the percentage of a fund's assets that represents gains and measures how much the fund's assets have appreciated. It can be an indicator of possible future capital gain distributions.

## **Premature death risk**

The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

## **Present value of distribution of cash flows methodology**

Method used to address a portfolio's sensitivity to rate changes along the yield curve. This approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

## **Principal trade**

A trade in which the market maker or dealer becomes a disclosed counterparty and assumes risk for the trade by transacting the security for their own account. Also called *broker risk trades*.

## **Probability of default**

The likelihood that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest.

## **Probate**

The legal process to confirm the validity of the will so that executors, heirs, and other interested parties can rely on its authenticity.

## **Program trading**

A strategy of buying or selling many stocks simultaneously.

## **Progressive tax rate schedule**

A tax regime in which the tax rate increases as the amount of income or wealth being taxed increases.

## **Property insurance**

A type of insurance used by individuals to manage property risk.

## **Property risk**

The possibility that a person's property may be damaged, destroyed, stolen, or lost.

## **Protective put**

An option strategy in which a long position in an asset is combined with a long position in a put on that asset.

## **Pure indexing**

Attempts to replicate a bond index as closely as possible, targeting zero active return and zero active risk.

## **Put spread**

A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

# **Q**

## **Qualified dividends**

Generally dividends from shares in domestic corporations and certain qualified foreign corporations which have been held for at least a specified minimum period of time.

## **Quantitative market-neutral**

An approach to building market-neutral portfolios in which large numbers of securities are traded and positions are adjusted on a daily or even an hourly basis using algorithm-based models.

## **Quoted margin**

The yield spread over the MRR established upon issuance of an FRN to compensate investors for assuming an issuer's credit risk.

# R

## **Re-base**

With reference to index construction, to change the time period used as the base of the index.

## **Realized volatility**

Historical volatility, the square root of the realized variance of returns, which is a measure of the range of past price outcomes for the underlying asset.

## **Rebalancing**

In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

## **Rebalancing overlay**

A type of overlay that addresses a portfolio's need to sell certain constituent securities and buy others.

## **Rebalancing range**

A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

## **Rebate rate**

The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

## **Reduced form credit models**

Credit models that solve for default probability over a specific time period using observable company-specific variables such as financial ratios and macroeconomic variables.

## **Reduced-form models**

Models that use economic theory and other factors such as prior research output to describe hypothesized relationships. Can be described as more compact representations of underlying structural models. Evaluate endogenous variables in terms of observable



exogenous variables.

## **Regime**

The governing set of relationships (between variables) that stem from technological, political, legal, and regulatory environments. Changes in such environments or policy stances can be described as changes in regime.

## **Regret**

The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

## **Regret-aversion bias**

An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

## **Relative value**

A concept that describes the selection of the most attractive individual securities to populate the portfolio with, using ranking and comparing.

## **Relative value volatility arbitrage**

A volatility trading strategy that aims to source and buy cheap volatility and sell more expensive volatility while netting out the time decay aspects normally associated with options portfolios.

## **Relative VaR**

The minimum portfolio loss expected to occur over a given time period at a specific confidence level based on a portfolio containing active positions minus benchmark holdings.

## **Repo rate**

The interest rate on a repurchase agreement.

## **Representativeness bias**

A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

## **Repurchase agreements**

In repurchase agreements, or *repos*, a security owner agrees to sell a security for a specific cash amount while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

## **Request for quote**

(RFQ) A non-binding quote provided by a market maker or dealer to a potential buyer or seller upon request. Commonly used in fixed income markets these quotes are only valid at the time they are provided.

## **Reserve portfolio**

The component of an insurer's general account that is subject to specific regulatory requirements and is intended to ensure the company's ability to meet its policy liabilities. The assets in the reserve portfolio are managed conservatively and must be highly liquid and low risk.

## **Resistance levels**

Price points on dealers' order boards where one would expect to see a clustering of offers.

## **Return attribution**

A set of techniques used to identify the sources of the excess return of a portfolio against its benchmark.

## **Returns-based attribution**

An attribution approach that uses only the total portfolio returns over a period to identify the components of the investment process that have generated the returns. The Brinson–Hood–Beebower approach is a returns-based attribution approach.

## **Returns-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

## **Returns-based style analysis**

A top-down style analysis that involves estimating the sensitivities of a portfolio to security market indexes.

## **Reverse repos**

Repurchase agreements from the standpoint of the lender.

## **Revocable trust**

The person whose assets are used to create the trust retains the right to rescind the trust relationship and regain title to the trust assets.

## **Risk attribution**

The analysis of the sources of risk.

## **Risk aversion**

The degree of an investor's unwillingness to take risk; the inverse of risk tolerance.

## **Risk budgeting**

The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

## **Risk capacity**

The ability to accept financial risk.

## **Risk perception**

The subjective assessment of the risk involved in the outcome of an investment decision.

## **Risk premium**

An extra return expected by investors for bearing some specified risk.

## **Risk reversal**

A strategy used to profit from the existence of an implied volatility skew and from changes in its shape over time. A combination of long (short) calls and short (long) puts on the same underlying with the same expiration is a long (short) risk reversal.

## **Risk tolerance**

The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

# S

## **Sample-size neglect**

A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or “real” data).

## **Scenario analysis**

What-if analysis that involves changing multiple assumptions at the same time in order to evaluate the change in an investment’s value.

## **Seagull spread**

An extension of the risk reversal foreign exchange option strategy that limits downside risk.

## **Securities lending**

A form of collateralized lending that may be used to generate income for portfolios.

## **Selective**

An index construction methodology that targets only those securities with certain characteristics.

## **Self-attribution bias**

A bias in which people take personal credit for successes and attribute failures to external factors outside the individual’s control.

## **Self-control bias**

A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

## **Separate accounts**

Accounts holding assets to fund future liabilities from variable life insurance and variable annuities, the products in which customers make investment decisions from a menu of options and themselves bear investment risk.

## **Sharpe ratio**

The average return in excess of the risk-free rate divided by the standard deviation of return; a measure of the average excess return earned per unit of standard deviation of return. Also known as the *reward-to-variability ratio*.

## **Short-biased**

A hedge fund strategy in which the manager uses a less extreme version of dedicated short-selling. It involves searching for opportunities to sell expensively priced equities, but short exposure may be balanced with some modest value-oriented, or index-oriented, long exposure.

## **Shortfall probability**

The probability of failing to meet a specific liability or goal.

## **Shrinkage estimation**

Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

## **Single-manager fund**

A fund in which one portfolio manager or team of portfolio managers invests in one strategy or style.

## **Smart beta**

Involves the use of transparent, rules-based strategies as a basis for investment decisions.

## **Smart order routers**

(SOR) Smart systems used to electronically route small orders to the best markets for execution based on order type and prevailing market conditions.

## **Social proof**

A bias in which individuals tend to follow the beliefs of a group.

## **Soft-catalyst event-driven approach**

An event-driven approach in which investments are made proactively in anticipation of a corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) that has yet to occur.

## Special dividends

A dividend paid by a company that does not pay dividends on a regular schedule, or a dividend that supplements regular cash dividends with an extra payment.

## Spread duration

The change in bond price for a given change in yield spread. Also referred to as *OAS duration* when the option-adjusted spread (OAS) is the yield measure used.

## Staged diversification strategy

The simplest approach to managing the risk of a concentrated position involves selling the concentrated position over some period of time, paying associated tax, and reinvesting the proceeds in a diversified portfolio.

## Static hedge

A hedge that is not sensitive to changes in the price of the asset hedged.

## Status quo bias

An emotional bias in which people do nothing (i.e., maintain the “status quo”) instead of making a change.

## Stock lending

Securities lending involving the transfer of equities.

## Stop-losses

A trading order that sets a selling price below the current market price with a goal of protecting profits or preventing further losses.

## Stops

Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

## Straddle

An option combination in which one buys *both* puts and calls, with the same exercise price and same expiration date, on the same underlying asset. In contrast to this long straddle, if someone *writes* both options, it is a short straddle.

## **Strangle**

A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

## **Stratified sampling**

A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

## **Structural credit models**

Credit models that apply market-based variables to estimate the value of an issuer's assets and the volatility of asset value.

## **Structural models**

Models that specify functional relationships among variables based on economic theory. The functional form and parameters of these models are derived from the underlying theory. They may include unobservable parameters.

## **Structural risk**

Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

## **Stub trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and entails buying and selling stock of a parent company and its subsidiaries, typically weighted by the percentage ownership of the parent company in the subsidiaries.

## **Support levels**

Price points on dealers' order boards where one would expect to see a clustering of bids.

## **Surplus**

The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

## **Surplus portfolio**

The component of an insurer's general account that is intended to earn higher expected returns than the reserve portfolio and so can assume more risk. Surplus portfolio assets are often managed aggressively with high-risk assets.

## **Survivorship bias**

Bias that arises in a data series when managers with poor track records are dropped from the database whereas managers with good track records remain. A data series of a given date reflects only entities that have survived to that date.

## **Swaption**

This instrument grants a party the right, but not the obligation, to enter into a rate swap at a pre-determined strike (fixed swap rate) on a future date, for a fixed up-front premium.

## **Synthetic long forward position**

The combination of a long call and a short put with identical strike prices, both traded at the same time on the same underlying.

## **Synthetic short forward position**

The combination of a short call and a long put at the same strike price, both traded at the same time on the same underlying.

# **T**

## **Tactical asset allocation**

Asset allocation that involves making short-term adjustments to the portfolio based on short-term predictions of relative performance among asset classes.

## **Tax alpha**

Calculated by subtracting the pre-tax excess return from the total return. Tax alpha isolates the benefit of tax management of the portfolio.

## **Tax avoidance**

The legal activity of understanding the tax laws and finding ways to minimize tax liability.

















# **FIXED INCOME AND EQUITY PORTFOLIO MANAGEMENT**

CFA® Program Curriculum  
**2022 • LEVEL III • VOLUME 3**

**WILEY**



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# How to Use the CFA Program Curriculum

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Congratulations on your decision to enter the Chartered Financial Analyst (CFA<sup>®</sup>) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities (competencies) it develops. Your commitment should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. CFA Program enrollment represents the first step toward a career-long commitment to professional education.

The CFA exam measures your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK<sup>™</sup>). The CBOK consists of four components:

- A broad outline that lists the major CFA Program topic areas ([www.cfainstitute.org/programs/cfa/curriculum/cbok](http://www.cfainstitute.org/programs/cfa/curriculum/cbok));
- Topic area weights that indicate the relative exam weightings of the top-level topic areas ([www.cfainstitute.org/programs/cfa/curriculum](http://www.cfainstitute.org/programs/cfa/curriculum));
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- CFA Program curriculum that candidates receive upon exam registration.

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, features of the curriculum, and tips for designing an effective personal study program.

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# BACKGROUND ON THE CBOK

CFA Program is grounded in the practice of the investment profession. CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the competencies that are relevant to the profession, beginning with the Global Body of Investment Knowledge (GBIK®). Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback about the GBIK. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

The CFA Institute staff—in conjunction with the Education Advisory Committee and Curriculum Level Advisors, who consist of practicing CFA charterholders—designs the CFA Program curriculum in order to deliver the CBOK to candidates. The exams, also written by CFA charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into six topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected. It is then divided into one or more study sessions. These study sessions should form the basic structure of your reading and preparation. Each study session includes a statement of its structure and objective and is further divided into assigned readings. An outline illustrating the organization of these study sessions can be found at the front of each volume of the curriculum.

The readings are commissioned by CFA Institute and written by content experts, including investment professionals and university professors. Each reading includes LOS and the core material to be studied, often a combination of text, exhibits, and in-text examples and questions. End of Reading Questions (EORQs) followed by solutions help you understand and master the material. The LOS indicate what you should be able to accomplish after

studying the material. The LOS, the core material, and the EORQs are dependent on each other, with the core material and EORQs providing context for understanding the scope of the LOS and enabling you to apply a principle or concept in a variety of scenarios.

*The entire readings, including the EORQs, are the basis for all exam questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK.*

You should use the LOS to guide and focus your study because each exam question is based on one or more LOS and the core material and practice problems associated with the LOS. As a candidate, you are responsible for the entirety of the required material in a study session.

We encourage you to review the information about the LOS on our website ([www.cfainstitute.org/programs/cfa/curriculum/study-sessions](http://www.cfainstitute.org/programs/cfa/curriculum/study-sessions)), including the descriptions of LOS “command words” on the candidate resources page at [www.cfainstitute.org](http://www.cfainstitute.org).

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## FEATURES OF THE CURRICULUM

### End of Reading Questions/Solutions

*All End of Reading Questions (EORQs) as well as their solutions are part of the curriculum and are required material for the exam.* In addition to the in-text examples and questions, these EORQs help demonstrate practical applications and reinforce your understanding of the concepts presented. Some of these EORQs are adapted from past CFA exams and/or may serve as a basis for exam questions.

### Glossary

For your convenience, each volume includes a comprehensive Glossary. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the Glossary.

Note that the digital curriculum that is included in your exam registration fee is searchable for key words, including Glossary terms.

### LOS Self-Check

We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

## Source Material

The CFA Institute curriculum cites textbooks, journal articles, and other publications that provide additional context or information about topics covered in the readings. As a candidate, you are not responsible for familiarity with the original source materials cited in the curriculum.

Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written or updated but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*<sup>®</sup>, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and several Nobel laureates have contributed articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this, and other, CFA Institute practice-oriented publications through the Research & Analysis webpage ([www.cfainstitute.org/en/research](http://www.cfainstitute.org/en/research)).

## Errata

The curriculum development process is rigorous and includes multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, there are times when we must make corrections. Curriculum errata are periodically updated and posted

by exam level and test date online ([www.cfainstitute.org/en/programs/submit-errata](http://www.cfainstitute.org/en/programs/submit-errata)). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

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## DESIGNING YOUR PERSONAL STUDY PROGRAM

### Create a Schedule

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all assigned readings and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skills, and abilities described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will probably spend more time on some study sessions than on others.

You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

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## CFA INSTITUTE LEARNING ECOSYSTEM (LES)

As you prepare for your exam, we will email you important exam updates, testing policies, and study tips. Be sure to read these carefully.

Your exam registration fee includes access to the CFA Program Learning Ecosystem (LES). This digital learning platform provides access, even offline, to all of the readings and End of Reading Questions found in the print curriculum organized as a series of shorter online

lessons with associated EORQs. This tool is your one-stop location for all study materials, including practice questions and mock exams.

The LES provides the following supplemental study tools:

## **Structured and Adaptive Study Plans**

The LES offers two ways to plan your study through the curriculum. The first is a structured plan that allows you to move through the material in the way that you feel best suits your learning. The second is an adaptive study plan based on the results of an assessment test that uses actual practice questions.

Regardless of your chosen study path, the LES tracks your level of proficiency in each topic area and presents you with a dashboard of where you stand in terms of proficiency so that you can allocate your study time efficiently.

## **Flashcards and Game Center**

The LES offers all the Glossary terms as Flashcards and tracks correct and incorrect answers. Flashcards can be filtered both by curriculum topic area and by action taken—for example, answered correctly, unanswered, and so on. These Flashcards provide a flexible way to study Glossary item definitions.

The Game Center provides several engaging ways to interact with the Flashcards in a game context. Each game tests your knowledge of the Glossary terms a in different way. Your results are scored and presented, along with a summary of candidates with high scores on the game, on your Dashboard.

## **Discussion Board**

The Discussion Board within the LES provides a way for you to interact with other candidates as you pursue your study plan. Discussions can happen at the level of individual lessons to raise questions about material in those lessons that you or other candidates can clarify or comment on. Discussions can also be posted at the level of topics or in the initial Welcome section to connect with other candidates in your area.

## **Practice Question Bank**

The LES offers access to a question bank of hundreds of practice questions that are in addition to the End of Reading Questions. These practice questions, only available on the LES, are intended to help you assess your mastery of individual topic areas as you progress through your studies. After each practice question, you will receive immediate feedback

noting the correct response and indicating the relevant assigned reading so you can identify areas of weakness for further study.

## Mock Exams

The LES also includes access to three-hour Mock Exams that simulate the morning and afternoon sessions of the actual CFA exam. These Mock Exams are intended to be taken after you complete your study of the full curriculum and take practice questions so you can test your understanding of the curriculum and your readiness for the exam. If you take these Mock Exams within the LES, you will receive feedback afterward that notes the correct responses and indicates the relevant assigned readings so you can assess areas of weakness for further study. We recommend that you take Mock Exams during the final stages of your preparation for the actual CFA exam. For more information on the Mock Exams, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## PREP PROVIDERS

You may choose to seek study support outside CFA Institute in the form of exam prep providers. After your CFA Program enrollment, you may receive numerous solicitations for exam prep courses and review materials. When considering a prep course, make sure the provider is committed to following the CFA Institute guidelines and high standards in its offerings.

Remember, however, that there are no shortcuts to success on the CFA exams; reading and studying the CFA Program curriculum *is* the key to success on the exam. The CFA Program exams reference only the CFA Institute assigned curriculum; no prep course or review course materials are consulted or referenced.

### SUMMARY

Every question on the CFA exam is based on the content contained in the required readings and on one or more LOS. Frequently, an exam question is based on a specific example highlighted within a reading or on a specific practice problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the exam.



2. All questions, problems, and their solutions are part of the curriculum and are required study material for the exam. These questions are found at the end of the readings in the print versions of the curriculum. In the LES, these questions appear directly after the lesson with which they are associated. The LES provides immediate feedback on your answers and tracks your performance on these questions throughout your study.
3. We strongly encourage you to use the CFA Program Learning Ecosystem. In addition to providing access to all the curriculum material, including EORQs, in the form of shorter, focused lessons, the LES offers structured and adaptive study planning, a Discussion Board to communicate with other candidates, Flashcards, a Game Center for study activities, a test bank of practice questions, and online Mock Exams. Other supplemental study tools, such as eBook and PDF versions of the print curriculum, and additional candidate resources are available at [www.cfainstitute.org](http://www.cfainstitute.org).
4. Using the study planner, create a schedule and commit sufficient study time to cover the study sessions. You should also plan to review the materials, answer practice questions, and take Mock Exams.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

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## FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and investment professional comments and feedback as we work to improve the curriculum, supplemental study tools, and candidate resources.

Please send any comments or feedback to [info@cfainstitute.org](mailto:info@cfainstitute.org). You can be assured that we will review your suggestions carefully. Ongoing improvements in the curriculum will help you prepare for success on the upcoming exams and for a lifetime of learning as a serious investment professional.



# Portfolio Management

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## STUDY SESSIONS

<b>Study Session 1</b>	Behavioral Finance
<b>Study Session 2</b>	Capital Market Expectations
<b>Study Session 3</b>	Asset Allocation and Related Decisions in Portfolio Management
<b>Study Session 4</b>	Derivatives and Currency Management
<b>Study Session 5</b>	Fixed-Income Portfolio Management (1)
<b>Study Session 6</b>	Fixed-Income Portfolio Management (2)
<b>Study Session 7</b>	Equity Portfolio Management (1)
<b>Study Session 8</b>	Equity Portfolio Management (2)
<b>Study Session 9</b>	Alternative Investments Portfolio Management
<b>Study Session 10</b>	Private Wealth Management (1)
<b>Study Session 11</b>	Private Wealth Management (2)
<b>Study Session 12</b>	Portfolio Management for Institutional Investors
<b>Study Session 13</b>	Trading, Performance Evaluation, and Manager Selection
<b>Study Session 14</b>	Cases in Portfolio Management and Risk Management

This volume includes Study Sessions 6–8.

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## TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; and evaluate portfolio performance.

# Study Session 6

## Fixed-Income Portfolio Management (2)

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This study session covers yield curve and credit strategies for fixed-income portfolios. Fundamental concepts necessary for understanding yield curves and yield curve strategies are reviewed. Portfolio management strategies, which are based on the investor's expectations regarding the level, slope, and curvature of the yield curve, are presented. Strategies used to construct and manage fixed-income credit portfolios follow. Coverage includes various credit spread measures, bottom-up and top-down approaches to credit strategies, and credit-related risks.

## READING ASSIGNMENTS

- Reading 13** Yield Curve Strategies  
by Robert W. Kopprasch, PhD, CFA, and Steven V. Mann, PhD
- Reading 14** Fixed-Income Active Management: Credit Strategies  
by Campe Goodman, CFA, and Oleg Melentyev, CFA

# Reading 13

## Yield Curve Strategies

by Robert W. Kopprasch, PhD, CFA, and Steven V. Mann, PhD

*Robert W. Kopprasch, PhD, CFA, is at Bates Group, LLC (USA). Steven V. Mann, PhD, is at the University of South Carolina (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a. describe the factors affecting fixed-income portfolio returns due to a change in benchmark yields;
- b. formulate a portfolio positioning strategy given forward interest rates and an interest rate view that coincides with the market view;
- c. formulate a portfolio positioning strategy given forward interest rates and an interest rate view that diverges from the market view in terms of rate level, slope, and shape;
- d. formulate a portfolio positioning strategy based upon expected changes in interest rate volatility;
- e. evaluate a portfolio's sensitivity using key rate durations of the portfolio and its benchmark;
- f. discuss yield curve strategies across currencies;
- g. evaluate the expected return and risks of a yield curve strategy.

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## 1. INTRODUCTION

The size and breadth of global fixed-income markets, as well as the term structure of interest rates within and across countries, lead investors to consider numerous factors when creating and managing a bond portfolio. While fixed-income index replication and bond portfolios that consider both an investor's assets and liabilities were addressed earlier in the curriculum, we now turn our attention to active bond portfolio management. In contrast to a passive index strategy, active fixed-income management involves taking positions in primary risk factors that deviate from those of an index in order to generate excess return. Financial analysts who can successfully apply fixed-income concepts and tools to evaluate yield curve changes and position a portfolio based upon an interest rate view find this to be a valuable skill throughout their careers.

Prioritizing fixed-income risk factors is a key first step. In what follows, we focus on the yield curve, which represents the term structure of interest rates for government or benchmark securities, with the assumption that all promised principal and interest payments take place. Fixed-income securities, which trade at a spread above the benchmark to compensate investors for credit and liquidity risk, will be addressed later in the curriculum. The starting point for active portfolio managers is the current term structure of benchmark interest rates and an interest rate view established using macroeconomic variables introduced earlier. In what follows, we demonstrate how managers may position a fixed-income portfolio to capitalize on expectations regarding the level, slope, or shape (curvature) of yield curves using both long and short cash positions, derivatives, and leverage.

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## 2. KEY YIELD CURVE AND FIXED-INCOME CONCEPTS FOR ACTIVE MANAGERS

### a. describe the factors affecting fixed-income portfolio returns due to a change in benchmark yields

The factors comprising an investor's expected fixed-income portfolio returns introduced earlier in the curriculum are summarized in [Equation 1](#):

#### Equation (1)

$$E(R) \approx \text{Coupon income}$$

$$+/- \text{ Rolldown return}$$

+/-  $E$  ( $\Delta$  Price due to investor's view of benchmark yields)

+/-  $E$  ( $\Delta$  Price due to investor's view of yield spreads)

+/-  $E$  ( $\Delta$  Price due to investor's view of currency value changes)

Sections 2 and 3 will focus on actively managing the first three components of [Equation 1](#), and Section 4 will include changes in currency. Credit strategies driving yield spreads will be discussed in a later lesson. As active management hinges on an investor's ability to identify actionable trades with specific securities, our review of yield curve and fixed-income concepts focuses on these practical considerations.

## 2.1. Yield Curve Dynamics

When someone refers to “the yield curve,” this implies that one yield curve for a given issuer applies to all investors. In fact, a yield curve is a stylized representation of the yields-to-maturity available to investors at various maturities for a specific issuer or group of issuers. Yield curve models make certain assumptions that may vary by investor or by the intended use of the curve, raising such issues as the following:

- Asynchronous observations of various maturities on the curve
- Maturity gaps that require interpolation and/or smoothing
- Observations that seem inconsistent with neighboring values
- Use of on-the-run bonds only versus all marketable bonds (i.e., including off-the-run bonds)
- Differences in accounting, regulatory, or tax treatment of certain bonds that may make them look like outliers

As an example, a yield curve of the most recently issued, or on-the-run, securities may differ significantly from one that includes off-the-run securities. Off-the-run bonds are typically less liquid than on-the-run bonds, and hence they have a lower price (higher yield-to-maturity). Inclusion of off-the-run bonds will tend to “pull” the yield curve higher.

This illustrates two key points about yield curves. First, although we often take reported yield curves as a “given,” they often do not consist of traded securities and must be derived from available bond yields-to-maturity using some type of model. This is particularly true for constant maturity yields, shown in some of the following exhibits. A constant maturity yield estimates, for example, what a hypothetical 5-year yield-to-maturity would be if a bond were



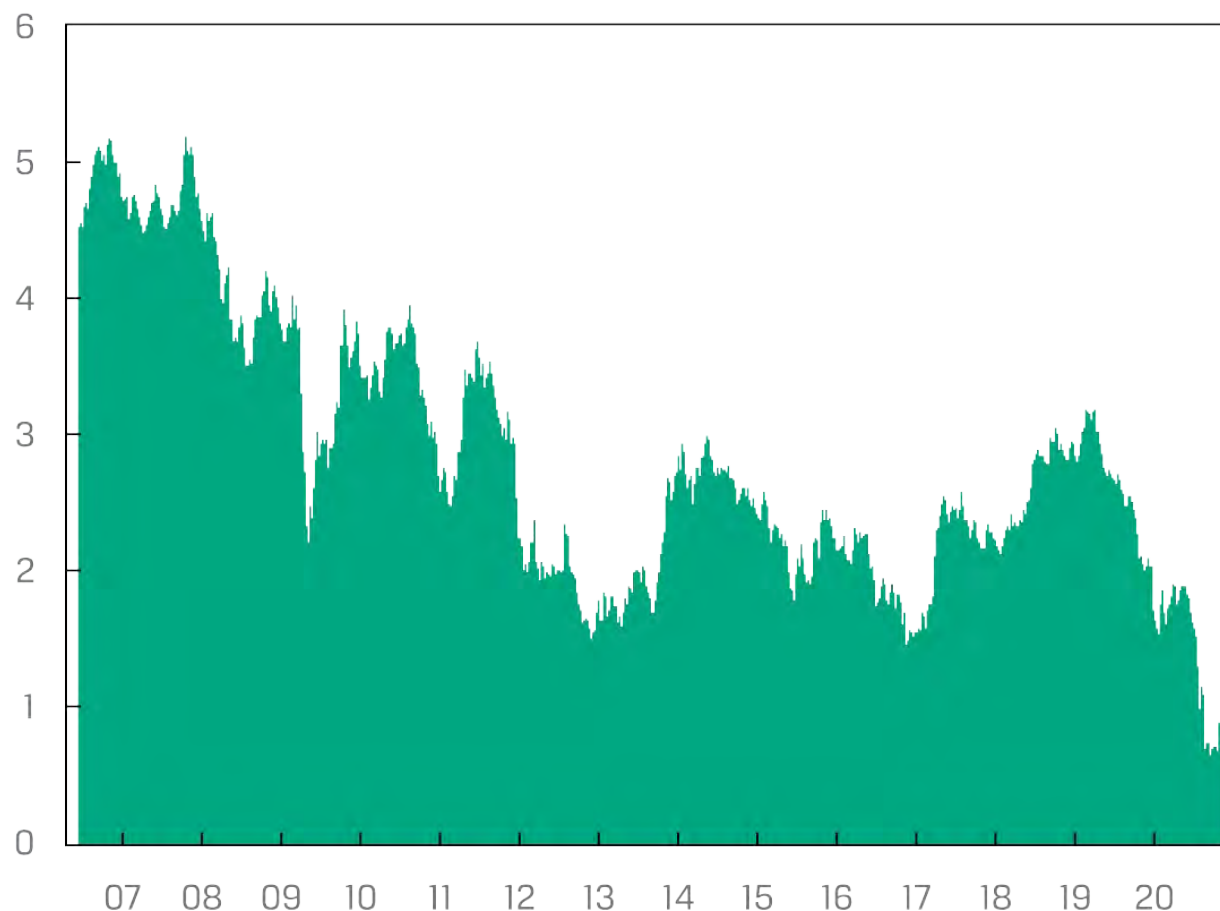
available with exactly five years to maturity. While some derivatives reference the daily constant maturity yield, the current on-the-run 5-year Treasury issued before today has a maturity of less than five years. Estimating a constant maturity 5-year yield typically requires interpolating the yields-to-maturity on actively traded bonds with maturities *near* five years. Different models and assumptions can produce different yield curves. The difference between models becomes more pronounced as yields-to-maturity are converted to spot and forward rates (as spot and forward rate curves amplify yield curve steepness and curvature).

Second, a tradeoff exists between yield-to-maturity and liquidity. Active management strategies must assess this tradeoff when selecting bonds for the portfolio, especially if frequent trading is anticipated. While off-the-run bonds may earn a higher return if held to maturity, buying and selling them will likely involve increased trading costs (especially in a market crisis).

Primary yield curve risk factors are often categorized by three types: a change in (1) level (a parallel “shift” in the yield curve); (2) slope (a flattening or steepening “twist” of the yield curve); and (3) shape or curvature (or “butterfly movement”). Earlier in the curriculum, principal components analysis was used to decompose yield curve changes into these three separate factors. Level, slope, and curvature movements over time accounted for approximately 82%, 12%, and 4%, respectively, of US Treasury yield curve changes. Although based upon a specific historical period, the consistency of these results over time and across global markets underscores the importance of these factors in realizing excess portfolio returns under an active yield curve strategy.

The following exhibits provide historical context for the three yield curve factors using constant maturity US Treasury yields. [Exhibit 1](#) shows US 10-year constant maturity yield levels.

#### **Exhibit 1. 10-Year US Treasury Yield, 2007–2020 (%)**



Source: US Federal Reserve.

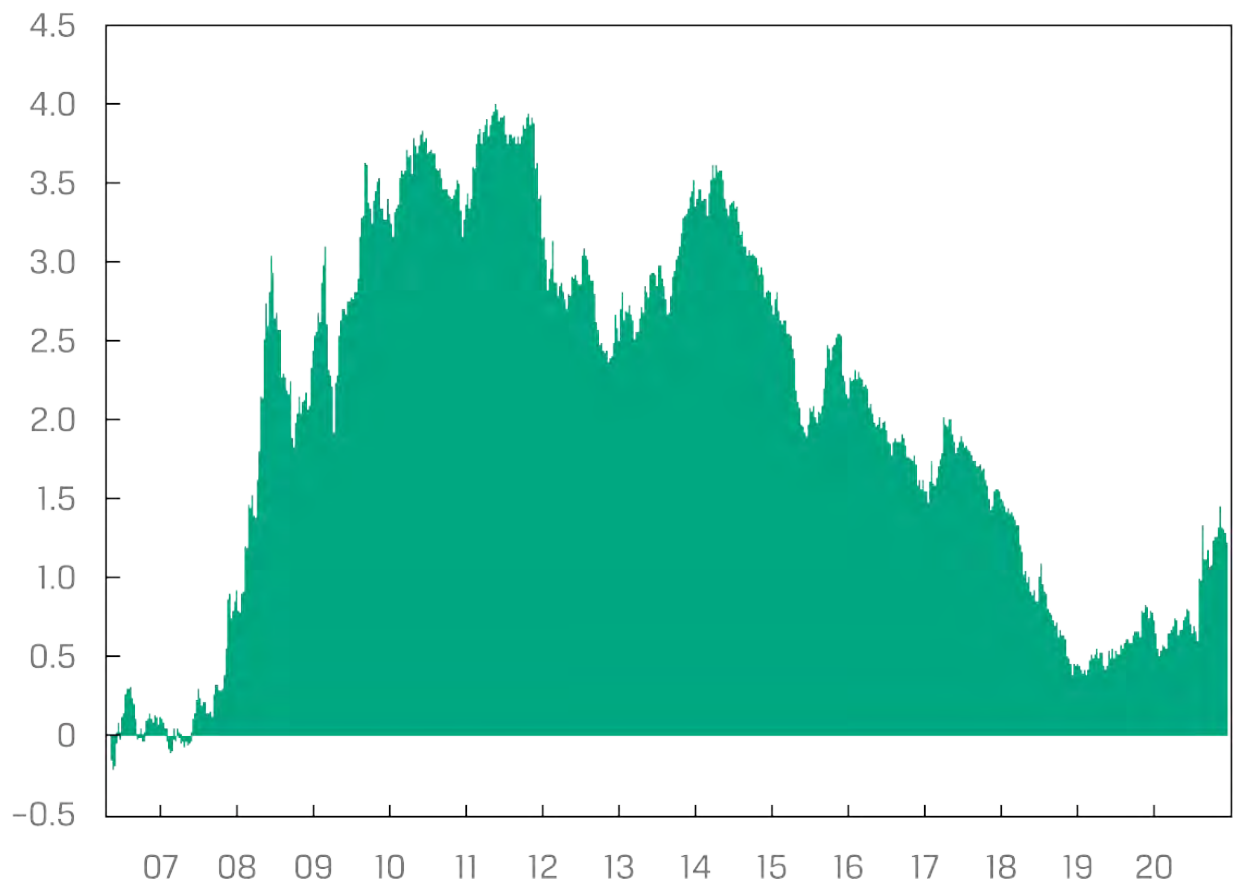
During the period shown in [Exhibit 1](#), 10-year US Treasury yields-to-maturity demonstrated significant volatility, falling to new lows in 2020 amid a flight to quality during the COVID-19 pandemic. Slower growth and accommodative monetary policy in the form of quantitative easing among global central banks since the 2008 global financial crisis years has driven government yields to zero and below. In 2020, negative yields were common on many Japanese, German, and Swiss government bonds, among others.

A change in yield *level* (or parallel shift) occurs when all yields-to-maturity represented on the curve change by the same number of basis points. Under this assumption, a portfolio manager might use a first-order duration statistic to approximate the impact of an expected yield curve change on portfolio value. This implies that yield curve changes occur only in parallel shifts, which is unreliable in cases where the yield curve's slope and curvature also change. Larger yield curve changes necessitate the inclusion of second-order effects in order to better measure changes in portfolio value.

Yield curve *slope* is often defined as the difference in basis points between the yield-to-maturity on a long-maturity bond and the yield-to-maturity on a shorter-maturity bond. For example, as of July 2020, the slope as measured by the 2s30s spread, or the difference

between the 30-year Treasury bond (30s) and the 2-year Treasury note (2s) yields-to-maturity (1.43% and 0.16%, respectively), was 127 bps. [Exhibit 2](#) shows the 2s30s spread for US Treasury constant maturity yields. As this spread increases, or widens, the yield curve is said to steepen, while a decrease, or narrowing, is referred to as a flattening of the yield curve. In most instances, the spread is positive and the yield curve is upward-sloping. If the spread turns negative, as was the case just prior to the 2008 global financial crisis, the yield curve is described as “inverted.”

**Exhibit 2. 2s30s US Yield Spread, 2007–2020 (%)**



Source: US Federal Reserve.

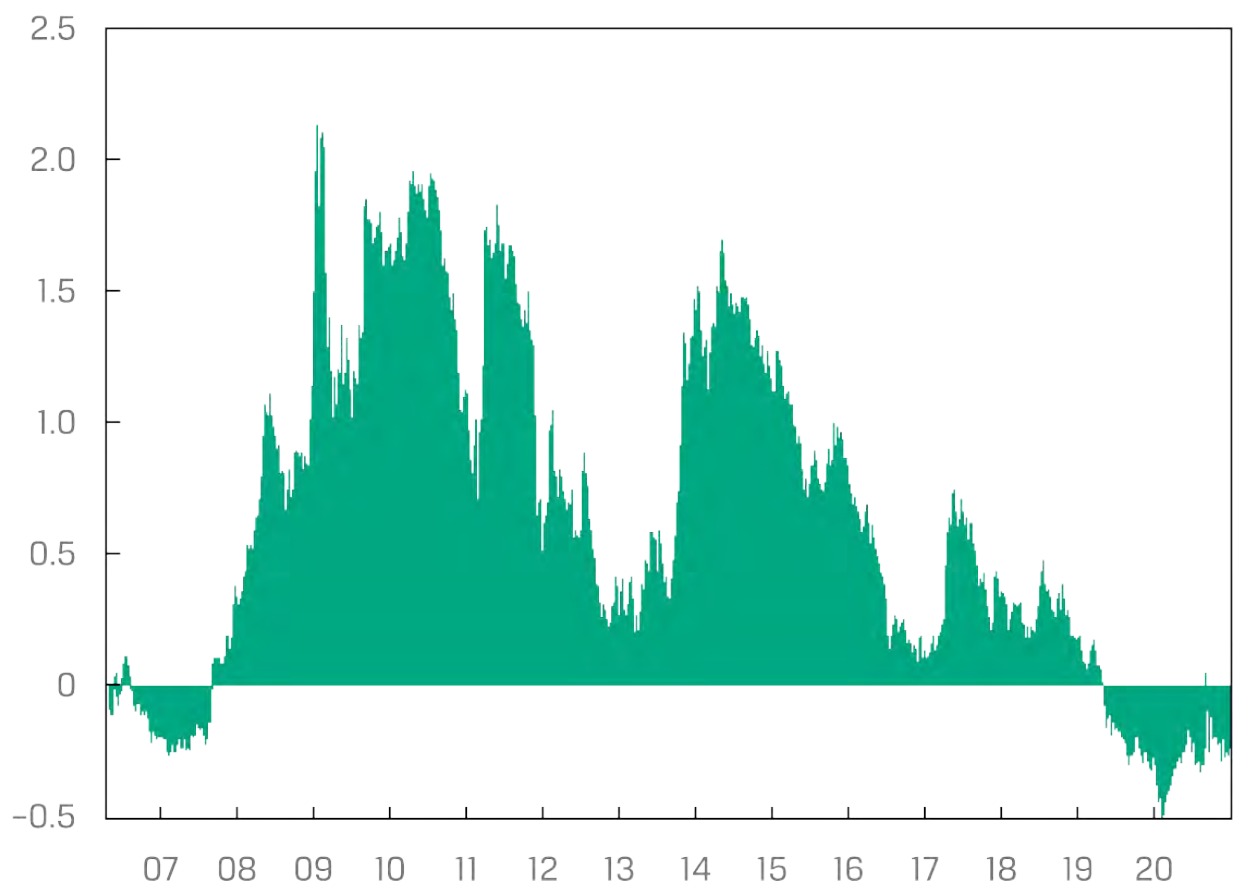
Yield curve shape or *curvature* is the relationship between yields-to-maturity at the short end of the curve, at a midpoint along the curve (often referred to as the “belly” of the curve), and at the long end of the curve. A common measure of yield curve curvature is the **butterfly spread**:

**Equation (2)**

$$\begin{aligned} \text{Butterfly spread} = & -(\text{Short-term yield}) \\ & + (2 \times \text{Medium-term yield}) - \text{Long-term yield} \end{aligned}$$

The butterfly spread takes on larger positive values when the yield curve has more curvature. **Exhibit 3** displays this measure of curvature for the US Treasury constant maturity yield curve using 2-year, 10-year, and 30-year tenors. Curvature indicates a difference between medium-term yields and a linear interpolation between short-term and long-term yields-to-maturity. A positive butterfly spread indicates a “humped” or concave shape to the midpoint of the curve, while a “saucer” or convex shape indicates the spread is negative. The butterfly spread changes when intermediate-term yield-to-maturity changes are of a different magnitude than those on the wings (the short- and long-end of the curve). Note that as in the case of yield curve slope, the butterfly spread was generally positive until 2020, except for the period just prior to the 2008 global financial crisis.

**Exhibit 3. US Butterfly Spread (2s/10s/30s), 2007–2020 (%)**

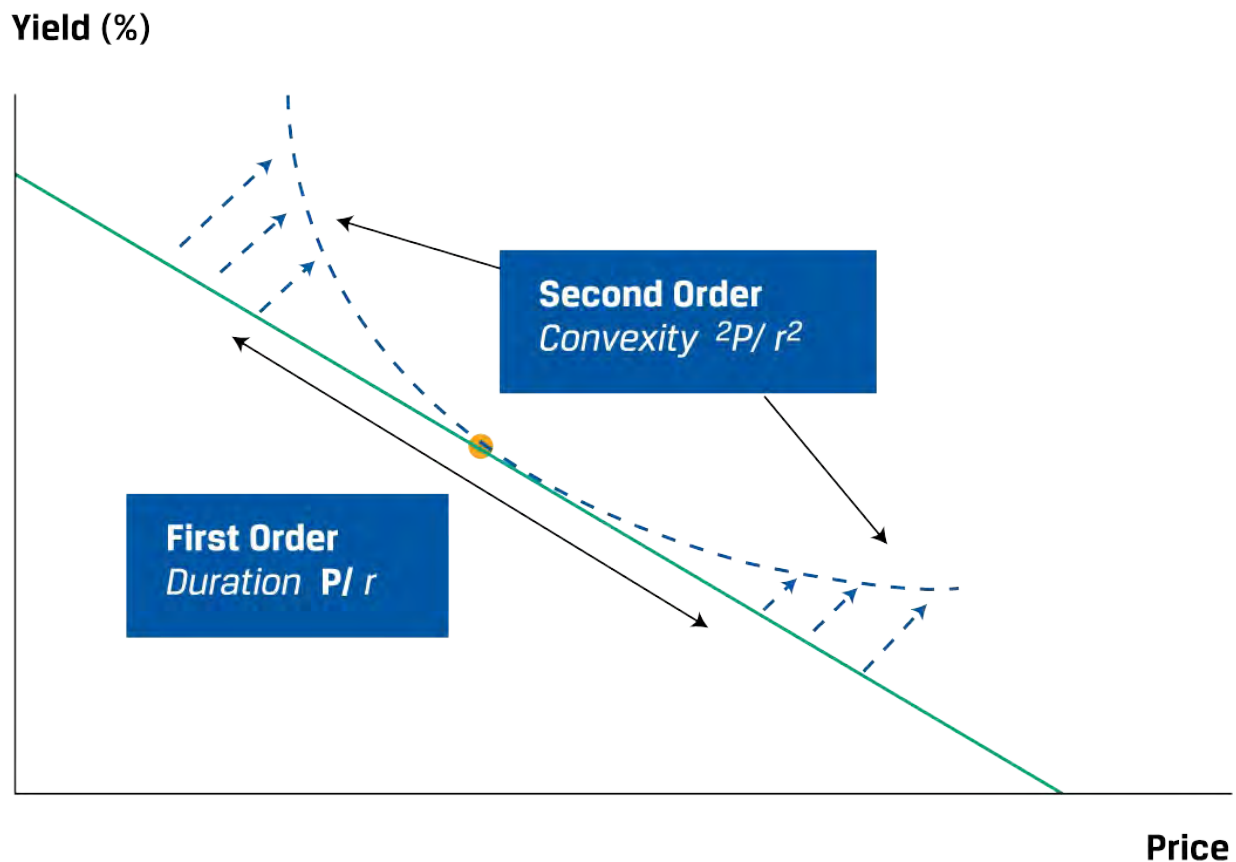


Source: US Federal Reserve.

## 2.2. Duration and Convexity

As active managers position their portfolios to capitalize on expected changes in the level, slope, and curvature of the benchmark yield curve, the anticipated change in portfolio value due to yield-to-maturity changes are captured by the third term in [Equation 1](#)—namely, the expected change in price due to investor’s view of benchmark yields. The price/yield relationship for fixed-income bonds was established earlier in the curriculum as the combination of two factors: a negative, linear first-order factor (*duration*) and a usually positive, non-linear second-order factor (*convexity*), as shown in [Exhibit 4](#).

**Exhibit 4. Price–Yield Relationship for a Fixed-Income Bond**



The third term in [Equation 1](#),  $E$  ( $\Delta$  Price due to investor’s view of benchmark yield), combines the duration and convexity effects in [Equation 3](#) of the percentage change in the full price ( $\% \Delta PV^{\text{Full}}$ ) for a single bond as introduced earlier:

### Equation (3)

$$\% \Delta PV^{\text{Full}} \approx -(\text{ModDur} \times \Delta \text{Yield}) + [\frac{1}{2} \times \text{Convexity} \times (\Delta \text{Yield})^2].$$

Fixed-income portfolio managers often approximate changes in a bond portfolio's present value (PV) by substituting market value (MV)-weighted averages for modified duration and convexity into [Equation 3](#).

**Equation (4)**

$$\text{AvgModDur} = \sum_{j=1}^J \text{ModDur}_j \times \left( \frac{\text{MV}_j}{\text{MV}} \right).$$

**Equation (5)**

$$\text{AvgConvexity} = \sum_{j=1}^J \text{Convexity}_j \times \left( \frac{\text{MV}_j}{\text{MV}} \right).$$

Active managers focus on the *incremental* effect on these summary statistics for a portfolio by adding or selling bonds in the portfolio or by buying and selling fixed-income derivatives. Duration is a first-order effect that attempts to capture a linear relationship between bond prices and yield-to-maturity. Convexity is a second-order effect that describes a bond's price behavior for larger movements in yield-to-maturity. This additional term is a positive amount on a traditional (option-free) fixed-rate bond for either a yield increase or decrease, causing the yield/price relationship to deviate from a linear relationship. Because duration is a first-order effect, it follows that duration management—accounting for changes in yield curve level—will usually be a more important consideration for portfolio performance than convexity management. This is consistent with our previous discussion of the relative importance of the yield curve level, slope, and curvature. As we shall see later in this lesson, convexity management is more closely associated with yield curve slope and shape changes.

All else equal, positive convexity is a valuable feature in bonds. If a bond has higher positive convexity than an otherwise identical bond, then the bond price increases more if interest rates decrease (and decreases less if interest rates increase) than the duration estimate would suggest. Said another way, the expected price change of a bond with positive convexity for a given rate change will be higher than the price change of an identical-duration, lower-convexity bond. This price behavior is valuable to investors; therefore, a bond with higher convexity might be expected to have a lower yield-to-maturity than a similar-duration bond with less convexity. All else equal, bonds with longer durations have higher convexity than bonds with shorter durations. Also, as noted earlier in the curriculum, convexity is affected by the *dispersion* of cash flows—that is, the *variance* of the times to receipt of cash flow. Higher cash flow dispersion leads to an increase in convexity. This is in contrast to Macaulay duration, which measures the weighted *average* of the times to cash flow receipt. Note that throughout this lesson, we will use “raw” versus scaled (or “raw” divided by 100) convexity figures often seen on trading platforms. We can see the convexity effect by comparing two bond portfolios:

## EXAMPLE 1

# US Treasury Securities Portfolio

Tenor	Coupon	Price	ModDur	Convexity
2y	0.250%	\$100	1.994	5.0
5y	0.875%	\$100	4.880	26.5
10y	2.000%	\$100	9.023	90.8

Consider two \$50 million portfolios: Portfolio A is fully invested in the 5-year Treasury bond, and Portfolio B is an investment split between the 2-year (58.94%) and the 10-year (41.06%) bonds. The Portfolio B weights were chosen to (approximately) match the 5-year bond duration of 4.88. How will the value of these portfolios change if all three Treasury yields-to-maturity immediately rise or fall by 50 bps?

Using [Equation 3](#), we can derive the percentage value change for Portfolios A and B as well as the dollar value of each \$50 million investment:

Portfolio	+ 50 bps % $\Delta$ Price	+ 50 bps $\Delta$ Price	– 50 bps % $\Delta$ Price	– 50 bps $\Delta$ Price
A	–2.407%	(\$1,203,438)	2.473%	\$1,236,563
B	–2.390%	(\$1,194,883)	2.490%	\$1,245,170

For example, for the case of a 50 bp increase in rates:

### Portfolio A

$$-2.407\% = (-4.880 \times 0.005) + [0.5 \times 26.5 \times (0.005^2)]$$

### Portfolio B

$$-2.390\% = 0.5894 \times (-1.994 \times 0.005) + [(0.5 \times 5 \times (0.005^2)] + 0.4106 \times (-9.023 \times 0.005) + [(0.5 \times 90.8 \times (0.005^2)]$$

Note that Portfolio B gains *more* (\$8,607) than Portfolio A when rates fall 50 bps and loses *less* (\$8,555) than Portfolio A when rates rise by 50 bps.

The first portfolio concentrated in a single intermediate maturity is often referred to as a **bullet** portfolio. The second portfolio, with similar duration but combining short- and long-term maturities, is a **barbell** portfolio. Although the bullet and barbell have the same duration, the barbell's higher convexity (40.229 versus 26.5 for the bullet) results in a larger gain as yields-to-maturity rise and a smaller loss when yields-to-maturity fall. Convexity is therefore valuable when interest rate volatility is expected to rise. This dynamic tends to cause investors to bid up prices on more convex, longer-maturity bonds, which drives changes in yield curve shape. As a result, the long end of the curve may decline or even invert (or invert further), increasing the curvature of the yield curve.

## EXAMPLE 2

### Portfolio Convexity

Portfolio convexity is a second-order effect that causes the value of a portfolio to respond to a change in yields-to-maturity in a non-linear manner. Which of the following best describes the effect of positive portfolio convexity for a given change in yield-to-maturity?

- a. Convexity causes a greater increase in price for a decline in yields-to-maturity and a greater decrease in price when yields-to-maturity rise.
- b. Convexity causes a smaller increase in price for a decline in yields-to-maturity and a greater decrease in price when yields-to-maturity rise.
- c. Convexity causes a greater increase in price for a decline in yields-to-maturity and a smaller decrease in price when yields-to-maturity rise.

The correct answer is c. Note that the convexity component of [Equation 3](#) involves squaring the change in yield-to-maturity, or  $[\frac{1}{2} \times \text{Convexity} \times (\Delta \text{Yield})^2]$ , making the term positive as long as portfolio convexity is positive. This adds to the overall portfolio gain when yields-to-maturity decline and reduces the portfolio loss when yields-to-maturity rise.

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## 3. YIELD CURVE STRATEGIES



- b. formulate a portfolio positioning strategy given forward interest rates and an interest rate view that coincides with the market view**
- c. formulate a portfolio positioning strategy given forward interest rates and an interest rate view that diverges from the market view in terms of rate level, slope, and shape**
- d. formulate a portfolio positioning strategy based upon expected changes in interest rate volatility**
- e. evaluate a portfolio's sensitivity using key rate durations of the portfolio and its benchmark**

Earlier in the curriculum, we established that yield curves are usually upward-sloping, with diminishing marginal yield-to-maturity increases at longer tenors—that is, flatter at longer maturities. As nominal yields-to-maturity incorporate an expected inflation premium, positively sloped yield curves are consistent with market expectations of rising or stable future inflation and relatively strong economic growth. Investor expectations of higher yields-to-maturity for assuming the increased interest rate risk of long-term bonds also contribute to this positive slope. Active managers often begin with growth and inflation forecasts, which they then translate into expected yield curve level, slope, and/or curvature changes. If their forecasts coincide with today's yield curve, managers will choose active strategies that are consistent with a static or stable yield curve. If their forecasts differ from what today's yield curve implies about these future yield curve characteristics, managers will position the portfolio to generate excess return based upon this divergent view, within the constraints of their investment mandate, using the cash and derivatives strategies we discuss next.

## 3.1. Static Yield Curve

A portfolio manager may believe that bonds are fairly priced and that the existing yield curve will remain unchanged over an investment horizon.

The two basic ways in which a manager may actively position a bond portfolio versus a benchmark index to generate excess return from a static or stable yield curve is to increase risk by adding either duration or leverage to the portfolio. If the yield curve is upward-sloping, longer duration exposure will result in a higher yield-to-maturity over time, while the “repo carry” trade (the difference between a higher-yielding instrument purchased and a lower-yielding (financing) instrument) will also generate excess returns.

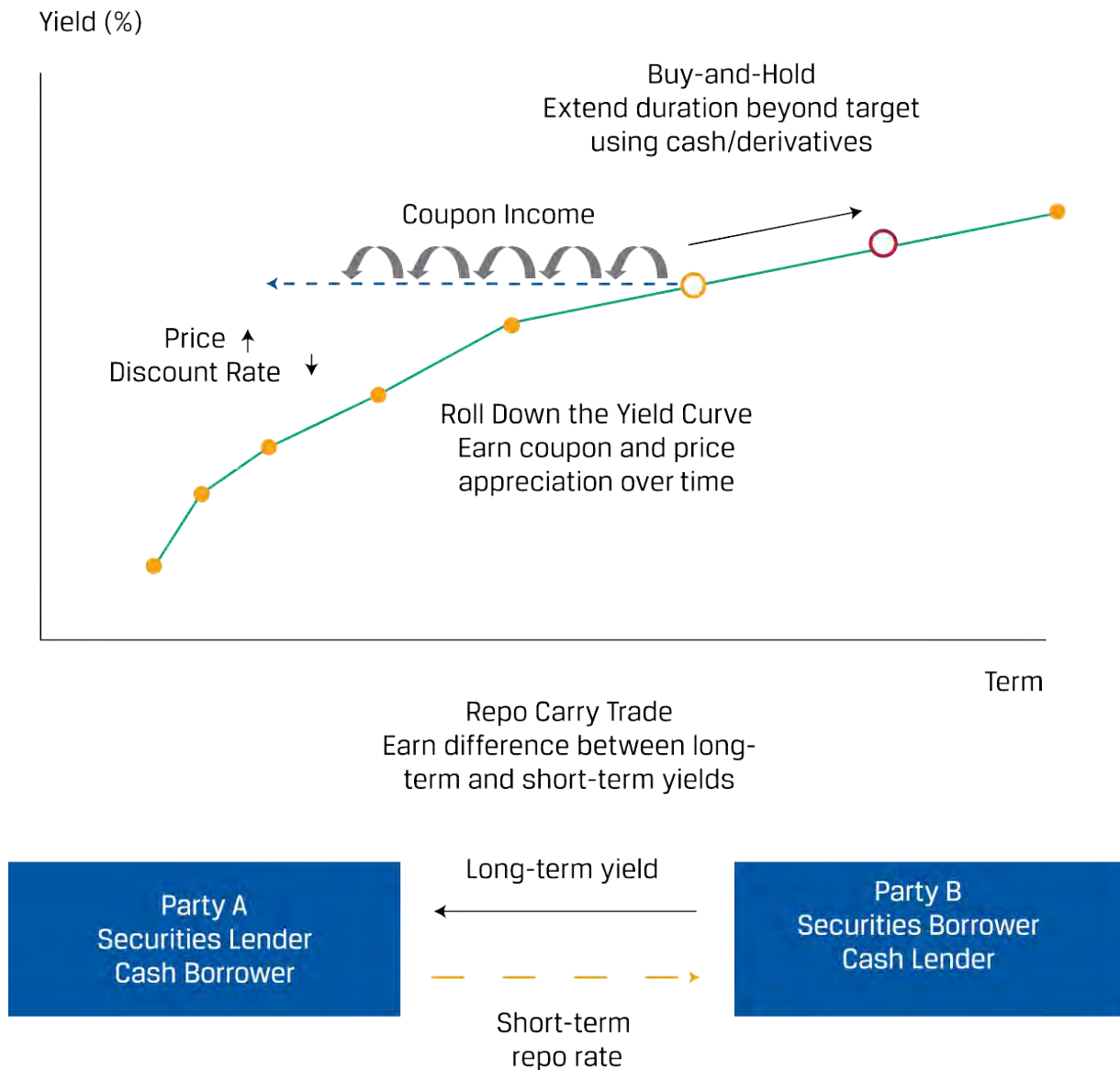
Starting with cash-based instruments, “buy-and-hold” is an obvious strategy if the yield curve is upward-sloping. In an active context, this involves buying bonds with duration

above the benchmark without active trading during a subsequent period. If the relationship between long- and short-term yields-to-maturity remains stable over this period, the manager is rewarded with higher return from the incremental duration. “Rolling down” the yield curve, a concept introduced previously, differs slightly from the “buy-and-hold” approach in terms of the investment time horizon and expected accumulation. The rolldown return component of [Equation 1](#) (sometimes referred to as “carry-rolldown”) incorporates not only coupon income (adjusted over time for any price difference from par) but also additional return from the passage of time and the investor’s ability to sell the shorter-maturity bond in the future at a higher price (lower yield-to-maturity due to the upward-sloping yield curve) at the end of the investment horizon. If the yield curve is upward-sloping, buying bonds with a maturity *beyond* the investment horizon offers a total return (higher coupon plus price appreciation) greater than the purchase of a bond with maturity *matching* the investment horizon if the curve remains static. Finally, a common strategy known as a repurchase agreement or repo trade may be used in an expected stable rate environment to add leverage risk to the portfolio. The repo market involves buying a long-term security and financing it at a short-term rate below the long-term yield-to-maturity—that is, earning a positive “repo carry.” At the end of the trade, the bond is sold and the repo is unwound. These cash-based strategies are summarized in [Exhibits 5 and 6](#).

Exhibit 5.
Cash-Based Static Yield Curve Strategies

Strategy	Description	Income	Objective
Buy-and-hold	Constant without active trading	Coupon income	Add duration beyond target given static yield curve view
Rolling down the yield curve	Constant, with $\Delta$ Price as maturity shortens	Coupon income +/- Rolldown return	Add duration and increased return if future shorter-term yields are below current yield-to-maturity
Repo carry trade	Finance bond purchase in repo market	(Coupon income +/- Rolldown return)—Financing cost	Generate repo carry return if coupon plus rolldown exceeds financing cost

Exhibit 6.
Carry, Rolldown, and Buy-and-Hold Strategies under a Static Yield Curve



Excess return under these strategies depends upon stable rate levels and yield curve shape. Note that a more nuanced “buy-and-hold” strategy under this scenario could also involve less liquid and higher-yielding government bonds (such as off-the-run bonds). The lack of portfolio turnover may make the strategy seem passive, but in fact it may be quite aggressive as it introduces liquidity risk, a topic addressed in detail later in the curriculum. The ability to benefit from price appreciation by selling a shorter-dated bond at a premium when rolling down (or riding) the yield curve hinges on a reasonably static and upward-sloping yield curve. Not only will the repo carry be maintained under this yield curve scenario, but it also will generate excess return due to the reduced cash outlay versus a term bond purchase.

Active managers whose investment mandate extends to the use of synthetic means to increase risk by adding duration or leverage to the portfolio might consider using the derivatives-based strategies in [Exhibit 7](#) to increase duration exposure beyond a benchmark target. Although the long futures example is similar to rolling down the yield curve, it relies

solely on price appreciation rather than bond coupon income. The receive-fixed swap, on the other hand, is similar to the cash-based repo carry trade, but the investor receives the fixed swap rate and pays a market reference rate (MRR), which is often referred to as “swap carry.”

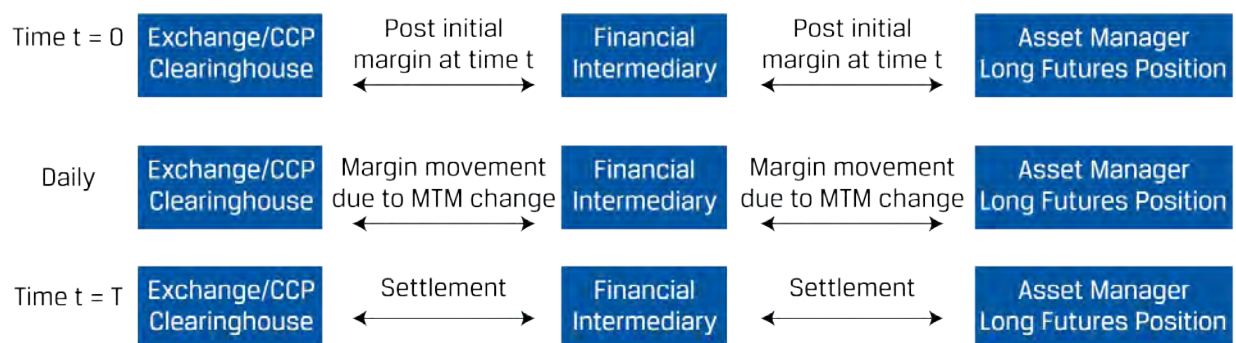
### Exhibit 7. Derivatives-Based Static Yield Curve Strategies

Strategy	Description	Targeted Return	Goal
Long futures position	Purchase contract for future bond delivery	$(\Delta \text{ Price} / \Delta \text{ Bond yield}) - \text{Margin cost}$	Synthetically increase duration (up-front margin and daily mark-to-market valuation)
Receive-fixed swap	Fixed-rate receiver on an interest rate swap	$(\text{Swap rate} - \text{MRR}) + (\Delta \text{ Swap mark-to-market} / \Delta \text{ Swap yield})$	Synthetically increase portfolio duration (up-front / mark-to-market collateral) + / - Swap carry

As mentioned previously in the curriculum, global exchanges offer a wide range of derivatives contracts across swap, bond, and short-term market reference rates for different settlement dates, and over the counter (OTC) contracts may be uniquely tailored to end user needs. Our treatment here is limited to futures and swaps and will extend to options in a later section.

Although margining was historically limited to exchange-traded derivatives, the advent of derivatives central counterparty (CCP) clearing mandated by regulatory authorities following the 2008 global financial crisis to mitigate counterparty risk has given rise to similar cash flow implications for OTC derivatives. Active managers using both exchange-traded and OTC derivatives must therefore maintain sufficient cash or eligible collateral to fulfill margin or collateral requirements. They must also factor any resulting foregone portfolio return into their overall performance. That said, since the initial cash outlay for a derivative is limited to initial margin or collateral as opposed to the full price for a cash bond purchase, derivatives have a high degree of implicit leverage. That is, a small move in price/yield can have a very large effect on a derivative’s mark-to-market value (MTM) relative to the margin posted. [Exhibit 8](#) shows these cash flow mechanics. This outsized price effect makes derivatives effective instruments for fixed-income portfolio management.

## Exhibit 8. Derivatives Cash Flow Impact for a Fixed-Income Portfolio



For example, bond futures involve a contract to take delivery of a bond on a specific future date. Changes in the futures contract value mirror those of the underlying bond's price over time, allowing an investor to create an exposure profile similar to a long bond position by purchasing this contract with a fraction of the outlay of a cash bond purchase. While futures contracts are covered in detail elsewhere in the curriculum, for our purposes here it is important to establish the basis point value (BPV) of a futures contract. Most government bond futures are traded and settled using the least costly or cheapest-to-deliver (CTD) bond among those eligible for future delivery. For example, the CME Group's Ultra 10-Year US Treasury Note Futures contract specifies delivery of an original 10-year issue Treasury security with not less than 9 years, five months and not more than 10 years to maturity with an assumed 6% yield-to-maturity and contract size of \$100,000. The "duration" of the bond futures contract is assumed to match that of the CTD security. In order to determine the futures BPV, we use the following approximation introduced previously:

### Equation (6)

$$\text{Futures BPV} \approx \text{BPV}_{\text{CTD}} / \text{CF}_{\text{CTD}},$$

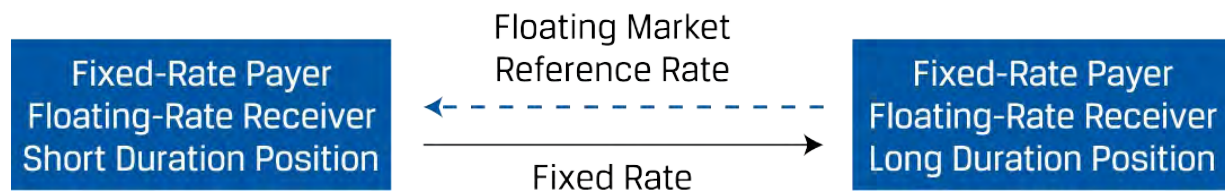
where  $\text{CF}_{\text{CTD}}$  is the conversion factor for the CTD security. For government bond futures with a fixed basket of underlying bonds, such as Australian Treasury bond futures, the futures BPV simply equals the BPV of an underlying basket of bonds.

The manager in [Example 1](#) can replicate the 10-year Treasury exposure using futures by matching the BPV of the cash bond. As explained elsewhere, the BPV of the \$20.53 million (or  $41.06\% \times \$50$  million) 10-year Treasury position equals the modified duration (9.023) multiplied by the full price (also known as the money duration) times one basis point, or \$18,524. If the CTD security under the Ultra 10-Year Futures contract is a Treasury bond also priced at par but with 9.5 years remaining to maturity, modified duration of 8.84, and a conversion factor of 0.684, then each \$100,000 futures contract has a BPV of \$129.24 ( $\$88.40/0.684$ ). The manager must therefore buy approximately 143 futures contracts

(\$18,524/\$129.24) to replicate the exposure. Note that as shown in [Exhibit 8](#), this will involve an outlay of initial margin and margin movement due to MTM changes rather than investment of full principal.

An interest rate swap involves the net exchange of fixed-for-floating payments, where the fixed rate (swap rate) is derived from short-term market reference rates for a given tenor. As shown in [Exhibit 9](#), the swap contract may be seen as a combination of bonds, namely a fixed-rate bond versus a floating-rate bond of the same maturity.

### Exhibit 9. Swaps as a Duration Management Tool



Note the similarities between the “carry” trade in [Exhibit 5](#) and the receive-fixed interest rate swap position on the right in [Exhibit 9](#). The fixed-rate receiver is “long” a fixed-rate term bond and “short” a floating-rate bond, giving rise to an exposure profile that mimics a “long” cash bond position by increasing duration. A swap’s BPV may be estimated using [Equation 7](#).

#### Equation (7)

$$\text{Swap BPV} = \text{ModDur}_{\text{Swap}} \times \text{Swap Notional} / 10,000.$$

The difference between the receive-fixed swap and long fixed-rate bond positions is best understood via an example.

### EXAMPLE 3

## Calculating Bond versus Swap Returns

Say a UK-based manager seeks to extend duration beyond an index by adding 10-year exposure. The manager considers either buying and holding a 10-year, 2.25% semi-annual coupon UK government bond priced at £93.947, with a corresponding yield-to-maturity of 2.9535%, or entering a new 10-year, GBP receive-fixed interest rate swap at 2.8535% versus the six-month GBP MRR currently set at 0.5925%. We compare the



results of both strategies over a six-month time horizon for a £100 million par value during which both the bond yield-to-maturity and swap rates fall 50 bps. We ignore day count details in the calculation.

Position	Income	Price Appreciation/MTM	Gain in 6 Months
10y UK bond	£1,125,000	£4,337,779	£5,462,778
10y GBP swap	£1,130,500	£4,234,260	£5,364,760

The relevant return components from [Equation 1](#) are income, namely coupon income for the bond versus “carry” for the swap, and  $E$  ( $\Delta$  Price due to investor’s view of benchmark yield) in the form of price appreciation for the bond versus an MTM gain for the swap:

10-Year UK Government Bond:

**Coupon income** = £1,125,000, or  $(2.25\%/2) \times £100$  million.

**Price appreciation** = £4,337,779. Using Excel, this is the difference between the 10-year, or  $[PV(0.029535/2, 20, 1.125, 100)]$ , and the 9.5-year bond at the lower yield-to-maturity, or  $[PV(0.024535/2, 19, 1.125, 100)] \times £1$  million.

We can separate bond price appreciation into two components:

**Rolldown return:** The difference between the 10-year and 9.5-year PV with *no* change in yield-to-maturity of £262,363, or  $[PV(0.029535/2, 20, 1.125, 100)] - [PV(0.029535/2, 19, 1.125, 100)] \times £1$  million].

**( $\Delta$  Price due to investor’s view of benchmark yield):** The difference in price for a 50 bp shift of the 9.5-year bond of £4,075,415, or  $[PV(0.024535, 19, 1.125, 100)] - [PV(0.029535, 19, 1.125, 100)] \times £1$  million.

10-Year GBP Swap:

**Swap carry** = £1,130,500, or  $[(2.8535\% - 0.5925\%)/2] \times £100,000,000$ .

**Swap MTM gain** = £4,234,260. The swap MTM gain equals the difference between the fixed leg and floating leg, which is currently at par. The fixed leg equals the 9.5-year swap value given a 50 bp shift in the fixed swap rate, which is £104,234,260, or  $[PV(0.023535/2, 19, 2.8535/2, 100)] \times £1$  million, and the floating leg is priced at par and therefore equal to £100,000,000.

We can use [Equation 7](#) to derive an approximate swap MTM change of £4,159,000 by multiplying swap BPV ( $8.318 \times £100$  million) by 50 bps. As in the case of a bond future, the cash outlay for the swap is limited to required collateral or margin for the transaction as opposed to the bond's full cash price. Note that for the purposes of this example, we have ignored any interest on the difference between the bond investment and the cash outlay for the swap.

While these strategies are designed to gain from a static or stable interest rate term structure, we now turn to portfolio positioning in a changing yield curve environment.

#### EXAMPLE 4

## Static Yield Curve Strategies under Curve Inversion

An investment manager who pursues the cash-based yield curve strategies described in [Exhibit 5](#) faces an inverted yield curve (with a decline in long-term yields-to-maturity and a sharp increase in short-term yields-to-maturity) instead. Which of the following is the *least* likely portfolio outcome under this scenario?

- a. The manager realizes a loss on a “buy-and-hold” position that extends duration beyond that of the index.
- b. The manager faces negative carry when financing a bond purchase in the repo market.
- c. The manager is able to reinvest coupon income from a yield curve rolldown strategy at a higher short-term yield-to-maturity.

### Solution:

The correct answer is a. The fall in long-term yields-to-maturity will lead to price *appreciation* under the “buy-and-hold” strategy. The difference between long-term and short-term yields-to-maturity in b will fall, leading to negative carry if short-term yields-to-maturity rise sharply. As for c, higher short-term yields-to-maturity will enable the manager to reinvest bond coupon payments at a higher rate.



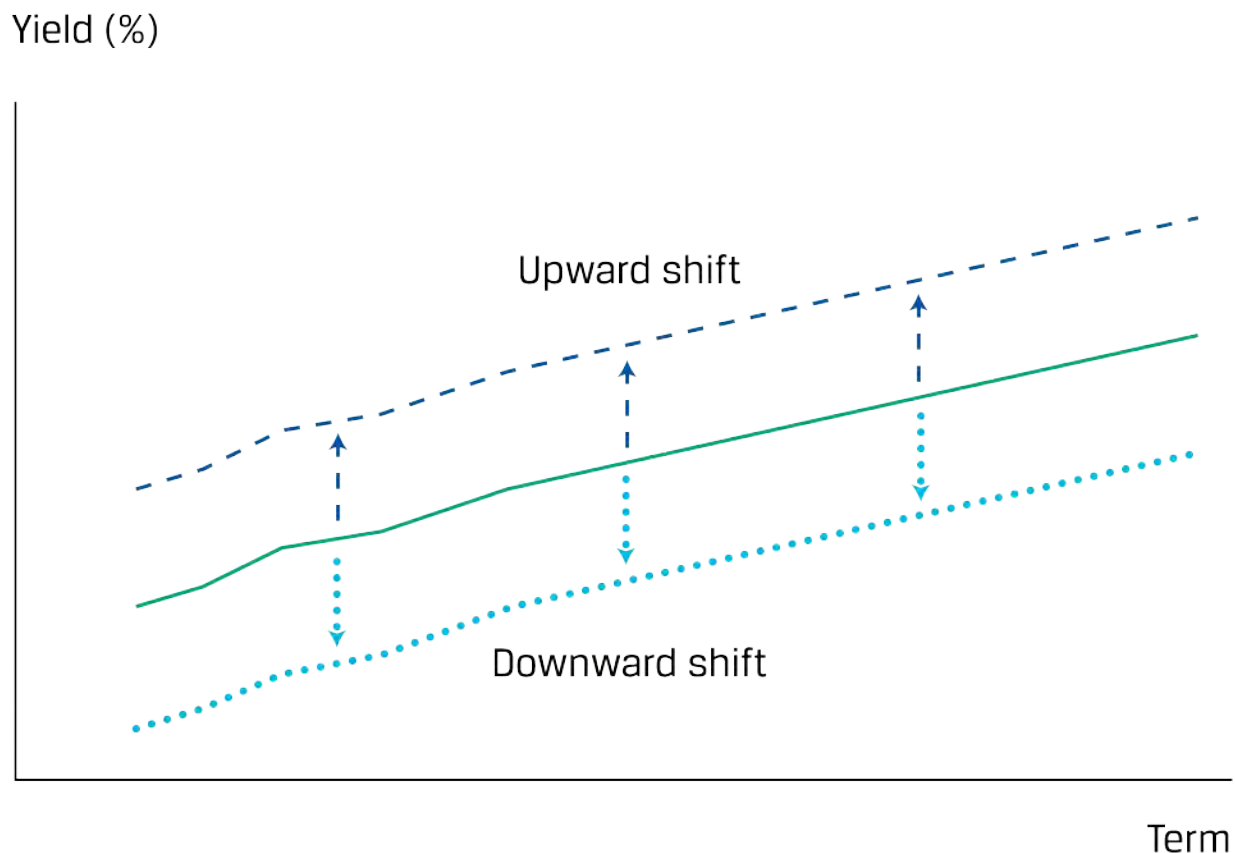
## 3.2. Dynamic Yield Curve

Exhibits 1 through 3 show that yield curves are dynamic over time, with significant changes in the level, slope, and curvature of rates across maturities. Unless otherwise specified, the sole focus here is on instantaneous yield-to-maturity changes affecting  $E(\Delta \text{ Price due to investor's view of benchmark yields})$ , the third component of Equation 1.

### 3.2.1. Divergent Rate Level View

The principal components analysis cited earlier underscores that rate level changes are the key driver of changes in single bond or bond portfolio values. The first term in Equation 3 shows that bond value changes result from yield-to-maturity changes multiplied by a duration statistic. For active fixed-income managers with a divergent rate level view, positioning the portfolio to increase profit as yield levels fall or minimizing losses as yield levels rise is of primary importance. To be clear, a divergent rate level view implies an expectation of a *parallel* shift in the yield curve, as shown in Exhibit 10.

**Exhibit 10. Yield Level Changes**



**Exhibit 1** shows a general decline in bond yield levels, referred to as a bull market, since 2007. This trend began in late 1981 when the 10-year US Treasury yield-to-maturity peaked at nearly 16%, a consequence of contractionary US Federal Reserve monetary policy in which the short-term federal funds rate was raised to 20% to combat double-digit inflation. Extending duration beyond a target index over this period was a winning active strategy, despite occasional periods of yield increases. **Exhibit 11** summarizes the major strategies an active manager might pursue if she expects lower yield levels and downside risks.

### Exhibit 11. Major Yield Curve Strategies to Increase Portfolio Duration

Strategy	Description	Expected Excess Return	Downside Risks
Cash bond purchase (“bullet”)	Extend duration with longer-dated bonds	Price appreciation as yield-to-maturity declines	Higher yield levels
Receive-fixed swap	Fixed-rate receiver on an interest rate swap	Swap MTM gain plus “carry” (fixed minus floating rate)	Higher swap yield levels and/or higher floating rates
Long futures position	Purchase contract for forward bond delivery	Futures MTM gain – Margin cost	Higher bond yields and/or higher margin cost

Assume the “index” portfolio equally weights the 2-, 5-, and 10-year Treasuries priced at par from **Example 1**, while a higher duration “active” portfolio is weighted 25% for 2- and 5-year Treasuries, respectively, and 50% in 10-year Treasuries. Average portfolio statistics are summarized here:

Portfolio	Coupon	Modified Duration	Convexity
Index	1.042%	5.299	40.8
Active (25/25/50)	1.281%	6.230	53.3

We can see from this table that the active portfolio has a blended coupon nearly 24 bps above that of the index.

We now turn to the impact of a parallel yield curve shift on the index versus active portfolios. Assuming an instantaneous 30 bp downward shift in yields-to-maturity, the index portfolio value would rise by approximately 1.608%, or  $(-5.299 \times -0.003) + 0.5 \times (40.8) \times (-0.003^2)$ , versus an estimated 1.893% increase for the actively managed portfolio, a positive difference of nearly \$285,000 for a \$100 million portfolio.

## EXAMPLE 5

### Portfolio Impact of Higher Yield-to-Maturity Levels

Consider a \$50 million Treasury portfolio equally weighted between 2-, 5-, and 10-year Treasuries using parameters from the prior example as the index, and an active portfolio with 20% each in 2- and 5-year Treasuries and the remaining 60% invested in 10-year Treasuries. Which of the following is closest to the active versus index portfolio value change due to a 40 bp rise in yields-to-maturity?

- a. Active portfolio declines by \$181,197 more than the index portfolio
- b. Active portfolio declines by \$289,915 more than the index portfolio
- c. Index portfolio declines by \$289,915 more than the active portfolio

#### Solution:

The correct answer is b. First, we must establish average portfolio statistics for the 20/20/60 portfolio using a weighted average of duration (6.79 versus 5.299 for the index) and convexity (60.8 versus 40.8 for the index). Second, using these portfolio statistics, we must calculate  $\% \Delta PV^{\text{Full}}$ , as shown in [Equation 3](#), for both the index and active portfolios, which are  $-2.087\%$  for the index and  $-2.667\%$  for the active portfolio, respectively. Finally, we multiply the difference of  $-0.58\%$  by the \$50 million notional to get  $-\$289,915$ .

Receive-fixed swaps or long futures positions may be used in place of a cash bond strategy to take an active view on rates. Note that most fixed-income managers will tend to favor option-free over callable bonds if taking a divergent rate level view due to the greater liquidity of option-free bonds. An exception to this arises when investors formulate portfolio positioning strategies based upon expected changes in interest rate volatility, as we will discuss in detail later in this lesson.

As 2020 began, some analysts expected government yields-to-maturity to eventually rise following over a decade of quantitative easing after the 2008 global financial crisis. However, yields instead reached new lows during 2020 when the COVID-19 pandemic caused a sharp economic slowdown, prompting additional monetary and fiscal policy stimulus. If analysts expected a strong economic rebound to increase yield levels, they might seek to lessen the adverse impact of higher rate levels by reducing duration. [Exhibit 12](#) outlines major strategies to achieve this goal.

### Exhibit 12. Major Yield Curve Strategies to Reduce Portfolio Duration

Strategy	Description	Expected Excess Return	Downside Risks
Cash bond sale (“bullet”)	Reduce duration with short sale/switch to shorter-dated bonds	Smaller price decline as yield-to-maturity increases	Lower yield levels
Pay-fixed (interest rate swap)	Fixed-rate payer on an interest rate swap	Swap MTM gain plus “swap carry” (MRR – Fixed swap rate)	Swap MTM loss amid lower swap yield levels and/or lower floating rates
Short futures position	Sell contract for forward bond delivery	Futures MTM gain – Margin cost	Futures MTM loss amid lower bond yields and/or higher margin cost

Returning to our “index” portfolio of equally weighted 2-, 5-, and 10-year Treasuries, we now consider an active portfolio positioned to reduce downside exposure to higher yields-to-maturity versus the index. In order to limit changes to the bond portfolio, the manager chooses a swap strategy instead.

#### EXAMPLE 6

### Five-Year Pay-Fixed Swap Overlay

In this example, the manager enters into a pay-fixed swap overlay with a notional principal equal to one-half of the size of the total bond portfolio. We will focus solely on

first-order effects of yield changes on price (ignoring coupon income and swap carry) to determine the active and index portfolio impact. As the pay-fixed swap is a “short” duration position, it is a negative contribution to portfolio duration and therefore subtracted from rather than added to the portfolio. Recall the \$100 million “index” portfolio has a modified duration of 5.299, or  $(1.994 + 4.88 + 9.023)/3$ . If the manager enters a \$50 million notional 5-year pay-fixed swap with an assumed modified duration of 4.32, the portfolio’s modified duration falls to 3.139, or  $[(5.299 \times 100) - (4.32 \times 50)]/100$ . Stated differently, the bond portfolio BPV falls from \$52,990 to \$31,390 with the swap. For a 25 bp yield increase, this \$21,600 reduction in active portfolio BPV reduces the adverse impact of higher rates by approximately \$540,000 versus the “index” portfolio.

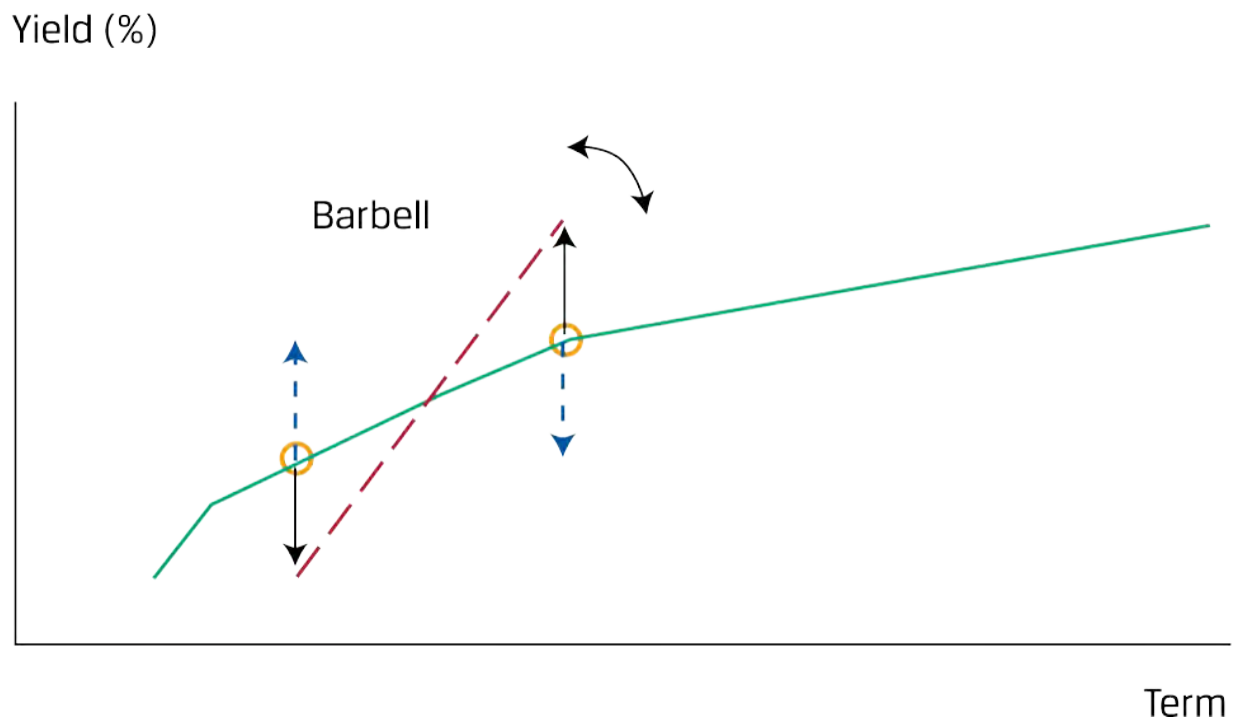
One point worth noting related to short duration positions is that with the exception of distressed debt situations addressed later in the curriculum, the uncertain cost and availability of individual bonds to borrow and sell short leads many active managers to favor the use of derivatives over short sales to establish a short bond position. Derivatives also facilitate duration changes without interfering with other active bond strategies within in a portfolio.

Portfolio managers frequently use average duration and yield level changes to estimate bond portfolio performance in broad terms. However, these approximations are only reasonable if we assume a parallel yield curve shift. As [Exhibits 2](#) and [3](#) show, non-parallel changes, or shifts in the slope and/or shape of the yield curve, occur frequently and require closer examination of individual positions and rate changes across maturities.

### 3.2.2. Divergent Yield Curve Slope View

[Exhibit 2](#) established that while a positively sloped yield curve prevails under most economic scenarios, this difference between long-term and short-term yields-to-maturity can vary significantly over time. Changes in monetary policy, as well as expectations for growth and inflation, affect yields differently across the term structure, resulting in an increase (steepening) or decrease (flattening) in this spread. Although the **barbell** strategy combining extreme maturities is often referred to in a long-only context as in [Example 1](#), here we take a more generalized approach in which the short-term and long-term security positions within the barbell trade may move in opposite directions—that is, combining a “short” and a “long” position. This type of barbell is an effective tool employed by managers to position a bond portfolio for yield curve steepening or flattening changes, as shown in [Exhibit 13](#).

#### Exhibit 13. Barbell Strategy for a Yield Curve Slope Change



A manager could certainly use a bullet to increase or decrease exposure to a specific maturity in anticipation of a price change that changes yield curve slope, but a *combination* of positions in both short and long maturities with greater cash flow dispersion is particularly well-suited to position for yield curve slope changes or twists. Managers combine long or short positions in either maturity segment to take advantage of expected yield curve slope changes—which may be duration neutral, net long, or short duration depending upon *how* the curve is expected to steepen or flatten in the future. Also, in some instances, the investment policy statement may allow managers to use bonds, swaps, and/or futures to achieve this objective. Finally, while not all strategies shown are cash neutral, here we focus solely on portfolio value changes due to yield changes, ignoring any associated funding or other costs that might arise as a result.

Yield curve steepener strategies seek to gain from an increase in yield curve slope, or a greater difference between long-term and short-term yields-to-maturity. This may be achieved by combining a “long” shorter-dated bond position with a “short” longer-dated bond position. For example, assume an active manager seeks to benefit from yield curve steepening with a net zero duration by purchasing the 2-year Treasury and selling the 10-year Treasury securities from our earlier example, both of which are priced at par.

Tenor	Coupon	Position		
		(\$ MM)	Modified Duration	Convexity
Long 2y	0.25%	163.8	1.994	5.0

Short 10y	2.00%	-36.2	9.023	90.8
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Note that here and throughout the lesson, negative portfolio positions reflect a “short” position. We can approximate the impact of *parallel* yield curve changes using portfolio duration and convexity. Portfolio duration is approximately zero, or  $[1.994 \times 163.8 / (163.8 - 36.2)] + [9.023 \times -36.2 / (163.8 - 36.2)]$ , and portfolio convexity equals  $-19.34$ , or  $[5.0 \times 163.8 / (163.8 - 36.2)] + [9.023 \times -36.2 / (163.8 - 36.2)]$ . A 25 bp increase in *both* 2-year and 10-year Treasury yields-to-maturity therefore has no duration effect on the portfolio, although negative convexity leads to a 0.006%, or \$7,712 decline in portfolio value, or  $\$127,600,000 \times 0.5 \times -19.34 \times 0.0025^2$ .

However, changes in the *difference* between short- and long-term yields-to-maturity are not captured by portfolio duration or convexity but rather require assessment of individual positions. For example, if yield curve *slope* increases from 175 bps to 225 bps due to a 25 bp *decline* in 2-year yields-to-maturity and a 25 bp *rise* in 10-year yields-to-maturity, the portfolio increases in value by \$1,625,412 as follows:

$$\text{2y: } \$819,102 = \$163,800,000 \times (-1.994 \times -0.0025 + 0.5 \times 5.0 \times -0.0025^2)$$

$$\text{10y: } \$806,310 = -\$36,200,000 \times (-9.023 \times 0.0025 + 0.5 \times 90.8 \times 0.0025^2)$$

## EXAMPLE 7

### Barbell Performance under a Flattening Yield Curve

Consider a Treasury portfolio consisting of a \$124.6 million long 2-year zero-coupon Treasury with an annualized 2% yield-to-maturity and a short \$25.41 million 10-year zero-coupon bond with a 4% yield-to-maturity. Calculate the net portfolio duration and solve for the first-order change in portfolio value based upon modified duration assuming a 25 bp rise in 2-year yield-to-maturity and a 30 bp decline in 10-year yield-to-maturity.

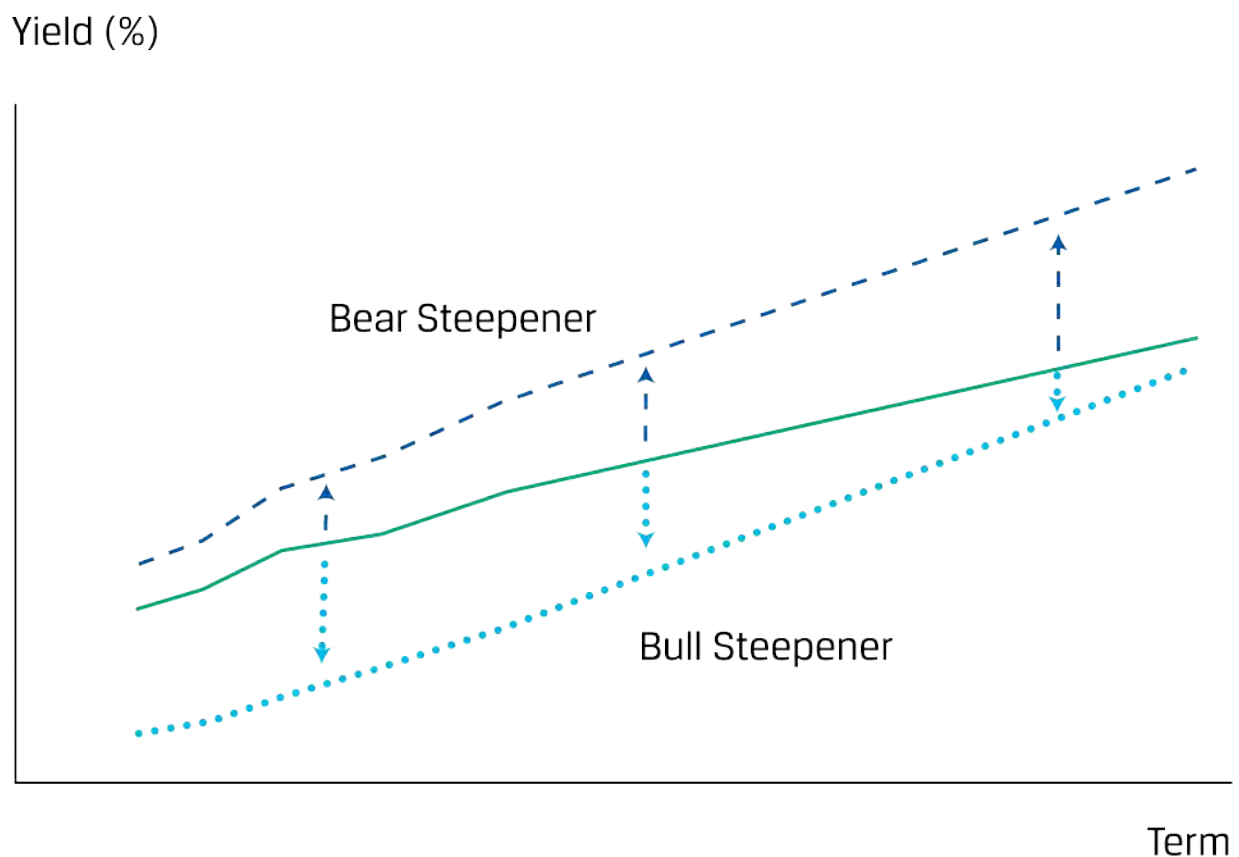
First, recall from earlier in the curriculum that Macaulay duration (MacDur) is equal to maturity for zero-coupon bonds and modified duration (ModDur) is equal to  $\text{MacDur} / (1 + r)$ , where  $r$  is the yield per period. We can therefore solve for the modified duration of the 2-year zero as  $1.96 (= 2 / 1.02)$  and the 10-year zero as  $9.62 (= 10 / 1.04)$ , so net portfolio duration equals zero, or  $(124.6 / 150 \times 1.96) + (25.4 / 150 \times -9.62)$ .

We may show that the 2-year Treasury BPV is close to \$24,430 ( $= 1.96 \times$

124,600,000/10,000) and the 10-year Treasury position BPV is also approximately \$24,430 ( $= 9.61 \times 25,410,000/10,000$ ), but it is a short position. Therefore a 25 bp *increase* in 2-year yield-to-maturity *decreases* portfolio value by \$610,750 (25 bps  $\times$  \$24,430), while a 30 bp *decrease* in the 10-year yield-to-maturity also *decreases* portfolio value (due to the short position) by an additional \$732,900 ( $= 30 \text{ bps} \times \$24,430$ ), for a total approximate portfolio *loss* of \$1,343,650.

The portfolio manager is indifferent as to whether the portfolio gain from a greater slope arises due to a greater change in value from short-term or long-term yield movements as the duration is matched between the two positions. Two variations of a steeper yield curve adapted from Smith (2014) are shown in [Exhibit 14](#).

#### Exhibit 14. Yield Curve Slope Changes—Steepening

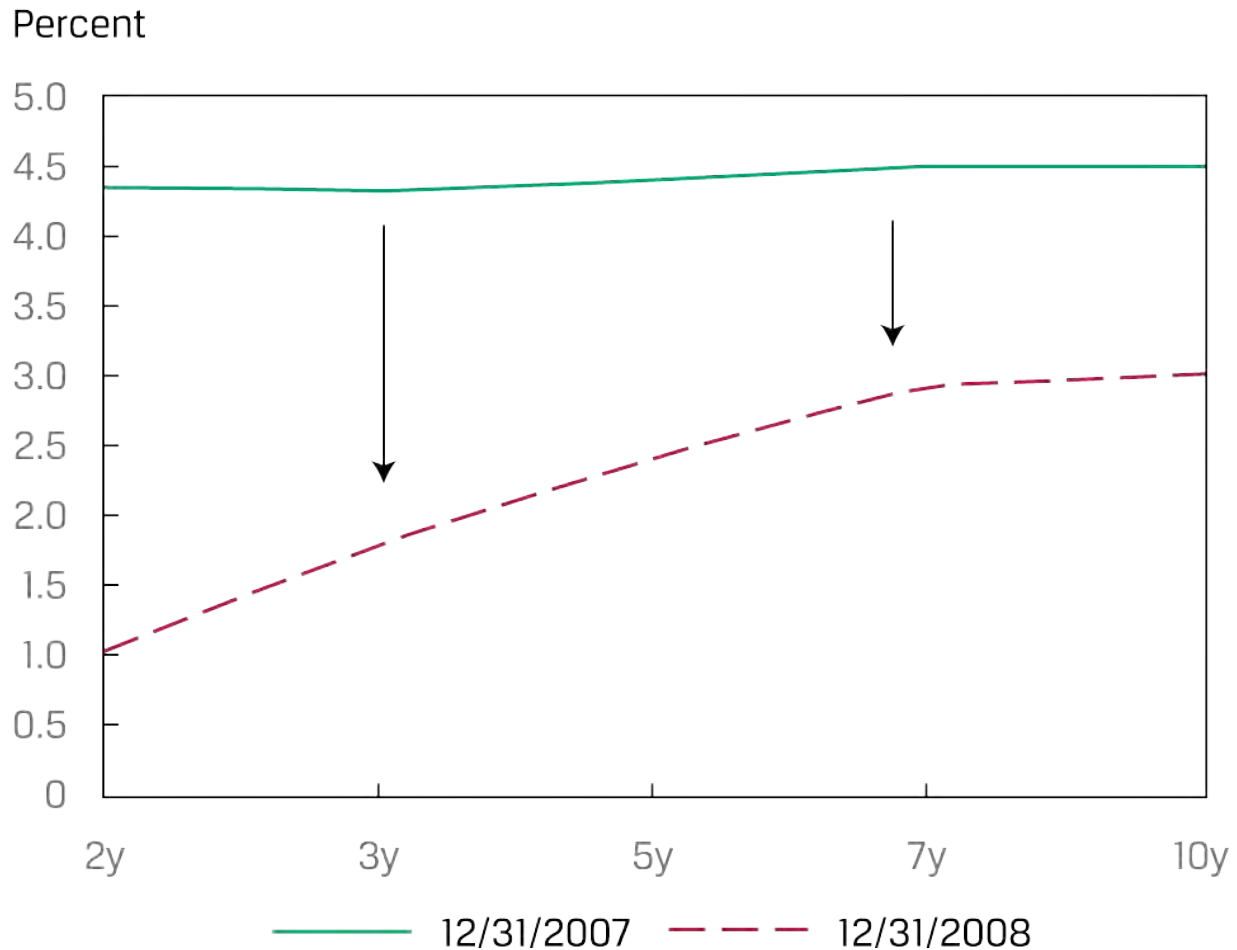


In an earlier lesson on establishing a rate view, we highlighted a **bull steepening** scenario under which short-term yields-to-maturity fall by more than long-term yields-to-maturity if the monetary authority cuts benchmark rates to stimulate economic activity during a



recession. [Exhibit 15](#) shows the bull steepening that occurred in the UK gilt yield curve amid the 2008 global financial crisis. After reaching a cycle peak of 5.75% in July 2007, the Bank of England cut its monetary policy base rate six times, down to 2.00% in early December 2008, due to weakening economic conditions and financial market stress.

**Exhibit 15. UK Government Yields, 2007 versus 2008 (Year End)**



Source: Bloomberg.

On the other hand, a **bear steepening** occurs when long-term yields-to-maturity rise more than short-term yields-to-maturity. This could result from a jump in long-term rates amid higher growth and inflation expectations while short-term rates remain unchanged. In this case, an analyst might expect the next central bank policy change to be a monetary tightening to curb inflation.

Bull or bear steepening expectations will change the strategy an active fixed-income manager might pursue, as seen in [Exhibit 16](#).

## Exhibit 16. Yield Curve Steepener Strategies

Strategy	Description	Expected Excess Return	Downside Risks
Duration neutral	Net zero duration	Portfolio gain from yield curve slope increase	Yield curve flattening
Bear steepener	Net negative (“short”) duration	Portfolio gain from slope increase and/or rising yields	Yield curve flattening and/or lower yields
Bull steepener	Net positive (“long”) duration	Portfolio gain from slope increase and/or lower yields	Yield curve flattening and/or higher yields

For example, assume an active manager expects the next yield curve change to be a bull steepening and establishes the following portfolio using the same 2-year and 10-year Treasury securities as in our prior examples.

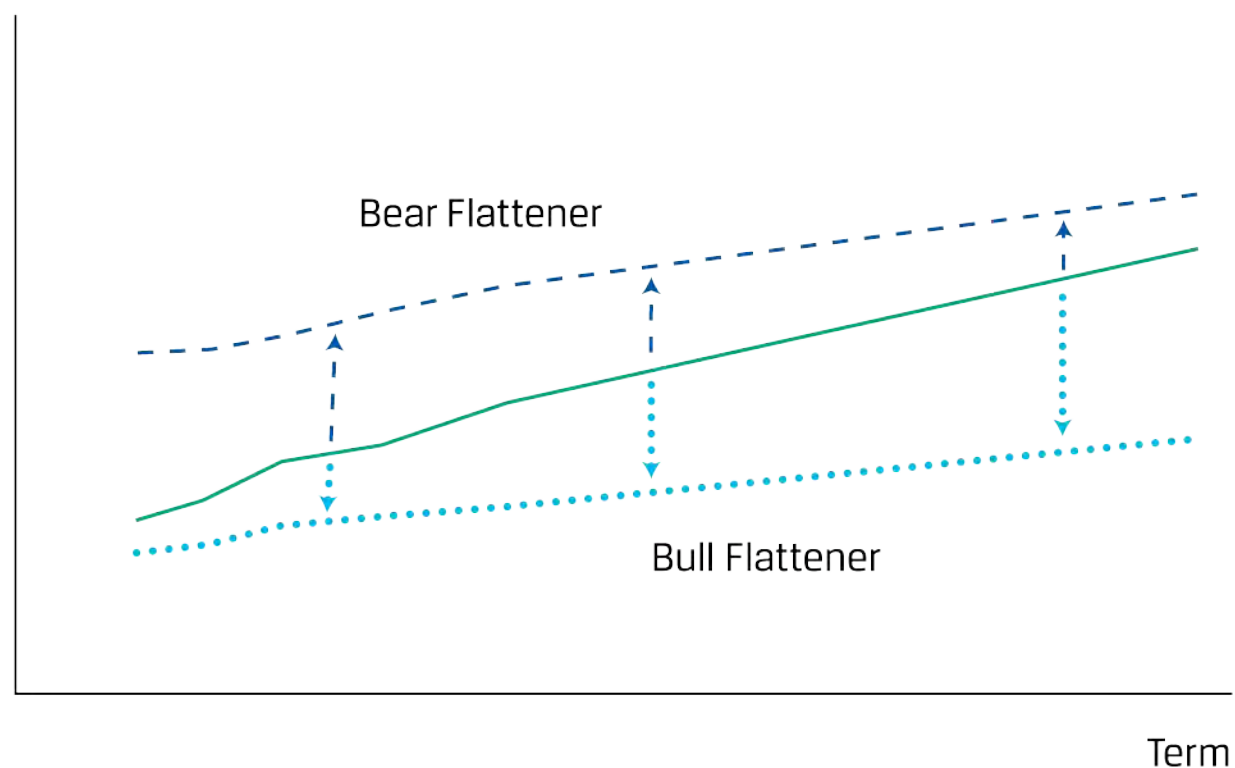
Tenor	Coupon	Position (\$ MM)	Modified Duration	Convexity
Long 2y	0.25%	213.8	1.994	5.0
Short 10y	2.00%	–36.2	9.023	90.8

In contrast to the earlier duration-matched steepener, the bull steepener increases the 2-year long Treasury position by \$50 million, introducing a net long duration position to capitalize on an anticipated greater decline in short-term yields-to-maturity. We can see this by solving for portfolio duration of 0.5613, or  $[1.994 \times 213.8 / (213.8 - 36.2)] + [9.023 \times -36.2 / (213.8 - 36.2)]$ , which is equivalent to a portfolio BPV of approximately \$9,969, or  $0.5613 \times [(\$213,800,000 - \$36,200,000) / 10,000]$ . We may use this portfolio BPV to estimate the approximate portfolio gain if the 2-year yield-to-maturity falls by 25 bps more than the 10-year yield-to-maturity rises, which is equal to \$249,225 ( $= 25 \text{ bps} \times \$9,969$ ).

Yield curve flattening involves an anticipated narrowing of the difference between long-term and short-term yields-to-maturity, two basic variations of which are shown in [Exhibit 17](#) and are adapted from Smith (2014).

## Exhibit 17. Yield Curve Slope Changes—Flattening

Yield (%)



A flatter yield curve may follow monetary policy actions due to changing growth and inflation expectations. For example, a **bear flattening** scenario might follow the bear steepening move seen in [Exhibit 15](#) if policymakers respond to rising inflation expectations and higher long-term rates by raising short-term policy rates. It was established earlier in the curriculum that investors sell higher risk assets and buy default risk-free government bonds in a flight to quality during highly uncertain markets, a situation which often contributes to **bull flattening** as long-term rates fall more than short-term rates. Flattener strategies may use a barbell strategy, which reverses the exposure profile of a steepener—namely, a “short” short-term bond position and a “long” long-term bond position. The bull and bear variations of this strategy are summarized in [Exhibit 18](#).

**Exhibit 18. Yield Curve Flattener Strategies**

Strategy	Description	Expected Excess Return	Downside Risks
Duration neutral	Net zero duration position	Portfolio gain from yield curve slope decrease	Yield curve steepening

Bear flattener	Net negative duration position	Portfolio gain from slope decrease and/or rising yields	Yield curve steepening and/or lower yields
Bull flattener	Net positive duration position	Portfolio gain from slope decrease and/or lower yields	Yield curve steepening and/or higher yields

Say, for example, a French investor expects the government yield curve to flatten over the next six months following years of quantitative easing by the European Central Bank through 2019. Her lack of a view as to whether this will occur amid lower or higher rates causes her to choose a duration neutral flattener using available French government (OAT) zero-coupon securities. She decides to enter the following trade at the beginning of 2020:

Tenor	Yield	Price	Notional (€ MM)	Modified Duration	Position BPV	Convexity
Short 2y	-0.65%	€101.313	-83.24	2.013	(€16,975)	6.1
Long 10y	0.04%	€99.601	17.05	9.996	€16,977	110

Note that as the Excel PRICE function returns a #NUM! error value for bonds with negative yields-to-maturity, we calculate the 2-year OAT zero-coupon bond price of 101.313 using  $100/(1 - 0.0065)^2$ . The initial portfolio BPV close to zero tells us that parallel yield curve shifts will have little effect on portfolio value, while the short 2-year and long 10-year trades position the manager to profit from a decline in the current 69 bp spread between 2- and 10-year OAT yields-to-maturity. After six months, the portfolio looks as follows:

Tenor	Yield	Price	Notional (€ MM)	Modified Duration	Convexity
Short 1.5y	-0.63%	€100.95	-83.24	1.51	3.8
Long 9.5y	-0.20%	€101.92	17.05	9.52	100.2

At the end of six months (June 2020), the sharp decline in economic growth and inflation expectations due to the COVID-19 pandemic caused the OAT yield curve to flatten as the 10-year yield-to-maturity fell. The six-month barbell return of €695,332 is comprised of

rolldown return and yield changes, calculated as follows:

## Rolldown Return

Zero-coupon bonds usually accrete in value as time passes if rates remain constant and the yield-to-maturity is positive. However, under negative yields-to-maturity, amortization of the bond's premium will typically result in a rolldown *loss*. In our example, the investor is short the original 2-year zero and therefore realizes a rolldown *gain* on the short position.

Rolldown return on the barbell may be shown to be approximately €277,924, as follows:

$$\text{"Short" 2-year: } -\text{€83.24 MM} \times [1/(1 + -0.65\%)^2] - [1/(1 + -0.65\%)^{1.5}]$$

$$\text{"Long" 10-year: } \text{€17.05 MM} \times [1/(1 + 0.04\%)^{10}] - [1/(1 + 0.04\%)^{9.5}]$$

## Δ Price Due to Benchmark Yield Changes

The yield difference falls from 69 bps to 43 bps, mostly due to a 24 bp decline in the 10-year yield-to-maturity. Note that the Excel DURATION and MDURATION functions also return a #NUM! error for negative yields-to-maturity. We may use either price changes, as shown next, or the modified duration and convexity statistics as of the end of the investment horizon, just shown, to calculate a return of €417,408 using [Equation 3](#).

$$\text{"Short" 2-year: } -\text{€83.24 MM} \times [1/(1 + -0.65\%)^{1.5}] - [1/(1 + -0.63\%)^{1.5}]$$

$$\text{"Long" 10-year: } \text{€17.05 MM} \times [1/(1 + 0.04\%)^{9.5}] - 1/(1 + -0.20\%)^{9.5}]$$

As we have considered duration-neutral, long, and short duration strategies to position the portfolio for expected yield curve slope changes, average duration is clearly no longer a sufficient summary statistic. A barbell strategy has greater cash flow dispersion and is therefore more convex than a bullet strategy, implying that its value will decrease by less than a bullet if yields-to-maturity rise and increase by more than a bullet if yields-to-maturity fall. We therefore must consider portfolio convexity in addition to duration when weighing yield curve slope strategies under different scenarios.

### 3.2.3. Divergent Yield Curve Shape View

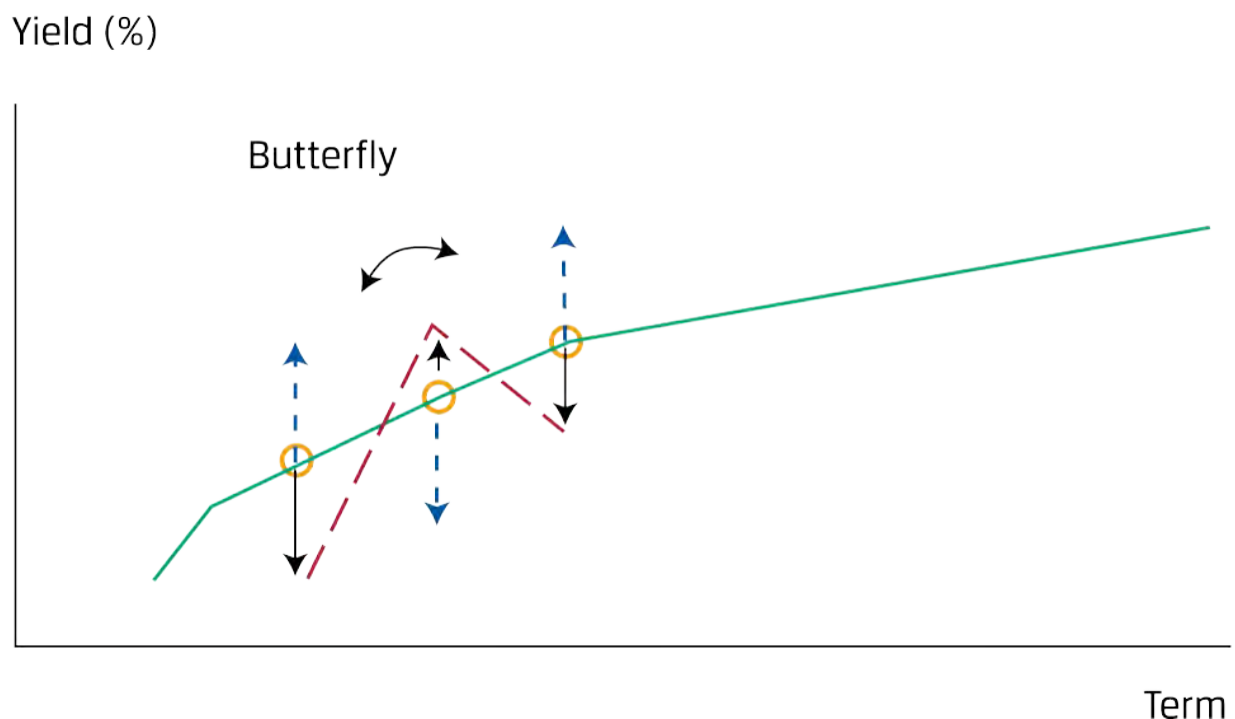
As described in Section 2.1, yield curve shape or curvature describes the relationship between short-, medium-, and long-term yields-to-maturity across the term structure. Recall from Equation 2 that we quantify the butterfly spread by subtracting both short- and long-term rates from twice the intermediate yield-to-maturity. Since the difference between short- and medium-term rates is typically greater than that between medium- and long-term rates,

the butterfly spread is usually positive, as seen earlier in [Exhibit 3](#).

What factors drive yield curve curvature changes as distinct from rate level or curve slope changes? The segmented markets hypothesis introduced previously offers one explanation: Different market participants face either regulatory or economic asset/liability management constraints that drive the supply and demand for fixed-income instruments within different segments of the term structure. For example, a potential factor driving the apparent butterfly spread volatility in [Exhibit 3](#) is the active central bank purchases of Treasury securities at specific maturities under its quantitative easing policy.

The most common yield curve curvature strategy combines a long bullet with a short barbell portfolio (or vice versa) in what is referred to as a **butterfly strategy** to capitalize on expected yield curve shape changes. The short-term and long-term bond positions of the barbell form the “wings,” while the intermediate-term bullet bond position forms the “body” of the butterfly, as illustrated in [Exhibit 19](#). Note that unlike the steepener and flattener cases, the investor is either “long” or “short” *both* a short-term and long-term bond and enters into an intermediate-term bullet trade in the opposite direction.

### Exhibit 19. Butterfly Strategy



For example, consider a situation in which an active manager expects the butterfly spread to rise due to lower 2- and 10-year yields-to-maturity and a higher 5-year Treasury yield-to-maturity. Using the same portfolio statistics as in prior examples with bonds priced at par,

consider the following combined *short* (5-year) bullet and *long* (2-year and 10-year) barbell strategy.

Tenor	Coupon	Position (\$ MM)	Modified Duration	Position BPV	Convexity
Long 2y	0.25%	110	1.994	\$21,934	5.0
Short 5y	0.875%	-248.3	4.88	(\$121,170)	26.5
Long 10y	2.00%	110	9.023	\$99,253	90.8

While the sum of portfolio positions (−\$28.3 MM) shows that the investor has a net “short” bond position, we can verify the strategy is duration neutral by either adding up the position BPVs or calculating the portfolio duration, or  $[1.994 \times (110/-28.3)] + [4.88 \times (-248.3/-28.3)] + [9.023 \times (110/-28.3)]$  to confirm that both are approximately zero. The portfolio convexity may be shown as −139.9, or  $[5.0 \times (110/-28.3)] + [26.5 \times (-248.3/-28.3)] + [90.8 \times (110/-28.3)]$ .

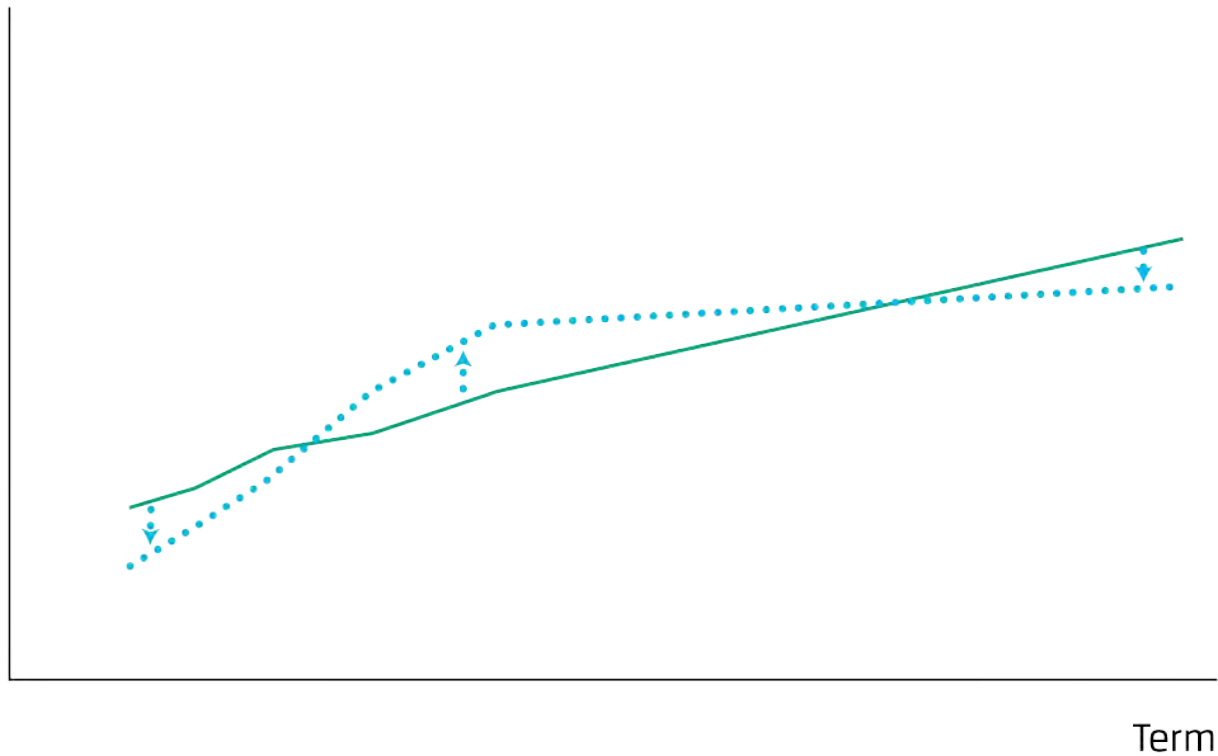
How does this portfolio perform if 2- and 10-year Treasury yields-to-maturity fall by 25 bps each and the 5-year yield-to-maturity rises by 50 bps? A duration-based estimate multiplying each position BPV by the respective yield change gives us an approximation of \$9,089,075, or  $(+25 \text{ bps} \times \$21,934) + (-(50 \text{ bps} \times -\$121,188)) + (+25 \text{ bps} \times \$99,253)$ . A more precise answer of \$9,038,877 incorporating convexity for each position may be derived using [Equation 3](#). You might ask why the precise portfolio value change is below our approximation. The answer lies in the relative *magnitude* of yield changes across the curve. Since the 5-year yield-to-maturity is assumed to increase by 50 bps rather than 25 bps, the convexity impact of the short bullet position outweighs that of the long barbell. Although the portfolio is nearly immune to parallel yield curve changes with a BPV close to zero, the portfolio gain in our example coincides with an increase in the butterfly spread from −50 bps to +100 bps.

This example shows that an active manager’s specific view on *how* yield curve shape will change will dictate the details of the combined bullet and barbell strategy. [Exhibit 20](#), adapted from Smith (2014), shows both the **negative butterfly** view just shown as well as a **positive butterfly**, which indicates a *decrease* in the butterfly spread due to an expected rise in short- and long-term yields-to-maturity combined with a lower medium-term yield-to-maturity. Note that a positive butterfly view indicates a decrease in butterfly spread due to a bond’s inverse price–yield relationship.

## Exhibit 20. Yield Curve Curvature Changes

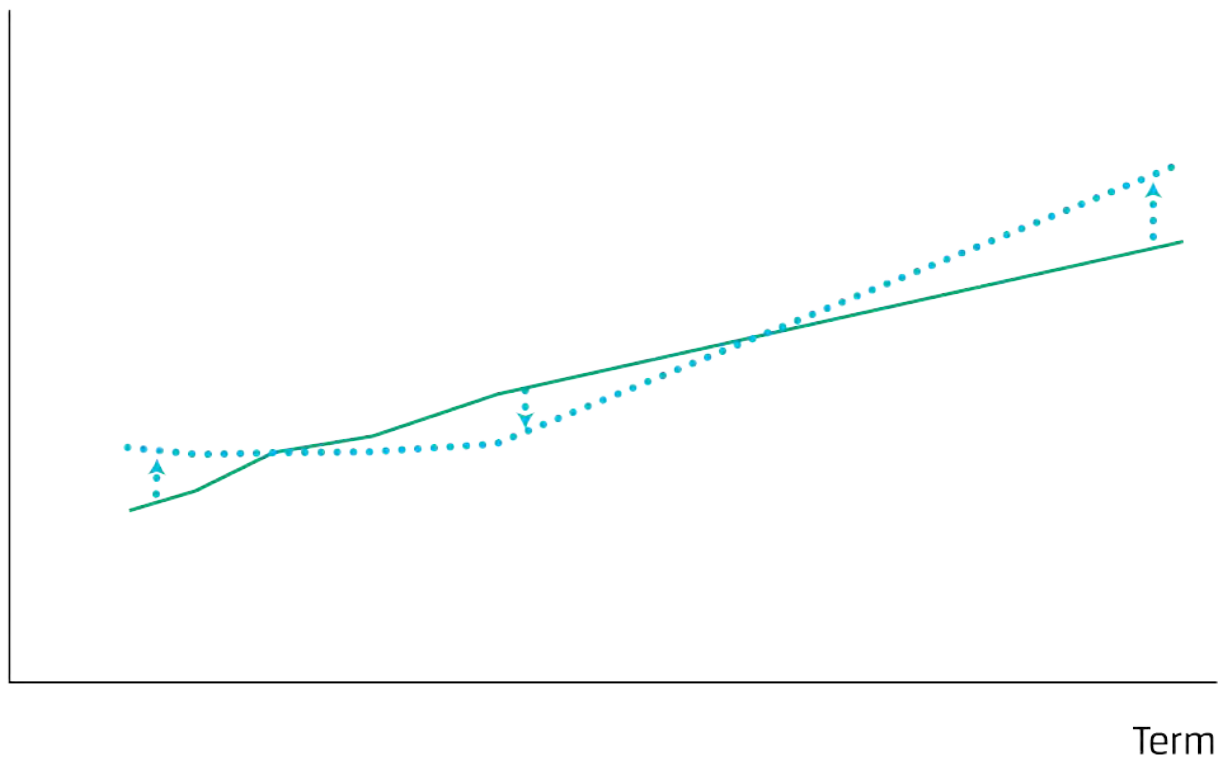
## ***A. Negative Butterfly***

Yield (%)



## ***B. Positive Butterfly***

Yield (%)





Note that as in the case of yield curve slope strategies, the *combination* of a short bullet and long barbell increases portfolio convexity due to higher cash flow dispersion, making this a more meaningful portfolio risk measure for this strategy than average duration (which remains neutral in the [Exhibit 20](#) example). [Exhibit 21](#) summarizes the two butterfly strategies.

### Exhibit 21. Yield Curve Curvature Strategies

Expected Scenario	Investor's Expectation	Active Position
Negative butterfly	Lower short- and long-term yields, Higher medium-term yields	Short bullet, Long barbell (long positions in short- and long-term bonds)
Positive butterfly	Higher short- and long-term yields, Lower medium-term yields	Long bullet, Short barbell (short positions in short- and long-term bonds)

### 3.2.4. Yield Curve Volatility Strategies

While the prior sections focused on strategies using option-free bonds and swaps and futures as opposed to bonds with embedded options and stand-alone option strategies, we now explicitly address the role of volatility in active fixed-income management.

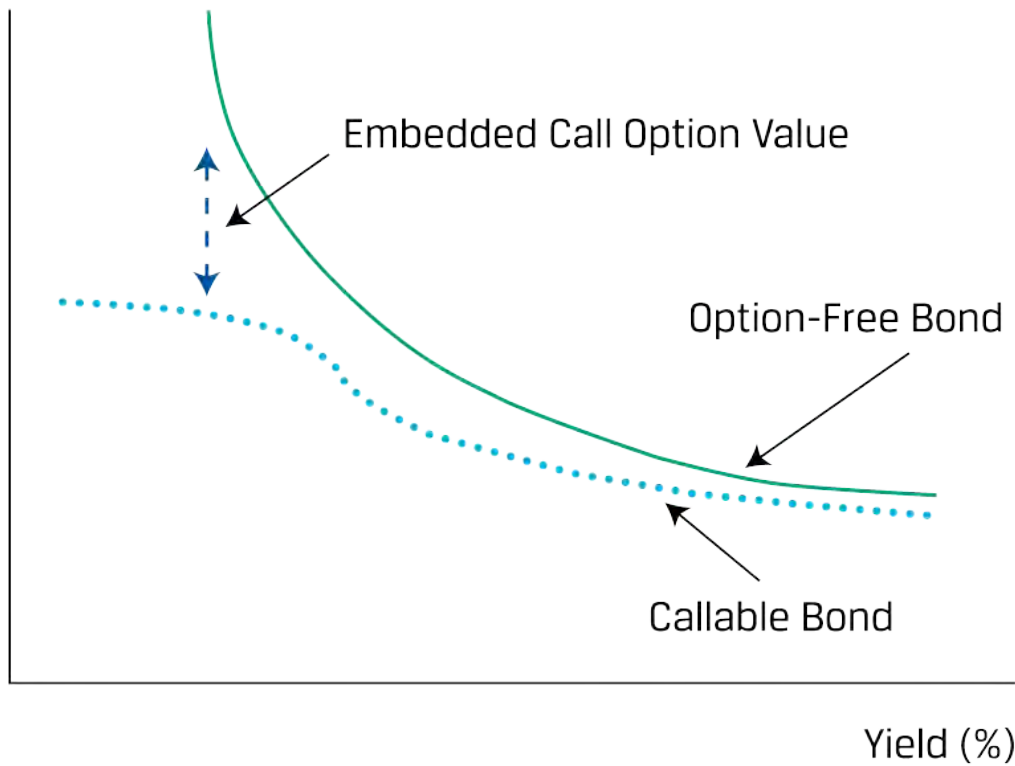
Option-only strategies play a more modest role in overall yield curve management. In markets such as in the United States where a significant portion of outstanding fixed-income bonds, such as asset-backed securities, have embedded options, investors use cash bond positions with embedded options more frequently than stand-alone options to manage volatility. For example, as of 2019 approximately 30% of the Bloomberg Barclays US Aggregate Bond Index was comprised of securitized debt, which mostly includes bonds with embedded options. As outlined earlier, the purchase of a bond call (put) option offers an investor the right, but not the obligation, to buy (sell) an underlying bond at a pre-determined strike price. An active manager's choice between purchasing or selling bonds with embedded call or put options versus an option-free bond with otherwise similar characteristics hinges

upon expected changes in the option value and whether the investor is “short” volatility (i.e., has sold the right to call a bond at a fixed price to the issuer), as in the case of callable bonds, or “long” volatility (i.e., owns the right to sell the bond at a fixed price to the issuer), as for puttable bonds. [Exhibit 22](#) shows how callable and puttable bond prices change versus option-free bonds as yields-to-maturity change.

## **Exhibit 22. Callable and Puttable versus Option-Free Bonds**

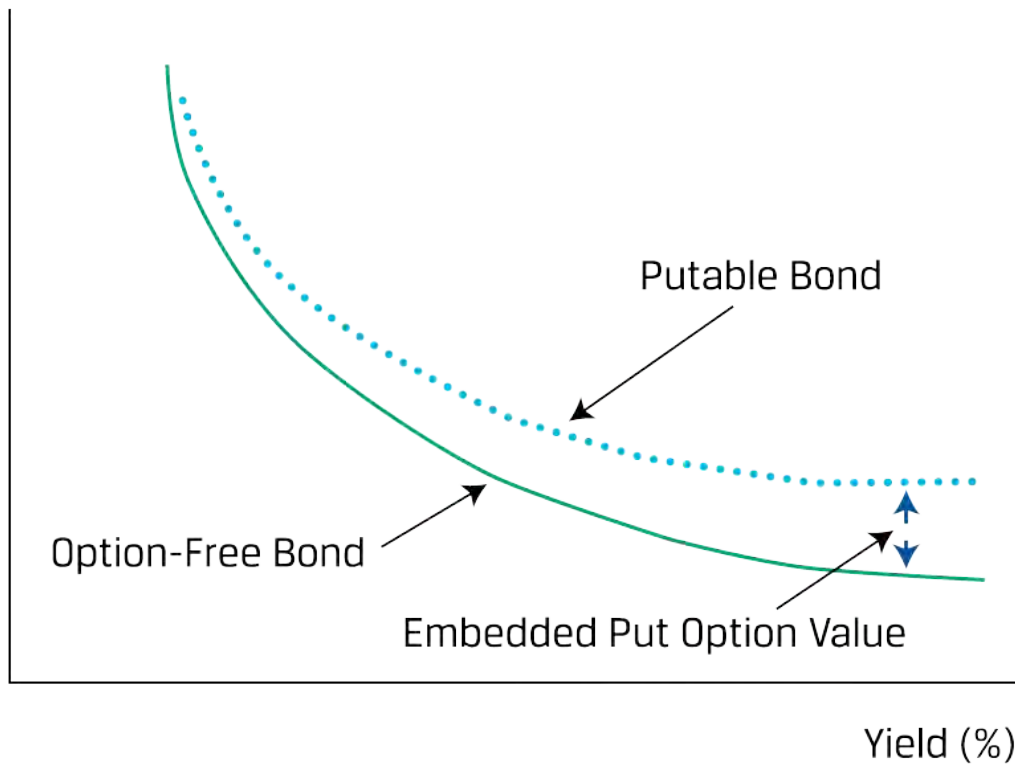
## ***A. Callable Bond***

Price



## ***B. Putable Bond***

Price



## EXAMPLE 8

### Option-Free Bonds versus Callable/Puttable Bonds

An investment manager is considering an incremental position in a callable, puttable, or option-free bond with otherwise comparable characteristics. If she expects a downward parallel shift in the yield curve, it would be most profitable to be:

- a. long a callable bond.
- b. short a puttable bond.
- c. long an option-free bond.

#### Solution:

“C” is correct. The value of a bond with an embedded option is equal to the sum of the value of an option-free bond plus the value to the embedded option. The bond investor can be either long or short the embedded option, depending on the type of bond. With a callable bond, the embedded call option is owned by the issuer of the bond, who can exercise this option if yields-to-maturity decrease (the bond investor is short the call option). With a puttable bond, the embedded put option is owned by the bond investor, who can exercise the option if yields-to-maturity increase. For a decrease in yields-to-maturity—as given in the question—the value of the embedded call option increases and the value of the embedded put option decreases. This means that a long position in a callable bond (“A”) would underperform compared to a long position in an option-free bond. A short position in a puttable bond (“B”) would underperform a long position in an option-free bond primarily because yields-to-maturity were declining, although the declining value of the embedded put option would mitigate some of the loss (the seller of the puttable bond has “sold” the embedded put).

As mentioned earlier in the curriculum, effective duration and convexity are the relevant summary statistics when future bond cash flows are contingent upon interest rate changes.

#### Equation (8)

$$\text{Effective Duration (EffDur)} = \frac{(PV_-) - (PV_+)}{2 \times (\Delta \text{Curve})(PV_0)}.$$

### Equation (9)

$$\text{Effective Convexity (EffCon)} = \frac{(PV_-) + (PV_+) - 2(PV_0)}{(\Delta \text{Curve})^2 \times (PV_0)}.$$

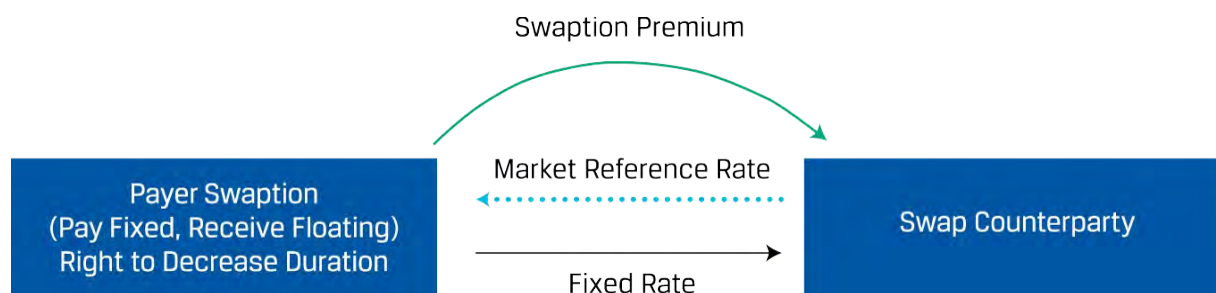
In [Equations 8 and 9](#),  $PV_-$  and  $PV_+$  are the portfolio value changes from a decrease and increase in yield-to-maturity, respectively,  $PV_0$  is the original portfolio value, and  $\Delta \text{Curve}$  is the change in the benchmark yield-to-maturity.

Although cash-based yield curve volatility strategies are limited to the availability of liquid callable or puttable bonds, several stand-alone derivatives strategies involve the right, but not the obligation, to change portfolio duration and convexity based upon an interest rate-sensitive payoff profile.

Interest rate put and call options are generally based upon a bond's price, not yield-to-maturity. Therefore, the purchase of a bond call option provides an investor the right, but not the obligation, to acquire an underlying bond at a pre-determined strike price. This purchased call option adds convexity to the portfolio and will be exercised if the bond price appreciates beyond the strike price (i.e., generally at a lower yield-to-maturity). On the other hand, a purchased bond put option benefits the owner if prices fall (i.e., yields-to-maturity rise) beyond the strike prior to expiration. Sale of a bond put (call) option limits an investor's return to the up-front premium received in exchange for assuming the potential cost of exercise if bond prices fall below (rise above) the pre-determined strike. Note that the option seller must post margin based on exchange or counterparty requirements until expiration.

An interest rate **swaption** involves the right to enter into an interest rate swap at a specific strike price in the future. This instrument grants the contingent right to increase or decrease portfolio duration. For example, [Exhibit 23](#) shows a purchased payer swaption, which a manager might purchase to benefit from higher rates using an option-based strategy.

### Exhibit 23. Purchased Payer Swaption



**Options on bond futures contracts** are liquid exchange-traded instruments frequently used by fixed-income market participants to buy or sell the right to enter into a futures position. Long option, swaption, and bond futures option strategies are summarized in Exhibit 24.

**Exhibit 24. Long Option, Swaption, and Bond Futures Option Strategies**

Strategy	Description	Targeted Return	Portfolio Impact
Long bond call option	Purchase right to take forward bond delivery	Max (Bond price at lower yield – Strike price, 0) – Call premium	Increase portfolio duration and convexity (up-front premium)
Long bond put option	Purchase right to deliver bond in the future	Max (Strike price – Bond price at higher yield, 0) – Put premium	Decrease portfolio duration and convexity (up-front premium)
Long payer swaption	Own the right to pay-fixed on an interest rate swap at a strike rate	Max (Strike rate – Swap rate, 0) – Swaption premium	Decrease in portfolio duration and convexity (up-front premium)
Long receiver swaption	Own the right to receive-fixed on an interest rate swap at a strike rate	Max (Swap rate – Strike rate, 0) – Swaption premium	Increase in portfolio duration and convexity (up-front premium)
Long call option on bond future	Own the right to take forward bond delivery at a strike price	Max (Bond futures price at lower yield – Strike price, 0) – Call premium	Increase in portfolio duration and convexity (up-front premium)

Long put option on bond future	Own the right to deliver bond in the future at a strike price	Max (Strike price – Bond futures price at higher yield, 0) – Put premium	Decrease in portfolio duration and convexity (up-front premium)
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## EXAMPLE 9

### Choice of Option Strategy

A parallel upward shift in the yield curve is expected. Which of the following would be the best option strategy?

- a. Long a receiver swaption
- b. Short a payer swaption
- c. Long a put option on a bond futures contract

#### Solution:

C is correct. With an expected upward shift in the yield curve, the portfolio manager would want to reduce portfolio duration in anticipation of lower bond prices. A put option increases in value as the yield curve shifts upward, while the price of the underlying bond declines below the strike. A is incorrect because a receiver swaption is an option to receive-fixed in an interest rate swap. With fixed-rate bond prices expected to fall as rates rise, the portfolio manager would not want to exercise an option to receive a fixed strike rate, which is similar to owning a fixed-rate bond. B is incorrect because a payer swaption is an option to pay-fixed/receive-floating in an interest rate swap. A *long*, not a short, position in a payer swaption would benefit from higher rates.

In an expected stable or static yield curve environment, an active manager may aim to “sell” volatility in the form of either owning callable bonds (which is an implicit “sale” of an option) or selling stand-alone options in order to earn premium income, if this is within the investment mandate. The active portfolio decision here depends upon the manager’s view as to whether future realized volatility will be greater or less than the implied volatility, as reflected by the price of a stand-alone option or a bond with embedded options. The manager will benefit if rates remain relatively constant and the bond is not called and/or the options sold expire worthless. Alternatively, if yield curve volatility is expected to increase, a manager may prefer to be long volatility in order to capitalize on large changes in level, yield curve slope, and/or shape using option-based

contracts.

## EXAMPLE 10

# Option-Free versus Callable and Puttable Bonds Amid Higher Yield Levels

Given a parallel shift upwards in the yield curve, what is the most likely ordering in terms of expected decline in value—from least to most—for otherwise comparable bonds? Assume that the embedded options are deep out-of-the-money.

- a. Callable bond, option-free bond, puttable bond
- b. Puttable bond, callable bond, option-free bond
- c. Puttable bond, option-free bond, callable bond

## Solution:

Answer: B is correct. The value of a bond with an embedded option may be considered as the value of an option-free bond plus the value of the embedded option. While the upward shift in the yield curve will cause the option-free component of each bond to depreciate in value, this change in yields-to-maturity will also affect the value of embedded options.

For a puttable bond, the bond investor has the option to “put” the bond back to the issuer if yields-to-maturity rise. The more rates rise, the more valuable this embedded option becomes. This increasing option value will partially offset the decline in value of the puttable bond relative to the option-free bond. This can be seen in the lower panel of [Exhibit 22](#): The dotted line for the puttable bond has a flatter slope than the solid line for the option-free bond; its price will decrease more slowly as yields-to-maturity increase.

For a callable bond, the bond issuer has an option to “call” the bond if yields-to-maturity decline; the more rates rise, the lower the call option value. Since the bond investor is short the embedded option and the value of the embedded option has fallen, this will partially offset the decline in the value of the callable bond relative to the option-free bond. The top panel of [Exhibit 22](#) shows that the dotted line for the callable bond has a flatter slope than the solid line for the option-free bond.

As rates continue to increase, the embedded option for the puttable bond rises in value



more quickly at the margin as it shifts toward becoming an in-contrast, the deep out-of-the-money embedded call option moves money as rates increase and the marginal impact of further rate

### 3.3. Key Rate Duration for a Portfolio

So far, we have evaluated changes in yield curve level, slope, and and three specific maturity points across the term structure of interest rates. The concept of **key rate duration** (or partial duration) introduced portfolio sensitivity over a set of maturities along the yield curve, with the key rate duration being identical to the effective duration:

#### Equation (10)

$$\text{KeyRateDur}_k = -\frac{1}{\text{PV}} \times \frac{\Delta \text{PV}}{\Delta r_k}$$

#### Equation (11)

$$\sum_{k=1}^n \text{KeyRateDur}_k = \text{EffDur},$$

where  $r_k$  represents the  $k$ th key rate. In contrast to effective duration, key rate duration helps identify “shaping risk” for a bond—that is, a bond’s sensitivity to a specific point on the benchmark yield curve. By breaking down a portfolio into its individual key rates, by maturity, an active manager can pinpoint and quantify key exposures. This is illustrated in the following simplified zero-coupon bond example.

Compare a passive zero-coupon US Treasury bond portfolio versus an active portfolio:

#### “Index” Zero-Coupon Portfolio

Tenor	Coupon	Annualized Yield	Price (per \$100)	Position (\$ MM)	Market Value (\$ MM)
2y	0.00%	1%	98.03	98.03	1









































































# Reading 14

## Fixed-Income Active Management: Credit Strategies

by Campe Goodman, CFA, and Oleg Melentyev, CFA

*Campe Goodman, CFA, is at Wellington Management (USA). Oleg Melentyev, CFA, is at Bank of America Merrill Lynch (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a. describe risk considerations for spread-based fixed-income portfolios;
- b. discuss the advantages and disadvantages of credit spread measures for spread-based fixed-income portfolios, and explain why option-adjusted spread is considered the most appropriate measure;
- c. discuss bottom-up approaches to credit strategies;
- d. discuss top-down approaches to credit strategies;
- e. discuss liquidity risk in credit markets and how liquidity risk can be managed in a credit portfolio;
- f. describe how to assess and manage tail risk in credit portfolios;
- g. discuss the use of credit default swap strategies in active fixed-income portfolio management;
- h. discuss various portfolio positioning strategies that managers can use to implement a specific credit spread view;
- i. discuss considerations in constructing and managing portfolios across international

credit markets;

- j. describe the use of structured financial instruments as an alternative to corporate bonds in credit portfolios;
- k. describe key inputs, outputs, and considerations in using analytical tools to manage fixed-income portfolios.

---

## 1. INTRODUCTION

Most fixed-income instruments trade at a nominal yield to maturity (YTM) that lies above that for an equivalent government or benchmark bond of similar maturity. This **yield spread** or difference compensates investors for the risk that they might not receive interest and principal cash flows as expected, whether as a result of a financially distressed corporate borrower, a sovereign issuer unable (or unwilling) to meet scheduled payments, or a deterioration in credit quality in an underlying pool of assets of a structured instrument such as an asset-backed security. A portion of the yield spread reflects the bid–offer cost of buying or selling a particular bond versus a government security, a liquidity premium that varies based on market conditions. Active managers of spread-based fixed-income portfolios take positions in credit and other risk factors that vary from those of an index to generate excess return versus passive index replication. Financial analysts who build on their foundational knowledge by mastering these more advanced fixed-income concepts and tools will broaden their career opportunities in the investment industry.

We begin by reviewing expected fixed-income portfolio return components with a particular focus on credit spreads. These spreads are not directly observable but rather derived from market information. Similar to benchmark yield curves, credit-spread curves are often defined by spread level and slope, and usually grouped by credit rating to gauge relative risk as well as to anticipate and act on expected changes in these relationships over the business cycle. We outline credit spread measures for fixed- and floating-rate bonds and quantify the effect of spread changes on portfolio value. Building blocks for active credit management beyond individual bonds include exchange-traded funds (ETFs), structured financial instruments, and derivative products such as credit default swaps (CDS). These tools are used to describe bottom-up and top-down active credit management approaches as well as how managers position spread-based fixed-income portfolios to capitalize on a market view.

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## 2. KEY CREDIT AND SPREAD CONCEPTS FOR ACTIVE MANAGEMENT

### a. describe risk considerations for spread-based fixed-income portfolios

Managers seeking to maximize fixed-income portfolio returns will usually buy securities with a higher YTM (and lower equivalent price) than a comparable default risk-free government bond. The excess return targeted by active managers of spread-based fixed-income portfolios is captured in the fourth term of the now familiar fixed-income return equation:

#### Equation (1)

$E(R) \approx$  Coupon income

+/- Rolldown return

+/-  $E(\Delta \text{ Price due to investor's view of benchmark yields})$

+/-  $E(\Delta \text{ Price due to investor's view of yield spreads})$

+/-  $E(\Delta \text{ Price due to investor's view of currency value changes})$

Similar to the benchmark yield curve addressed earlier in the curriculum, yield spreads for a specific bond issuance over a comparable government bond cannot be directly observed but are rather derived or estimated from market information. This yield spread is a risk premium that primarily compensates investors for assuming credit and liquidity risks.

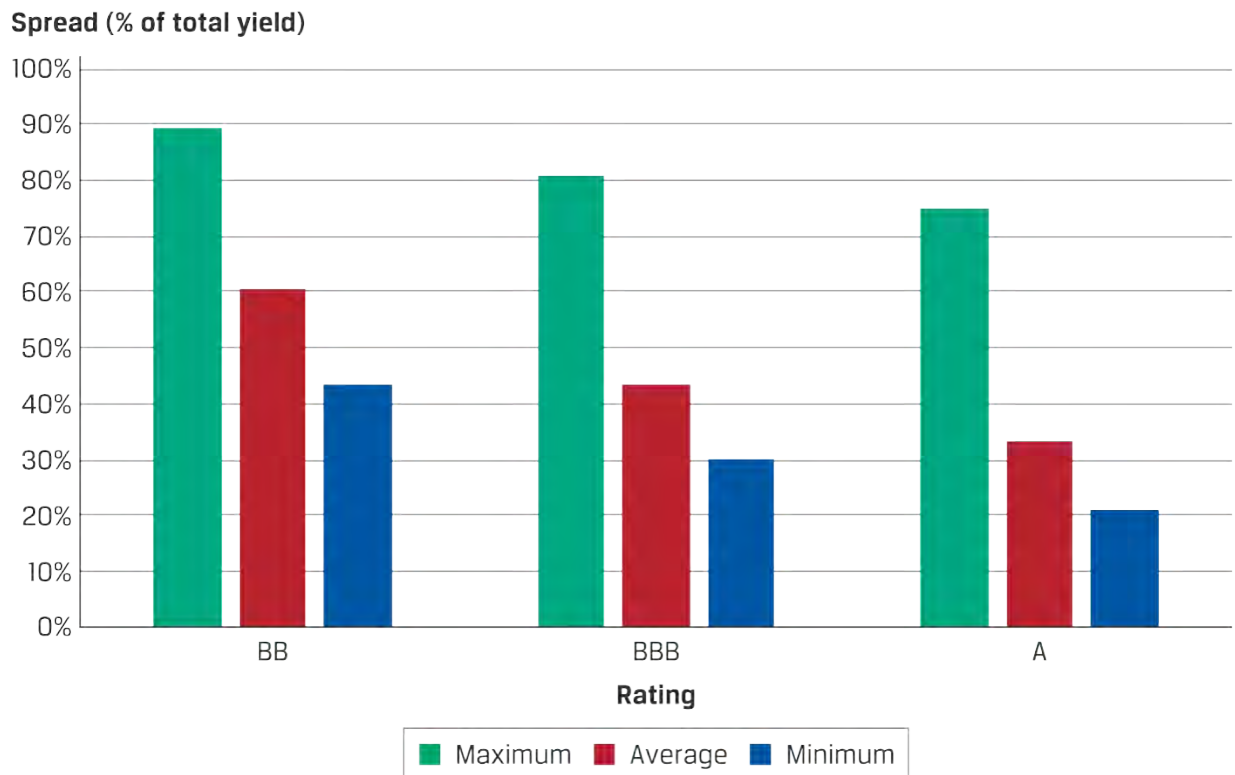
While credit risk for a specific borrower depends on both the likelihood of default and the loss severity in a default scenario, credit risk for a specific bond *issuance* also depends on the period over which payments are promised, the relative seniority of the debt claim, and the sources of repayment, such as the value of underlying collateral, among other factors.

Liquidity risk refers to an investor's ability to readily buy or sell a specific security. The YTM difference (or bid-ask spread) between the purchase and sale price of a bond depends on market conditions and on the specific supply-and-demand dynamics of each fixed-income security. As active fixed-income portfolio managers identify and pursue specific credit strategies, they must also consider trading costs when calculating expected excess returns.

## 2.1. Credit Risk Considerations

Yield spreads over default risk-free government bonds mostly compensate investors for the potential of not receiving promised cash flows (issuer default) and for the loss severity if a default occurs. Spreads range widely across ratings categories and time periods. For example, [Exhibit 1](#) shows yield spreads as a percentage of total YTM for A-, BBB-, and BB rated US corporate issuers from mid-2009 to mid-2020.

**Exhibit 1. Yield Spreads as a Percentage of YTM, 2009–2020**



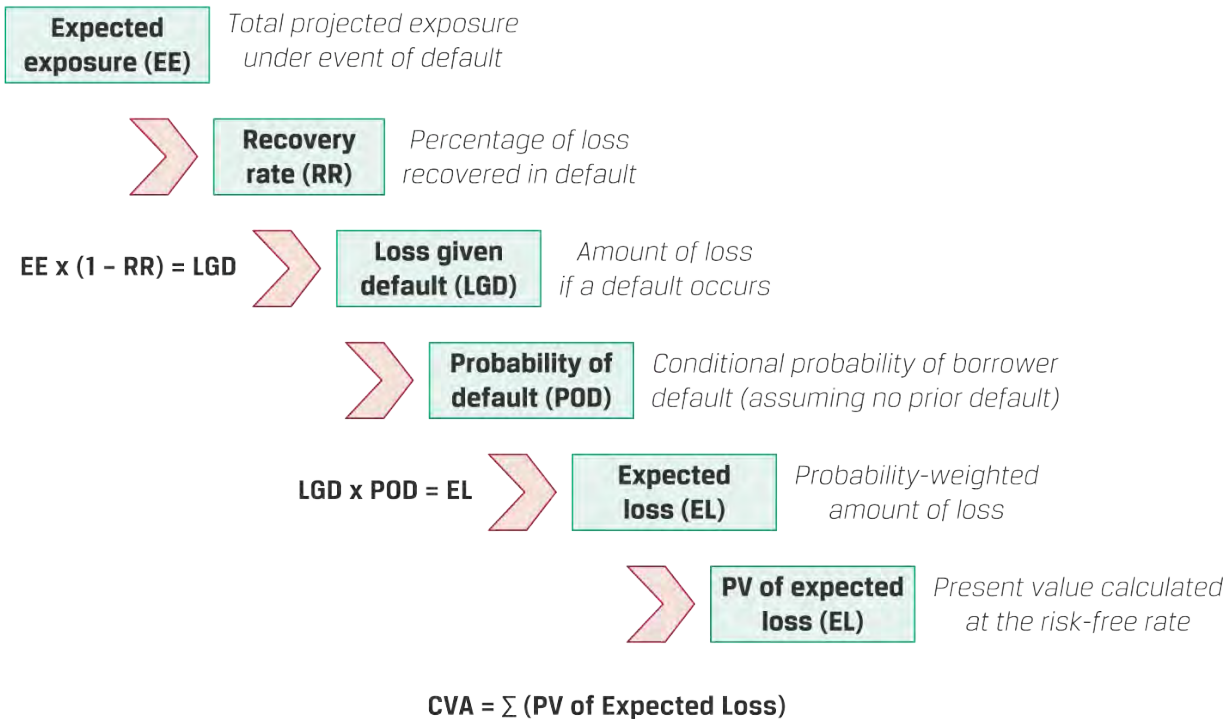
Source: Bloomberg

On average, 60% of total YTM was attributable to yield spread for BB rated issuers versus 33% for A rated issuers over the period. This percentage was at a minimum for all rating categories in 2010 as the US economy recovered from the 2008–09 financial crisis and reached its peak in early 2020 during the economic slowdown due to the COVID-19 pandemic. The higher average proportion of all-in yield attributable to credit risk warrants a greater focus on this factor among high-yield investors over the credit cycle.

### 2.1.1. Default Probabilities and Recovery Rates

The **credit valuation adjustment (CVA)** framework shown earlier in the curriculum and in **Exhibit 2** comprises the present value of credit risk for a loan, bond, or derivative obligation.

## Exhibit 2. Credit Valuation Adjustment

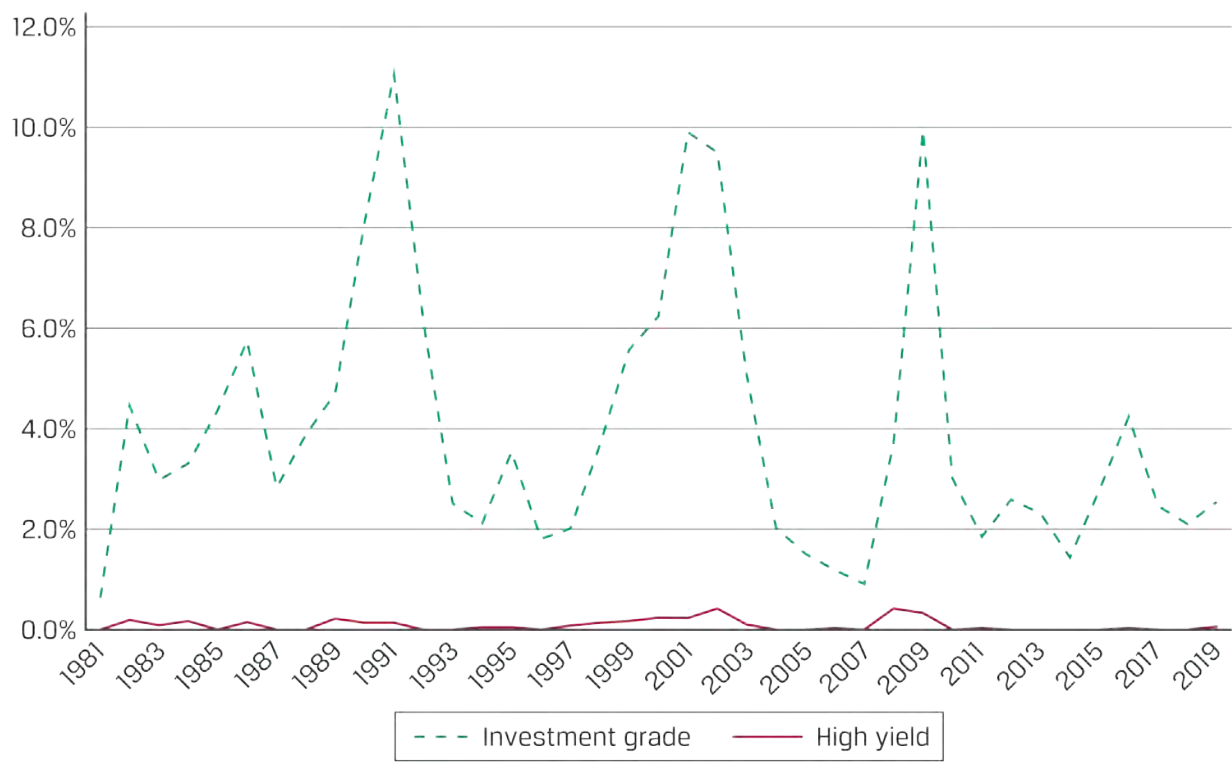


The CVA framework provides a useful means to evaluate the two key components of credit risk. These include (1) **default risk** (also called **probability of default** [POD]), or the likelihood that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest according to the terms of the debt security; and (2) **loss severity** (also called loss given default [LGD]), which is the amount of loss if a default occurs. POD is usually expressed as a percentage in annual terms. LGD is most often expressed as a percentage of par value. Recall that the one-period credit spread estimate from an earlier lesson on CDS where we ignored the time value of money was simply the product of LGD and POD ( $\text{Spread} \approx \text{LGD} \times \text{POD}$ ). This implies that a simple one-period POD can be approximated by dividing credit spread by LGD ( $\text{POD} \approx \text{Spread}/\text{LGD}$ ). While this estimate works well for bonds trading close to par, distressed bonds tend to trade on a price rather than a spread basis, which approaches the recovery rate  $(1 - \text{LGD})$  as default becomes likely.

The historical POD and the LGD rate is much lower for investment-grade bonds than for high-yield bonds. A **credit loss rate** represents the *realized* percentage of par value lost to default for a group of bonds, or the bonds' default rate multiplied by the loss severity.

According to Moody’s Investors Service, the highest annual credit loss rate for US investment-grade corporate bonds from 1983 to 2019 was 0.41%, with an average of just 0.05%. For high-yield bonds, the average credit loss rate over the same period was 2.53%, and in several years, usually around economic recessions, losses exceeded 5%. [Exhibit 3](#) shows global annual corporate default rates from S&P Global Ratings for a similar period.

**Exhibit 3. Annual Global Corporate Bond Default Rates (%)**



Source: S&P Global Ratings

[Exhibit 3](#) makes clear that the likelihood of default rises significantly as the economy slows, reaching peaks during the 1990–91, 2001, and 2008 recessions. The percentage of par value lost in a default scenario depends on a bond’s (or loan’s) relative position in the capital structure and whether it is secured or unsecured, as shown in [Exhibit 4](#).

**Exhibit 4. Average Volume Weighted US Corporate Debt Recovery Rates, 1983–2019**

First lien bank loan	64%
Second lien bank loan	29%

Senior unsecured bank loan	44%
First lien bond	55%
Second lien bond	45%
Senior unsecured bond	35%
Senior subordinated bond	27%
Subordinated bond	28%
Junior subordinated bond	14%

Source: Moody's Investors Service

## EXAMPLE 1

# Estimating Credit Spreads Using POD and LGD

A bank analyst observes a first lien bank loan maturing in two years with a spread of 100 bps from an issuer considering a new second lien bank loan. Using average historical volume weighted corporate debt recovery rates (RR) as a guide, what is the estimated credit spread for the new second lien bank loan?

## Answer:

1. Using the POD approximation ( $POD \approx \text{Spread}/LGD$  and  $LGD = (1 - RR)$ ), the analyst uses the current first lien bank loan credit spread and expected first lien bank loan recovery rate to estimate the issuer's POD to be 2.778% ( $=1.00\%/(1 - 0.64)$ ).
2. Using the issuer POD from Answer 1 and the expected second lien bank loan recovery rate of 29%, the bank analyst solves for the expected second lien spread using ( $POD \times LGD$ ) to get 197 bps ( $=2.778\% \times (1 - 0.29)$ ).

## 2.1.2. Default versus Credit Migration

Although actual defaults are relatively rare among higher-rated bond issuers, changes in the



*relative* assessment of creditworthiness occurs more frequently. **Credit migration**, or the likelihood of a change in a bond's public credit rating, usually has a negative effect on bond prices. This effect occurs because the chance of downgrade exceeds that of an upgrade, and the yield spread increase at lower credit ratings is far greater than the spread decrease in the event of a credit upgrade.

The POD versus credit migration varies significantly across the credit spectrum. For example, [Exhibit 5](#) shows the two-year average rate of global corporate default and one-notch downgrade.

**Exhibit 5. Two-Year Average Global Corporate Default/Downgrade, 1981–2019**

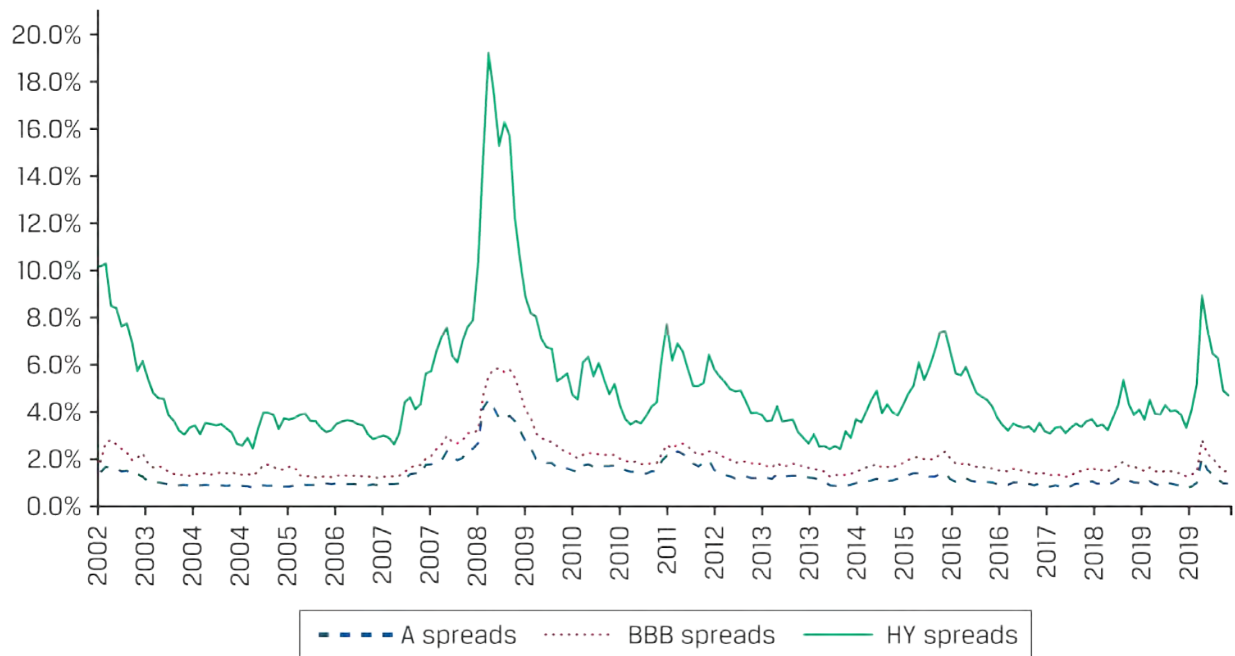
Statistic/Rating	AAA	AA	A	BBB	BB	B	CCC
Default Probability (%)	0.03	0.06	0.14	0.45	1.96	7.83	36.49
One Notch Downgrade (%)	16.22	13.79	8.81	5.66	9.82	5.22	

Source: S&P Global Ratings

Investors typically categorize credit risk using public debt ratings, distinguishing between investment-grade and high-yield market segments. Investment-grade bonds generally have higher credit ratings, lower default risk, and higher recovery in the event of default and offer lower all-in yields to maturity. High-yield bonds usually have higher yields to maturity as a result of lower (sub-investment or speculative grade) credit ratings, higher default risk, and lower recovery in the event of default. In an earlier yield curve strategies lesson, changes in the level, slope, and shape of the government bond term structure across maturities were established as primary risk factors. The level and slope of credit spread curves are often categorized by public credit rating to distinguish relative market changes across the credit spectrum.

For example, the relative historical yield spread *level* across public rating categories for US corporate borrowers is shown in [Exhibit 6](#).

**Exhibit 6. A, BBB, and High-Yield US 10-year Corporate Spread Levels (%)**



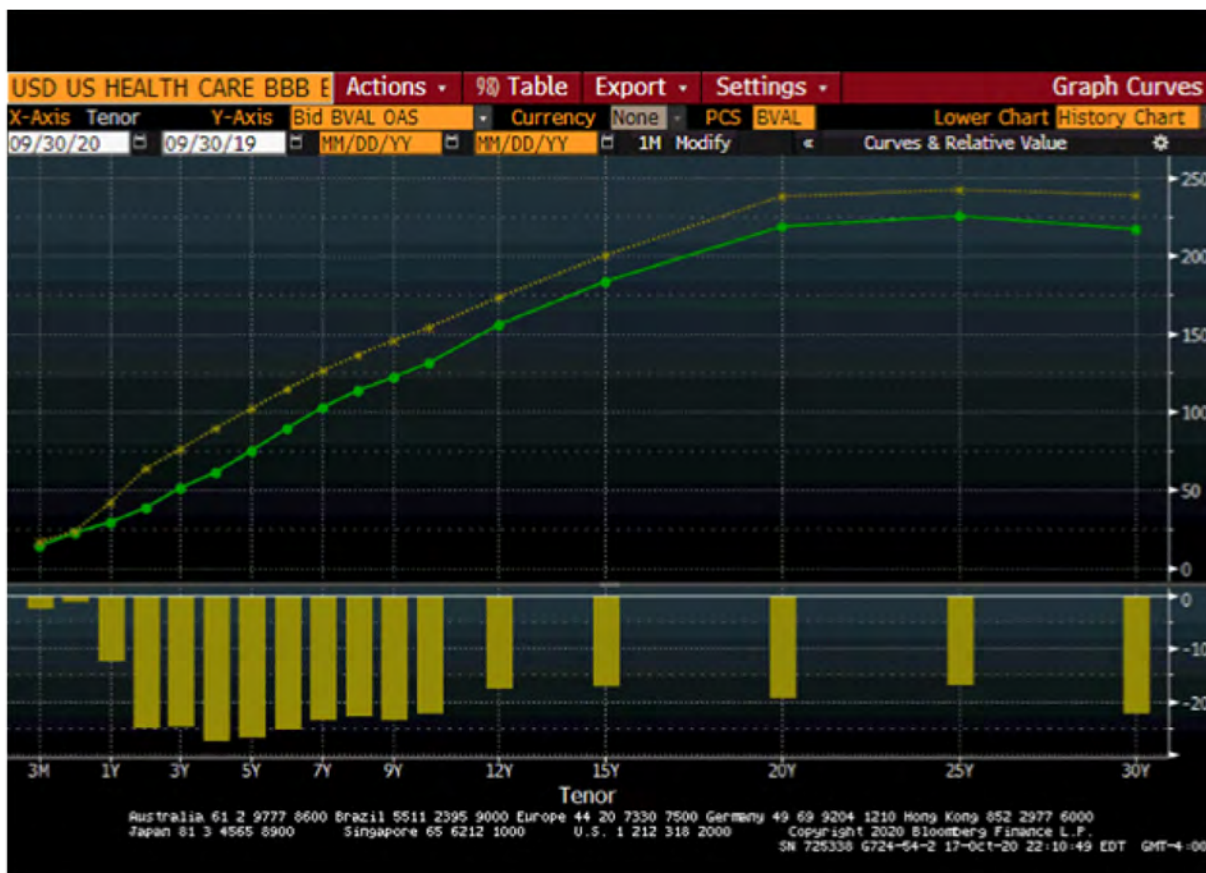
Source: Bloomberg

Lower-rated bonds face a greater impact from adverse market events, as evidenced by the widening gap between BBB rated and high-yield bonds during the 2008 financial crisis and the COVID-19 pandemic in 2020.

### 2.1.3. Credit Spread Curves

Active managers often position spread-based portfolios to capitalize on expected credit spread curve changes in a way similar to the benchmark yield curve strategies seen in an earlier lesson. While frequent issuers with many bonds outstanding across maturities have their own issuer-specific credit curve, credit spread curves are usually categorized by rating, issuer type, and/or corporate sector. These curves are derived from the difference between all-in yields to maturity for bonds within each respective category and a government benchmark bond or swap yield curve, with adjustments for specific credit spread measures covered in detail later. For example, [Exhibit 7](#) shows the decline in option-adjusted spreads for US BBB rated health care companies over a one-year period from the end of Q3 2019 to 2020, with the bar graph at the bottom showing the decrease for each maturity.

**Exhibit 7. BBB Rated US Corporate Health Care Spreads, 2019–2020**



Source: Bloomberg

Primary credit risk factors for a specific issuer include the level and slope of the issuer's credit spread curve. For instance, ignoring liquidity differences across maturities, an upward-sloping credit spread curve suggests a relatively low near-term default probability that rises over time as the likelihood of downgrade and/or default increases. A flatter credit spread curve in contrast indicates that downgrade/default probabilities are equally likely in the near- and long-term.

Credit spread curve changes are broadly driven by the **credit cycle**, the expansion and contraction of credit over the business cycle, which translates into asset price changes based on default and recovery expectations across maturities and rating categories. **Exhibit 8** outlines key credit cycle characteristics and the general effect on credit spread curve levels and slope for high- and low-rated issuers.

## Exhibit 8. General Credit Cycle Characteristics

Early  
Expansion

Late

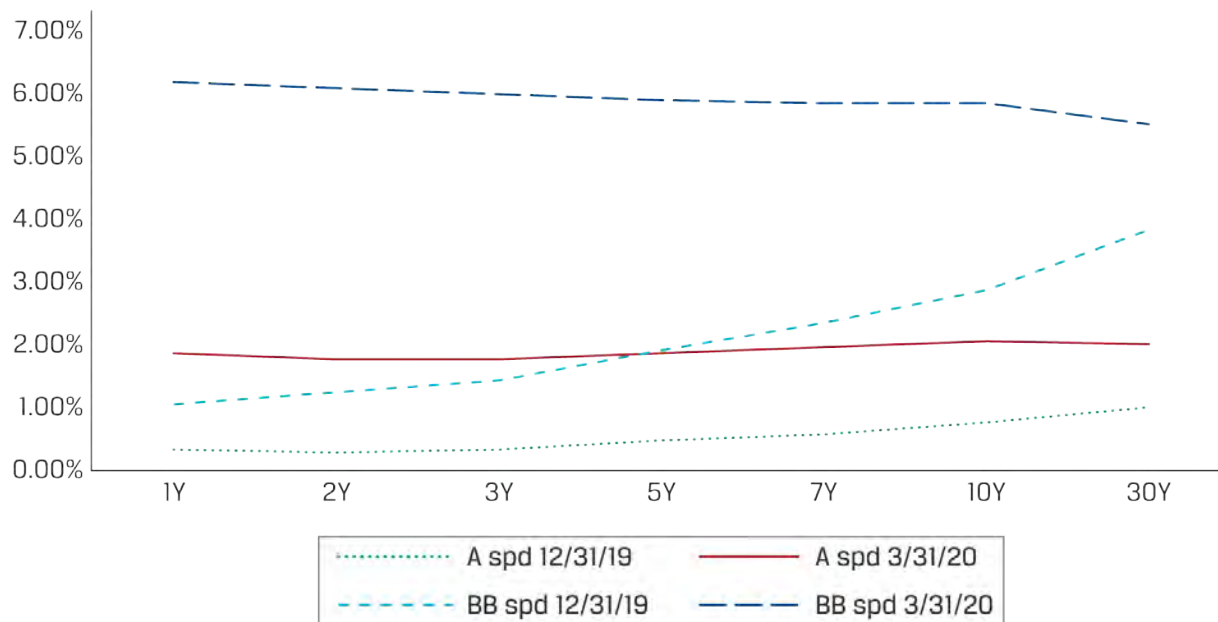
Contraction

	<b>(Recovery)</b>	<b>Expansion</b>	<b>Peak</b>	<b>(Recession)</b>
Economic Activity	Stable	Accelerating	Decelerating	Declining
Corporate Profitability	Rising	Peak	Stable	Falling
Corporate Leverage	Falling	Stable	Rising	Peak
Corporate Defaults	Peak	Falling	Stable	Rising
Credit Spread Level	Stable	Falling	Rising	Peak
Credit Spread Slope	Stable for high grade, inverted for low ratings	Steeper for both higher and lower ratings	Steeper for both higher and lower ratings	Flatter for high grade, inverted for low ratings

**Exhibits 3** and **6** demonstrate the significant variability in annual credit loss rates and credit spread changes, respectively, across the ratings spectrum. Lower-rated issuers tend to experience greater slope and level changes over the credit cycle, including more frequent inversion of the credit curve, given their larger rise in annual credit losses during economic downturns. Higher-rated issuers, in contrast, face smaller credit spread changes and usually exhibit upward-sloping credit curves and fewer credit losses during periods of economic contraction. Credit spread differences *between* major ratings categories tend to narrow during periods of strong economic growth and widen when growth is expected to slow.

For example, consider the widening of BB versus single-A US corporate spreads during Q1 2020 shown in **Exhibit 9**. The difference between two-year BB spreads and A spreads for the same tenor more than tripled over this three-month period.

#### **Exhibit 9. BB versus A Credit Spread Curve, 2019 versus 2020**



Source: Bloomberg

## EXAMPLE 2

# Credit Cycle and Credit Spread Curve Changes

Which of the following *best* describes the expected shape of the credit spread curve in an economic downturn?

- A. Investment-grade and high-yield issuers usually experience similar credit spread curve steepening because of declining corporate profitability.
- B. High-yield issuers usually experience more spread curve steepening than investment-grade issuers because higher leverage leads to a greater decline in profitability.
- C. High-yield issuers often experience more pronounced flattening or credit spread curve inversion in an economic downturn because the probability of downgrade or default is higher in the near term than the long term.

## Solution:

The correct answer is C. While investment-grade and high-yield issuers both experience declining profitability in an economic downturn, as in answers A and B, this usually

leads to a flatter credit spread curve for investment-grade issuers and often to credit spread curve inversion for high-yield issuers, given a rise in near-term downgrades and defaults.

Actual price movements of lower-rated bonds can be quite different from what analytical models based on benchmark rates and credit spreads would predict under issuer-specific and market stress scenarios. For example, issuer financial distress will cause a bond's price to diverge from what a model using benchmark rates would suggest. As an issuer nears default, the price of its bond approaches the estimated recovery rate, regardless of the current benchmark YTM, because investors no longer expect to receive risky future coupon payments. Under a “flight to quality” market stress scenario, investors sell high-risk, low-rated bonds, which fall in price, and purchase government bonds, which experience price appreciation. This observed negative correlation between high-yield credit spreads and government benchmark yields to maturity often leads fixed-income practitioners to use statistical models and historical bond market data to estimate **empirical duration** rather than rely on analytical duration estimates based on duration and convexity. This market stress scenario is addressed in the following example.

### EXAMPLE 3

## Empirical versus Analytical Duration

A high-yield bond fund manager is considering adding a US\$50 million face value, five-year, 6.75% semiannual coupon bond with a YTM of 5.40% to an active portfolio. The manager uses regression analysis to estimate the bond's empirical duration to be 2.95. Calculate the bond's analytical duration, and estimate the difference in the expected versus actual market value change for this position, given a 50 bp decline in benchmark yields to maturity using these two measures.

### Solution:

1. Solve for the bond's analytical duration by using the Excel MDURATION function (MDURATION(settlement, maturity, coupon, yield, frequency, basis)) using a settlement date of 1 January 2022, maturity of 1 January 2027, a 6.75% coupon, 5.40% YTM, semiannual frequency and basis of 0 (30/360 day count) to get 4.234. Note the analytical duration is greater than the observed empirical duration of 2.95.
2. The bond position value can be calculated using the Excel PRICE function (PRICE(settlement, maturity, coupon, yield, frequency, basis)) to solve for a price of 105.847 per 100 face value, or a price of US\$52,923,500 for a US\$50 million

face value.

3. The difference in percentage market value change can be estimated using the 0.50% yield change multiplied by modified duration ( $-\text{ModDur} \times \Delta\text{Yield}$ ) for the two estimates. If the benchmark YTM declines by 50 bps, then

Analytical duration estimate:  $2.117\% = (-4.234 \times -0.5\%)$

Empirical duration estimate:  $1.475\% = (-2.95 \times -0.5\%)$

The analytical duration calculation overestimates the price gain versus the empirical duration estimate.

4. The difference is 0.642% ( $2.117\% - 1.475\%$ ), or an expected US\$339,769 ( $=0.642\% \times \$52,923,500$ ) value difference between the two measures.

While the concept of empirical duration emphasizes the *direction* of high-yield credit spread changes versus benchmark rates, as suggested earlier, the *magnitude* of credit spread changes is greater for lower- versus higher-rate bonds. As we will see later in the lesson, this empirical observation leads to the use of credit spread measure changes based on *percentage* as opposed to absolute credit spread changes for lower-rated issuers.

## 2.2. Credit Spread Measures

- b. discuss the advantages and disadvantages of credit spread measures for spread-based fixed-income portfolios, and explain why option-adjusted spread is considered the most appropriate measure**

### 2.2.1. Fixed-Rate Bond Credit Spread Measures

The estimation of yield spreads from market information gives rise to several measures of the difference between a fixed-rate bond's YTM and a benchmark rate. Recall that the YTM is an internal rate of return calculation of all bond cash flows that assumes any earlier payments are reinvested at the same rate and the bond is held to maturity. Spread comparisons are accurate when comparing bonds with identical maturities but different coupons. Because bond maturities vary in practice, a mismatch arises that creates measurement bias if the yield curve is sloped. As a bond rolls down the curve, the benchmark security can also change over time. Finally, yield-based measures do not accurately gauge the return of carry-based strategies often used by active managers (for example, long a risky bond, short a default risk-

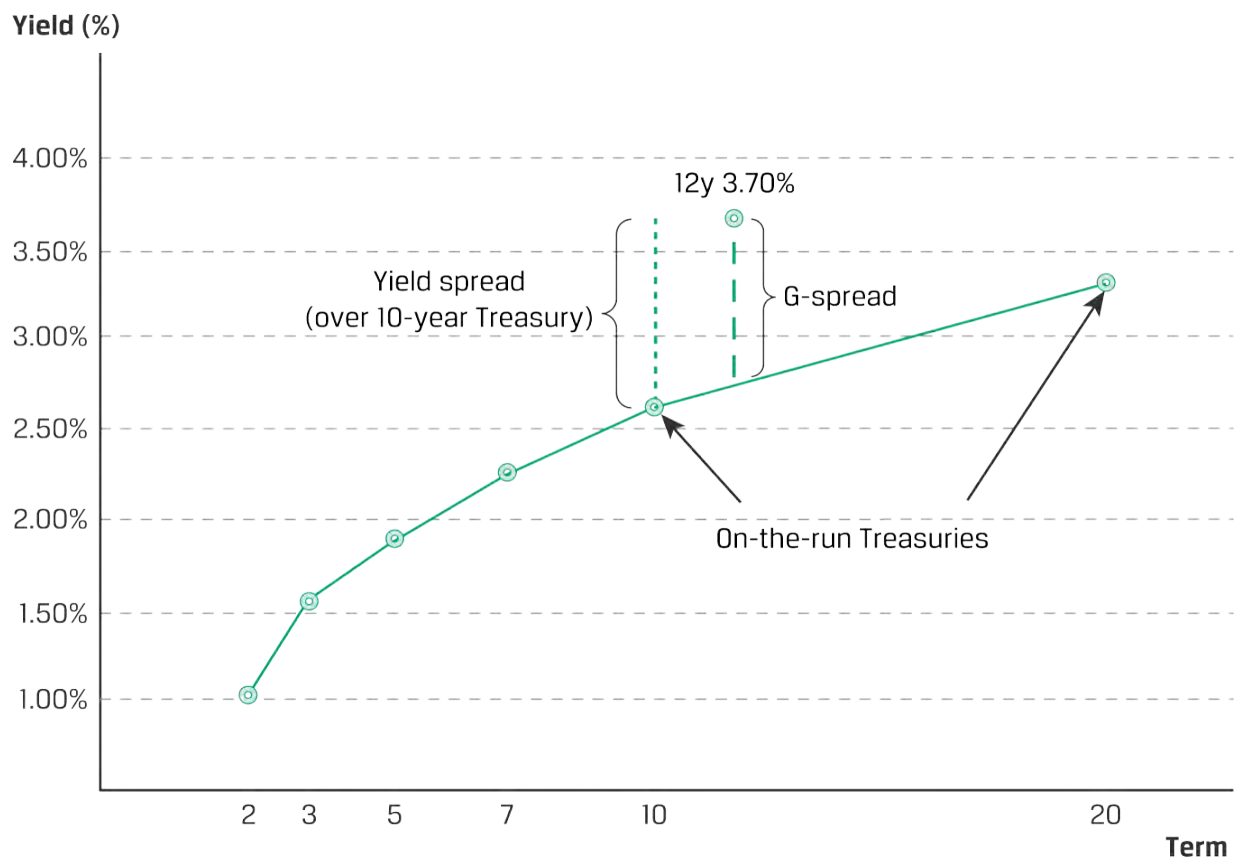


free position in the repo market).

The yield spread (or benchmark spread) defined earlier as the simple difference between a bond's YTM and the YTM of an on-the-run government bond of similar maturity is easy to calculate and interpret for option-free bonds, and it is particularly useful for infrequently traded bonds. The yield spread also facilitates the approximation of bond price changes for a given benchmark YTM change, assuming a constant yield spread. That said, this simple government bond-based measure has both curve slope and maturity mismatch biases and lacks consistency over time because government benchmarks change as a bond nears maturity.

The **G-spread** uses constant maturity Treasury yields to maturity as the benchmark. **Exhibit 10** shows the difference between yield spread and G-spread measures using the example of a bond with 12 years remaining to maturity. While the yield spread for this bond would likely be quoted over a 10-year government benchmark rate, the G-spread involves an interpolation between 10-year and 20-year government yields to maturity.

**Exhibit 10. Yield Spread versus G-Spread**





## EXAMPLE 4

# Yield Spread versus G-Spread

A portfolio manager considers the following annual coupon bonds:

Issuer	Term	Coupon	Yield	ModDur
Bank	8y	2.75%	2.68%	7.10
Government	7y	1.5%	1.39%	6.61
Government	10y	1.625%	1.66%	9.16

1. Calculate the yield spread and G-spread for the bank bond.
2. An increase in expected inflation causes the government yield curve to steepen, with a 20-point rise in the 10-year government bond YTM and no change in the 7-year government YTM. If the respective bank bond yield spread measures remain unchanged, calculate the expected bank bond percentage price change in each case, and explain which is a more accurate representation of the market change in this case.

## Solution to 1:

Yield spread for the bank bond is 1.290%, or the simple difference between the 2.68% bank bond YTM and the 1.39% YTM of the nearest on-the-run government bond.

The G-spread is the difference between the bank bond YTM and a linear interpolation of the YTMs of the 7-year government bond ( $r_{7\text{yr}}$ ) and the 10-year government bond ( $r_{10\text{yr}}$ ). Calculate the approximate 8-year government rate as follows:

1. Solve for the weights of the 7-year and the 10-year bond in the interpolation calculation.

$$\text{7-year bond weight} = w_7 = 66.7\% (= (10 - 8)/(10 - 7))$$

$$\text{10-year bond weight} = w_{10} = 33.3\% (\text{or } (1 - w_7))$$

$$\text{Note that } (w_7 \times 7) + (w_{10} \times 10 = 8).$$

2. The 8-year government rate is a weighted average of the 7-year bond rate and the 10-year bond rate using the weights in Step 1.

$$\begin{aligned} r_{8\text{yr}} &= w_7 \times r_{7\text{yr}} + w_{10} \times r_{10\text{yr}} \\ &= (66.7\% \times 1.39\%) + (33.3\% \times 1.66\%) = 1.48\% \end{aligned}$$

3. The G-spread, or the difference between the bank bond YTM and the 8-year government rate, equals 1.20% (= 2.68% – 1.48%).

## Solution to 2:

For the yield spread measure, neither the 1.20% spread nor the 7-year government rate of 1.39% has changed, so an analyst considering only these two factors would expect the bank bond price to remain unchanged.

However, for the G-spread measure, the 15 bp increase in the 10-year government YTM causes the 8-year interpolated government YTM to change.

1. The 7-year and the 10-year bond weights for the interpolation are the same as for Question 1,  $w_7 = 66.7\%$  and  $w_{10} = 33.3\%$ .
2. The new 8-year government rate is a weighted average of the 7-year bond rate and the 10-year bond rate using the weights in Step 1.

$$\begin{aligned} r_{8\text{yr}} &= w_7 \times r_{7\text{yr}} + w_{10} \times r_{10\text{yr}} \\ &= (66.7\% \times 1.39\%) + (33.3\% \times 1.81\%) = 1.53\% \end{aligned}$$

3. The bank bond YTM has risen by 0.05% to 2.73% (=1.53% + 1.20%).
4. The bank bond price change can be estimated by multiplying the yield change by modified duration ( $-\text{ModDur} \times \Delta\text{Yield}$ ) as in earlier lessons. This change can be calculated as -0.355% ( $=-7.1 \times 0.05\%$ ).

Note that we can confirm this using the Excel PV function ( $=\text{PV}(\text{rate}, \text{nper}, \text{pmt}, \text{FV}, \text{type})$ ) where “rate” is the interest rate per period (0.0268), “nper” is the number of periods (8), “pmt” is the periodic coupon (2.75), “FV” is future value (100), and “type” corresponds to payments made at the end of each period (0).

Initial bank bond price: 100.50 ( $=\text{PV}(0.0268, 8, 2.75, 100, 0)$ )

New bank bond price: 100.14 ( $=\text{PV}(0.0273, 8, 2.75, 100, 0)$ )

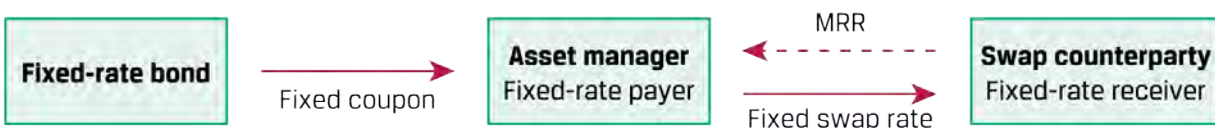
Price change:  $-0.354\% (= (100.14 - 100.50)/100.50)$

The G-spread calculation provides a more accurate representation of the estimated bank bond price change in this case because it incorporates the term structure of interest rates.

The **I-spread (interpolated spread)** uses interest rate swaps as the benchmark. Recall that swap rates are derived using short-term lending or market reference rates (MRRs) rather than default-risk-free rates, and unlike government bonds, they are quoted across all maturities. Short-term MRR were historically survey-based Libor rates and are transitioning to transaction-based, secured overnight funding rates. The spread over an MRR-based benchmark can be interpreted as a *relative* rather than absolute credit risk measure for a given bond issuer. An issuer might use the I-spread to determine the relative cost of fixed-rate versus floating-rate borrowing alternatives, while an investor can use the MRR spread to compare pricing more readily across issuers and maturities. Swap benchmarks have the added benefit of directly measuring all-in bond YTM with an instrument that can be used both as a duration hedge and to measure carry return more accurately for a leveraged position. While the I-spread addresses the maturity mismatch of bonds and benchmarks as raised earlier, it incorporates yield levels using a point on the curve to estimate a risky bond's yield spread rather than the term structure of interest rates and is limited to option-free bonds as a credit risk measure.

**Asset swaps** convert a bond's periodic fixed coupon to MRR plus (or minus) a spread. If the bond is priced close to par, this spread approximately equals the bond's credit risk over the MRR. [Exhibit 11](#) shows the mechanics of an asset swap.

### Exhibit 11. Asset Swap Mechanics



The **asset swap spread (ASW)** is the difference between the bond's fixed coupon rate and the fixed rate on an interest rate swap versus MRR, which matches the coupon dates for the remaining life of the bond. If we assume an investor purchases a bond at par, the asset swap transforms the fixed-rate coupon to an equivalent spread over MRR for the life of the bond. Note that under a bond default scenario, the asset manager would still face the mark-to-market settlement of the swap.

## EXAMPLE 5

### ASW versus I-Spread

Consider the information from the bank and government annual coupon bonds from the prior example:

Issuer	Term	Coupon	Yield	ModDur
Bank	8y	2.75%	2.68%	7.10
Government	7y	1.5%	1.39%	6.61
Government	10y	1.625%	1.66%	9.16

Assuming that 7- and 10-year swap spreads over the respective government benchmark yields to maturity are 15 bps and 20 bps, calculate the ASW and the I-spread for the bank bond, and interpret the difference between the two.

#### Solution:

1. Solve for the weights of the 7-year and the 10-year bond in the interpolation calculation.

$$7\text{-year bond weight} = w_7 = 66.7\% (= (10 - 8)/(10 - 7)).$$

$$10\text{-year bond weight} = w_{10} = 33.3\% \text{ (or } (1 - w_7)).$$

$$\text{Note that } (w_7 \times 7) + (w_{10} \times 10) = 8.$$

2. The interpolated 8-year swap rate is a weighted average of the 7-year swap rate (1.54% = 1.39% + 0.15%) and the 10-year swap rate (1.86% = 1.66% + 0.20%).

$$r_{\text{Swap8yr}} = w_7 \times r_{\text{Swap7yr}} + w_{10} \times r_{\text{Swap10yr}}$$

$$(66.7\% \times 1.54\%) + (33.3\% \times 1.86\%) = 1.647\%$$

3. The ASW equals the difference between the bank bond *coupon* of 2.75% and the 8-year swap rate of 1.647%, or 110.3 bps.
4. The I-spread is the difference between the bank bond's current YTM of 2.68% and the 8-year swap rate of 1.647%, or 103.3 bps.

The ASW is an estimate of the spread over MRR versus the bond's original coupon rate to maturity, while the I-spread is an estimate of the spread over MRR for a new par bond from the bank issuer, with the difference largely reflecting the premium or discount of the outstanding bond price.

While both the G-spread and I-spread use the same discount rate for each cash flow, a more precise approach incorporating the term structure of interest rates is to derive a constant spread over a government (or interest rate swap) spot curve instead. This spread is known as the **zero-volatility spread (Z-spread)** of a bond over the benchmark rate. The Z-spread formula shown in [Equation 2](#) was introduced in an earlier reading.

### Equation (2)

$$PV = \frac{PMT}{(1 + z_1 + Z)^1} + \frac{PMT}{(1 + z_2 + Z)^2} + \dots + \frac{PMT + FV}{(1 + z_N + Z)^N}$$

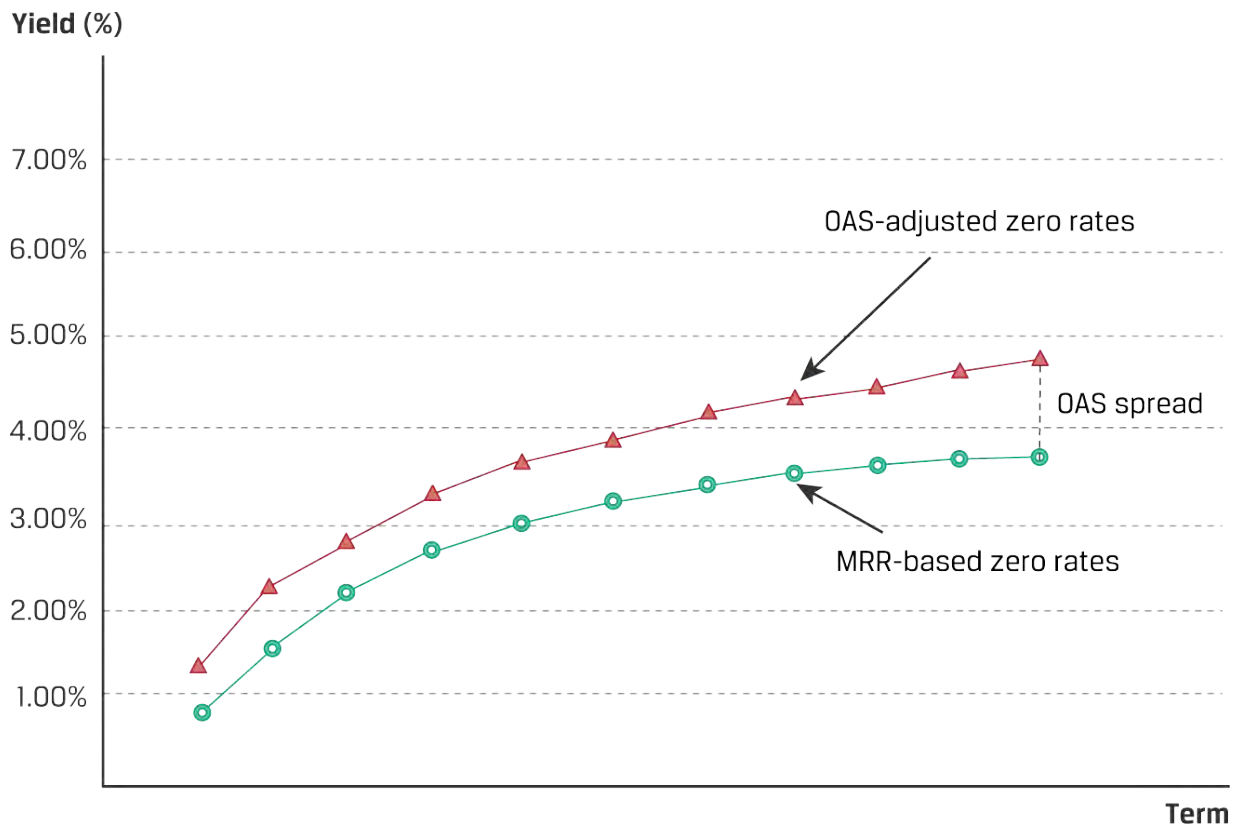
Here the bond price (PV) is a function of coupon (PMT) and principal (FV) payments in the numerator with respective benchmark spot rates  $z_1 \dots z_N$  derived from the swap or government yield curve and a constant Z-spread per period (Z) in the denominator discounted as of a coupon date. While more accurate than either the G-spread or I-spread, this is a more complex calculation that is conducted by practitioners using either a spreadsheet or other analytical model.

**Credit default swap (CDS) basis** refers to the difference between the Z-spread on a specific bond and the CDS spread of the same (or interpolated) maturity for the same issuer. Recall from earlier in the curriculum that a CDS is a derivative contract in which a protection buyer makes a series of premium (or CDS spread) payments to a protection seller in exchange for compensation for credit losses (or the difference between par and the recovery rate) under a credit event. Negative basis arises if the yield spread is above the CDS spread, and positive basis indicates a yield spread in excess of the CDS market. Although spreads for a single issuer across bond and CDS markets should be closely aligned in principle, in practice, CDS basis arises because of such factors as bond price differences from par, accrued interest, and varying contract terms, among other items. As in the case of asset swaps, CDS basis is a pricing measure, but unlike ASW, a CDS contract is terminated and settled following a credit event with no residual interest rate swap mark-to-market exposure. Similar to the I-spread using swaps or the asset swap just mentioned, CDS basis is a useful credit measure for investors actively trading or hedging credit risk using CDS, as addressed in detail later.

The **option-adjusted spread (OAS)** is a generalization of the Z-spread calculation that incorporates bond option pricing based on assumed interest rate volatility. Earlier readings

established the use of the term structure of zero rates combined with a volatility assumption to derive forward interest rates used to value bonds with embedded options. The OAS is the constant yield spread over the zero curve which makes the arbitrage-free value of such a bond equal to its market price as shown in [Exhibit 12](#). Note that the Z-spread for an option-free bond is simply its OAS, assuming zero volatility.

### Exhibit 12. OAS



The OAS approach is the most appropriate yield spread measure for active fixed-income portfolio managers because it provides a consistent basis for comparing credit risk yield spreads for option-free, callable, putable, and structured fixed-income instruments. OAS calculations typically rely on fixed-income analytical models that incorporate the current term structure of interest rates, interest rate volatility, and term structure model factors introduced earlier in addition to the specific option-based features of a particular bond. Although OAS provides the best means to facilitate yield spread comparisons across different fixed-income securities, the main drawback of the OAS is that it is highly dependent on volatility and other model assumptions. For example, returns on structured financial instruments are highly dependent on prepayment versus extension risk, as outlined in an earlier lesson. While some analytical models calculate OAS using a standard or constant prepayment speed assumption, values based on historical or empirical analysis might provide

very different and more accurate results. Also, the theoretical nature of the OAS calculation implies that bonds with embedded options are unlikely to realize the spread implied by the bond's OAS. Despite these shortcomings, OAS is the most widely accepted credit spread measure for comparing bonds with and without optionality across a fixed-income bond portfolio.

## EXAMPLE 6

### Portfolio OAS

A European portfolio manager is presented with the following information on a portfolio of two bonds. Calculate the OAS of the portfolio.

Issuer	Face Value	Price*	Accrued Interest*	OAS (bps p.a.)
Company A	€ 100,000,000	95	1.5	125
Company B	€ 200,000,000	97	2.0	150

\*Per 100 of par value

### Solution:

1. Solve for bond and portfolio values:

A. Company A bond:  $€96,500,000 = €100,000,000 \times (0.95 + 0.015)$

B. Company B bond:  $€198,000,000 = €200,000,000 \times (0.97 + 0.02)$

C. Portfolio:  $€294,500,000 = €96,500,000 + €198,000,000$

2. Solve for portfolio weights  $w_A$  and  $w_B$ :

A. Company A ( $w_A$ ):  $32.8\% = €96,500,000 / €294,500,000$

B. Company B ( $w_B$ ):  $67.2\% = €198,000,000 / €294,500,000$

3. Solve for portfolio OAS using  $(OAS_A \times w_A) + (OAS_B \times w_B)$ .

$$OAS = 142 \text{ bps p.a.} = (0.328 \times 125 \text{ bps}) + (0.672 \times 150 \text{ bps})$$

Exhibit 13 summarizes these fixed-rate bond credit spread measures adapted from O’Kane and Sen (2005).

### Exhibit 13. Key Fixed-Rate Bond Credit Spread Measures

Spread	Description	Advantages	Disadvantages
Yield spread	Difference between bond YTM and government benchmark of similar tenor	Simple to calculate and observe	Maturity mismatch, curve slope bias, and inconsistent over time
G-spread (Government spread)	Spread over interpolated government bond	Transparent and maturity matching default risk-free bond	Subject to changes in government bond demand
I-spread (Interpolated spread)	Yield spread over swap rate of same tenor	Spread versus market based (MRR) measure often used as hedge or for carry trade	Point estimate of term structure and limited to option-free bonds
ASW (Asset swap)	Spread over MRR of fixed bond coupon	Traded spread to convert current bond coupon to MRR plus a spread	Tradable spread rather than spread measure corresponding to cashflows and limited to option-free bonds
Z-spread (Zero volatility spread)	Yield spread over a government (or swap) spot curve	Accurately captures term structure of government or swap zero rates	More complex calculation limited to option-free bonds
CDS Basis	Yield spread versus CDS spread of same tenor	Interpolated CDS spread versus Z-spread	Traded spread rather than spread measure corresponding to cashflows and limited to option-free bonds



OAS	Yield spread using Z-spread including bond option volatility	Provides generalized comparison for valuing risky option-free bonds with bonds with embedded options	Complex calculation based on volatility and prepayment assumptions; bonds with embedded options are unlikely to earn OAS over time
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## EXAMPLE 7

### Comparison of Fixed-Rate Bond Credit Spread Measures

- An active manager observes a yield spread for an outstanding corporate bond that is above the G-spread for that same bond. Which of the following is the most likely explanation for the difference?
  - The government benchmark bond used to calculate the yield spread has a *shorter* maturity than the corporate bond, and the benchmark yield curve is *upward* sloping.
  - The government benchmark bond used to calculate the yield spread has a *shorter* maturity than the corporate bond, and the benchmark curve is *downward* sloping.
  - The government benchmark bond used to calculate the yield spread has a *longer* maturity than the corporate bond, and the benchmark yield curve is *downward* sloping.
- An active manager is weighing the purchase of two callable bonds with similar credit risks and the same final maturity. Which of the two bonds is more likely to be called on the next call date?
  - The bond with the lower ASW
  - The bond with the lower Z-spread
  - The bond with the lower OAS

### **Solution to 1:**

The correct answer is A. For a given all-in YTM, the lower the (on-the-run or interpolated) benchmark rate, the higher the relevant spread measure over the benchmark. Therefore, the higher yield spread versus G-spread most likely arises from the government benchmark having a shorter maturity than the bond and an upward sloping government yield curve. As for B and C, the yield spread would be lower than the G-spread for a downward sloping yield curve.

### **Solution to 2:**

The correct answer is C. The OAS measure is best suited to compare the impact of embedded options on similar bonds because it incorporates a volatility assumption to account for the value of bond options. Answer A indicates the spread over MRR for an outstanding bond swapped versus the original coupon rate, while the Z-spread in B assumes zero volatility and therefore does not capture the value of bond options.

## ***2.2.2. Floating-Rate Note Credit Spread Measures***

In contrast to fixed-rate bonds, floating-rate notes (FRNs) pay a periodic interest coupon comprising a variable MRR plus a (usually) constant yield spread. While fixed- and floating-rate bonds both decline in price if credit risk rises, interest rate risk on these bond types differs, and the associated FRN credit spread measures warrant our attention.

An earlier reading provided a simplified framework for valuing a floating-rate bond on a payment date, shown in [Equation 3](#):

### **Equation (3)**

$$PV = \frac{\left( \frac{(MRR + QM) \times FV}{m} \right)}{\left( 1 + \frac{(MRR + DM)}{m} \right)^1} + \frac{\left( \frac{(MRR + QM) \times FV}{m} \right)}{\left( 1 + \frac{(MRR + DM)}{m} \right)^2} + \dots + \frac{\left( \frac{(MRR + QM) \times FV}{m} \right) + FV}{\left( 1 + \frac{(MRR + DM)}{m} \right)^N}$$

Each interest payment is MRR plus the **quoted margin** (QM) times par (FV) and divided by m, the number of periods per year. Rather than a fixed YTM as for fixed-rate bonds, the periodic discount rate per period is MRR plus the **discount margin** (DM) divided by the periodicity (m), or (MRR + DM)/m. Note that for the purposes of [Equation 3](#), MRR is based on current MRR and therefore implies a flat forward curve. The QM is the yield spread over the MRR established upon issuance to compensate investors for assuming the credit risk of the issuer. While some FRN bond indentures include an increase or decrease in the QM if public ratings or other criteria change, given that this spread is usually fixed through maturity, the QM does not reflect credit risk changes over time.

The discount (or required) margin is the yield spread versus the MRR such that the FRN is priced at par on a rate reset date. For example, assume an FRN issued at par value pays three-month MRR plus 1.50%. The QM is 150 bps. If the issuer's credit risk remains unchanged, the DM also equals 150 bps. On each quarterly reset date, the floater will be priced at par value. Between coupon dates, the flat price will be at a premium or discount to par value if MRR falls or rises. If on a reset date, the DM falls to 125 bps because of an issuer upgrade, the FRN will be priced at a premium above par value. The amount of the premium is the present value of the premium future cash flows. The annuity difference of 25 bps per period is calculated for the remaining life of the bond. [Exhibit 14](#) summarizes the relationship between the QM versus DM and an FRN's price on any reset date.

#### Exhibit 14. FRN Discount, Premium, and Par Pricing

FRN price	Description	QM versus DM
Par	FRN trades at a price (PV) equal to its future value (FV)	QM = DM
Discount	FRN trades at PV < FV	QM < DM

## EXAMPLE 8

## Discount Margin

A London-based investor owns a five-year £100 million FRN that pays three-month MRR + 1.75% on a quarterly basis. The current MRR of 0.50% is assumed to remain constant over time. If the issuer's credit risk deteriorates and the DM rises to 2.25%, explain whether the FRN is trading at a discount or premium, and calculate the price difference from par.

## Solution:

The FRN is trading at a discount because the QM is below the DM. We can solve for the price difference using the following steps.

1. Solve for the quarterly interest payment  $(=(\text{MRR} + \text{QM}) \times \text{FV}/m)$  in the numerator and the discount rate  $(=(\text{MRR} + \text{DM})/m)$  in the denominator of [Equation 3](#) with QM = 1.75%, DM = 2.25%, MRR = 0.50%, and  $m = 4$ .

**A.** Quarterly interest payment: £562,500  $(= (0.50\% + 1.75\%) \times £100,000,000/4)$

**B.** Discount rate: 0.6875%  $(= (0.50\% + 2.25\%)/4)$

2. Solve for the new price using results from 1A and 1B with  $N = 20$ .

$$\begin{aligned} £97,671,718 = & \frac{£562,500}{(1 + 0.6875\%)} + \frac{£562,500}{(1 + 0.6875\%)^2} + \frac{£562,500}{(1 + 0.6875\%)^3} \\ & + \dots + \frac{£100,562,500}{(1 + 0.6875\%)^{20}} \end{aligned}$$

3. The price difference is £2,328,282  $(= £100,000,000 - £97,671,718)$ .

The **zero-discount margin (Z-DM)** incorporates forward MRR into the yield spread calculation for FRNs. As in the case of the zero-volatility spread for fixed-rate bonds shown earlier, the Z-DM is the fixed periodic adjustment applied to the FRN pricing model to solve

for the observed market price. As [Equation 4](#) shows, this calculation incorporates the respective benchmark spot rates  $z_i$  derived from the swap or government yield curve for the Z-spread into the FRN pricing model shown earlier.

#### Equation (4)

$$PV = \frac{\left( \frac{(MRR + QM) \times FV}{m} \right)}{\left( 1 + \frac{(MRR + Z - DM)}{m} \right)^1} + \frac{\left( \frac{(z_2 + QM) \times FV}{m} \right)}{\left( 1 + \frac{(z_2 + Z - DM)}{m} \right)^2} + \dots + \frac{\left( \frac{(z_N + QM) \times FV}{m} \right) + FV}{\left( 1 + \frac{(z_N + Z - DM)}{m} \right)^N}$$

As in the case of the Z-spread for fixed-rate bonds, the Z-DM will change based on changes in the MRR forward curve. For example, in an upward-sloping yield curve, the Z-DM will be below the DM. Also, the Z-DM assumes an unchanged QM and that the FRN will remain outstanding until maturity. [Exhibit 15](#) summarizes FRN credit spreads as adapted from O’Kane and Sen (2005).

#### Exhibit 15. Key FRN Credit Spread Measures

Spread	Description	Advantages	Disadvantages
QM	Yield spread over MRR of original FRN	Represents periodic spread related FRN cash flow	Does not capture changes in credit risk over time
DM	Yield spread over MRR to price FRN at par	Establishes spread difference from QM with constant MRR	Assumes a flat MRR zero curve
Z-DM	Yield spread over MRR curve	Incorporates forward MRR rates in yield spread measure	More complex calculation and yield spread does not match FRN cash flows

## EXAMPLE 9

### Floating-Rate Credit Spread Measure

An Australian investor holds a three-year FRN with a coupon of three-month MRR + 1.25%. Given an expected strong economic recovery, she anticipates a rise in Australian MRR over the next three years and an improvement in the FRN issuer's creditworthiness. Which of the following credit spread measures does she expect to be the *lowest* as a result?

- A. QM
- B. DM
- C. Z-DM

#### Solution:

The correct answer is C. The QM will be above the DM if issuer creditworthiness improves. As MRRs rise over the next three years, the upward-sloping curve will cause the Z-DM to remain below the DM.

### 2.2.3. Portfolio Return Impact of Yield Spreads

We now turn from credit spread measures to their impact on expected portfolio return. The first and third variables in [Equation 1](#), namely roll-down return and E ( $\Delta$  Price due to investor's view of yield spreads), are directly relevant for active managers targeting excess return above a benchmark portfolio using credit strategies.

In the first instance, recall from earlier lessons that investors "rolling down" the yield curve accumulate coupon income and additional return from fixed-rate bond price appreciation over an investment horizon if benchmark rates are positive and the yield curve slopes upward. For fixed-rate bonds priced at a spread over the benchmark, roll-down return from coupon income is higher by the bond's original credit spread. The roll-down return due to price appreciation will also be higher than for an otherwise identical government security because the higher-yielding instrument will generate greater carry over time. Note that this higher return comes with greater risk and assumes all promised payments take place and the bond remains outstanding—that is, no default or prepayment occurs, and the bond is not called.

## EXAMPLE 10

# Corporate versus Government Bond Roll Down

A London-based investor wants to estimate roll-down return attributable to a fixed-rate, option-free corporate bond versus UK gilts over the next six months assuming a static, upward-sloping government yield curve and a constant credit spread. The corporate bond has exactly 10 years remaining to maturity, a semiannual coupon of 3.25%, and a YTM of 2.75%, while the closest maturity UK gilt is a 1.75% coupon currently yielding 1.80%, with 9.5 years remaining to maturity.

1. Calculate the annualized roll-down return to the UK corporate bond versus the government bond over the next six months.
2. Describe how the relative roll-down return would change if the investor were to use an interpolated government benchmark rather than the actual 9.5-year gilt.

## Solution to 1:

Solve for the annualized difference in roll-down return by calculating the change in price plus the coupon income for both the corporate bond and the government bond.

1. Calculate the corporate bond roll-down return per £100 face value. For price changes, use the Excel PV function ( $= -PV(\text{rate}, \text{nper}, \text{pmt}, \text{FV}, \text{type})$ ) where “rate” is the interest rate per period ( $0.0275/2$ ), “nper” is the number of periods (20), “pmt” is the periodic coupon ( $3.25/2$ ), “FV” is future value (100), and “type” corresponds to payments made at the end of each period (0).
  - A. Initial price is 104.346 ( $= -PV(0.0275/2, 20, 3.25/2, 100, 0)$ ).
  - B. Price in six months is 104.155 ( $= -PV(0.0275/2, 19, 3.25/2, 100, 0)$ ). Price depreciation is 0.18% ( $= (104.155 - 104.346)/104.346$ ).
  - C. Six-month coupon income is 1.625 ( $= 3.25/2$ ), or equal to 1.557% ( $= 1.625/104.346$ ), which combined (without rounding) with  $-0.18\%$  from B results in a 1.375% six-month return (2.75% annualized).
2. Calculate the UK gilt price change and coupon income.
  - A. Initial price is 99.565 ( $= -PV(0.018/2, 19, 1.75/2, 100, 0)$ ).

**B.** Price in six months is 99.586 ( $= -PV(0.018/2, 18, 1.75/2, 100, 0)$ ). Price appreciation is 0.021% ( $= (99.586 - 99.565)/99.565$ ).

**C.** Six-month coupon income is 0.875 ( $= 1.75/2$ ), or equal to 0.879% ( $0.875/99.565$ ), which combined with +0.021% equals 0.9% for six months (1.80% annualized).

The annualized roll-down return difference is the 2.75% corporate bond realized return less the 1.80% UK gilt realized return, or 0.95%.

## Solution to 2:

The interpolated benchmark involves the use of the most liquid, on-the-run government bonds to derive a hypothetical 10-year UK gilt YTM. Because the UK gilt yield curve is upward sloping in this example, we can conclude that the relative roll-down return using an interpolated benchmark would be lower than the 0.95% difference in Question 1.

Active credit managers often view the E ( $\Delta$  Price due to investor's view of yield spreads) term in Equation 1 on a stand-alone basis because they manage benchmark rate risks separately from credit. Equation 5 is similar to equations from earlier lessons quantifying the change in bond price for a given YTM change, but it is limited here to yield spread changes, or  $\% \Delta PV^{Spread} (= \Delta PV / \Delta Spread)$ .

### Equation (5)

$$\% \Delta PV^{Spread} \approx -(\text{EffSpreadDur} \times \Delta \text{Spread}) + (\frac{1}{2} \times \text{EffSpreadCon} \times (\Delta \text{Spread})^2)$$

where effective spread duration (EffSpreadDur) and effective spread convexity (EffSpreadCon) reflect spread rather than curve changes, and  $\Delta \text{Spread}$  is typically defined as the change in OAS.

### Equation (6)

$$\text{EffSpreadDur} = \frac{(PV_-) - (PV_+)}{2 \times (\Delta \text{Spread})(PV_0)}$$

### Equation (7)



$$\text{EffSpreadCon} = \frac{(PV_-) + (PV_+) - 2(PV_0)}{(\Delta\text{Spread})^2 \times (PV_0)}$$

The first term of [Equation 5](#) is sometimes simply referred to as **spread duration**, or, alternatively, as **OAS duration** when OAS is the underlying spread. Active managers approximate bond portfolio value changes due to spread changes by substituting market value–weighted averages for the duration and convexity measures in [Equation 5](#). As noted earlier, spread changes for lower-rated bonds tend to be consistent on a proportional percentage rather than absolute basis; therefore, adjusting spread duration to capture this **Duration Times Spread (DTS)** effect is important, as in [Equation 8](#).

### Equation (8)

$$\text{DTS} \approx (\text{EffSpreadDur} \times \text{Spread})$$

A portfolio's DTS is the market value–weighted average of DTS of its individual bonds, and spread changes of a portfolio are measured on a percentage ( $\Delta\text{Spread}/\text{Spread}$ ) basis rather than in absolute basis point terms, as in the following example.

## EXAMPLE 11

### DTS Example

A financial analyst compares a portfolio evenly split between two technology company bonds trading at par to an index with an average OAS of 125 bps.

Issuer	OAS	EffSpreadDur
A Rated Bond	100 bps	3.0
BB Rated Bond	300 bps	4.0

Calculate the portfolio DTS, and estimate how the technology bond portfolio will perform if index OAS widens by 10 bps.

### Solution:

Portfolio DTS is the market value–weighted average of DTS based on [Equation 8](#), or

$$\sum_{i=1}^n w_i (\text{EffSpreadDur}_i \times \text{Spread}_i).$$

1. Portfolio DTS in this two-asset example is  $w_A(\text{EffSpreadDur}_A \times \text{Spread}_A) + w_{BB}(\text{EffSpreadDur}_{BB} \times \text{Spread}_{BB})$  with equal weights ( $w_A = w_{BB} = 0.50$ ). Solve for portfolio DTS of 750 ( $= (0.5 \times 100 \text{ bps} \times 3.0) + (0.5 \times 300 \text{ bps} \times 4.0)$ ).
2. Index spread widening of 10 bps is equivalent to 8% (10 bps/125 bps spread) on a  $\Delta\text{Spread}/\text{Spread}$  basis. We can therefore calculate the estimated basis point change in the technology bond portfolio by multiplying the portfolio DTS of 750 by the 8% expected percentage spread change to get an expected 60 bps p.a. widening for the technology bond portfolio.

As active credit managers consider *incremental* effects of credit-based portfolio decisions, they often use spread duration–based statistics to gauge the first-order impact of spread movements. For example, [Equation 9](#) approximates the annualized **excess spread** return for a spread-based bond:

### Equation (9)

$$\text{ExcessSpread} \approx \text{Spread}_0 - (\text{EffSpreadDur} \times \Delta\text{Spread})$$

$\text{Spread}_0$  is the initial yield spread, which changes to  $(\text{Spread}_0/\text{Periods Per Year})$  for holding periods of less than a year. Note that this calculation assumes no defaults for the period in question. While relatively rare, as an event of default grows more likely, expected future bond cash flows are impaired, and a bond's value instead approaches the present value of expected recovery. The annualized expected excess return shown in [Equation 10](#) incorporates both default probability and loss severity:

$$E[\text{ExcessSpread}] \approx$$

### Equation (10)

$$\text{Spread}_0 - (\text{EffSpreadDur} \times \Delta\text{Spread}) - (\text{POD} \times \text{LGD})$$

[Equation 10](#) captures a key goal of active credit management, which is to maximize expected spread return in excess of the portfolio credit loss or realized percentage of par value lost to defaults over time.

## EXAMPLE 12

# Excess Spread and Expected Excess Spread

A corporate bond has an effective spread duration of five years and a credit spread of 2.75% (275 bps).

1. What is the approximate excess return if the bond is held for six months and the credit spread narrows 50 bps to 2.25%? Assume the spread duration remains at five years and that the bond does not experience default losses.
2. What is the instantaneous (holding period of zero) excess return if the spread rises to 3.25%?
3. Assume the bond has a 1% annualized expected POD and expected loss severity of 60% in the event of default. What is the expected excess return if the bond is held for six months and the credit spread is expected to fall to 2.25%?

### Solution to 1:

Using Equation 9 ( $\text{Spread}_0 - (\text{EffSpreadDur} \times \Delta\text{Spread})$ ), the excess return on the bond is  $3.875\% = (2.75\% \times 0.5) - [(2.25\% - 2.75\%) \times 5]$ .

### Solution to 2:

Using Equation 9, the instantaneous excess return on the bond is approximately  $-2.5\% = (2.75\% \times 0) - [(3.25\% - 2.75\%) \times 5]$ .

### Solution to 3:

Using Equation 10 ( $\text{Spread}_0 - (\text{EffSpreadDur} \times \Delta\text{Spread}) - (\text{POD} \times \text{LGD})$ ), the expected excess return on the bond is approximately  $3.575\% = (2.75\% \times 0.5) - [(2.25\% - 2.75\%) \times 5] - (0.5 \times 1\% \times 60\%)$ .

Finally, we must address the difference in duration as an interest rate sensitivity measure for FRNs versus fixed-rate bonds. The periodic reset of MRRs in both the FRN numerator and denominator leads to a *rate* duration of near zero for floaters trading at par on a reset date (prior to MRR reset). As we saw in an earlier DM example, changes in *spread* (DM or Z-DM) are the key driver of price changes for a given FRN yield change. The respective FRN rate and spread duration measures are shown in Equations 11 and 12 and demonstrated in the following example.

### Equation (11)

$$\text{EffRateDur}_{\text{FRN}} = \frac{(PV_-) - (PV_+)}{2 \times (\Delta \text{MRR})(PV_0)}$$

### Equation (12)

$$\text{EffSpreadDur}_{\text{FRN}} = \frac{(PV_-) - (PV_+)}{2 \times (\Delta \text{DM})(PV_0)}$$

We return to the example of a five-year £100 million FRN at three-month MRR + 1.75%, with a DM of 2.25% and a 0.50% MRR priced at £97,671,718. We can derive the FRN's effective rate duration by first calculating  $PV_-$  and  $PV_+$  using a spreadsheet by shifting MRR down and up by 0.05% as follows:

$$\begin{aligned} PV_0 &= £97,671,718 = \frac{£562,500}{(1 + 0.6875\%)} + \frac{£562,500}{(1 + 0.6875\%)^2} + \dots + \frac{£100,562,500}{(1 + 0.6875\%)^{20}} \\ PV_- &= £97,668,746 = \frac{£550,000}{(1 + 0.6750\%)} + \frac{£550,000}{(1 + 0.6750\%)^2} + \dots + \frac{£100,550,000}{(1 + 0.6750\%)^{20}} \\ PV_+ &= £97,674,685 = \frac{£575,000}{(1 + 0.7000\%)} + \frac{£575,000}{(1 + 0.7000\%)^2} + \dots + \frac{£100,575,000}{(1 + 0.7000\%)^{20}} \end{aligned}$$

Solving for  $\text{EffRateDur}_{\text{FRN}}$ , we arrive at a rate duration of  $-0.061$ , which is slightly negative because the floater trades at a discount. The spread duration statistic  $\text{EffSpreadDur}_{\text{FRN}}$  is calculated in a similar manner by shifting DM down and up by 0.05%, with  $PV_-$  and  $PV_+$  equal to £97,972,684 and £97,515,401 and  $\text{EffSpreadDur}_{\text{FRN}}$  equal to 4.682.

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## 3. CREDIT STRATEGIES

### 3.1. Bottom-Up Credit Strategies

#### c. discuss bottom-up approaches to credit strategies

As active fixed-income managers consider the selection process for spread-based bond portfolio investments, they must assess different ways in which to maximize excess spread across the fixed-income issuer types, industries, and instruments within their prescribed

investment mandate. A fundamental choice these investors face is whether to engage in an individual security selection process or bottom-up approach; a macro- or market-based, top-down approach in pursuing this objective; or a combination of both.

Fundamental credit analysis covered earlier in the curriculum considers the basis on which a specific issuer can satisfy its interest and principal payments through bond maturity. Analysts often assess unsecured corporate bonds using factors such as profitability and leverage to identify the sources and variability of cash flows available to an issuer to service debt. These measures are usually chosen and compared relative to an industry and/or the jurisdiction in which the issuer operates. In the case of a sovereign borrower, the relevant metric is the economic activity within a government's jurisdiction and the government's ability and willingness to levy taxes and generate sufficient revenue to meet its obligations. Alternatively, for a special purpose entity issuer with bonds backed by mortgage-based or other securitized cash flows, a credit measure of both the residential borrowers and underlying collateral value as well as internal credit enhancements are among the primary factors considered in the assessment.

While individual bonds across all these issuer types are usually rated by at least two of the major credit rating agencies, active managers typically conduct their own credit assessment of individual borrowers rather than relying on ratings, which are frequently used to define a mandate (e.g., investment grade versus high yield), categorize, or benchmark investments of similar credit quality.

### **3.1.1. *Defining the Credit Universe***

A bottom-up approach typically begins with a manager defining the universe of eligible bonds within a mandate and then grouping the universe into categories that allow consistent relative value analysis across comparable borrowers. For example, a corporate bond portfolio manager is likely to divide eligible bonds into industry sectors, such as media and telecommunications and industrials, as well as into subsectors and/or firms located in different jurisdictions. Media and telecommunications subsectors include firms in the cable and satellite industries, internet media, and telecommunications carriers. Within each sector or subsector based on either industry classification methodologies or a customized approach, she can use relative value analysis to determine the bonds that are attractively valued.

#### **EXAMPLE 13**

### **Dividing the Credit Universe**

An investor is conducting a relative value analysis on global bond issuers in the health care sector. He is trying to decide whether the global health care sector is a sufficiently

narrow sector for his analysis. Through his research, he has determined the following:

- Biotech and pharmaceutical companies are active globally across Europe, Asia, and the Americas.
- Health care facilities are typically local in nature and tend to sell into only one of these three regions.
- Medical equipment and devices is a more cyclical business, and many of these firms are part of multi-industry companies in which health care accounts for a smaller fraction of overall company sales.

Describe considerations that the investor can use in determining how to best divide the health care sector into comparable companies.

### **Solution:**

An investor typically seeks to isolate a sector that contains a set of companies for which he expects company-level risks, rather than industry or macro risks, to be the dominant factors. Based on the investor's analysis, biotech and pharmaceutical companies differ meaningfully from health care facilities and medical equipment manufacturers. Health care facilities have a narrow regional focus in contrast to the global focus in biotech and pharma.

The investor might therefore want to divide the global health care sector into global biotech and global pharmaceuticals. Hospitals and other health care facilities warrant separate treatment given their narrow geographic focus and different industry drivers. He might want to consider a different approach to medical device companies given their multi-industry profiles.

### **3.1.2. Bottom-Up Credit Analysis**

Once the credit universe has been divided into sectors and prospective bonds identified, the investor evaluates each issuer's implied credit risk comparing company-specific financial information to spread-related compensation for assuming default, credit migration, and liquidity risks for comparative purposes.

Beyond the prospects within a company's industry, its competitive position within that industry, and operating history, financial ratios are a valuable tool to compare creditworthiness across firms. Earlier lessons stressed the value of key ratios, including

profitability and cash flow, leverage, and debt coverage, which are summarized in Exhibit 16.

### Exhibit 16. Key Financial Ratios for Bottom-Up Credit Analysis

Ratio	Description	Advantages	Disadvantages
EBITDA/ Total Assets	<b>Profitability</b> Cash flow as a percentage of assets	Combines operating income with non-cash expense	Ignores capital expenditures and working capital changes
Debt/ Capital	<b>Leverage</b> Fraction of company's capital financed with debt	Direct measure of relative reliance on debt financing	More relevant for investment-grade than high-yield issuers
EBITDA/ Interest Expense	<b>Coverage</b> Cash flow available to service debt	Measures relative issuer ability to meet debt payments	Volatile measure for firms with high cash flow variability

While offering a relatively consistent basis for comparison across firms and over time, reliance on financial ratios based on publicly available accounting data alone is of limited value because of comparability issues across firms and industries as well as the historical nature of financial statements. Alternative measures combine several relevant financial ratios with market-based measures to establish a forward-looking approach to creditworthiness.

A previous lesson established that statistical credit analysis models to measure individual issuer creditworthiness can be categorized as either **reduced form credit models** or **structural credit models**. Reduced form models solve for **default intensity**, or the POD over a specific time period, using observable company-specific variables such as financial ratios and recovery assumptions as well as macroeconomic variables, including economic growth and market volatility measures. Structural credit models use market-based variables to estimate the market value of an issuer's assets and the volatility of asset value. The likelihood of default is defined as the probability of the asset value falling below that of liabilities.

An early example of the reduced form approach is the **Z-score** established by **Altman (1968)**, which combined liquidity (working capital/total assets), profitability (retained earnings/total assets), asset efficiency (EBIT/ total assets), market versus book value of

equity, and asset turnover (sales/total assets) factors weighted by coefficients to form a composite score. Each composite, or Z-score, was used to classify manufacturing firms into those expected to remain solvent and those anticipated to go bankrupt. Similar to credit scoring models, this multiple discriminant analysis reduces the dimensionality of the input variables to a single cutoff Z-score that represents the default threshold, as shown in the following example.

## EXAMPLE 14

### Z-Score Comparison of Two Firms

A United Kingdom–based financial analyst considers a Z-score model in evaluating two publicly traded non-manufacturing companies as follows:

$$\text{Z-Score Model} = 1.2 \times A + 1.4 \times B + 3.3 \times C + 0.6 \times D + 0.999 \times E,$$

where

A is Working Capital/Total Assets

B is Retained Earnings/Total Assets

C is EBIT/Total Assets

D is Market Value of Equity/Total Liabilities

E is Sales/Total Assets

Firms with a Z-score greater than 3.0 are considered financially sound, those scoring between 3.0 and 1.8 are at greater risk of financial distress, and those with a Z-score below 1.8 are likely to face insolvency.

1. Calculate the Z-score for Firm 1 and Firm 2. Which has a higher likelihood of financial distress based on this measure?

Financial Data (GBP thousands)/Firm	Firm 1	Firm 2
Total Sales	23,110	15,270
EBIT	6,910	2,350
Current Assets	7,560	4,990
Total Assets	36,360	23,998
Current Liabilities	5,400	3,564



Total Liabilities	9,970	10,050
Retained Earnings	20,890	13,787
Market Value of Equity	29,000	18,270

2. Evaluate the most likely reasons for the difference in creditworthiness between the two firms based on the Z-score model factors.

### Solution to 1:

First, calculate the respective ratios for both firms as follows, noting that working capital is equal to current assets minus current liabilities:

<b>Z-Score Factors</b>	<b>Firm 1</b>	<b>Firm 2</b>
Working Capital/Assets	0.059	0.059
Retained Earnings/Assets	0.575	0.575
EBIT/Total Assets	0.190	0.098
Market Value of Equity/Total Liabilities	2.909	1.818
Sales/Total Assets	0.636	0.636

Solving for the respective Z-scores, we find that Firm 1 has a Z-score of 3.883, while Firm 2 has a Z-score of 2.925. Firm 2 therefore has a greater likelihood of financial distress.

### Solution to 2:

Comparing the respective Z-score ratios of Firm 1 and Firm 2, we find that Firm 2 has a far lower asset efficiency (EBIT/Total Assets of 9.8% versus 19% for Firm 1) and a lower relative equity market value (Market Value of Equity/Total Liabilities of 1.818 versus 2.909 for Firm 1) than Firm 1, while all other ratios are comparable.

Structural credit models used in practice include Moody's Analytics Expected Default Frequency (EDF) and Bloomberg's Default Risk (DRSK) models, both of which provide daily POD estimates for a broad range of issuers over a selected period. The EDF model estimates a forward-looking POD defined as the point at which the market value of assets falls below a firm's obligations. The model uses asset volatility to determine the likelihood of

reaching the default point and is calibrated for different industries, regions, and observed credit market dynamics.

Bloomberg's DRSK model estimate for AbbVie Inc., as shown in Exhibit 17, includes a market-based asset value measure derived from equity market capitalization and equity volatility as well as a default threshold measured using the book value of liabilities. These and other DRSK model inputs in the left column of the screen can be defined by users and compared within and across industry sectors. In addition to the one-year POD estimate of 0.0413%, DRSK calculates a “model” CDS spread (upper left corner) which can be compared to the actual market CDS spread.

**Exhibit 17. Bloomberg DRSK Model Estimate for AbbVie Inc.**



Source: Bloomberg

Both the EDF and DRSK approaches are sometimes referred to as “distance to default” models because a probability distribution is used to determine how far an issuer’s current market value of assets is from the default threshold for a given period.

## EXAMPLE 15

### “Distance to Default” Models

An active manager is weighing an investment in the bonds of two issuers in the same industry with identical PODs using a structural credit model. Which of the following changes to the model inputs for one of the issuers would lead the analyst to expect an increase in the POD for that issuer?

- A. An increase in the issuer’s coverage ratio
- B. An increase in the volatility of the issuer’s stock price
- C. A decrease in the issuer’s leverage ratio

#### Solution:

The correct answer is B. Higher equity volatility increases the likelihood that the market value of the issuer’s assets will fall below the default threshold. A higher coverage ratio in A implies higher cash flow as a percentage of assets, increasing the issuer’s ability to service its debt obligations. The decrease in the issuer’s leverage ratio in C represents a decline in the amount of debt versus equity, reducing the issuer’s likelihood of financial distress.

### 3.1.3. Bottom-Up Relative Value Analysis

Given two issuers with similar credit risk, the investor will typically choose bonds of the issuer with the higher yield spread, given the greater potential for excess returns. For issuers with different credit-related risk, the investor must decide whether the additional spread is sufficient compensation for the incremental exposure. The excess expected return calculation in [Equation 10](#) captures the relationship between yield spreads and the components of credit risk, as seen in the following example.

## EXAMPLE 16

### Comparing Investments Using Expected Excess Return

A portfolio manager considers two industrial bonds for a one-year investment:

Issuer	Rating	EffSpreadDur	YTM	Z-Spread
A Rated Industrial	A2	5.0	4.0%	100 bps
B Rated Industrial	B2	7.0	6.5%	350 bps

The manager observes a historical annual default probability of 0.27% for A2 rated issuers and 3.19% for B2 rated issuers and assumes a 40% recovery rate for both bonds.

1. Compute the estimated excess return for each bond assuming no change in spreads, and interpret whether the B rated bond spread provides sufficient compensation for the incremental risk.
2. Which bond is more attractive if spreads are expected to widen by 10%?

### Solution to 1:

As per Equation 10,

$$E[\text{ExcessSpread}] \approx \text{Spread}_0 - (\text{EffSpreadDur} \times \Delta\text{Spread}) - (\text{POD} \times \text{LGD}).$$

A rated expected excess return is  $0.84\% = 1\% - (5 \times 0) - (0.27\% \times 60\%)$ . B rated expected excess return is  $1.59\% = 3.5\% - (7 \times 0) - (3.19\% \times 60\%)$ . The B rated bond appears to provide sufficient compensation for the added risk.

### Solution to 2:

Recalculate Equation 10 with  $\Delta\text{Spread}$  of 10 bps for the A rated bond and 35 bps for the B rated bond.

$$\text{A rated excess return is } 0.34\% = 1\% - (5 \times 0.1\%) - (0.27\% \times 60\%).$$

$$\text{B rated excess return is } -0.86\% = 3.5\% - (7 \times 0.35\%) - (3.19\% \times 60\%).$$

The A rated bond is more attractive under this scenario.

In practice, bonds from different issuers usually also have various maturity, embedded call or put provisions, liquidity, and other characteristics, so these additional features should be

taken into account during the security selection process. For example, callability or priority within the capital structure must be considered as it can affect valuation. Also, bonds recently issued in larger tranches by highly liquid issuers have narrower bid–offer spreads and greater daily transaction volume, which allows an investor to buy or sell the bond at a lower cost. This feature is likely to be of greater value to investors who expect short-term spread narrowing and/or have a short time horizon. Note that relative liquidity tends to decline over time as the issuer returns to the bond market and offers a price concession for new issues. On the other hand, an investor has a longer investment horizon with the flexible maturity, he might be able to increase excess return via a greater duration. Other factors driving potential yield spread differences to be considered include issuer credit or negative ratings outlooks, potential merger and acquisition activity, and other negative company events not adequately reflected in the analysis.

When deciding among frequent issuers with several bond issues, an investor should consider using credit spread curves for these issuers across maturities.

EXAMPLE 17

## Using Spread Curves in Relative Value Analysis

A United States–based issuer has the following option-free bonds outstanding:

Outstanding Debt	Term	Coupon	Price
2-year issue	2	4.25%	106.7
5-year issue	5	3.25%	106
15-year issue	15	2.75%	91

Current on-the-run US Treasury YTM's are as follows:

Tenor	Coupon	Price
2y	0.250%	100
5y	0.875%	100
10y	2.000%	100
20y	2.250%	100



































































































































































# Study Session 7

## Equity Portfolio Management (1)

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Because equity securities represent a significant portion of many investment portfolios, equity portfolio management is often an important component of overall investment success. This study session begins by explaining the role played by equity investments in portfolios, with consideration given to costs and shareholder responsibilities. It then discusses two approaches to equity portfolio management: passive or index-based investing and active equity strategies. The reading on passive equity investing addresses important issues such as alternative approaches to index replication and factor-based passive strategies. Tracking error, risk, and return considerations from an indexing perspective are examined.

## READING ASSIGNMENTS

- Reading 15** Overview of Equity Portfolio Management  
by James Clunie, PhD, CFA, and James Alan Finnegan, CAIA, RMA, CFA
- Reading 16** Passive Equity Investing  
by David M. Smith, PhD, CFA, and Kevin K. Yousif, CFA

# Reading 15

## Overview of Equity Portfolio Management

by James Clunie, PhD, CFA, and James Alan Finnegan, CAIA, RMA, CFA

*James Clunie, PhD, CFA, is at Jupiter Asset Management (United Kingdom). James Alan Finnegan, CAIA, RMA, CFA (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a. describe the roles of equities in the overall portfolio;
- b. describe how an equity manager's investment universe can be segmented;
- c. describe the types of income and costs associated with owning and managing an equity portfolio and their potential effects on portfolio performance;
- d. describe the potential benefits of shareholder engagement and the role an equity manager might play in shareholder engagement;
- e. describe rationales for equity investment across the passive–active spectrum.

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## 1. INTRODUCTION AND THE ROLE OF EQUITIES IN A PORTFOLIO

- a. describe the roles of equities in the overall portfolio;

Equities represent a sizable portion of the global investment universe and thus often represent a primary component of investors' portfolios. Rationales for investing in equities include

potential participation in the growth and earnings prospects of an economy's corporate sector as well as an ownership interest in a range of business entities by size, economic activity, and geographical scope. Publicly traded equities are generally more liquid than other asset classes and thus may enable investors to more easily monitor price trends and purchase or sell securities with low transaction costs.

This reading provides an overview of equity portfolio management. Section 1.1 discusses the roles of equities in a portfolio. Section 2 discusses the equity investment universe, including several ways the universe can be segmented. Sections 3 and 4 cover the income and costs in an equity portfolio. Section 5 discusses shareholder engagement between equity investors and the companies in which they invest. Section 6 discusses equity investment across the passive–active investment spectrum. A summary of key points completes the reading.

## **1.1. The Roles of Equities in a Portfolio**

Equities provide several roles in (or benefits to) an overall portfolio, such as capital appreciation, dividend income, diversification with other asset classes, and a potential hedge against inflation. In addition to these benefits, client investment considerations play an important role for portfolio managers when deciding to include equities in portfolios.

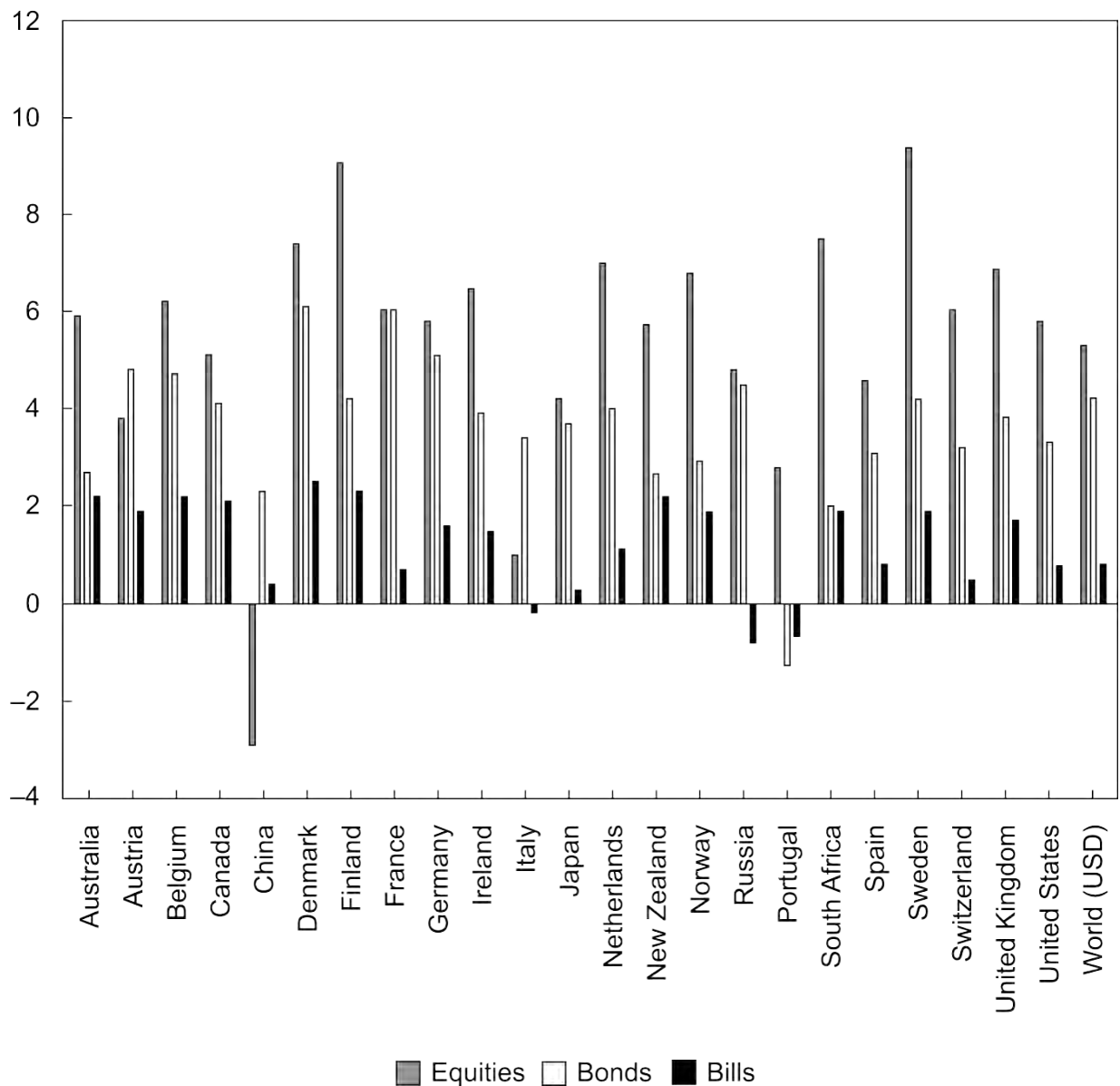
### **1.1.1. *Capital Appreciation***

Long-term returns on equities, driven predominantly by capital appreciation, have historically been among the highest among major asset classes. [Exhibit 1](#) demonstrates the average annual real returns on equities versus bonds and bills—both globally and within various countries—from 1967–2016. With a few exceptions, equities outperformed both bonds and bills, in particular, during this period across the world.

#### **Exhibit 1. Real Returns on Equities (1967–2016)**



# Real Annualized Return (%)



\* China data are from 1993 to 2016.

\*\* Russia data are from 1995 to 2016.

Source: Credit Suisse Global Investment Returns Yearbook 2017, Summary Edition.

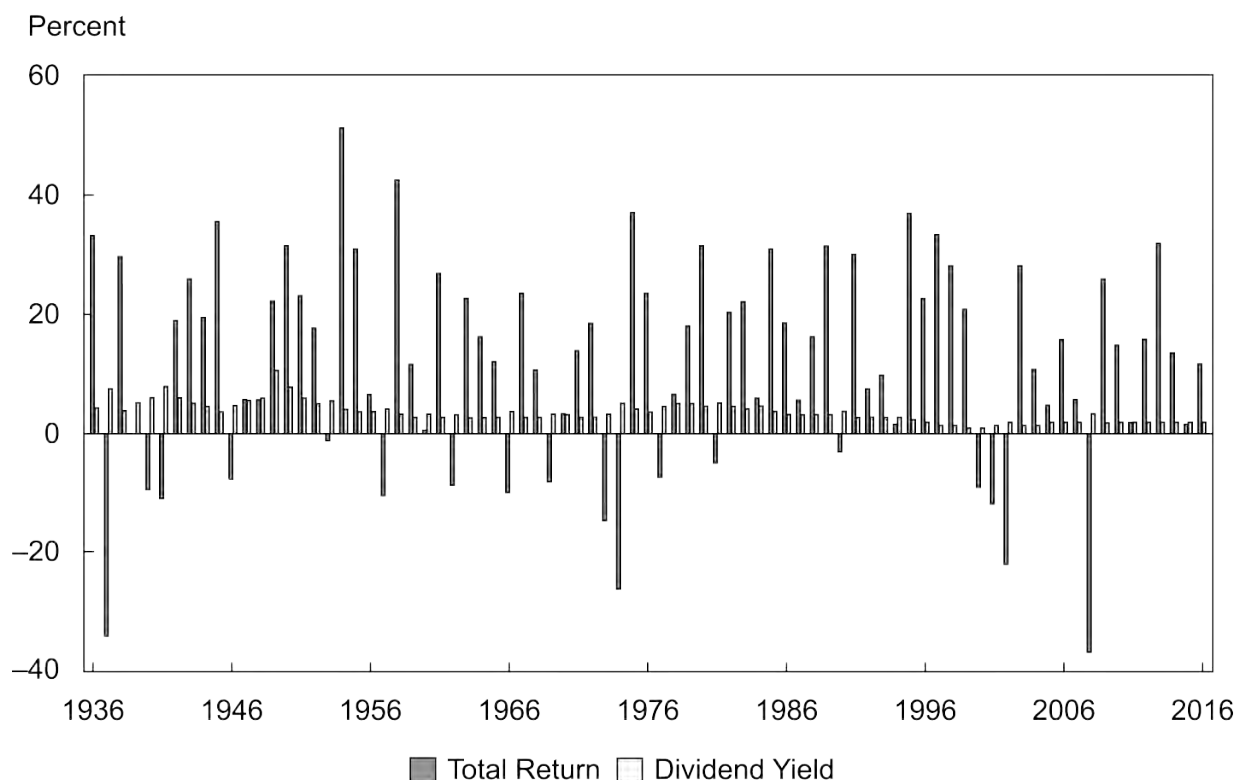
Equities tend to outperform other asset classes during periods of strong economic growth, and they tend to underperform other asset classes during weaker economic periods. Capital (or price) appreciation of equities often occurs when investing in companies with growth in earnings, cash flows, and/or revenues—as well as in companies with competitive success. Capital appreciation can occur, for example, in such growth-oriented companies as small technology companies as well as in large, mature companies where management successfully reduces costs or engages in value-added acquisitions.

### 1.1.2. Dividend Income

The most common sources of income for an equity portfolio are dividends. Companies may choose to distribute internally generated cash flows as common dividends rather than reinvest the cash flows in projects, particularly when suitable projects do not exist or available projects have a high cost of equity or a low probability of future value creation. Large, well-established corporations often provide dividend payments that increase in value over time, although there are no assurances that common dividend payments from these corporations will grow or even be maintained. In addition to common dividends, preferred dividends can provide dividend income to those shareholders owning preferred shares.

Dividends have comprised a significant component of long-term total returns for equity investors. Over shorter periods of time, however, the proportion of equity returns from dividends (reflected as dividend yield) can vary considerably relative to capital gains or losses. [Exhibit 2](#) illustrates this effect of dividend returns relative to annual total returns on the S&P 500 Index from 1936 through 2016. Since 1990, the dividend yield on the S&P 500 has been in the 1–3% range; thus, the effect of dividends can clearly be significant during periods of weak equity market performance. Also note that the dividend yield may vary considerably by sector within the S&P 500.

**Exhibit 2. S&P 500 Dividend Contribution (1936–2016)**



Source: Bloomberg.

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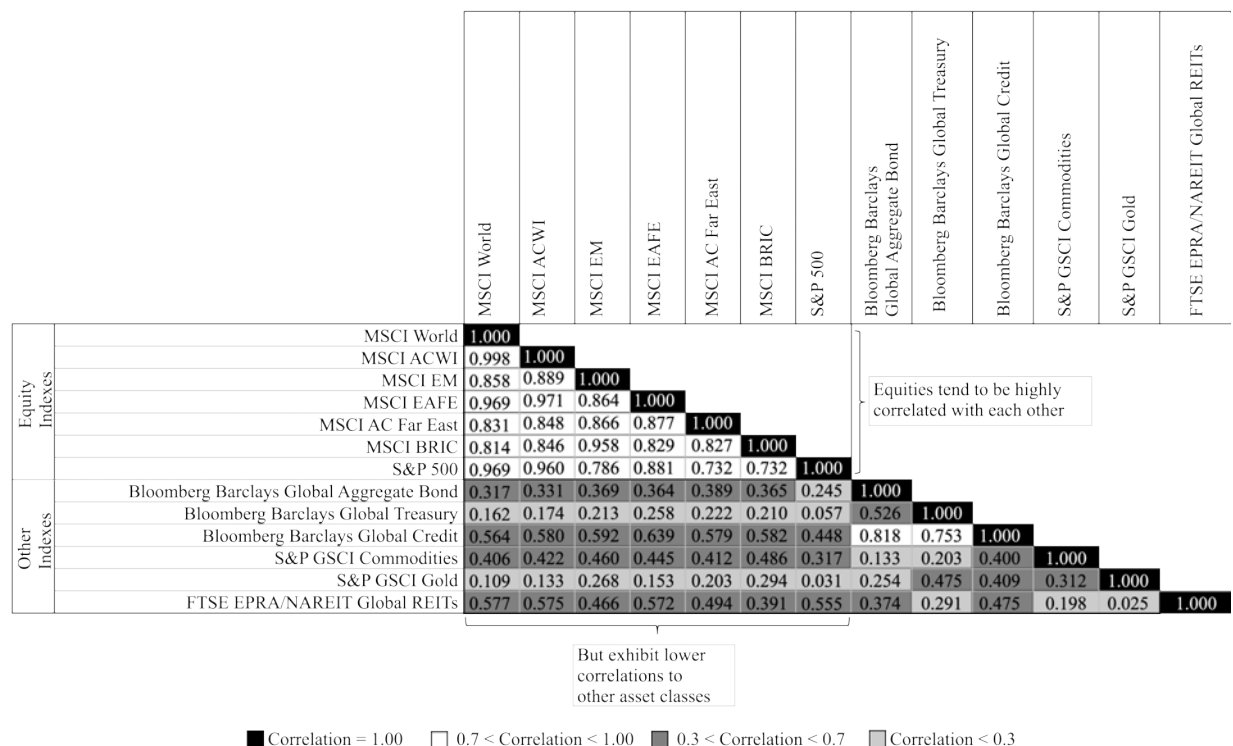
### 1.1.3. *Diversification with Other Asset Classes*

Individual equities clearly have unique characteristics, although the correlation of returns among equities is often high. In a portfolio context, however, equities can provide meaningful diversification benefits when combined with other asset classes (assuming less than perfect correlation). Recall that a major reason why portfolios can effectively reduce risk (typically expressed as standard deviation of returns) is that combining securities whose returns are less than perfectly correlated reduces the standard deviation of the diversified portfolio below the weighted average of the standard deviations of the individual investments. The challenge in diversifying risk is to find assets that have a correlation that is much lower than +1.0.

**Exhibit 3** provides a correlation matrix across various global equity indexes and other asset classes using total monthly returns from January 2001 to February 2017.<sup>1</sup> The correlation matrix shows that during this period, various broad equity indexes and, to a lesser extent, country equity indexes were highly correlated with each other. Conversely, both the broad and country equity indexes were considerably less correlated with indexes in other asset classes, notably global treasury bonds and gold. Overall, **Exhibit 3** indicates that combining equities with other asset classes can result in portfolio diversification benefits.

It is important to note that correlations are not constant over time. During a long historical period, the correlation of returns between two asset classes may be low, but in any given period, the correlation can differ from the long term. Correlation estimates can vary based on the capital market dynamics during the period when the correlations are measured. During periods of market crisis, correlations across asset classes and among equities themselves often increase and reduce the benefit of diversification. As with correlations, volatility (standard deviation) of asset class returns may also vary over time.

#### **Exhibit 3. Correlation Matrix, January 2001 to February 2017**



Source: Morningstar Direct.

#### 1.1.4. Hedge Against Inflation

Some individual equities or sectors can provide some protection against inflation, although the ability to do so varies. For example, certain companies may be successful at passing along higher input costs (such as raw materials, energy, or wages) to customers. This ability to pass along costs to customers can protect a company's or industry's profit margin and cash flow and can be reflected in their stock prices. As another example, companies within sectors that produce broad-based commodities (e.g., oil or industrial metals producers) can more directly benefit from increases in commodity prices. Although individual equities or sectors can protect against inflation, the success of equities as an asset class in hedging inflation has been mixed. Certain empirical studies have indeed shown that real returns on equities and inflation have positive correlation over the long-term, thus in theory forming a hedge. However, the degree of correlation typically varies by country and is dependent on the time period assessed. In fact, for severe inflationary periods, some studies have shown that real returns on equities and inflation have been *negatively* correlated. When assessing the relationship between equity returns and inflation, investors should be aware that inflation is typically a lagging indicator of the business cycle, while equity prices are often a leading indicator.

#### 1.1.5. Client Considerations for Equities in a Portfolio

The inclusion of equities in a portfolio can be driven by a client's goals or needs. A client's investment considerations are typically described in an investment policy statement (IPS), which establishes, among other things, a client's return objectives, risk tolerance, constraints, and unique circumstances. By understanding these client considerations, a financial adviser or wealth manager can determine whether—and how much—equities should be in a client's portfolio.

Equity investments are often characterized by such attributes as growth potential, income generation, risk and return volatility, and sensitivity to various macro-economic variables (e.g., energy prices, GDP growth, interest rates, and inflation). As a result, a portfolio manager can adapt such specific factors to an equity investor's investment goals and risk tolerance. For example, a risk-averse and conservative investor may prefer some exposure to well-established companies with strong and stable cash flow that pay meaningful dividends. Conversely, a growth-oriented investor with an aggressive risk tolerance may prefer small or large growth-oriented companies (e.g., those in the social media or alternative energy sectors).

Wealth managers and financial advisers often consider the following investment objectives and constraints when deciding to include equities (or asset classes in general, for that matter) in a client's portfolio:

- *Risk objective* addresses how risk is measured (e.g., in absolute or relative terms); the investor's willingness to take risk; the investor's ability to take risk; and the investor's specific risk objectives.
- *Return objective* addresses how returns are measured (e.g., in absolute or relative terms); stated return objectives.
- *Liquidity requirement* is a constraint in which cash is needed for anticipated or unanticipated events.
- *Time horizon* is the time period associated with an investment objective (e.g., short term, long term, or some combination of the two).
- *Tax concerns* include tax policies that can affect investor returns; for example, dividends may be taxed at a different rate than capital gains.
- *Legal and regulatory factors* are external factors imposed by governmental, regulatory, or oversight authorities.
- *Unique circumstances* are an investor's considerations other than liquidity requirements, time horizon, or tax concerns that may constrain portfolio choices. These considerations may include environmental, social, and governance (ESG) issues or religious preferences.

ESG considerations often occur at the request of clients because interest in sustainable investing has grown. With regard to equities, these considerations often determine the suitability of certain sectors or individual company stocks for designated investor portfolios. Historically, ESG approaches used by portfolio managers have largely represented **negative screening** (or exclusionary screening), which refers to the practice of excluding certain sectors or companies that deviate from accepted standards in such areas as human rights or environmental concerns. More recently, portfolio managers have increasingly focused on **positive screening** or **best-in-class** approaches, which attempt to identify companies or sectors that score most favorably with regard to ESG-related risks and/or opportunities. **Thematic investing** is another approach that focuses on investing in companies within a specific sector or following a specific theme, such as energy efficiency or climate change. **Impact investing** is a related approach that seeks to achieve targeted social or environmental objectives along with measurable financial returns through engagement with a company or by direct investment in projects or companies.

## EXAMPLE 1

### Roles of Equities

Alex Chang, Lin Choi, and Frank Huber manage separate equity portfolios for the same investment firm. Chang's portfolio objective is conservative in nature, with a regular stream of income as the primary investment objective. Choi's portfolio is more aggressive in nature, with a long-term horizon and with growth as the primary objective. Finally, Huber's portfolio consists of wealthy entrepreneurs who are concerned about rising inflation and wish to preserve the purchasing power of their wealth.

Discuss the investment approach that each portfolio manager would likely use to achieve his or her portfolio objectives.

#### **Solution:**

Given that his portfolio is focused on a regular stream of income, Chang is likely to focus on companies with regular dividend income. More specifically, Chang is likely to invest in large, well-established companies with stable or growing dividend payments. With a long-term horizon, Choi is most interested in capital appreciation of her portfolio, so she is likely to focus on companies with earnings growth and competitive success. Finally, Huber's clients are concerned about the effects of inflation, so he will likely seek to invest in shares of companies that can provide an inflation hedge. Huber would likely seek companies that can successfully pass on higher input costs to their customers, and he may also seek commodity producers that may benefit from rising commodity prices.

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## 2. EQUITY INVESTMENT UNIVERSE

- b. describe how an equity manager's investment universe can be segmented;

Given the extensive range of companies in which an equity portfolio manager may invest, an important task for the manager is to segment companies or sectors according to similar characteristics. This segmentation enables portfolio managers to better evaluate and analyze their equity investment universe, and it can help with portfolio diversification. Several approaches to segmenting the equity investment universe are discussed in the following sections.

### 2.1. Segmentation by Size and Style

A popular approach to segmenting the equity universe incorporates two factors: (1) size and (2) style. Size is typically measured by market capitalization and often categorized by large cap, mid cap, and small cap. Style is typically classified as value, growth, or a combination of value and growth (typically termed “blend” or “core”). In addition, style is often determined through a “scoring” system that incorporates multiple metrics or ratios, such as price-to-book ratios, price-to-earnings ratios, earnings growth, dividend yield, and book value growth. These metrics are then typically “scored” individually for each company, assigned certain weights, and then aggregated. The result is a composite score that determines where the company's stock is positioned along the value–growth spectrum. A combination of growth and value style is not uncommon, particularly for large corporations that have both mature and higher growth business lines.

[Exhibit 4](#) illustrates a common matrix that reflects size and style dimensions. Each category in the matrix can be represented by companies with considerably different business activities. For example, both a small, mature metal fabricating business and a small health care services provider may fall in the Small Cap Value category. In practice, individual stocks may not clearly fall into one of the size/style categories. As a result, the size/style matrix tends to be more of a scatter plot than a simple set of nine categories. An example of a scatter plot is demonstrated in [Exhibit 5](#), which includes all listed equities on the New York Stock Exchange as of March 2017. Each company represents a single dot in [Exhibit 5](#). This more granular representation enables the expansion of size and style categories, such as blue chip and micro-cap companies in size and deep value and high growth in style. It should be noted

that Morningstar applies the term “core” for those stocks in which neither value nor growth characteristics dominate, and the term “blend” for those funds with a combination of both growth and value stocks or mostly core stocks.

**Exhibit 4. Equity Size and Style Matrix**

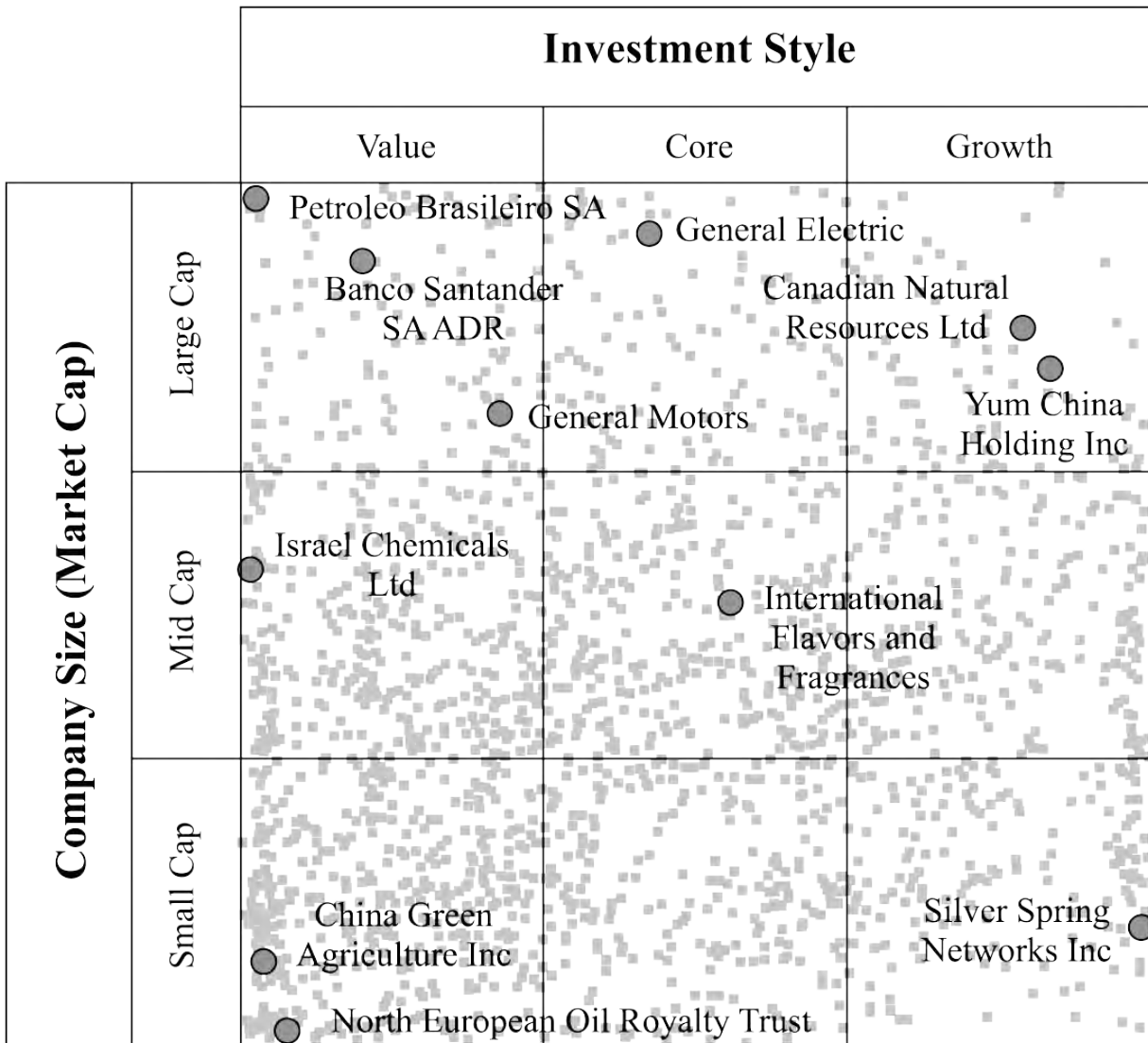
		Investment Style		
		Value	Core	Growth
Company Size (Market Cap)	Large Cap	Large Cap value	Large Cap core	Large Cap growth
	Mid Cap	Mid Cap value	Mid Cap core	Mid Cap growth
	Small Cap	Small Cap value	Small Cap core	Small Cap growth

Source: Morningstar.



**Exhibit 5. Equity Size and Style Scatter Plot**





Source: Morningstar Direct.

Segmentation by size/style can provide several advantages for portfolio managers. First, portfolio managers can construct an overall equity portfolio that reflects desired risk, return, and income characteristics in a relatively straightforward and manageable way. Second, given the broad range of companies within each segment, segmentation by size/style results in diversification across economic sectors or industries. Third, active equity managers—that is, those seeking to outperform a given benchmark portfolio—can construct performance benchmarks for specific size/style segments. Generally, large investment management firms may have sizable teams dedicated toward specific size/style categories, while small firms may specialize in a specific size/style category, particularly mid-cap and small-cap companies, seeking to outperform a standard benchmark or comparable peer group.

The final advantage of segmentation by size/style is that it allows a portfolio to reflect a company's maturity and potentially changing growth/value orientation. Specifically, many companies that undertake an IPO (initial public offering) are small and in a growth phase,

and thus they may fall in the small-cap growth category. If these companies can successfully grow, their size may ultimately move to mid cap or even large cap, while their style may conceivably shift from high growth to value or a combination of growth and value (e.g., a growth and income stock). Accordingly, over the life cycle of companies, investor preferences for these companies may shift increasingly from capital appreciation to dividend income. In addition, segmentation also helps fund managers adjust holdings over time—for example, when stocks that were previously considered to be in the growth category mature and possibly become value stocks. The key disadvantages of segmentation by size/style are that the categories may change over time and may be defined differently among investors.

## 2.2. Segmentation by Geography

Another common approach to equity universe segmentation is by geography. This approach is typically based on the stage of markets’ macroeconomic development and wealth. Common geographic categories are *developed markets*, *emerging markets*, and *frontier markets*. [Exhibit 6](#) demonstrates the commonly used geographic segmentation of international equity indexes according to MSCI. Other major index providers—such as FTSE, Standard & Poor’s, and Russell—also provide similar types of international equity indexes.

Geographic segmentation is useful to equity investors who have considerable exposure to their domestic market and want to diversify by investing in global equities. A key weakness of geographic segmentation is that investing in a specific market (e.g., market index) may provide lower-than-expected exposure to that market. As an example, many large companies domiciled in the United States, Europe, or Asia may be global in nature as opposed to considerable focus on their domicile. Another key weakness of geographic segmentation is potential currency risk when investing in different global equity markets.

**Exhibit 6. MSCI International Equity Indexes (as of November 2016)**

Developed Markets		
Americas	Europe and Middle East	Pacific
Canada	Austria	Australia
United States	Belgium	Hong Kong SAR
	Denmark	Japan
	Finland	New Zealand
	France	Singapore
	Germany	
	Ireland	

Israel  
Italy  
Netherlands  
Norway  
Portugal  
Spain  
Sweden  
Switzerland  
United Kingdom

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### **Emerging Markets**

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<b>Americas</b>	<b>Europe, Middle East, and Africa</b>	<b>Asia Pacific</b>
Brazil	Czech Republic	Chinese mainland
Chile	Egypt	India
Colombia	Greece	Indonesia
Mexico	Hungary	Korea
Peru	Poland	Malaysia
	Qatar	Philippines
	Russia	Taiwan Region
	South Africa	Thailand
	Turkey	Pakistan
	United Arab Emirates	

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### **Frontier Markets**

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<b>Americas</b>	<b>Europe and CIS</b>	<b>Africa</b>	<b>Middle East</b>	<b>Asia</b>
Argentina	Croatia	Kenya	Bahrain	Bangladesh
	Estonia	Mauritius	Jordan	Sri Lanka
	Lithuania	Morocco	Kuwait	Vietnam
	Kazakhstan	Nigeria	Lebanon	
	Romania	Tunisia	Oman	
	Serbia			
	Slovenia			

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*Notes:*

1. The following markets are not included in the developed, emerging, or frontier indexes but have their own market-specific indexes: Saudi Arabia, Jamaica, Trinidad & Tobago, Bosnia Herzegovina, Bulgaria, Ukraine, Botswana, Ghana, Zimbabwe, and Palestine.

2. Pakistan was reclassified from the frontier market to the emerging market category as of May 2017.
3. CIS: Commonwealth of Independent States (formerly the USSR).

## 2.3. Segmentation by Economic Activity

Economic activity is another approach that portfolio managers may use to segment the equity universe. Most commonly used equity classification systems group companies into industries/sectors using either a *production-oriented* approach or a *market-oriented* approach. The production-oriented approach groups companies that manufacture similar products or use similar inputs in their manufacturing processes. The market-oriented approach groups companies based on the markets they serve, the way revenue is earned, and the way customers use companies' products. For example, using a production-oriented approach, a coal company may be classified in the basic materials or mining sector. However, using a market-oriented approach, this same coal company may be classified in the energy sector given the primary market (heating) for the use of coal. As another example, a commercial airline carrier may be classified in the transportation sector using the production-oriented approach, while the same company may be classified in the travel and leisure sector using the market-oriented approach.

Four main global classification systems segment the equity universe by economic activity: (1) the Global Industry Classification Standard (GICS); (2) the Industrial Classification Benchmark (ICB); (3) the Thomson Reuters Business Classification (TRBC); and (4) the Russell Global Sectors Classification (RGS). The GICS uses a market-oriented approach, while the ICB, TRBC, and RGS all use a production-oriented approach. These classification systems help standardize industry definitions so that portfolio managers can compare and analyze companies and industries/sectors. In addition, the classification systems are useful in the creation of industry performance benchmarks.

**Exhibit 7** compares the four primary classification systems mentioned. Each system is classified broadly and then increasingly more granular to compare companies and their underlying businesses.

### Exhibit 7. Primary Sector Classification Systems

Level/System	GICS	ICB	TRBC	RGS
1st	11 Sectors	10 Industries	10 Economic Sectors	9 Economic Sectors

2nd	24 Industry Groups	19 Super Sectors	28 Business Sectors	33 Sub-Sectors
3rd	68 Industries	41 Sectors	54 Industry Groups	157 Industries
4th	157 Sub-Industries	114 Sub-Sectors	136 Industries	Not Applicable

Source: Thomson Reuters, S&P/MSCI, FTSE/Dow Jones.

To illustrate how segmentation of the classification systems may be used in practice, [Exhibit 8](#) demonstrates how GICS, perhaps the most prominent classification system, sub-divides selected sectors—in this case, Consumer Discretionary, Consumer Staples, and Information Technology—into certain industry group, industry, and sub-industry levels.

#### Exhibit 8. GICS Classification Examples

Sector	Consumer Discretionary	Consumer Staples	Information Technology
Industry Group Example	Automobiles & Components	Food, Beverage & Tobacco	Technology Hardware & Equipment
Industry Example	Automobiles	Beverages	Electronic Equipment, Instruments & Components
Sub-Industry Example	Motorcycle Manufacturers	Soft Drinks	Electronic Manufacturing Services

Source: MSCI.

As with other segmentation approaches mentioned previously, segmentation by economic activity enables equity portfolio managers to construct performance benchmarks for specific sectors or industries. Portfolio managers may also obtain better industry representation (diversification) by segmenting their equity universe according to economic activity. The key disadvantage of segmentation by economic activity is that the business activities of companies—particularly large ones—may include more than one industry or sub-industry.

## EXAMPLE 2

# Segmenting the Equity Investment Universe

A portfolio manager is initiating a new fund that seeks to invest in the Chinese robotics industry, which is experiencing rapidly accelerating earnings. To help identify appropriate company stocks, the portfolio manager wants to select an approach to segment the equity universe.

Recommend which segmentation approach would be most appropriate for the portfolio manager.

### Solution:

Based on his desired strategy to invest in companies with rapidly accelerating (growing) earnings, the portfolio manager would most likely segment his equity universe by size/style. The portfolio manager would most likely use an investment style that reflects growth, with size (large cap, mid cap, or small cap) depending on the company being analyzed. Other segmentation approaches, including those according to geography and economic activity, would be less appropriate for the portfolio manager given the similar geographic and industry composition of the Chinese robotics industry.

## 2.4. Segmentation of Equity Indexes and Benchmarks

Segmentation of equity indexes or benchmarks reflects some of or all the approaches previously discussed in this section. For example, the MSCI Europe Large Cap Growth Index, the MSCI World Small Cap Value Index, the MSCI Emerging Markets Large Cap Growth Index, or the MSCI Latin America Midcap Index combine various geographic, size, and style dimensions. This combination of geography, size, and style also sometimes applies to individual countries—particularly those in large, developed markets.

A more focused approach to segmentation of equity indexes uses industries or sectors. Because many industries and sectors are global in scope, the most common types of these indexes are comprised of companies in different countries. A few examples include the following:

- Global Natural Resources—the *S&P Global Natural Resources Index* includes 90 of the largest publicly traded companies in natural resources and commodities businesses

across three primary commodity-related sectors: agribusiness; energy; and metals and mining.

- Worldwide Oil and Natural Gas—the *MSCI World Energy Index* includes the large-cap and mid-cap segments of publicly traded oil and natural gas companies within the developed markets.
- Multinational Financials—the *Thomson Reuters Global Financials Index* includes the 100 largest publicly traded companies within the global financial services sector as defined by the TRBC classification system.

Finally, some indexes reflect specific investment approaches, such as ESG. Such ESG indexes are comprised of companies that reflect certain considerations, such as sustainability or impact investing.

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## 3. INCOME ASSOCIATED WITH OWNING AND MANAGING AN EQUITY PORTFOLIO

- c. describe the types of income and costs associated with owning and managing an equity portfolio and their potential effects on portfolio performance;

Dividends are the primary source of income for equity portfolios. In addition, some portfolio managers may use securities lending or option-writing strategies to generate income. On the cost side, equity portfolios incur various fees and trading costs that adversely affect portfolio returns. The primary types of income and costs are discussed in this section.

### 3.1. Dividend Income

Investors requiring regular income may prefer to invest in stocks with large or frequent dividend payments, whereas growth-oriented investors may have little interest in dividends. Taxation is an important consideration for dividend income received, particularly for individuals. Depending on the country where the investor is domiciled, where dividends are issued, and the type of investor, dividends may be subject to withholding tax and/or income tax.

Beyond regular dividends, equity portfolios may receive **special dividends** from certain



companies. Special dividends occur when companies decide to distribute excess cash to shareholders, but the payments may not be maintained over time. **Optional stock dividends** are another type of dividend in which shareholders may elect to receive either cash or new shares. When the share price used to calculate the number of stock dividend shares is established before the shareholder's election date, the choice between a cash or stock dividend may be important. This choice represents "optionality" for the shareholder, and the optionality has value. Some market participants, typically investment banks, may offer to purchase this "option," providing an additional, if modest, source of income to an equity investor.

## 3.2. Securities Lending Income

For some investors, **securities lending**—a form of collateralized lending—may be used to generate income for portfolios. Securities lending can facilitate short sales, which involve the sale of securities the seller does not own. When a securities lending transaction involves the transfer of equities, the transaction is generally known as **stock lending** and the securities are generally known as *stock loans*. Stock loans are collateralized with either cash or other high-quality securities to provide some financial protection to the lender. Stock loans are usually open-ended in duration, but the borrower must return the shares to the lender on demand.

Stock lenders generally receive a fee from the stock borrower as compensation for the loaned shares. Most stock loans in developed markets earn a modest fee, approximately 0.2–0.5% on an annualized basis. In emerging markets, fees are typically higher, often 1–2% annualized for large-cap stocks. In many equity markets, certain stocks—called "specials"—are in high demand for borrowing. These specials can earn fees that are substantially higher than average (typically 5–15% annualized), and in cases of extreme demand, they could be as high as 25–100% annually. However, such high fees do not normally persist for long periods of time.

In addition to fees earned, stock lenders can generate further income by reinvesting the cash collateral received (assuming a favorable interest rate environment). However, as with virtually any other investment, the collateral would be subject to market risk, credit risk, liquidity risk, and operational risk. The administrative costs of a securities lending program, in turn, will reduce the collateral income generated. Dividends on loaned stock are "manufactured" by the stock borrower for the stock lender—that is, the stock borrower ensures that the stock lender is compensated for any dividends that the lender would have received had the stock not been loaned.

Index funds are frequent stock lenders because of their large, long-term holdings in stocks. In addition, because index funds merely seek to replicate the performance of an index, portfolio managers of these funds are normally not concerned that borrowed stock used for short-



selling purposes might decrease the prices of the corresponding equities. Large, actively managed pension funds, endowments, and institutional investors are also frequent stock lenders, although these investors are likely more concerned with the effect on their returns if the loaned shares are used to facilitate short-selling. The evidence on the impact of stock lending on asset prices has, however, been mixed (see, for example, [Kaplan, Moskowitz, and Sensoy 2013](#)).

### 3.3. Ancillary Investment Strategies

Additional income can be generated for an equity portfolio through a trading strategy known as **dividend capture**. Under this strategy, an equity portfolio manager purchases stocks just before their ex-dividend dates, holds these stocks through the ex-dividend date to earn the right to receive the dividend, and subsequently sells the shares. Once a stock goes ex-dividend, the share price should, in theory, decrease by the value of the dividend. In this way, capturing dividends would increase portfolio income, although the portfolio would, again in theory, experience capital losses of similar magnitude. However, the share price movement could vary from this theoretical assumption given income tax considerations, stock-specific supply/demand conditions, and general stock market moves around the ex-dividend date.

Selling (writing) options can also generate additional income for an equity portfolio. One such options strategy is writing a *covered call*, whereby the portfolio manager already owns the underlying stock and sells a call option on that stock. Another options strategy is writing a *cash-covered put* (also called a *cash-secured put*), whereby the portfolio manager writes a put option on a stock and simultaneously deposits money equal to the exercise price into a designated account. Under both covered calls and cash-covered puts, income is generated through the writing of options, but clearly the risk profile of the portfolio would be altered. For example, writing a covered call would limit the upside from share price appreciation of the underlying shares.

#### EXAMPLE 3

### Equity Portfolio Income

Isabel Cordova is an equity portfolio manager for a large multinational investment firm. Her portfolio consists of several dividend-paying stocks, and she is interested in generating additional income to enhance the portfolio's total return. Describe potential sources of additional income for Cordova's equity portfolio.

#### Solution:

Cordova's primary source of income for her portfolio would likely be "regular" and, in some cases, special dividends from those companies that pay them. Another potential source of income for Cordova is securities (stock) lending, whereby eligible equities in her portfolio can be loaned to other market participants, including those seeking to sell short securities. In this case, income would be generated from fees received from the stock borrower as well as from reinvesting the cash collateral received. Another potential income-generating strategy available to Cordova is dividend capture, which entails purchasing stocks just before their ex-dividend dates, holding the stocks through the ex-dividend date to earn the right to receive the dividend, and subsequently selling the shares. Selling (writing) options, including covered call and cash-covered put (cash-secured put) strategies, is another way Cordova can generate additional income for her equity portfolio.

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## 4. COSTS ASSOCIATED WITH OWNING AND MANAGING AN EQUITY PORTFOLIO

- c. describe the types of income and costs associated with owning and managing an equity portfolio and their potential effects on portfolio performance;

Management fees are typically determined as a percentage of the funds under management (an *ad-valorem* fee) at regular intervals. For actively managed portfolios, the level of management fees involves a balance between fees that are high enough to fund investment research but low enough to avoid detracting too much from investor returns. Management fees for actively managed portfolios include direct costs of research (e.g., remuneration and expenses for investment analysts and portfolio managers) and the direct costs of portfolio management (e.g., software, trade processing costs, and compliance). For passively managed portfolios, management fees are typically low because of lower direct costs of research and portfolio management relative to actively managed portfolios.

### 4.1. Performance Fees

In addition to management fees, portfolio managers sometimes earn performance fees (also known as incentive fees) on their portfolios. Performance fees are generally associated with hedge funds and long/short equity portfolios, rather than long-only portfolios. These fees are

an incentive for portfolio managers to achieve or outperform return objectives, to the benefit of both the manager and investors. As an example, a performance fee might represent 10–20% of any capital appreciation in a portfolio that exceeds some stated annual absolute return threshold (e.g., 8%). Several performance fee structures exist, although performance fees tend to be “upwards only”—that is, fees are earned by the manager when performance objectives are met, but fund investors are not reimbursed when performance is negative. However, performance fees could be reduced following a period of poor performance. Fee calculations also reflect high-water marks. A **high-water mark** is the highest value, net of fees, that the fund has reached. The use of high-water marks protects clients from paying twice for the same performance. For example, if a fund performed well in a given year, it might earn a performance fee. If the value of the same fund fell the following year, no performance fee would be payable. Then, if the fund’s value increased in the third year to a point just below the value achieved at the end of the first year, no performance fee would be earned because the fund’s value did not exceed the high-water mark. This basic fee structure is used by many alternative investment funds and partnerships, including hedge funds.

Investment managers typically present a standard schedule of fees to a prospective client, although actual fees can be negotiated between the manager and investors. For a fund, fees are established in the prospectus, although investors could negotiate special terms (e.g., a discount for being an early investor in a fund).

## 4.2. Administration Fees

Equity portfolios are subject to administration fees. These fees include the processing of corporate actions, such as rights issues; the measurement of performance and risk of a portfolio; and voting at company meetings. Generally, these functions are provided by an investment management firm itself and are included as part of the management fee.

Some functions, however, are provided by external parties, with the fees charged to the client in addition to management fees. These externally provided functions include:

- *Custody fees* paid for the safekeeping of assets by a custodian (often a subsidiary of a large bank) that is independent of the investment manager.
- *Depository fees* paid to help ensure that custodians segregate the assets of the portfolio and that the portfolio complies with any investment limits, leverage requirements, and limits on cash holdings.
- *Registration fees* that are associated with the registration of ownership of units in a mutual fund.

## 4.3. Marketing and Distribution Costs

Most investment management firms market and distribute their services to some degree. Marketing and distribution costs typically include the following:

- Costs of employing marketing, sales, and client servicing staff
- Advertising costs
- Sponsorship costs, including costs associated with sponsoring or presenting at conferences
- Costs of producing and distributing brochures or other communications to financial intermediaries or prospective clients
- “Platform” fees, which are costs incurred when an intermediary offers an investment management firm fund services on the intermediary’s platform of funds (e.g., a “funds supermarket”)
- Sales commissions paid to such financial intermediaries as financial planners, independent financial advisers, and brokers to facilitate the distribution of funds or investment services

When marketing and distribution services are performed by an investment management firm, the costs are likely included as part of the management fee. However, those marketing and distribution services that are performed by external parties (e.g., consultants) typically incur additional costs to the investor.

## 4.4. Trading Costs

Buying and selling equities incurs a series of trading (or transaction) costs. Some of these trading costs are explicit, including brokerage commission costs, taxes, stamp duties, and stock exchange fees. In addition, many countries charge a modest regulatory fee for certain types of equity trading.

In contrast to explicit costs, some trading costs are implicit in nature. These implicit costs include the following:

- Bid–offer spread
- Market impact (also called price impact), which measures the effect of the trade on transaction prices

- Delay costs (also called slippage), which arise from the inability to complete desired trades immediately because of order size or lack of market liquidity

In an equity portfolio, total trading costs are a function of the size of trades, the frequency of trading, and the degree to which trades demand liquidity from the market. Unlike many other equity portfolio costs, such as management fees, the total cost of trading is generally not revealed to the investor. Rather, trading costs are incorporated into a portfolio's total return and presented as overall performance data. One final trading cost relates to stock lending transactions that were previously discussed. Equity portfolio managers who borrow shares in these transactions must pay fees on shares borrowed.

## 4.5. Investment Approaches and Effects on Costs

Equity portfolio costs tend to vary depending on their underlying strategy or approach. As mentioned previously, passively managed strategies tend to charge lower management fees than active strategies primarily because of lower research costs to manage the portfolios. Passively managed equity portfolios also tend to trade less frequently than actively managed equity portfolios, with trading in passive portfolios typically involving rebalancing or changes to index constituents. Index funds, however, do face a “hidden” cost from potential predatory trading. As an illustration, a predatory trader may purchase (or sell short) shares prior to their effective inclusion (or deletion) from an index, resulting in price movement and potential profit for a predatory trader. Such predatory trading strategies can be regarded as a cost to investors in index funds, albeit a cost that is not necessarily evident to a portfolio manager or investor.

Some active investing approaches “demand liquidity” from the market. For example, in a momentum strategy, the investor seeks to buy shares that are already rising in price (or sell those that are already falling). In contrast, some active investing approaches are more likely to “provide liquidity” to the market, such as deep value strategies (i.e., those involving stocks that are deemed to be significantly undervalued). Investment strategies that involve frequent trading and demand liquidity are, unsurprisingly, likely to have higher trading costs than long-term, buy-and-hold investment strategies.

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## 5. SHAREHOLDER ENGAGEMENT

- d. describe the potential benefits of shareholder engagement and the role an equity manager might play in shareholder engagement;

Shareholder engagement refers to the process whereby investors actively interact with companies. Shareholder engagement often includes voting on corporate matters at general meetings as well as other forms of communication (e.g., quarterly investor calls or in-person meetings) between shareholders and representatives of a company. Generally, shareholder engagement concerns issues that can affect the value of a company and, by extension, an investor's shares.

When shareholders engage with companies, several issues may be discussed. Some of these issues include the following:

- *Strategy*—a company's strategic goals, resources, plans for growth, and constraints. Also of interest may be a company's research, product development, culture, sustainability and corporate responsibility, and industry and competitor developments. Shareholders may ask the company how it balances short-term requirements and long-term goals and how it prioritizes the interests of its various stakeholders.
- *Allocation of capital*—a company's process for selecting new projects as well as its mergers and acquisitions strategy. Shareholders may be interested to learn about policies on dividends, financial leverage, equity raising, and capital expenditures.
- *Corporate governance* and regulatory and political risk—including internal controls and the operation of its audit and risk committees.
- *Remuneration*—compensation structures for directors and senior management, incentives for certain behaviors, and alignment of interests between directors and shareholders. In some cases, investors may be able to influence future remuneration structures. Such influence, especially regarding larger companies, often involves the use of remuneration consultants and an iterative process with large, long-term shareholders.
- *Composition of the board of directors*—succession planning, director expertise and competence, culture, diversity, and board effectiveness.

## 5.1. Benefits of Shareholder Engagement

Shareholder engagement can provide benefits for both shareholders and companies. From a company's perspective, shareholder engagement can assist in developing a more effective corporate governance culture. In turn, shareholder engagement may lead to better company performance to the benefit of shareholders (as well as other stakeholders).

Investors may also benefit from engagement because they will have more information about companies or the sectors in which companies operate. Such information may include a company's strategy, culture, and competitive environment within an industry. Shareholder

engagement is particularly relevant for active portfolio managers given their objective to outperform a benchmark portfolio. By contrast, passive (or index) fund managers are primarily focused on tracking a given benchmark or index while minimizing costs to do so. Any process, such as shareholder engagement, that takes up management time (and adds to cost) would detract from the primary goal of a passive manager. This would be less of an issue for very large passively managed portfolios, where any engagement costs could be spread over a sizable asset base.

In theory, some investors could benefit from the shareholder engagement of others under the so-called “free rider problem.” Specifically, assume that a portfolio manager using an active strategy actively engages with a company to improve its operations and was successful in increasing the company’s stock price. The manager’s actions in this case improved the value of his portfolio and also benefitted other investors who own the same stock in their portfolios. Investors who did not participate in shareholder engagement benefitted from improved performance but without the costs necessary for engagement.

In addition to shareholders, other stakeholders of a company may also have an interest in the process and outcomes of shareholder engagement. These stakeholders may include creditors, customers, employees, regulators, governmental bodies, and certain other members of society (e.g., community organizations and citizen groups). These other stakeholders can gain or lose influence with companies depending on the outcomes of shareholder engagement. For example, employees can be affected by cost reduction programs requested by shareholders. Another example is when creditors of a company are affected by a change in a company’s vendor payment terms, which can impact the company’s working capital and cash flow. Such external forces as the media, the academic community, corporate governance consultants, and proxy voting advisers can also influence the process of shareholder engagement.

Shareholders that also have non-financial interests, such as ESG considerations, may also benefit from shareholder engagement. However, these benefits are difficult to quantify. Empirical evidence relating shareholder returns to a company’s adherence to corporate governance and ESG practices is mixed. This mixed evidence could be partly attributable to the fact that a company’s management quality and effective ESG practices may be correlated with one another. As a result, it is often difficult to isolate non-financial factors and measure the direct effects of shareholder engagement.

## **5.2. Disadvantages of Shareholder Engagement**

Shareholder engagement also has several disadvantages. First, shareholder engagement is time consuming and can be costly for both shareholders and companies. Second, pressure on company management to meet near-term share price or earnings targets could be made at the expense of long-term corporate decisions. Third, engagement can result in selective



disclosure of important information to a certain subset of shareholders, which could lead to a breach of insider trading rules while in possession of specific, material, non-public information about a company. Finally, conflicts of interest can result for a company. For example, a portfolio manager could engage with a company that also happens to be an investor in the manager's portfolio. In such a situation, a portfolio manager may be unduly influenced to support the company's management so as not to jeopardize the company's investment mandate with the portfolio manager.

## **5.3. The Role of an Equity Manager in Shareholder Engagement**

Active managers of equity portfolios typically engage, to some degree, with companies in which they currently (or potentially) invest. In fact, investment firms in some countries have legal or regulatory responsibilities to establish written policies on stewardship and/or shareholder engagement. Engagement activities for equity portfolio managers often include regular meetings with company management or investor relations teams. Such meetings can occur at any time but are often held after annual, semi-annual, or quarterly company results have been published.

For such non-financial issues as ESG, large investment firms, in particular, sometimes employ an analyst (or team of analysts) who focuses on ESG issues. These ESG-focused analysts normally work in conjunction with traditional fundamental investment analysts, with primary responsibility for shareholder voting decisions or environmental or social issues that affect equity investments. In lieu of—or in addition to—dedicated ESG analyst teams, some institutional investors have retained outside experts to assist with corporate governance monitoring and proxy voting. In response to this demand, an industry that provides corporate governance services, including governance ratings and proxy advice, has developed.

### **5.3.1. *Activist Investing***

A distinct and specialized version of engagement is known as activist investing. Activist investors (or activists) specialize in taking stakes in companies and creating change to generate a gain on the investment. Hedge funds are among the most common activists, possibly because of the potential for, in many cases, high performance fees. In addition, because hedge funds are subject to limited regulation, have fewer investment constraints, and can often leverage positions, these investors often have more flexibility as activists.

Engagement through activist investing can include meetings with management as well as shareholder resolutions, letters to management, presentations to other investors, and media campaigns. Activists may also seek representation on a company's board of directors as a



way of exerting influence. Proxy contests are one method used to obtain board representation. These contests represent corporate takeover mechanisms in which shareholders are persuaded to vote for a group seeking a controlling position on a company's board of directors. Social media and other communication tools can help activists coordinate the actions of other shareholders.

### 5.3.2. Voting

The participation of shareholders in general meetings, also known as general assemblies, and the exercise of their voting rights are among the most influential tools available for shareholder engagement. General meetings enable shareholders to participate in discussions and to vote on major corporate matters and transactions that are not delegated to the board of directors. By engaging in general meetings, shareholders can exercise their voting rights on major corporate issues and better monitor the performance of the board and senior management.

Proxy voting enables shareholders who are unable to attend a meeting to authorize another individual (e.g., another shareholder or director) to vote on their behalf. Proxy voting is the most common form of investor participation in general meetings. Although most resolutions pass without controversy, sometimes minority shareholders attempt to strengthen their influence at companies via proxy voting. Occasionally, multiple shareholders may use this process to collectively vote their shares in favor of or in opposition to a certain resolution.

Some investors use external proxy advisory firms that provide voting recommendations and reduce research efforts by investors. Portfolio managers need not follow the recommendations of proxy advisory firms, but these external parties can highlight potential controversial issues. An investor's voting instructions are typically processed electronically via third-party proxy voting agents.

When an investor loans shares, the transaction is technically an assignment of title with a repurchase option; that is, the voting rights are transferred to the borrower. The transfer of voting rights with stock lending could potentially result in the borrower having different voting opinions from the lending investor. To mitigate this problem, some stock lenders recall shares ahead of voting resolutions to enable exercise of their voting rights. The downside of this action would be the loss of stock lending revenue during the period of stock loan recall and potential reputation risk as an attractive lender. Investors, in some cases, may borrow shares explicitly to exercise the voting rights attached. This process is called *empty voting*, whereby no capital is invested in the voted shares.

#### EXAMPLE 4

# Shareholder Engagement

An investor manages a fund with a sizable concentration in the transportation sector and is interested in meeting with senior management of a small aircraft manufacturer. Discuss how the investor may benefit from his/her shareholder engagement activities, as well as from the shareholder engagement of other investors, with this manufacturer.

## **Solution:**

The investor may benefit from information obtained about the aircraft manufacturer, such as its strategy, allocation of capital, corporate governance, remuneration of directors and senior management, culture, and competitive environment within the aerospace industry. The investor may also benefit as a “free rider,” whereby other investors may improve the manufacturer’s operating performance through shareholder engagement—to the benefit of all shareholders. Finally, if the investor has non-financial interests, such as ESG, he or she may address these considerations as part of shareholder engagement.

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## 6. EQUITY INVESTMENT ACROSS THE PASSIVE-ACTIVE SPECTRUM

- e. describe rationales for equity investment across the passive–active spectrum.

The debate between passive management and active management of equity portfolios has been a longstanding one in the investment community. In reality, the decision between passive management and active management is not an “either/or” (binary) alternative. Instead, equity portfolios tend to exist across a passive–active spectrum, ranging from portfolios that closely track an equity market index or benchmark to unconstrained portfolios that are not subject to any benchmark or index. In some cases, portfolios may resemble a “closet index” in which the portfolio is advertised as actively managed but essentially resembles a passively managed fund. For an equity manager (or investment firm), several rationales exist for positioning a portfolio along the passive–active spectrum. Each of these rationales is discussed further.

## 6.1. Confidence to Outperform

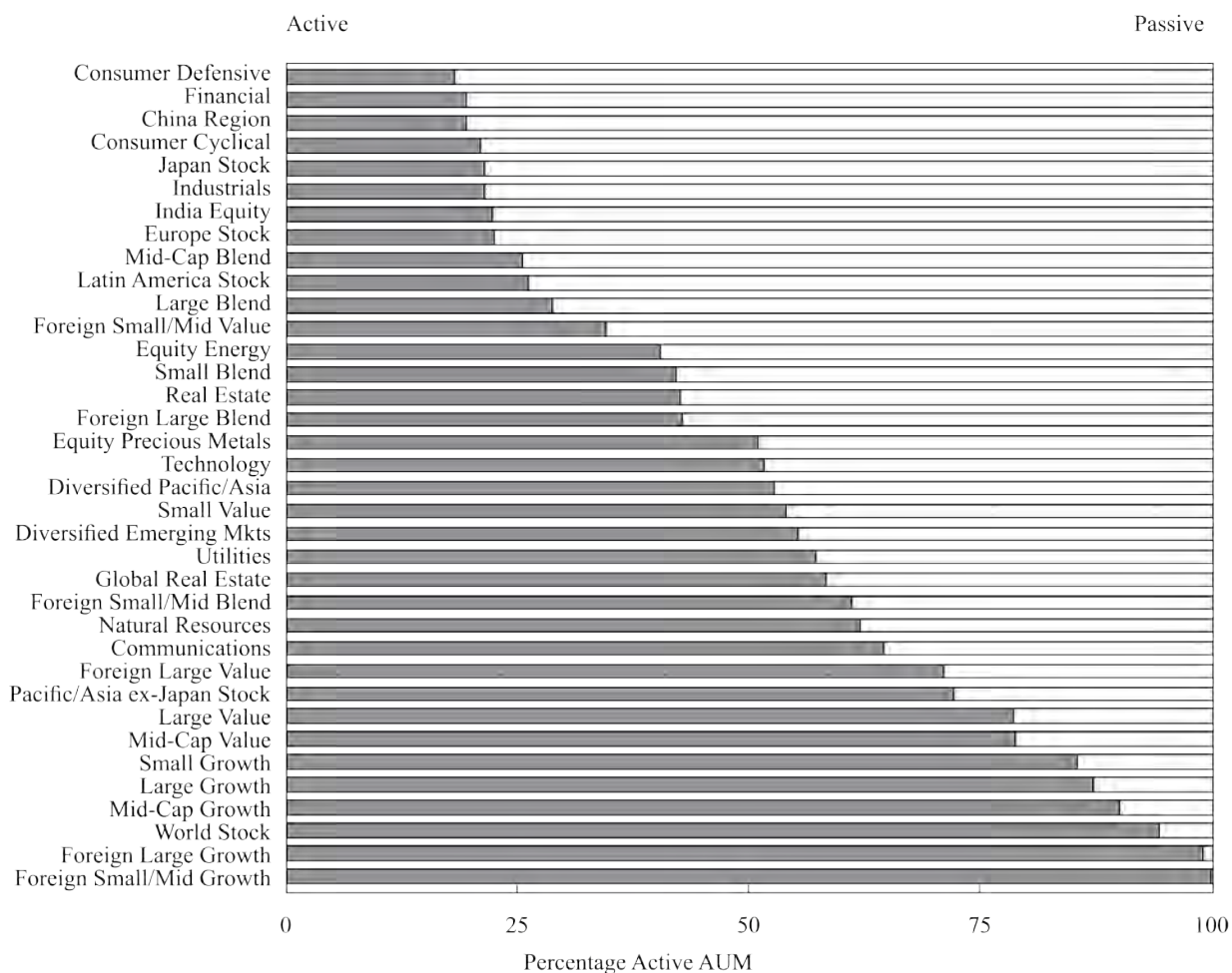
An active investment manager typically needs to be confident that she can adequately outperform her benchmark. This determination requires an understanding of the manager's equity investment universe as well as a competitive analysis of other managers that have a similar investment universe.

## 6.2. Client Preference

For equity portfolio managers, client preference is a primary consideration when deciding between passive or active investing. Portfolio managers must assess whether their passive or active investment strategies will attract sufficient funds from clients to make the initiatives viable. Another consideration reflects investors' beliefs regarding the potential for active strategies to generate positive alpha. For example, in some equity market categories, such as large-cap/developed markets, companies are widely known and have considerable equity analyst coverage. For such categories as these, investors often believe that potential alpha is substantially reduced because all publicly available information is efficiently disseminated, analyzed, and reflected in stock prices.

A comparison of passive and active equities is illustrated in [Exhibit 9](#). The exhibit demonstrates the relative proportion of investment passive and active equities in US open-ended mutual funds and exchange-traded funds (ETFs) by equity category. Nearly all equities in some categories, such as foreign small/mid-cap growth, are managed on an active basis. Conversely, equities in other categories, such as large-cap blend, are predominantly managed on a passive basis.

**Exhibit 9. Passive versus Active Equities in US Open-Ended Mutual Funds and ETFs**



Source: Morningstar Direct. Data as of August 2016.

## 6.3. Suitable Benchmark

An investor or equity manager's choice of benchmark can play a meaningful role in the ability to attract new funds. This choice is particularly relevant in the institutional equity market, where asset owners (and their consultants) regularly screen new managers in desired equity segments. As part of the selection process in desired equity segments, active managers normally must have benchmarks with sufficient liquidity of underlying securities (thus maintaining a reasonable cost of trading). In addition, the number of securities underlying the benchmark typically must be broad enough to generate sufficient alpha. For this reason, many country or sector-specific investment strategies (e.g., consumer defensive companies) are managed passively rather than actively.

## 6.4. Client-Specific Mandates

Client-specific investment mandates, such as those related to ESG considerations, are typically managed actively rather than passively. This active approach occurs because passive management may not be particularly efficient or cost effective when managers must meet a client's desired holdings (or holdings to avoid). For example, a mandate to avoid investments in companies involved in certain “unacceptable” activities (e.g., the sale of military technology or weapons, tobacco/alcohol, or gambling) requires ongoing monitoring and management. As part of this *exclusionary (or negative) screening* process, managers need to determine those companies that are directly, as well as indirectly, involved in such “unacceptable” industries. Although ESG investing is typically more active than passive, several investment vehicles enable a portfolio manager to invest passively according to ESG-related considerations.

## 6.5. Risks/Costs of Active Management

As mentioned previously, active equity management is typically more expensive to implement than passive management. Another risk that active managers face—perhaps more so than with passive managers—is reputation risk from the potential violation of rules, regulations, client agreements, or ethical principles. Lastly, “key person” risk is relevant for active managers if the success of an investment manager's firm is dependent on one or a few individuals (“star managers”) who may potentially leave the firm.

## 6.6. Taxes

Compared with active strategies, passive strategies generally have lower turnover and generate a higher percentage of long-term gains. An index fund that replicates its benchmark can have minimal rebalancing. In turn, active strategies can be designed to minimize tax consequences of gains/income at the expense of higher trading costs. One overall challenge is that tax legislation differs widely across countries.

### EXAMPLE 5

## Passive–Active Spectrum

James Drummond, an equity portfolio manager, is meeting with Marie Goudreaux, a wealthy client of his investment firm. Goudreaux is very cost conscious and believes that equity markets are highly efficient. Goudreaux also has a narrow investment focus, seeking stocks in specific country and industry sectors.

Discuss where Goudreaux's portfolio is likely to be positioned across the passive–active spectrum.

### Solution:

Goudreaux's portfolio is likely to be managed passively. Because she believes in market efficiency, Goudreaux likely believes that Drummond's ability to generate alpha is limited. Goudreaux's cost consciousness also supports passive management, which is typically less expensive to implement than active management. Finally, Goudreaux's stated desire to invest in specific countries and sectors would likely be better managed passively.

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## SUMMARY

This reading provides an overview of the roles equity investments may play in the client's portfolio, how asset owners and investment managers segment the equity universe for purposes of defining an investment mandate, the costs and obligations of equity ownership (including shareholder engagement) and issues relevant to the decision to pursue active or passive management of an equity portfolio. Among the key points made in this reading are the following:

- Equities can provide several roles or benefits to an overall portfolio, including capital appreciation, dividend income, diversification with other asset classes, and a potential hedge against inflation.
- The inclusion of equities in a portfolio can be driven by a client's goals or needs. Portfolio managers often consider the following investment objectives and constraints when deciding to include equities (or asset classes in general, for that matter) in a client's portfolio: *risk objective*; *return objective*; *liquidity requirement*; *time horizon*; *tax concerns*; *legal and regulatory factors*; and *unique circumstances*.
- Investors often segment the equity universe according to (1) size and style; (2) geography; and (3) economic activity.
- Sources of equity portfolio income include dividends; securities lending fees and interest; dividend capture; covered calls; and cash-covered puts (or cash-secured puts).

- Sources of equity portfolio costs include management fees; performance fees; administration fees; marketing/distribution fees; and trading costs.
- Shareholder engagement is the process whereby companies engage with their shareholders. The process typically includes voting on corporate matters at general meetings and other forms of communication, such as quarterly investor calls or in-person meetings.
- Shareholder engagement can provide benefits for both shareholders and companies. From a company's perspective, shareholder engagement can assist in developing a more effective corporate governance culture. In turn, shareholder engagement may lead to better company performance to the benefit of shareholders (as well as other stakeholders).
- Disadvantages of shareholder engagement include costs and time involved, pressure on a company to meet near-term share price or earnings targets, possible selective disclosure of information, and potential conflicts of interest.
- Activist investors (or activists) specialize in taking stakes in companies and creating change to generate a gain on the investment.
- The participation of shareholders in general meetings, also known as general assemblies, and the exercise of their voting rights are among the most influential tools available for shareholder engagement.
- The choice of using active management or passive management is not an “either/or” (binary) alternative but rather a decision involving a passive–active spectrum. Investors may decide to position their portfolios across the passive–active spectrum based on their confidence to outperform, client preference, suitable benchmarks, client-specific mandates, risks/costs of active management, and taxes.

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## PRACTICE PROBLEMS

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### The following information relates to questions 1–8

Three years ago, the Albright Investment Management Company (Albright) added four new funds—the Barboa Fund, the Caribou Fund, the DoGood Fund, and the Elmer Fund—to its existing fund offering. Albright’s new funds are described in Exhibit 1.

#### Exhibit 1. Albright Investment Management Company New Funds

Fund	Fund Description
Barboa Fund	Invests solely in the equity of companies in oil production and transportation industries in many countries.
Caribou Fund	Uses an aggressive strategy focusing on relatively new, fast-growing companies in emerging industries.
DoGood Fund	Investment universe includes all US companies and sectors that have favorable environmental, social, and governance (ESG) ratings and specifically excludes companies with products or services related to aerospace and defense.
Elmer Fund	Investments selected to track the S&P 500 Index. Minimizes trading based on the assumption that markets are efficient.

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Hans Smith, an Albright portfolio manager, makes the following notes after examining these funds:

**Note 1**

The fee on the Caribou Fund is a 15% share of any capital appreciation above a 7% threshold and the use of a high-water mark.

**Note 2**

The DoGood Fund invests in Fleeker Corporation stock, which is rated high in the ESG space, and Fleeker's pension fund has a significant investment in the DoGood Fund. This dynamic has the potential for a conflict of interest on the part of Fleeker Corporation but not for the DoGood Fund.

**Note 3**

The DoGood Fund's portfolio manager has written policies stating that the fund does not engage in shareholder activism. Therefore, the DoGood Fund may be a free-rider on the activism by these shareholders.

**Note 4**

Of the four funds, the Elmer Fund is most likely to appeal to investors who want to minimize fees and believe that the market is efficient.

**Note 5**

Adding investment-grade bonds to the Elmer Fund will decrease the portfolio's short-term risk.

Smith discusses means of enhancing income for the three funds with the junior analyst, Kolton Frey, including engaging in securities lending or writing covered calls. Frey tells Smith the following:

**Statement 1**

Securities lending would increase income through reinvestment of the cash collateral but would require the fund to miss out on dividend income from the lent securities.

**Statement 2**

Writing covered calls would generate income, but doing so would limit the upside share price appreciation for the underlying shares.

1. The Barboa Fund can be *best* described as a fund segmented by:
  - A. size/style.
  - B. geography.
  - C. economic activity.
2. The Caribou Fund is *most likely* classified as a:
  - A. large-cap value fund.
  - B. small-cap value fund.
  - C. small-cap growth fund.
3. The DoGood Fund's approach to the aerospace and defense industry is *best* described as:
  - A. positive screening.
  - B. negative screening.
  - C. thematic investing.
4. The Elmer fund's management strategy is:
  - A. active.
  - B. passive.
  - C. blended.
5. Based on Note 1, the fee on the Caribou Fund is *best* described as a:
  - A. performance fee.
  - B. management fee.
  - C. administrative fee.
6. Which of the following notes about the DoGood Fund is correct?
  - A. Only Note 2
  - B. Only Note 3

C. Both Note 2 and Note 3

7. Which of the notes regarding the Elmer Fund is correct?

A. Only Note 4

B. Only Note 5

C. Both Note 4 and Note 5

8. Which of Frey's statements about securities lending and covered call writing is correct?

A. Only Statement 1

B. Only Statement 2

C. Both Statement 1 and Statement 2

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## SOLUTIONS

1. C is correct. The Barboa Fund invests solely in the equity of companies in the oil production and transportation industries in many countries. The fund's description is consistent with the production-oriented approach, which groups companies that manufacture similar products or use similar inputs in their manufacturing processes.

A is incorrect because the fund description does not mention the firms' size or style (i.e., value, growth, or blend). Size is typically measured by market capitalization and often categorized as large cap, mid-cap, or small cap. Style is typically classified as value, growth, or a blend of value and growth. In addition, style is often determined through a "scoring" system that incorporates multiple metrics or ratios, such as price-to-book ratios, price-to-earnings ratios, earnings growth, dividend yield, and book value growth. These metrics are then typically "scored" individually for each company, assigned certain weights, and then aggregated.

B is incorrect because the fund is invested across many countries, which indicates that the fund is not segmented by geography. Segmentation by geography is typically based upon the stage of countries' macroeconomic development and wealth. Common geographic categories are developed markets, emerging markets, and frontier markets.

2. C is correct because the fund focuses on new companies that are generally classified as

small firms, and the fund has a style classified as aggressive. A widely used approach to segment the equity universe incorporates two factors: size and style. Size is typically measured by market capitalization and often categorized as large cap, mid-cap, or small cap. Style is typically classified as value, growth, or a blend of value and growth.

3. B is correct. The DoGood fund excludes companies based on specified activities (e.g., aerospace and defense), which is a process of negative screening. Negative or exclusionary screening refers to the practice of excluding certain sectors or companies that deviate from accepted standards in areas such as human rights or environmental concerns

A is incorrect because positive screening attempts to identify companies or sectors that score most favorably regarding ESG-related risks and/or opportunities. The restrictions on investing indicates that a negative screen is established.

C is incorrect because thematic investing focuses on investing in companies within a specific sector or following a specific theme, such as energy efficiency or climate change. The DoGood Fund's investment universe includes all companies and sectors that have favorable ESG (no specific sectors or screens) but with specific exclusions.

4. B is correct. The fund is managed assuming that the market is efficient, and investments are selected to mimic an index. Compared with active strategies, passive strategies generally have lower turnover and generate a higher percentage of long-term gains. An index fund that replicates its benchmark can have minimal rebalancing.
5. A is correct. Performance fees serve as an incentive for portfolio managers to achieve or outperform return objectives, to the benefit of both the manager and investors. Several performance fee structures exist, although performance fees tend to be "upward only"—that is, fees are earned by the manager when performance objectives are met, but fund investors are not reimbursed when performance is negative. Performance fees could be reduced following a period of poor performance, however. Fee calculations also reflect high-water marks. As described in Note 1, the fee for the Caribou Fund is a 15% share of any capital appreciation above a 7% threshold, with the use of a high-water mark, and is therefore a performance fee.

B is incorrect because management fees include direct costs of research (such as remuneration and expenses for investment analysts and portfolio managers) and the direct costs of portfolio management (e.g., software, trade processing costs, and compliance). Management fees are typically determined as a percentage of the funds under management.

C is incorrect because administrative fees include the processing of corporate actions such as rights issues and optional stock dividends, the measurement of performance and risk of a portfolio, and voting at company meetings. Generally, these functions are

provided by an investment management firm itself and are included as part of the management fee.

6. B is correct because the fund becomes a free-rider if it allows other shareholders to engage in actions that benefit the fund, and therefore Note 3 is correct. In theory, some investors could benefit from the shareholder engagement of others under the so-called “free rider problem.” Specifically, assume that a portfolio manager using an active strategy actively engages with a company to improve its operations and was successful in increasing the company’s stock price. The manager’s actions in this case improved the value of his portfolio and also benefitted other investors that own the same stock in their portfolios. Those investors that did not participate in shareholder engagement benefit from improved performance but without the costs necessary for engagement.

Note 2 is incorrect because a conflict of interest arises on the part of the DoGood Fund if it owns shares of a company that invests in the fund. Conflicts of interest can result for a company. For example, a portfolio manager could engage with a company that also happens to be an investor in the manager’s portfolio. In such a situation, a portfolio manager may be unduly influenced to support the company’s management so as not to jeopardize the company’s investment mandate with the portfolio manager.

7. A is correct. For passively managed portfolios, management fees are typically low because of lower direct costs of research and portfolio management relative to actively managed portfolios. Therefore, Note 4 is correct.

Note 5 is incorrect because the predictability of correlations is uncertain.

8. B is correct. Writing covered calls also generates additional income for an equity portfolio, but doing so limits the upside from share price appreciation of the underlying shares. Therefore, Statement 2 is correct.

A is incorrect because dividends on loaned stock are “manufactured” by the stock borrower for the stock lender—that is, the stock borrower ensures that the stock lender is compensated for any dividends that the lender would have received had the stock not been loaned. Therefore, Statement 1 is incorrect. Frey is incorrect in stating that the funds would miss out on dividend income on lent securities.

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## NOTES

<sup>1</sup>Monthly return data cover January 2001 to February 2017 for all indexes except the FTSE EPRA/NAREIT Global Real Estate Index (whose inception date was November 2008).

# Reading 16

## Passive Equity Investing

by David M. Smith, PhD, CFA, and Kevin K. Yousif, CFA

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## LEARNING OUTCOMES

The candidate should be able to:

- a. discuss considerations in choosing a benchmark for a passively managed equity portfolio;
- b. compare passive factor-based strategies to market-capitalization-weighted indexing;
- c. compare different approaches to passive equity investing;
- d. compare the full replication, stratified sampling, and optimization approaches for the construction of passively managed equity portfolios;
- e. discuss potential causes of tracking error and methods to control tracking error for passively managed equity portfolios;
- f. explain sources of return and risk to a passively managed equity portfolio.

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## 1. CHOOSING A BENCHMARK: INDEXES AS A BASIS FOR INVESTMENT

- a. discuss considerations in choosing a benchmark for a passively managed equity

portfolio;

This reading provides a broad overview of passive equity investing, including index selection, portfolio management techniques, and the analysis of investment results.

Although they mean different things, passive equity investing and indexing have become nearly synonymous in the investment industry. Indexing refers to strategies intended to replicate the performance of benchmark indexes, such as the S&P 500 Index, the Topix 100, the FTSE 100, and the MSCI All-Country World Index. The main advantages of indexing include low costs, broad diversification, and tax efficiency. Indexing is the purest form of a more general idea: passive investing. Passive investing refers to any rules-based, transparent, and investable strategy that does not involve identifying mispriced individual securities. Unlike indexing, however, passive investing can include investing in a changing set of market segments that are selected by the portfolio manager.

Studies over the years have reported support for passive investing. [Renshaw and Feldstein \(1960\)](#) observe that the returns of professionally managed portfolios trailed the returns on the principal index of that time, the Dow Jones Industrial Average. They also conclude that the index would be a good basis for what they termed an “unmanaged investment company.” [French \(2008\)](#) indicates that the cost of passive investing is lower than the cost of active management.

Further motivation for passive investing comes from studies that examine the return and risk consequences of stock selection, which involves identifying mispriced securities. This differs from asset allocation, which involves selecting asset class investments that are, themselves, essentially passive indexed-based portfolios. [Brinson, Hood, and Beebower \(1986\)](#) find a dominant role for asset allocation rather than security selection in explaining return variability. With passive investing, portfolio managers eschew the idea of security selection, concluding that the benefits do not justify the costs.

The efficient market hypothesis gave credence to investors’ interest in indexes by theorizing that stock prices incorporate all relevant information—implying that after costs, the majority of active investors could not consistently outperform the market. With this backdrop, investment managers began to offer strategies to replicate the returns of stock market indexes as early as 1971.

In comparison with passive investing strategies, active management of an investment portfolio requires a substantial commitment of personnel, technological resources, and time spent on analysis and management that can involve significant costs. Consequently, passive portfolio fees charged to investors are generally much lower than fees charged by their active managers. This fee differential represents the most significant and enduring advantage of passive management.

Another advantage is that passive managers seeking to track an index can generally achieve

their objective. Passive managers model their clients' portfolios to the benchmark's constituent securities and weights as reported by the index provider, thereby replicating the benchmark. The skill of a passive manager is apparent in the ability to trade, report, and explain the performance of a client's portfolio. Gross-of-fees performance among passive managers tends to be similar, so much of the industry views passive managers as undifferentiated apart from their scope of offerings and client-servicing capabilities.

Investors of passively managed funds may seek market return, otherwise known as beta exposure, and do not seek outperformance, known as alpha. A focus on beta is based on a single-factor model: the capital asset pricing model.

Since the turn of the millennium, passive factor-based strategies, which are based on more than a single factor, have become more prevalent as investors gain a different understanding of what drives investment returns. These strategies maintain the low-cost advantage of index funds and provide a different expected return stream based on exposure to such factors as style, capitalization, volatility, and quality.

This reading contains the following sections. Sections 1–3 focus on how to choose a passive benchmark, including weighting considerations. Sections 4 and 5 look at how to gain exposure to the desired index, whether through a pooled investment, a derivatives-based approach, or a separately managed account. Section 6 describes passive portfolio construction techniques. Section 7 discusses how a portfolio manager can control tracking error against the benchmark, including the sources of tracking error. Section 8 introduces methods a portfolio manager can use to attribute the sources of return in the portfolio, including country returns, currency returns, sector returns, and security returns. This section also describes sources of portfolio risk. A summary of key points concludes the reading.

## **1.1. Choosing a Benchmark**

Investors initially used benchmark indexes solely to compare the performance of an active portfolio manager against the performance of an unmanaged market portfolio. Indexes are now used as a basis for investment strategies. Many investment vehicles try to replicate index performance, which has contributed to a proliferation of indexes. Indeed, many indexes are developed specifically as a basis for new investment securities.

Successful investors choose their performance benchmarks with care. It is surprising that investors who spend countless hours analyzing the investment process and past performance of an active management strategy may accept a strategy based on a benchmark index without question. A comprehensive analysis of the creation methodology and performance of an index is just as important to investors as the analysis of an active strategy.



### **1.1.1. Indexes as a Basis for Investment**

For an index to become the basis for an equity investment strategy, it must meet three initial requirements. It must be rules-based, transparent, and investable.

Examples of rules include criteria for including a constituent stock and the frequency with which weights are rebalanced. An active manager may use rules and guidelines, but it is often impossible for others to replicate the active manager's decision process. Index rules, on the other hand, must be objective, consistent, and predictable.

Transparency may be the most important requirement because passive investors expect to understand the rules underlying their investment choices. Benchmark providers disclose the rules used and constituents in creating their indexes without any black-box methodologies, which assures investors that indexes will continue to represent the intended strategy.

Equity index benchmarks are investable when their performance can be replicated in the market. For example, the FTSE 100 Index is an investable index because its constituent securities can be purchased easily on the London Stock Exchange. In contrast, most investors cannot track hedge fund-of-funds indexes, such as the HFRI series of indexes, because of the difficulty of buying the constituent hedge funds. Another example of a non-investable index is the Value Line Geometric Index, which is a multiplicative average price. In other words, the value of the index is obtained by multiplying the prices and taking a root corresponding to the number of stocks. This index is not useful for investing purposes because it cannot be replicated.

Certain features of individual securities make them non-investable as index constituents. Many stock indexes "free-float adjust" their shares outstanding, which means that they count only shares available for trade by the public, excluding those shares that are held by founders, governments, or other companies. When a company's shares that are floated in the market are a small fraction of the total shares outstanding, trading can result in disproportionate effects. Similarly, stocks for which trading volume is a small fraction of the total shares outstanding are likely to have low liquidity and commensurately high trading costs. Many indexes consequently require that stocks have float and average shares traded above a certain percent of shares outstanding.

Equity index providers include CRSP, FTSE Russell, Morningstar, MSCI, and S&P Dow Jones. These index providers publicize the rules underlying their indexes, communicate changes in the constituent securities, and report performance. For a fee, they may also provide data to investors who want to replicate the underlying basket of securities.

Index providers have taken steps to make their indexes more investable. One key decision concerns when individual stocks will migrate from one index to another. As a stock increases in market capitalization (market cap) over time, it might move from small-cap to mid-cap to large-cap status. Some index providers have adopted policies intended to limit stock

migration problems and keep trading costs low for investors who replicate indexes. Among these policies are buffering and packeting. **Buffering** involves establishing ranges around breakpoints that define whether a stock belongs in one index or another. As long as stocks remain within the buffer zone, they stay in their current index. For example, the MSCI USA Large Cap Index contains the 300 largest companies in the US equity market. But a company currently in the MSCI USA Mid Cap Index must achieve a rank as the 200th largest stock to move up to the Large Cap Index. Similarly, a large-cap constituent must shrink and be the 451st largest stock to move down to the Mid Cap Index. Size rankings may change almost every day with market price movements, so buffering makes index transitions a more gradual and orderly process.

The effect of buffering is demonstrated with the MSCI USA Large Cap Index during the regularly scheduled May 2016 reconstitution. The MSCI USA Large Cap Index consists of stocks of US-based companies that meet the criterion to be considered for large cap. Further, the MSCI USA Large Cap Index is intended to represent the largest 70% of the market capitalization of the US equity market.

At each rebalance date, MSCI sets a cutoff value for the smallest company in the index and then sets the buffer value at 67% of the cutoff value. During the May 2016 rebalance, the cutoff market capitalization (market cap) of the smallest company in the index was USD 15,707 million; so, the buffer value was USD 10,524 million or approximately USD 10.5 billion.

Whole Foods Market, a grocery store operating primarily in the United States, had experienced a drop in market value from USD 15.3 billion in May of 2015 to USD 10.4 billion in May of 2016. The drop in value put the market cap of Whole Foods Market at a lower value than the acceptable buffer. That is, Whole Foods Market was valued at USD 10.4 billion, which was below the buffer point of USD 10.5 billion. Per the stated rules, Whole Foods Market was removed from the MSCI USA Large Cap Index and was added to the MSCI USA Mid Cap Index.

**Packeting** involves splitting stock positions into multiple parts. Let us say that a stock is currently in a mid-cap index. If its capitalization increases and breaches the breakpoint between mid-cap and large-cap indexes, a portion of the total holding is transferred to the large-cap index but the rest stays in the mid-cap index. On the next reconstitution date, if the stock value remains large-cap and all other qualifications are met, the remainder of the shares are moved out of the mid-cap and into the large-cap index. A policy of packeting can keep portfolio turnover and trading costs low. The Center for Research in Security Prices (CRSP)

uses packeting in the creation of the CRSP family of indexes.

### **1.1.2. Considerations When Choosing a Benchmark Index**

The first consideration when choosing a benchmark index is the desired *market exposure*, which is driven by the objectives and constraints in the investor's investment policy statement (IPS). For equity portfolios, the choices to be made include the market segment (broad versus sectors; domestic versus international), equity capitalization (large, mid, or small), style (value, growth, or blend/core), exposure, and other constituent characteristics (e.g., high or low momentum, low volatility, and quality) that are considered risk factors.

The choice of market depends on the investor's perspective. The investor's domicile, risk tolerance, liquidity needs, and legal considerations all influence the decision. For example, the decision will proceed differently for an Indian institutional investor than for a US-based individual investor. In India, the domestic equity universe is much smaller than in the United States, making the Indian investor more likely to invest globally. But a domestic investment does not carry with it the complexities of cross-border transactions.

A common way to implement the domestic/international investment decision is to use country indexes. Some indexes cover individual countries, and others encompass multiple country markets. For example, the global equity market can also be broken into geographic regions or based on development status (developed, emerging, or frontier markets). The US market is frequently treated as distinct from other developed markets because of its large size.

Another decision element is the *risk-factor exposure* that the index provides. As described later, equity risk factors can arise from several sources, including the holdings' market capitalization (the Size factor), investment style (growth vs. value, or the Value factor), price momentum (the Momentum factor), and liquidity (the Liquidity factor).

The Size factor is perhaps the best known of these. Market history and empirical studies show that small-cap stocks tend to be riskier and provide a higher long-term return than large-cap stocks. This return difference is considered a risk factor. To the extent that a benchmark's return is correlated with this risk factor, the benchmark has exposure to the Size factor. A similar argument applies to the Value factor, which is calculated as the return on value stocks less the return on growth stocks.

Practically speaking, some investors consider certain size ranges (e.g., small cap) to be more amenable to alpha generation using active management and others (e.g., large cap) amenable to lower-cost passive management. Size classifications range from mega cap to micro cap. Classifications are not limited to individual size categories. For example, many indexes seek to provide equity exposure to both small- and mid-cap companies ("smid-cap" indexes). Investors who desire exposure across the capitalization spectrum may use an "all-cap" index.

Such indexes do not necessarily contain all stocks in the market; they usually just combine representative stocks from each of the size ranges. Note that a large-cap stock in an emerging market may have the same capitalization as a small-cap stock in a developed country. Accordingly, index providers usually classify company capitalizations in the context of the local market environment.

Equity benchmark selection also involves the investor's preference for exposure on the growth vs. value style spectrum. Growth stocks exhibit such characteristics as high price momentum, high P/Es, and high EPS growth. Value stocks, however, may exhibit high dividend yields, low P/Es, and low price-to-book value ratios. Depending on their basic philosophy and market outlook, investors may have a strong preference for growth or value.

**Exhibit 1** shows the number of available total-return equity indexes<sup>1</sup> in various classifications available worldwide. Broad market exposure is provided by nearly two-thirds of all indexes, while the others track industry sectors. Developed market indexes are about twice as common as emerging-market indexes. The majority of broad market indexes cover the all-cap space or are otherwise focused on large-cap and mid-cap stocks.

### Exhibit 1. Characteristics of Equity Indexes

Equity indexes	9,165
Broad market indexes	5,658
Sector indexes	3,479
Not classified	28
Of the 5,658 broad market indexes:	
Developed markets	2,903
Emerging markets	1,701
Developed & emerging markets	1,050
Not classified	4
Of the 5,658 broad market indexes:	
All-cap stocks	1,892
Large-cap stocks	121
Large-cap and mid-cap stocks	2,100
Mid-cap stocks	657

Mid- and small-cap stocks	39
Small-cap stocks	846
Not classified	3

Source: Morningstar Direct, May 2017.

Once the investor has settled on the market, capitalization, and style of benchmark, the next step is to explore the method used in constructing and maintaining the benchmark index.

## 2. CHOOSING A BENCHMARK: INDEX CONSTRUCTION METHODOLOGIES

- a. discuss considerations in choosing a benchmark for a passively managed equity portfolio;

Equity index providers differ in their stock inclusion methods, ranging from **exhaustive** to **selective** in their investment universes. Exhaustive stock inclusion strategies are those that select every constituent of a universe, while selective approaches target only those securities with certain characteristics. The CRSP US Total Market Index has perhaps the most exhaustive set of constituents in the US market. This market-cap-weighted index includes approximately 4,000 publicly traded stocks from across the market-cap spectrum. In contrast, the S&P 500 Index embodies a selective approach and aims to provide exposure to US large-cap stocks. Its constituent securities are selected using a committee process and are based on both size and broad industry affiliation.

The weighting method used in constructing an index influences its performance. One of the most common weighting methods is market-cap weighting. The equity market cap of a constituent company is its stock price multiplied by the number of shares outstanding. Each constituent company's weight in the index is calculated as its market capitalization divided by the total market capitalization of all constituents of the index. In the development of the capital asset pricing model, the capitalization-weighted market portfolio is mean–variance efficient, meaning that it offers the highest return for a given level of risk. To the extent a capitalization-weighted equity index is a reasonable proxy for the market portfolio, the tracking portfolio may be close to mean–variance efficient.

A further advantage of the capitalization-weighted approach is that it reflects a strategy's investment capacity. A cap-weighted index can be thought of as a liquidity-weighted index because the largest-cap stocks tend to have the highest liquidity and the greatest capacity to handle investor flows at a manageable cost. Many investor portfolios tend to be biased toward large-cap stocks and use benchmarks that reflect that bias.

The most common form of market-cap weighting is free-float weighting, which adjusts each constituent's shares outstanding for closely held shares that are not generally available to the investing public. The process to determine the free-float-adjusted shares outstanding relies on publicly available information to determine the holders of the shares and whether those shares would be available for purchase in the marketplace. One reason to adjust a company's share count may include strategic holdings by governments, affiliated companies, founders, and employees. Another less common reason is to account for limitations on foreign ownership of a company; these limitations typically represent rules that are generally set up by a governmental entity through regulation.

Adjusting a company's shares outstanding for float can be a complex task and often requires an index provider to reach out to the company's shareholder services unit or to rely on analytical judgements. Although all data used in determining a company's free-float-adjusted shares outstanding are public information, the various index providers often report a different number of shares outstanding for the same security. This variation in reported shares outstanding can often be attributed to small differences in their methodologies.

In a *price-weighted* index, the weight of each stock is its price per share divided by the sum of all share prices in the index. A price-weighted index can be interpreted as a portfolio that consists of one share of each constituent company. Although some price-weighted indexes, such as the Dow Jones Industrial Average and the Nikkei 225, have high visibility as indicators of day-to-day market movements, price-weighted investment approaches are not commonly used by portfolio managers. A stock split for any constituent of the index complicates the index calculation. The weight in the index of the stock that split decreases, and the index divisor decreases as well. With its divisor changed, the index ceases to be a simple average of the constituent stocks' prices. For price-weighted indexes, the assumption that the same number of shares is held in each component stock is a shortcoming, because very few market participants invest in that way.

*Equally weighted* indexes produce the least-concentrated portfolios. Such indexes have constituent weights of  $1/n$ , where  $n$  represents the number of stocks in the index. Equal weighting of stocks within an index is considered a naive strategy because it does not show preference toward any single stock. The reduction of single stock concentration risk and slow changing sector exposures make equal weighting attractive to many investors.

As noted by [Zeng and Luo \(2013\)](#), broad market equally weighted indexes are factor-indifferent and the weighting randomizes factor mispricing. Equal weighting also produces higher volatility than cap weighting, one reason being that it imparts a small-cap bias to the



portfolio. Equal weights deviate from market weights most dramatically for large-cap indexes, which contain mega-cap stocks. Constrained market-cap ranges such as mid-cap indexes, even if market weighted, tend to have relatively uniform weights.

Equally weighted indexes require regular rebalancing because immediately after trading in the constituent stocks begins, the weights are no longer equal. Most investors use a regular reweighting schedule. Standard & Poor’s offers its S&P 500 Index in an equally weighted format and rebalances the index to equal weights once each quarter. Therein would appear to lie a misleading aspect of equally weighted indexes. For a 91-day quarter, the index is not equally weighted for  $90/91 = 99\%$  of the time.

Another drawback of equal weighting is its limited investment capacity. The smallest-cap constituents of an equally weighted index may have low liquidity, which means that investors cannot purchase a large number of shares without causing price changes. [Zeng and Luo \(2013\)](#) address this issue by assuming that 10% of shares in the cap-weighted S&P 100 and 500 and 5% of shares in the cap-weighted S&P 400 and 600 indexes are currently held in cap-weighted indexing strategies without any appreciable liquidity problems. They then focus on the smallest-cap constituent of each index as of December 2012, and they determine the value that 10% (5%) of its market capitalization represents. Finally, they multiply this amount by the number of stocks in the index to estimate the total investment capacity for tracking each of the S&P equally weighted equity indexes. Zeng’s and Luo’s estimates are shown in [Exhibit 2](#).

**Exhibit 2. Estimated Investment Capacity of Equally Weighted (EW) Equity Indexes**

Index	Capitalization Category	Estimated Capacity
S&P 100 EW	Mega cap	USD 176 billion
S&P 500 EW	Large cap	USD 82 billion
S&P 400 EW	Mid cap	USD 8 billion
S&P 600 EW	Small cap	USD 2 billion

Source: [Zeng and Luo \(2013\)](#).

[Qin and Singal \(2015\)](#) show that equally weighted portfolios have a natural advantage over cap-weighted portfolios. To the extent that any of the constituent stocks are mispriced, equally weighted portfolios will experience return superiority as the stock prices move up or down toward their correct intrinsic value. Because of the aforementioned need to rebalance

back to equal weights, Qin and Singal find that the advantage largely vanishes when taxes and transaction costs are considered. However, based on their results, tax-exempt institutional investors could experience superior returns from equal weighting.

Other non-cap-weighted indexes are weighted based on such attributes as a company or stock's fundamental characteristics (e.g., sales, income, or dividends). Discussed in more detail later, fundamental weighting delinks a constituent stock's portfolio weight from its market value. The philosophy behind fundamental weighting is that although stock prices may become over- or undervalued, the market price will eventually converge to a level implied by the fundamental attributes.

Market-cap-weighted indexes and fundamentally weighted indexes share attractive characteristics, including low cost, rules-based construction, transparency, and investability. Their philosophies, however, are different. Market-cap-weighted portfolios are based on the efficient market hypothesis, while fundamentally weighted indexes look to exploit possible inefficiencies in market pricing.

An important concern in benchmark selection relates to how concentrated the index is. In this case, the concept of the effective number of stocks, which is an indication of portfolio concentration, can provide important information. An index that has a high degree of stock concentration or a low effective number of stocks may be relatively undiversified.

Woerheide and Persson (1993) show that the Herfindahl–Hirschman Index (HHI) is a valid measure of stock-concentration risk in a portfolio, and Hannam and Jamet (2017) demonstrate its use by practitioners. The HHI is calculated as the sum of the constituent weightings squared, as shown in Equation 1:

#### Equation (1)

$$HHI = \sum_{i=1}^n w_i^2$$

where  $w_i$  is the weight of stock  $i$  in the portfolio.

The HHI can range in value from  $1/n$ , where  $n$  is equal to the number of securities held, to 1.0. An HHI of  $1/n$  would signify an equally weighted portfolio, and a value of 1.0 would signify portfolio concentration in a single security.

Using the HHI, one can estimate the effective (or equivalent) number of stocks, held in equal weights, that would mimic the concentration level of the chosen index. The effective number of stocks for a portfolio is calculated as the reciprocal of the HHI, as shown in Equation 2.

#### Equation (2)



$$\text{Effective number of stocks} = \frac{1}{\sum_{i=1}^n w_i^2} = 1/\text{HHI}$$

Malevergne, Santa-Clara, and Sornette (2009) demonstrate that cap-weighted indexes have a surprisingly low effective number of stocks. Consider the NASDAQ 100, a US-based market-cap-weighted index consisting of 100 stocks. If the index were weighted uniformly, each stock's weight would be 0.01 (1%). In May 2017, the constituent weights ranged from 0.123 for Apple, Inc., to 0.0016 for Liberty Global plc, a ratio of 77:1. Weights for the top five stocks totaled almost 0.38 (38%), a significant allocation to those securities. Across all stocks in the index, the median weight was 0.0039 (that is, 0.39%). The effective number of stocks can be estimated by squaring the weights for the stocks, summing the results, and calculating the reciprocal of that figure. The squared weights for the NASDAQ 100 stocks summed to 0.0404, the reciprocal of which is  $1/0.0404 = 24.75$ , the effective number of stocks. Thus, the 100 stocks in the index had a concentration level that can be thought of as being equivalent to approximately 25 stocks held in equal weights.

## EXAMPLE 1

### Effective Number of Stocks

A market-cap-weighted index contains 50 stocks. The five largest-cap stocks have weights of 0.089, 0.080, 0.065, 0.059, and 0.053. The bottom 45 stocks represent the remaining weight of 0.654, and the sum of the squares of those weights is 0.01405. What are the portfolio's Herfindahl–Hirschman Index and effective number of stocks held?

#### Solution:

The stocks, their weights, and their squared weights are shown in [Exhibit 3](#).

**Exhibit 3. Calculations for Effective Number of Stocks**

Stock	Weight	Squared Weight
1	0.089	0.00792
2	0.080	0.00640
3	0.065	0.00423
4	0.059	0.00348

5	0.053	0.00281
Stocks 6–50	0.654	Sum of squared weights for stocks 6–50: 0.01405
Total for stocks 1–50	1.000	0.03889

The HHI is shown in the final row: 0.03889. The reciprocal of the HHI is  $1/0.03889 = 25.71$ . Thus, the effective number of stocks is approximately 26. The fact that the portfolio weights are far from being a uniform 2% across the 50 stocks makes the effective number of stocks held in equal weights less than 26.

The stock market crises of 2000 and 2008 brought heightened attention to investment strategies that are defensive or volatility reducing. For example, some income-oriented investors are drawn to strategies that weight benchmark constituents based on the dividend yield of each stock. Volatility weighting calculates the volatility of each constituent stock and weights the index based on the inverse of each stock's relative volatility. A related method produces a minimum-variance index using mean–variance optimization.

**Exhibit 4** shows the various methods for weighting the constituent securities of broad-based, non-industry-sector, total-return equity indexes.

#### **Exhibit 4. Equity Index Constituent Weighting Methods**

<b>Weighting Method</b>	<b>Number of Indexes</b>
Market-cap, free-float adjusted	5,182
Market-cap-weighted	169
Multi-factor-weighted	143
Equal-weighted	63
Dividend-weighted	36

Source: Morningstar Direct, May 2017.

Another consideration in how an index is constructed involves its periodic rebalancing and reconstitution schedule. Reconstitution of an index frequently involves the addition and deletion of index constituents, while rebalancing refers to the periodic reweighting of those constituents. Index reconstitution and rebalancing create turnover. The turnover for developed-market, large-cap indexes that are infrequently reconstituted tends to be low, while benchmarks constructed using stock selection rather than exhaustive inclusion have higher turnover. As seen in [Exhibit 5](#), both rebalancing and reconstitution occur with varied frequency, although the former is slightly more frequent.

#### **Exhibit 5. Index Rebalancing/Reconstitution Frequency for Broad Equity Market Total-Return Indexes**

<b>Frequency</b>	<b>Rebalancing</b>	<b>Reconstitution</b>
Daily	3	2
Monthly	4	3
Quarterly	2,481	1,379
Semi-annually	2,743	3,855
Annually	260	308
As needed	74	13

*Note:* The totals for the Rebalancing and Reconstitution columns differ slightly, as does the index total in Exhibit 4.

*Source:* Morningstar Direct, May 2017.

The method of reconstitution may produce additional effects. When reconstitution occurs, index-tracking portfolios, mutual funds, and ETFs will want to hold the newly included names and sell the deleted names. The demand created by investors seeking to track an index can push up the stock prices of added companies while depressing the prices of the deleted ones. Research shows that this produces a significant price effect in each case. Depending on the reconstitution method used by index publishers, arbitrageurs may be able to anticipate the changes and front-run the trades that will be made by passive investors. In some cases, the index rules are written so that the decision to add or remove an index constituent is voted on by a committee maintained by the index provider. Where a committee makes the final decision, the changes become difficult to guess ahead of time. In other cases, investors know the precise method used for reconstitution so guessing is often successful.

[Chen, Noronha, and Singal \(2004\)](#) find that constituent changes for indexes that

reconstitute using subjective criteria are often more difficult for arbitrageurs to predict than indexes that use objective criteria. Even indexes that use objective criteria for reconstitution often announce the changes several weeks before they are implemented. Stocks near the breakpoint between small-cap and large-cap indexes are especially vulnerable to reconstitution-induced price changes. The smallest-cap stocks in the Russell 1000 Large-Cap Index have a low weight in that cap-weighted index. After any of those stocks are demoted to the Russell 2000 Small-Cap Index, they are likely to have some of the highest weights.

[Petajisto \(2010\)](#) shows that the process of moving in that direction tends to be associated with increases in stock prices, while movements into the large-cap index tend to have negative effects. He also concludes that transparency in reconstitution is a virtue rather than a drawback.

A final consideration is investability. As stated in a prior section, an effective benchmark must be investable in that its constituent stocks are available for timely purchase in a liquid trading environment. Indexes that represent the performance of a market segment that is not available for direct ownership by investors must be replicated through derivatives strategies, which for reasons explained later may be sub-optimal for many investors.

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## 3. CHOOSING A BENCHMARK: FACTOR-BASED STRATEGIES

- b. compare passive factor-based strategies to market-capitalization-weighted indexing;

Traditional indexing generally involves tracking the returns to a market-cap-weighted benchmark index. Yet most benchmark returns are driven by factors, which are risk exposures that can be identified and isolated. An investor who wants access only to specific aspects of an index's return stream can invest in a subset of constituent securities that best reflect the investor's preferred risk factors, such as Size, Value, Quality, and Momentum. The goal of being exposed to one or more specific risk factors will also drive the choice of a benchmark index.

Factor-based strategies are an increasingly popular variation on traditional indexing, and they have important implications for benchmark selection. Some elaboration on the topic is warranted. The origin of passive factor-based strategies dates to at least the observation by [Banz \(1981\)](#) that small-cap stocks tend to outperform large-cap stocks. Work by [Fama and French \(2015\)](#) shows that at least five risk factors explain US equity market returns. Their asset pricing model incorporates the market risk premium from the CAPM plus factors for a company's size, book-to-market (value or growth style classification), operating profitability,

and investment intensity. Consistent with prior research, they find a positive risk premium for small companies and value stocks over large companies and growth stocks. They measure operating profitability as the previous year's gross profit minus selling, general, and administrative expenses as well as interest expense—all divided by the beginning book value of equity. Investment intensity is measured as the growth rate in total assets in the previous year.

Although the concepts underlying passive factor investing, sometimes marketed as “smart beta,” have been known for a long time, investors’ use of the technique increased dramatically over time. There presently exist many passive investment vehicles and indexes that allow access to such factors as Value, Size, Momentum, Volatility, and Quality, which are described in [Exhibit 6](#). Many investors use their beliefs about market conditions to apply factor tilts to their portfolios. This is the process of intentionally overweighting and underweighting certain risk factors. Passive factor-based strategies can be used in place of or to complement a market-cap-weighted indexed portfolio.

#### **Exhibit 6. Common Equity Risk Factors**

<b>Factor</b>	<b>Description</b>
Growth	Growth stocks are generally associated with high-performing companies with an above-average net income growth rate and high P/Es.
Value	Value stocks are generally associated with mature companies that have stable net incomes or are experiencing a cyclical downturn. Value stocks frequently have low price-to-book and price-to-earnings ratios as well as high dividend yields.
Size	A tilt toward smaller size involves buying stocks with low float-adjusted market capitalization.
Yield	Yield is identified as dividend yield relative to other stocks. High dividend-yielding stocks may provide excess returns in low interest rate environments.
Momentum	Momentum attempts to capture further returns from stocks that have experienced an above-average increase in price during the prior period.
Quality	Quality stocks might include those with consistent earnings and dividend growth, high cash flow to earnings, and low debt-to-equity ratios.
Volatility	Low volatility is generally desired by investors seeking to lower their downside risk. Volatility is often measured as the standard

deviation of stock returns.

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Passive factor-based equity strategies use passive rules, but they frequently involve active decision making: Decisions on the timing and degree of factor exposure are being made. As [Jacobs and Levy \(2014\)](#) note, the difference between passive factor investing and conventional active management is that with the former, active management takes place up front rather than continuously. Relative to broad-market-cap-weighting, passive factor-based strategies tend to concentrate risk exposures, leaving investors exposed during periods when a chosen risk factor is out of favor. The observation that even strong risk factors experience periods of underperformance has led many investors toward multi-factor approaches. Passive factor-based strategies tend to be transparent in terms of factor selection, weighting, and rebalancing. Possible risks include ease of replication by other investors, which can produce overcrowding and reduce the realized advantages of a strategy.

## Fundamental Factor Indexing

Capitalization weighting of indexes and index-tracking portfolios involve treating each constituent stock as if investors were buying all the available shares. [Arnott, Hsu, and Moore \(2005\)](#) developed an alternative weighting method based on the notion that if stock market prices deviate from their intrinsic value, larger-cap stocks will exhibit this tendency more than smaller-cap stocks. Thus, traditional cap weighting is likely to overweight overpriced stocks and underweight underpriced stocks. The combination is intended to make cap-weighting inferior to a method that does not use market prices as a basis for weighting.

The idea advanced by Arnott, Hsu, and Moore is to use a cluster of company fundamentals—book value, cash flow, revenue, sales, dividends, and employee count—as a basis for weighting each company. A separate weighting is developed for each fundamental measure. In the case of a large company, its sales might be 1.3% of the total sales for all companies in the index, so its weight for this criterion would be 0.013. For each company, the weightings are averaged across all of the fundamental measures, and those average values represent the weight of each stock in a “composite fundamentals” index.

The authors show that over a 43-year period, a fundamental index would have outperformed a related cap-weighted index by an average of almost 200 basis points per year. They hasten to add that the result should not necessarily be considered alpha, because the fundamental portfolio provides heightened exposure to the Value and Size

factors.

Since the time of the seminal article's publication, fundamental-weighted indexing strategies for country markets as well as market segments have gained in popularity and attracted a large amount of investor funds.

No matter the style of a passive factor-based strategy, its ultimate goal is to improve upon the risk or return performance of the market-cap-weighted strategy. Passive factor-based approaches gain exposure to many of the same risk factors that active managers seek to exploit. The strategies can be return oriented, risk oriented, or diversification oriented.

Return-oriented factor-based strategies include dividend yield strategies, momentum strategies, and fundamentally weighted strategies. Dividend yield strategies can include dividend growth as well as absolute dividend yield. The low interest rate environment, which followed the 2008–2009 global financial crisis, led to an increase in dividend yield strategies as investors sought reliable income streams. An example index is the S&P 1500 High Yield Dividend Aristocrats Index. This index selects securities within the S&P 1500 that increased dividends in each of the past 20 years and then weights those securities by their dividend yield, with the highest dividend-yielding stocks receiving the highest weight.

Another return-oriented strategy is momentum, which is generally defined by the amount of a stock's excess price return relative to the market over a specified time period. Momentum can be determined in various ways. One example is MSCI's Momentum Index family, in which a stock's most recent 12-month and 6-month price performance are determined and then used to weight the securities in the index.<sup>2</sup>

Risk-oriented strategies take several forms, seeking to reduce downside volatility and overall portfolio risk. For example, risk-oriented factor strategies include volatility weighting, where all of an index's constituents are held and then weighted by the inverse of their relative price volatility. Price volatility is defined differently by each index provider, but two common methods include using standard deviation of price returns for the past 252 trading days (approximately one calendar year) or the weekly standard deviation of price returns for the past 156 weeks (approximately three calendar years).

Volatility weighting can take other forms as well. Minimum variance investing is another risk reducing strategy, and it requires access to a mean–variance optimizer. Minimum variance weights are those that minimize the volatility of the portfolio's returns based on historical price returns, subject to certain constraints on the index's construction. Constraints can include limitations on sector over/under weights, country selection limits, and limits on single stock concentration levels. Mean–variance optimizer programs can be accessed from such vendors as Axioma, BARRA, and Northfield.



Risk weighting has the advantages of being simple to understand and providing a way to reduce absolute volatility and downside returns. However, the development of these strategies is based on past return data, which may not reflect future returns. Thus, investors will not always achieve their objectives despite the strategy's stated goal.

Diversification-oriented strategies include equally weighted indexes and maximum-diversification strategies. Equal weighting is intuitive and is discussed elsewhere in the reading as having a low amount of single-stock risk. The low single-stock risk comes by way of the weighting structure of  $1/n$ , where  $n$  is equal to the number of securities held.

**Choueifaty and Coignard (2008)** define maximum diversification by calculating a “diversification ratio” as the ratio of the weighted average volatilities divided by the portfolio volatility. Diversification strategies then can attempt to maximize future diversification by determining portfolio weights using past price return volatilities.

Portfolio managers who pursue factor-based strategies often use multiple benchmark indexes, including a factor-based index and a broad market-cap-weighted index. This mismatch in benchmarks can also produce an unintended mismatch in returns, known as tracking error, from the perspective of the end investor who has modeled a portfolio against a broad market-cap-weighted index. Tracking error indicates how closely the portfolio behaves like its benchmark and is measured as the standard deviation of the differences between a portfolio's returns and its benchmark returns. The concept of tracking error is discussed in detail later.

Finally, passive factor-based strategies can involve higher management fees and trading commissions than broad-market indexing. Factor-based index providers and managers demand a premium price for the creation and management of these strategies, and those fees decrease performance. Also, commission costs can be higher in factor-based strategies than they are in market-cap-weighted strategies. All else equal, higher costs will lead to lower net performance.

Passive factor-based approaches may offer an advantage for those investors who believe it is prudent to seek out groups of stocks that are poised to have desirable return patterns. Active managers also believe in seeking those stocks, but active management brings the burden of higher fees that can eat into any outperformance. Active managers may also own stocks that are outside the benchmark and are, thus, incompatible with the investment strategy. In contrast, passive factor-based strategies can provide nearly pure exposure to specific market segments, and there are numerous benchmarks against which to measure performance. Fees are restricted because factor-based strategies are rules based and thus do not require constant monitoring. An investor's process of changing exposures to specific risk factors as market conditions change is known as factor rotation. With factor rotation, investors can use passive vehicles to make active bets on future market conditions.



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## 4. APPROACHES TO PASSIVE EQUITY INVESTING: POOLED INVESTMENTS

- c. compare different approaches to passive equity investing;

Passive equity investment strategies may be implemented using several approaches, from the do-it-yourself method of buying stocks to hiring a subadviser to create and maintain the investment strategy. Passively managed investment strategies can be replicated by any internal or external portfolio manager who has the index data, trading tools, and necessary skills. In contrast, actively managed funds each, in theory, have a unique investment strategy developed by the active portfolio manager.

This section discusses different approaches to gain access to an investment strategy's desired performance stream: pooled investments (e.g., mutual funds and exchange-traded funds), derivatives-based portfolios (using options, futures, and swaps contracts), and direct investment in the stocks underlying the strategy.

Some passive investments are managed to establish a target beta, and managers are judged on how closely they meet that target. Portfolio managers commonly use futures and open-end mutual funds to transform a position (in cash, for example) and obtain the desired equity exposure. This process is known as “equitizing.” The choice of which method to use is largely determined by the financing costs of rolling the futures contracts over time.<sup>3</sup> With multinational indexes, it can be expedient to buy a set of complementary exchange-traded funds to replicate market returns for the various countries.

### 4.1. Pooled Investments

Pooled investments are the most convenient approach for the average investor because they are easy to purchase, hold, and sell. This section covers conventional open-end mutual funds and exchange-traded funds (ETFs).

The Qualidex Fund, started in 1970, was the first open-end index mutual fund available to retail investors. It was designed to track the Dow Jones Industrial Average. The Vanguard S&P 500 Index Fund, started in 1975, was the first retail fund to attract investors on a large scale. The primary advantage provided by a mutual fund purchase is its ease of investing and record keeping.

Investors who want to invest in a passively managed mutual fund must take the same steps as

those investing in actively managed ones. First, a needs analysis must be undertaken to decide on the investor's return and risk objectives as well as investment constraints, and then to find a corresponding strategy. For example, risk-averse equity investors may seek a low volatility strategy, while investors looking to match the broad market may prefer an all-cap market-cap-weighted strategy. Once the need has been identified, it is likely that a mutual fund-based strategy can be built to match that need.

Traditional mutual fund shares can be purchased directly from the adviser who manages the fund, through a fund marketplace, or through an individual financial adviser. The process is the same for any mutual fund whether passively or actively managed. Investment companies generally have websites and call centers to help their prospective investors transact shares.

A fund marketplace is a brokerage company that offers funds from different providers. The advantage of buying a mutual fund from a fund marketplace is the ease of purchasing a mutual fund from different providers while maintaining a single account for streamlined record keeping.

A financial adviser can also help in purchasing a fund by offering the guidance needed to identify the strategy, providing the single account to house the fund shares, and gaining access to lower-cost share classes that may not be available to all investors.

No matter how mutual fund shares are purchased, the primary benefits of investing passively using mutual funds are low costs and the convenience of the fund structure. The manager of the passively managed fund handles all of the needed rebalancing, reconstitution, and other changes that are required to keep the investment portfolio in line with the index. Passively managed strategies require constant maintenance and care to reinvest cash from dividends and to execute the buys and sells required to match the additions and deletions of securities to the index. The portfolio manager of a passively managed mutual fund also has most of the same responsibilities as a direct investor. These include trading securities, managing cash, deciding how to proceed with corporate actions, voting proxies, and reporting performance. Moreover, index-replicating mutual funds bear costs in such areas as registration, custodial, and audit, which are similar to those for actively managed mutual funds.

Record keeping functions for a mutual fund include maintaining a record of who owns the shares and when and at what price those shares were purchased. Record keepers work closely with both the custodian of the fund shares to ensure that the security is safely held in the name of the investor and the mutual fund sponsor who communicates those trades.

In the United States, mutual funds are governed by provisions of the Investment Company Act of 1940. In Europe, Undertakings for Collective Investment in Transferable Securities (UCITS) is an agreement among countries in the European Union that governs the management and sale of collective investment funds (mutual funds) across European borders.

ETFs are another form of pooled investment vehicle. The first ETF was launched in the

Canadian market in 1990 to track the return of 35 large stocks listed on the Toronto Stock Exchange. ETFs were introduced in the US market in 1993. They are registered funds that can be bought and sold throughout the trading day and change hands like stocks. Advantages of the ETF structure include ease of trading, low management fees, and tax efficiency. Unlike with traditional open-end mutual funds, ETF shares can be bought by investors using margin borrowing; moreover, investors can take short positions in an ETF. ETFs offer flexibility in that they track a wide array of indexes.

ETFs have a unique structure that requires a fund manager as well as an authorized participant who can deliver the assets to the manager. The role of the authorized participant is to be the market maker for the ETF and the intermediary between investors and the ETF fund manager when shares are created or redeemed. To create shares of the ETF, the authorized participant delivers a basket of the underlying stocks to the fund manager and, in exchange, receives shares of the ETF that can be sold to the public. When an authorized participant needs to redeem shares, the process is reversed so that the authorized participant delivers shares of the ETF in exchange for a basket of the underlying stocks that can then be sold in the market.

The creation/redemption process is used when the authorized participant is either called upon to deliver new shares of the ETF to meet investor needs or when large redemptions are requested. The redemption process occurs when an authorized participant needs to reduce its exposure to the ETF holding and accepts shares of the underlying securities in exchange for shares of the ETF.

All else equal, taxable investors in an ETF will have a smaller taxable event than those in a similarly managed mutual fund. Managers of mutual funds must sell their portfolio holdings to fulfill shareholder redemptions, creating a taxable event where gains and losses are realized. ETFs have the advantage of accommodating those redemptions through an in-kind delivery of stock, which is the redemption process. Capital gains are not recorded when a redemption is fulfilled through an in-kind delivery of securities, so the taxable gain/loss passed to the investor becomes smaller.

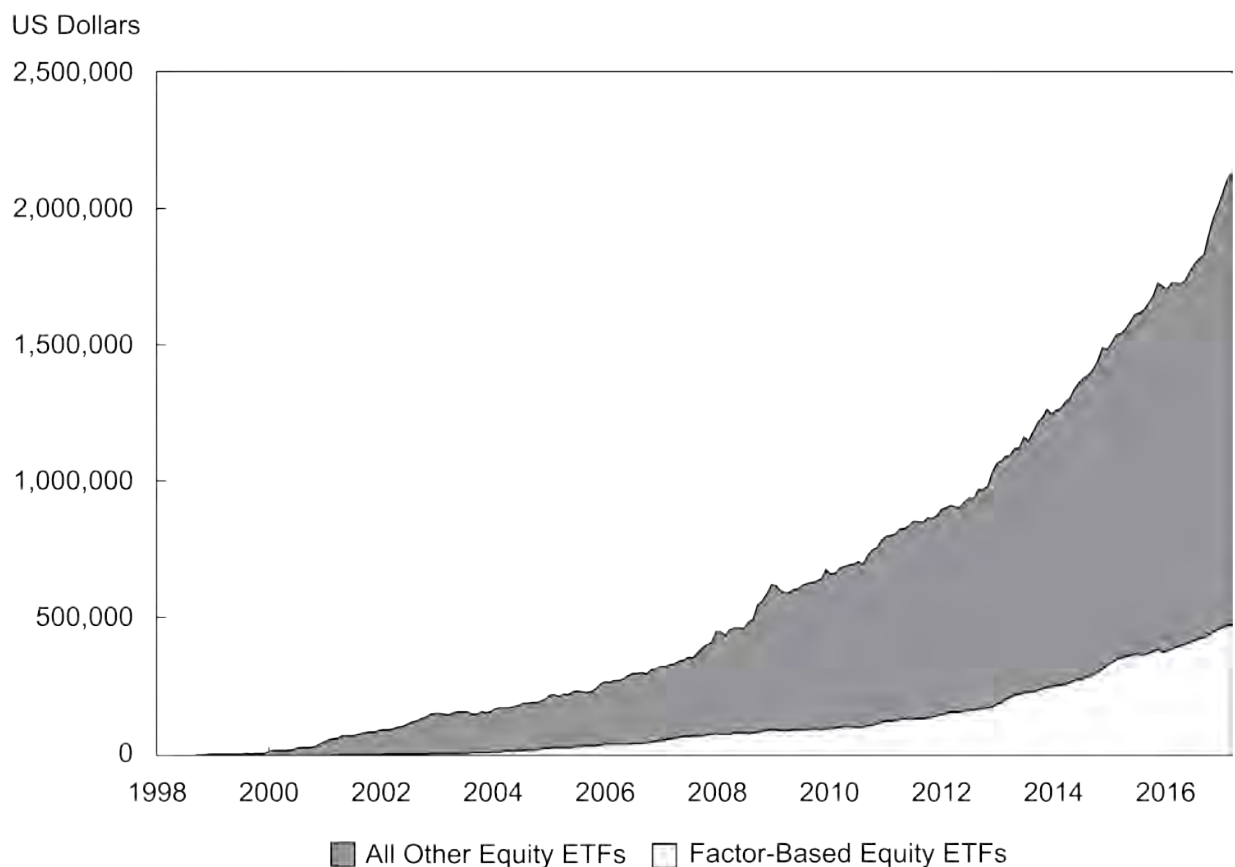
Disadvantages of the ETF structure include the need to buy at the offer and sell at the bid price, commission costs, and the risk of an illiquid market when the investor needs to buy or sell the actual ETF shares.

ETFs that track indexes are used to an increasing degree by financial advisers to provide targeted exposure to different sectors of the investable market. Large investors find it more cost effective to build their own portfolios through replication, stratified sampling, and optimization, concepts to be introduced later. Other investors find ETFs to be a relatively low-cost method of tracking major indexes. Importantly, like traditional open-end mutual funds, ETFs are an integrated approach in that portfolio management and accounting are conducted by the fund adviser itself. A limitation is that there are far more benchmark indexes than ETFs, so not all indexes have an exchange-traded security that tracks them,

although new ETFs are constantly being created. [Exhibit 7](#) depicts the strong global trend in investor net flows into index-tracking equity ETFs since 1998. The exhibit does not reflect changes in value caused by market fluctuations, but rather purely investments and redemptions.

[Exhibit 7](#) also shows that, over time, factor-based ETFs have become a large segment of the market. Factor-based ETFs provide exposure to such single factors as Size, Value, Momentum, Quality, Volatility, and Yield. Among the most important innovations are ETFs that track multiple factors simultaneously. For example, the iShares Edge MSCI Multifactor USA ETF emphasizes exposure to Size, Value, Momentum, and Quality factors. Meanwhile, the ETF attempts to maintain characteristics that are similar to the underlying MSCI USA Diversified Multiple-Factor Index, including industry sector exposure. As of 2017, the fund's expense ratio is 0.20% and it holds all 139 of the stocks in the index.

**Exhibit 7. Cumulative Monthly Flows (USD millions) into Index-Tracking Equity ETF Shares Listed in 33 Markets, January 1997–April 2017**



Source: Morningstar Direct, May 2017.

[Exhibit 8](#) shows that, among 33 major exchange locations, the market value of equity ETFs

that track indexes approaches USD 3 trillion. US exchanges have about one-third of the individual ETFs and more than 75% of the total market value as of May 2017. Japan, the United Kingdom, and Switzerland have more than half of the remaining market value. These numbers reflect purely passive ETFs, including factor-based securities.

**Exhibit 8. Number of Index-Tracking Equity ETFs and Their Market Values  
(in USD millions) May 2017**

<b>Exchange Location</b>	<b>ETFs</b>	<b>Market Value</b>
United States	1,104	2,236,166
Japan	99	200,965
United Kingdom	365	139,900
Switzerland	272	104,025
Germany	205	81,047
France	260	66,680
Canada	252	47,625
Netherlands	24	22,350
South Korea	177	12,162
Hong Kong SAR	63	9,605
Italy	22	3,724
Singapore	41	3,451
Australia	55	2,873
Mexico	12	2,319
Sweden	4	1,922
Spain	6	1,654
Brazil	13	1,411
South Africa	27	1,347
New Zealand	11	566
Finland	1	234
Next 13 Locations	52	794
<b>Total for 33 Locations</b>	<b>3,166</b>	<b>2,940,818</b>

Source: Morningstar Direct, May 2017.

The decision of whether to use a conventional open-end mutual fund versus an ETF often comes down to cost and flexibility. Investors who seek to mimic an index must identify a suitable tracking security. According to Morningstar, in the United States, ETFs track 1,354 distinct equity indexes while conventional open-end mutual funds track only 184. Of the ETFs, 38 benchmarks are for price-only returns and the remainder are for total returns, which also include the return from reinvested dividends. Long-term investors benefit from the slightly lower expense ratios of ETFs than otherwise equivalent conventional open-end mutual funds. However, the brokerage fees associated with frequent investor trades into ETF shares can negate the expense ratio advantage and thus make ETFs less economical.

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## **5. APPROACHES TO PASSIVE EQUITY INVESTING: DERIVATIVES-BASED APPROACHES & INDEX-BASED PORTFOLIOS**

- c. compare different approaches to passive equity investing;

Beyond purchasing a third-party-sponsored pooled investment and building it themselves, investors can access index performance through such derivatives as options, swaps, or futures contracts. Derivative strategies are advantageous in that they can be low cost, easy to implement, and provide leverage. However, they also present a new set of risks, including counterparty default risk for derivatives that are not traded on exchanges or cleared through a clearing house. Derivatives can also be relatively difficult to access for individual investors.

Options, swaps, and futures contracts can be found on many of the major indexes, such as the MSCI EAFE Index (EAFE stands for Europe, Australasia, and the Far East) and the S&P 500 Index. Options and futures are traded on exchanges and so are processed through a clearing house. This is important because a clearing house eliminates virtually all of the default risk present in having a contract with a single counterparty. Equity swaps, on the other hand, are generally executed with a single counterparty and so add the risk of default by that counterparty.

Derivatives allow for leverage through their notional value amounts. Notional value of the contracts can be many times greater than the initial cash outlay. However, derivatives expire, whereas stocks can be held indefinitely. The risk of an expiring options contract is a complete loss of the relatively small premium paid to acquire the exposure. Futures and swaps can be extended by “rolling” the contract forward, which means selling the expiring contract and buying a longer dated one.

Futures positions must be initiated with a futures commission merchant (FCM), a clearing house member assigned to trade on behalf of the investor. The FCM posts the initial margin required to open the position and then settles on a daily basis to comply with the maintenance margin required by the clearing house. The FCM also helps close the position upon expiration. However, futures accounts are not free of effort on the client's part. Having a futures account requires the management of daily cash flows, sometimes committing additional money and sometimes drawing it down.

It is uncommon for passive portfolio managers to use derivatives in the long term to synthetically mimic the return from physical securities. Derivatives are typically used to adjust a pre-existing portfolio to move closer to meeting its objectives. These derivative positions are often referred to as an **overlay**. A **completion overlay** addresses an indexed portfolio that has diverged from its proper exposure. A common example is a portfolio that has built up a surplus of cash from investor flows or dividends, causing the portfolio's beta to be significantly less than that of the benchmark. Using derivatives can efficiently restore the overall portfolio beta to its target. A **rebalancing overlay** addresses a portfolio's need to sell certain constituent securities and buy others. Particularly in the context of a mixed stock and bond portfolio, using equity index derivatives to rebalance toward investment policy target weights can be efficient and cost-effective. A **currency overlay** assists a portfolio manager in hedging the returns of securities that are held in a foreign currency back to the home country's currency.

Equity index derivatives offer several advantages over cash-based portfolio construction approaches. A passive portfolio manager can increase or decrease exposure to the entire index portfolio in a single transaction. Managers who want to make tactical adjustments to portfolio exposure often find derivatives to be a more efficient tool than cash-market transactions for achieving their goals. Many derivatives contracts are highly liquid, sometimes more so than the underlying cash assets. Especially in this case, portfolio exposures can be tactically adjusted quickly and at low cost.

For the longer term, strategic changes to portfolios are usually best made using cash instruments, which have indefinite expirations and do not necessitate rolling over expiring positions. Futures markets, for example, can impose position limits on such instruments that constrain the scale of use. Derivatives usage is also sometimes restricted by regulatory bodies or investment policy statement stipulations, so in this case cash could be a preferred approach. Finally, depending on the index that is being tracked by the passive portfolio manager, a suitable exchange-traded futures contract may not be available.

In addition to options, which have nonlinear payoffs<sup>4</sup>, the two primary types of equity index derivatives contracts are futures and swaps. Equity index futures provide exposure to a specific index. Unlike many commodity futures contracts, index futures are cash-settled, which means the counterparties exchange cash rather than the underlying shares.

The buyer of an equity index futures contract obtains the right to buy the underlying (in this case, an index) on the expiration date of the contract at the futures price prevailing at the time the derivative was purchased. For exchange-traded futures, the buyer is required to post margin (collateral) in the account to decrease the credit risk to the exchange, which is the effective counterparty. For S&P 500 Index futures contracts as traded on the Chicago Mercantile Exchange, every USD change in the futures price produces a USD 250 change in the contract value (thus a “multiplier” of 250). On 4 August 2016, the September S&P 500 futures contract settled at a price of 2,159.30, after settling at 2,157 the day before. The change in contract value was thus  $250 \times \text{USD } (2,159.30 - 2,157) = \text{USD } 575$ .

Equity index futures contracts for various global markets are shown in [Exhibit 9](#).

### Exhibit 9. Representative Equity-Index Futures Contracts

Index Futures Contract	Market	Contract Currency and Multiplier
<b>Americas</b>		
Dow Jones mini	United States	USD 5
S&P 500	United States	USD 250
S&P 500 mini	United States	USD 50
NASDAQ 100 mini	United States	USD 20
Mexican IPC	Mexico	MXN 10
S&P/TSX Composite mini	Canada	CAD 5
S&P/TSX 60	Canada	CAD 200
Ibovespa	Brazil	BRL 1
<b>Europe, Middle East, and Africa</b>		
Euro STOXX 50	Europe	EUR 10
FTSE 100	United Kingdom	GBP 10
DAX 30	Germany	EUR 25
CAC 40	France	EUR 10
FTSE/Athens 20	Greece	EUR 5
OMX Stockholm 30	Sweden	SEK 100
Swiss Market	Switzerland	CHF 10
OMX Copenhagen 20	Denmark	DKK 100
PSI-20	Portugal	EUR 1
IBEX 35	Spain	EUR 10



WIG20	Poland	PLN 10
BIST 30	Turkey	TRY 100
FTSE/JSE Top 40	South Africa	ZAR 10
<b>Asia Pacific</b>		
S&P/ASX 200	Australia	AUD 25
CSI 300	Chinese mainland	CNY 300
Hang Seng	Hong Kong SAR	HKD 50
H-Shares	Hong Kong SAR	HKD 50
Nifty 50	India	INR 50
Nikkei 225	Japan	JPY 1,000
Topix	Japan	JPY 10,000
KOSPI 200	Korea	KRW 500,000

Source: Please see [www.investing.com/indices/indices-futures](http://www.investing.com/indices/indices-futures), May 2017.

Given that futures can be traded using only a small amount of margin, it is clear that futures provide a significant degree of potential leverage to a portfolio. Leverage can be considered either a positive or negative characteristic, depending on the manner with which the derivative instrument is used. Unlike some institutional investors' short-sale constraints on stock positions, many investors do not face constraints on opening a futures position with a sale of the contracts. Among other benefits of futures is the high degree of liquidity in the market, as evidenced by low bid–ask spreads. Both commission and execution costs also tend to be low relative to the exposure achieved. The low cost of transacting makes it easy for portfolio managers to use futures contracts to modify the equity risk exposure of their portfolios.

Equity index futures do come with some disadvantages. Futures are used by index fund managers because the instruments are expected to move in line with the underlying index. To the extent that the futures and spot prices do not move in concert, the portfolio may not track the benchmark perfectly. The extent to which futures prices do not move with spot prices is known as basis risk. Basis risk results from using a hedging instrument that is imperfectly matched to the investment being hedged. Basis risk can arise when the underlying securities pay dividends, while the futures contract tracks only the price of the underlying index. The difference can be partially mitigated when futures holders combine that position with interest-bearing securities.

As noted, futures account holders also must post margin. The margin amount varies by

trading exchange. In the case of an ASX-200 futures contract, the initial margin required by the Sydney Futures Exchange in January 2017 for an overnight position is AUD 6,700. The minimum maintenance margin for one contract is AUD 5,300.

By way of example, assume an investor buys an ASX-200 futures contract priced at AUD 5,700, and the futures contract has a multiplier of 25. The investor controls AUD 142,500 [=  $25 \times \text{AUD } 5,700$ ] in value. This currency amount is known as the contract unit value. With the initial margin of AUD 6,700 and a maintenance margin of AUD 5,300, a margin call will be triggered if the contract unit value decreases by more than AUD 1,400. A decrease of AUD 1,400 in the margin is associated with a contract unit value of AUD 142,500 – AUD 1,400 = AUD 141,100. This corresponds to an ASX-200 futures price of AUD 5,644 [=  $\text{AUD } 141,100 / 25$ ]. Thus, a futures price decrease of 0.98% [=  $(\text{AUD } 5,644 - \text{AUD } 5,700) / \text{AUD } 5,700$ ] is associated with a decrease in the margin account balance of 20%. This example demonstrates how even a small change in the index value can result in a margin call once the mark-to-market process occurs.

Another derivatives-based approach is the use of equity index swaps. Equity index swaps are negotiated arrangements in which two counterparties agree to exchange cash flows in the future. For example, consider an investor who has a EUR 20 million notional amount and wants to be paid the return on her benchmark index, the Euro STOXX 50, during the coming year. In exchange, the investor agrees to pay a floating rate of return of Libor + 0.20% per year, with settlement occurring semi-annually. Assuming a six-month stock index return of 2.3% and annualized Libor of 0.18% per year, the first payment on the swap agreement would be calculated as follows. The investor would receive EUR 20 million  $\times$  0.023 = EUR 460,000. The investor would be liable to the counterparty for EUR 20 million  $\times$  (0.0018 + 0.0020)  $\times$  (180/360) = EUR 38,000; so, when the first settlement occurs the investor would receive EUR 460,000 – EUR 38,000 = EUR 422,000. In this case, the payment received by the passive portfolio manager is from the first leg of the swap, and the payment made by that manager is from the second leg. Libor is used in this example, but the second leg can also involve the return on a different index, stock, or other asset, or even a fixed currency amount per period.

Disadvantages of swaps include counterparty, liquidity, interest rate, and tax policy risks. Relatively frequent settlement decreases counterparty risk and reduces the potential loss from a counterparty's failure to perform. Equity swaps tend to be non-marketable instruments, so once the agreement is made there is not a highly liquid market that allows them to be sold to another party (though it is usually possible to go back to the dealer and enter into an offsetting position). Although the equity index payment recipient is an equity investor, this investor must deliver an amount linked to Libor; the investor bears interest rate risk. One prime motivation for initiating equity swaps is to avoid paying high taxes on the full return amount from an equity investment. This advantage is dependent on tax laws remaining favorable, which means that equity swaps carry tax policy risk.

There are a number of advantages to using an equity swap to gain synthetic exposure to index

returns. Exchange-traded futures contracts are available only on a limited number of equity indexes. Yet as long as there is a willing counterparty, a swap can be initiated on virtually any index. So swaps can be customized with respect to the underlying as well as to settlement frequency and maturity. Although most swap agreements are one year or shorter in maturity, they can be negotiated for as long a tenor as the counterparties are willing. If a swap is used, it is not necessary for an investor to pay transaction costs associated with buying all of the index constituents. Like futures, a swap can help a portfolio manager add leverage or hedge a portfolio, which is usually done on a tactical or short-term basis.

## **5.1. Separately Managed Equity Index-Based Portfolios**

Building an index-based equity portfolio as a separately managed portfolio requires a certain set of capabilities and tools. An equity investor who builds an indexed portfolio will need to subscribe to certain data on the index and its constituents. The investor also requires a robust trading and accounting system to manage the portfolio, broker relationships to trade efficiently and cheaply, and compliance systems to meet applicable laws and regulations.

The data subscription can generally be acquired directly from the index provider and may be offered on a daily or less-frequent basis. Generally, the data are provided for analysis only and a separate license must be purchased for index replication strategies. The index subscription data should include company and security identifiers, weights, cash dividend, return, and corporate action information. Corporate actions can include stock dividends and splits, mergers and acquisitions, liquidations, and other reasons for index constituent inclusion and exclusion. These data are generally provided in electronic format and can be delivered via file downloads or fed through a portfolio manager's analytical systems, such as Bloomberg or FactSet. The data are then used as the basis for the indexed portfolio.

Certain trading systems, such as those provided by Charles River Investment Management Solution, SS&C Advent (through Moxy), and Eze Castle Integration, allow the manager to see her portfolio and compare it to the chosen benchmark. Common features of trading systems include electronic communication with multiple brokers and exchanges, an ability to record required information on holdings for taxable investors, and modeling tools so that a portfolio can be traded to match its benchmark.

Accounting systems should be able to report daily performance, record historical transactions, and produce statements. Portfolio managers rely heavily on their accounting systems and teams to help them understand the drivers of portfolio performance.

Broker relationships are an often-overlooked advantage of portfolio managers that are able to negotiate better commission rates. Commissions are a negative drag on a portfolio's returns. The commission rates quoted to a manager can differ on the basis of the type of securities being traded, the size of the trade, and the magnitude of the relationship between the manager

and broker.

Finally, compliance tools and teams are necessary. Investors must adhere to a myriad of rules and regulations, which can come from client agreements and regulatory bodies. Sanctions for violating compliance-related rules can range from losing a client to losing the registration to participate in the investment industry; thus, a robust compliance system is essential to the success of an investment manager.

Compliance rules can be company-wide or specific to an investor's account. Company-wide rules take such forms as restricting trades in stocks of affiliated companies. Rules specific to an account involve such matters as dealing with a directed broker or steps to prevent cash overdrafts. Compliance rules should also be written to prohibit manager misconduct, such as front-running in a personal account prior to executing client trades.

To ensure that their portfolios closely match the return stream of the chosen index, indexed portfolio managers must review their holdings and their weightings versus the index each day. Although a perfect match is a near impossibility because of rounding errors and trading costs, the manager must always weigh the benefits and costs of maintaining a close match.

To establish the portfolio, the manager creates a trading file and transmits the file to an executing broker, who buys the securities using a program trade. **Program trading** is a strategy of buying or selling many stocks simultaneously. Index portfolio managers may trade thousands of positions in a single trade file and are required to deliver the orders and execute the trades quickly. The creation of trades may be done on something as rudimentary as an Excel spreadsheet, but it is more likely to be created on an order management system (OMS), such as Charles River

Portfolio managers use their OMS to model their portfolios against the index, decide which trades to execute, and transmit the orders. Transmitting an order in the United States is generally done on a secure communication line, such as through FIX Protocol. FIX Protocol is an electronic communication protocol to transmit the orders from the portfolio manager to the broker or directly to the executing market place. The orders are first transmitted via FIX Protocol to a broker who executes the trade and then delivers back pricing and settlement instructions to the OMS. International trading is usually communicated using a similar protocol through SWIFT. SWIFT stands for "Society for Worldwide Interbank Financial Telecommunication," and is a service that is used to securely transmit trade instructions.

Index-based strategies seek to replicate an index that is priced at the close of business each day. Therefore, most index-based trade executions take place at the close of the business day using market-on-close (MOC) orders. Matching the trade execution to the benchmark price helps the manager more closely match the performance of the index.

Beyond the portfolio's initial construction, managers maintain the portfolio by trading any index changes, such as adds/deletes, rebalances, and reinvesting cash dividend payments.

These responsibilities require the manager to commit time each day to oversee the portfolio and create the necessary trades. Best practice would be to review the portfolio's performance each day and its composition at least once a month.

Dividends paid over time can accumulate to significant amounts that must be reinvested into the securities in the index. Index fund managers must determine when the cash paid out by dividends should be reinvested and then create trades to purchase the required securities.

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## 6. PASSIVE PORTFOLIO CONSTRUCTION

- d. compare the full replication, stratified sampling, and optimization approaches for the construction of passively managed equity portfolios;

This section discusses the principal approaches that equity portfolio managers use when building a passive-indexed portfolio by transacting in individual securities. The three approaches are full replication, stratified sampling, and optimization. According to Morningstar, among index-tracking equity ETF portfolios globally:

- 38% of funds (representing 42% of July 2016 assets) use full replication,
- 41% of funds (representing 54% of assets) use stratified sampling or optimization techniques, and
- 21% of funds (representing only about 4% of assets) use synthetic replication, using over-the-counter derivatives).

### 6.1. Full Replication

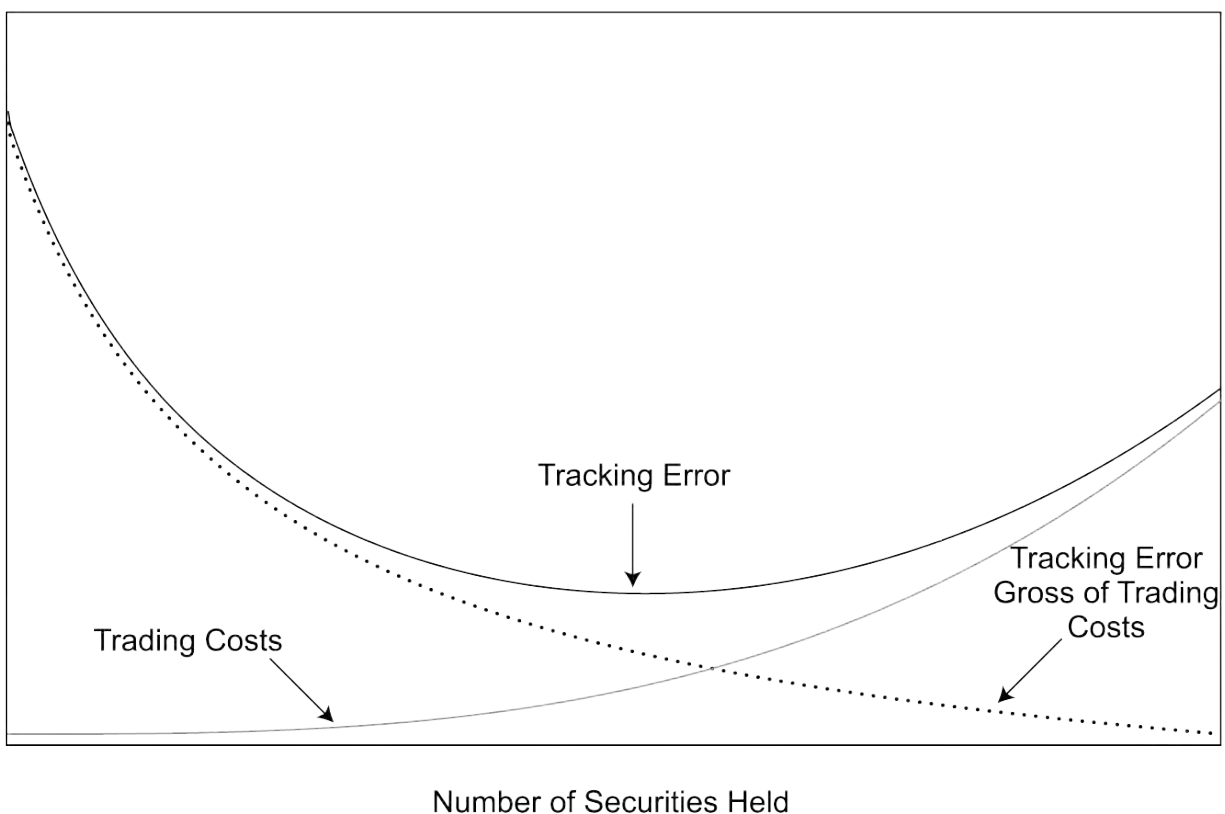
Full replication in index investing occurs when a manager holds all securities represented by the index in weightings that closely match the actual index weightings. Advantages of full replication include the fact that it usually accomplishes the primary goal of matching the index performance, and it is easy to comprehend. Full replication, however, requires that the asset size of the mandate is sufficient and that the index constituents are available for trading.

Not all indexes lend themselves to full replication. For example, the MSCI ACWI Investable Markets Index consists of over 8,000 constituents,<sup>5</sup> but not all securities need be held to closely match the characteristics and performance of that index. Other indexes, such as the

S&P 500, have constituents that are readily available for trading and can be applied to portfolios as small as USD 10 million.

With respect to the choice between index replication versus sampling, as the number of securities held increases, tracking error decreases because the passive portfolio gets closer to replicating the index perfectly. Yet as the portfolio manager adds index constituent stocks that are smaller and more thinly traded than average, trading costs increase. The trading costs can take the form of brokerage fees and upward price pressure as a result of the portfolio's purchases. These transaction costs can depress performance and start to impose a small negative effect on tracking effectiveness. As the portfolio manager moves to the least liquid stocks in the index, transaction costs begin to dominate and tracking error increases again. Thus, for an index that has some constituent securities that are relatively illiquid, the conceptual relationship between tracking error and the number of securities held is U-shaped. The relation can be depicted as shown in [Exhibit 10](#).

**Exhibit 10. Relation Between Tracking Error and Transaction Costs versus Number of Benchmark Index Constituent Stocks Held**



Source: Author team.

Many managers attempt to match an index's characteristics and performance through a full

replication technique, but how does a manager create the portfolio? As mentioned in a prior section, the passive equity manager needs data from the index provider to construct the portfolio. This includes the constituent stocks, their relevant identifiers (ticker, CUSIP, SEDOL, or ISIN), shares outstanding, and price. Additional data, such as constituents’ dividends paid and total return, facilitate management of the portfolio.

The manager then uses the index data to create the portfolio by replicating as closely as possible the index constituents and weights. The portfolio construction method may vary by investor, but the most common method is to import the provided data into a data compiler such as Charles River, Moxy, or some other external or internally created OMS. The imported data show the manager the trades that are needed to match the index. [Exhibit 11](#) contains an example for a portfolio that has an initial investment of USD 10 million.

**Exhibit 11. Sample Index Portfolio Positions and Transactions**

Identifier	Security Description	Price	Current Weight	Model Weight	Current Weight – Model Weight = Variance	Current Shares
Cash	Cash	1	50%	0%	50%	5,000,000
SECA	Security 1	100	50%	50%	0%	50,000
SECB	Security 2	50	0%	50%	–50%	0

[Exhibit 11](#) shows a current portfolio made up of one security and a cash holding that needs to be traded to match a two-security index. The index becomes the model for the portfolio, and that model is used to match the portfolio. This type of modeling can easily and cheaply be conducted using spreadsheet and database programs, such as Excel and Access. However, the modeling is only a part of the portfolio management process.

The OMS should also be programmed to provide the investor with pre-trade compliance to check for client-specific restrictions, front-running issues, and other compliance rules. The OMS is also used to deliver the buy and sell orders for execution using FIX or SWIFT Protocol, as described previously.

After initial creation of the indexed portfolio, the manager must maintain the portfolio



according to any changes in the index. The changes are announced publicly by the index provider. Index fund managers use those details to update their models in the OMS and to determine the number of shares to buy or sell. A fully replicated portfolio must make those changes in a timely manner to maintain its performance tracking with the index. Again, a perfectly replicated index portfolio must trade at the market-on-close price where available to match the price used by the index provider in calculating the index performance.

## 6.2. Stratified Sampling

Despite their preference to realize the benefits of pure replication of an index, portfolio managers often find it impractical to hold all the constituent securities. Some equity indexes have a large number of constituents, and not all constituents offer high trading liquidity. This can make trading expensive, especially if a portfolio manager needs to scale up the portfolio. Brokerage fees can also become excessive if the number of constituents is large.

Holding a limited sample of the index constituents can produce results that track the index return and risk characteristics closely. But such sampling is not done randomly. Rather, portfolio managers use stratified sampling. To stratify is to arrange a population into distinct strata or subgroupings. Arranged correctly, the various strata will be mutually exclusive and also exhaustive (a complete set), and they should closely match the characteristics and performance of the index. Common stratification approaches include using industry membership and equity style characteristics. Investors who use stratified sampling to track the S&P 500 commonly assign each stock to one of the eleven sectors designated by the Global Industry Classification Standard (GICS). For multinational indexes, stratification is often done first on the basis of country affiliation. Indexes can be stratified along multiple dimensions (e.g., country affiliation and then industry affiliation) within each country. An advantage of stratifying along multiple dimensions is closer index tracking.

In equity indexing, stratified sampling is most frequently used when the portfolio manager wants to track indexes that have many constituents or when dealing with a relatively low level of assets under management. Indexes with many constituents are usually multi-country or multi-cap indexes, such as the S&P Global Broad Market Index that consists of more than 11,000 constituents. Most investors are reluctant to trade and maintain 11,000 securities when a significantly smaller number of constituents would achieve most portfolios' tracking objectives. Regardless of the stratified sampling approach used, passive equity managers tend to weight portfolio holdings proportionately to each stratum's weight in the index.

### EXAMPLE 2

## Stratified Sampling



A portfolio manager responsible for accounts of high-net-worth individuals is asked to build an index portfolio that tracks the S&P 500 Value Index, which has more than 300 constituents. The manager and the client agree that the minimum account size will be USD 750,000, but the manager explains to the client that full replication is not feasible at a reasonable cost because of the mandate size. How can the manager use stratified sampling to achieve her goal of tracking the S&P 500 Value Index?

### **Solution:**

The manager recommends that the client set a maximum number of constituents (for example, 200) to limit the average lot size and to reduce commission costs. Next, the manager seeks to identify the constituents to hold based on their market capitalization. That is, the manager selects the 200 securities with the largest market capitalizations. Then the manager seeks to more closely match the performance of the index by matching the sector weightings of the sampled portfolio to the sector weightings of the index. After comparing sector weights, the manager reweights the sampled portfolio. Using this method of stratified sampling meets the manager's stated goal of closely tracking the performance of the index at a reasonable cost.

## **6.3. Optimization**

Optimization approaches for index portfolio construction, such as full replication and stratified sampling, have index-tracking goals. Optimization typically involves maximizing a desirable characteristic or minimizing an undesirable characteristic, subject to one or more constraints. For an indexed portfolio, optimization could involve minimizing index tracking error, subject to the constraint that the portfolio holds 50 constituent securities or fewer. The desired output from the optimization process is identification of the 50 securities and their weights that results in the lowest possible tracking error. The number of security holdings is not the only possible constraint. Other common constraints include limiting portfolio membership to stocks that have a market capitalization above a certain specified level, style characteristics that mimic those of the benchmark, restricting trades to round lots, and using only stocks that will keep rebalancing costs low.

Roll (1992) and Jorion (2003) demonstrate that running an optimization to minimize tracking error can lead to portfolios that are mean–variance inefficient versus the benchmark. That is, the optimized portfolio may exhibit higher risk than the benchmark it is being optimized against. They show that a useful way to address this problem is to add a constraint on total portfolio volatility. Accordingly, the manager of an optimized passive fund would aim to make its total volatility equal to that of the benchmark index.

**Fabozzi, Focardi, and Kolm (2010)** note that in practice, passive portfolio managers often conduct a mean–variance optimization using all the index constituents, the output from which shows highly diverse weightings for the stocks. Given that investing in the lowest-weight stocks may involve marginal transaction costs that exceed marginal diversification benefits, in a second, post-optimization stage, the managers may then delete the lowest-weighted stocks.

Optimization can be conducted in conjunction with stratified sampling or alone. Optimization programs, when run without constraints, do not consider country or industry affiliation but rather use security level data. Optimization requires an analyst who has a high level of technical sophistication, including familiarity with computerized optimization software or algorithms, and a good understanding of the output.

Advantages of optimization involve a lower amount of tracking error than stratified sampling. Also, the optimization process accounts explicitly for the covariances among the portfolio constituents. Although two securities from different industry sectors may be included in a passive portfolio under stratified sampling, if their returns move strongly together, one will likely be excluded from an optimized portfolio.

Usually the constituents and weights of an optimized portfolio are determined based on past market data; however, returns, variances, and correlations between securities tend to vary over time. Thus, the output from an optimization program may apply only to the period from which the data are drawn and not to a future period. Even if current results apply to the future, they might not be applicable for long. This means that optimization would need to be run frequently and adjustments made to the portfolio, which can be costly.

## **6.4. Blended Approach**

For indexes that have few constituent securities or for which the constituents are homogeneous, full replication is typically advisable. When the reverse is true, sampling or optimization are likely to be the preferred methods. But such indexes as the Russell 3000, the S&P 1500, and the Wilshire 5000 span the capitalization spectrum from large to small. For these indexes, the 1,000 or so largest constituents are quite liquid, which means that brokerage fees, bid–ask spreads, and trading costs are low. For the largest-cap portion of an indexed portfolio, full replication is a sensible and desirable approach. For the index constituents that have smaller market capitalizations or less liquidity, however, a stratified sampling or optimization approach can be useful for all the reasons mentioned previously in this section. Thus, an indexed portfolio can actually be managed using a blended approach consisting of full replication for more-liquid issues and one of the other methods for less-liquid issues.

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## 7. TRACKING ERROR MANAGEMENT

- e. discuss potential causes of tracking error and methods to control tracking error for passively managed equity portfolios;

As discussed previously, managers of passive strategies use a variety of approaches to track indexes in cost-efficient ways. To the extent the portfolio manager's skills are ineffective, tracking error results. This section discusses the measurement and management of tracking error.

### 7.1. Tracking Error and Excess Return

Tracking error and excess return are two measures that enable investors to differentiate performance among passive portfolio managers. Tracking error indicates how closely the portfolio behaves like its benchmark and measures a manager's ability to replicate the benchmark return. Tracking error is calculated as the standard deviation of the difference between the portfolio return and its benchmark index return. Excess return measures the difference between the portfolio returns and benchmark returns. Tracking error for portfolio  $p$  then can be expressed by [Equation 3](#).

#### Equation (3)

$$\text{Tracking error}_p = \sqrt{\text{Variance}(R_p - R_b)}$$

where  $R_p$  is the return on the portfolio and  $R_b$  is the return on the benchmark index. Excess return for portfolio  $p$  is calculated as in [Equation 4](#).

#### Equation (4)

$$\text{Excess return}_p = R_p - R_b$$

Tracking error and excess return are distinct measures; the terms should not be used interchangeably. Tracking error measures the manager's ability to closely track the benchmark over time. In principle, a manager whose return is identical to that of the index could have arrived at that point by lagging and subsequently leading the index, producing a net difference of zero. But being a standard deviation, tracking error cannot be zero in cases such as the one described. Excess returns can be positive or negative and tell the investor how the manager performed relative to the benchmark. Tracking error, which is a standard

deviation, is always presented as a non-negative number.

Index fund managers endeavor to have low tracking error and excess returns that are not negative. Low tracking error is important in measuring the skill of the index fund manager because the investor's goal is to mimic the return stream of the index. Avoiding negative excess returns versus the benchmark is also important because the manager will want to avoid underperforming the stated index.

Tracking error varies according to the manager's approach to tracking the index. An index that contains a large number of constituents will tend to create higher tracking error than those with fewer constituents. This is because a large number of constituents may prevent the manager from fully replicating the index.

For an index fund, the degree of tracking error fluctuates over time. Also, the value will differ depending on whether the data frequency is daily or less frequent.

### EXAMPLE 3

## Tracking Error and Excess Return

Exhibit 12 illustrates key portfolio metrics for three of the older and larger conventional open-end funds in the Australian and South Korean markets. Based on the levels of tracking error and excess return figures provided in the exhibit, explain whether the funds are likely replicating or sampling.

### Exhibit 12. Major Conventional Index Mutual Funds in Australia and South Korea

Fund Name (Holdings)	Holdings	Annual Management Fee (bps)	3-Year Annualized Tracking Error	3-Year Annualized Excess Return
<i>Australian market benchmark for the following funds is the S&amp;P/ASX 300 Index.</i>				
<i>Number of securities in the index: 300.</i>				
BlackRock Indexed Australian Equity Fund	296	20	0.0347%	−0.1684%
Macquarie True	259	0	0.0167%	0.0111%

Index Australian  
Shares

Vanguard Australian Shares Index	293	18	0.1084%	−0.1814%
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*South Korean market benchmark for the funds below is the KRX KOSPI  
200 Korea Index.*

*Number of securities in the index: 200.*

KB Star Korea Index Equity CE	190	36	1.2671%	0.3356%
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KIM Cruise Index F2.8 Equity-Deriv A	178	9	1.5019%	1.7381%
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Samsung Index Premium Equity- Deriv A	204	40	1.3325%	1.1097%
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## Solution:

Based on the number of stocks in the fund compared to the index constituent number, it appears most funds are attempting to replicate. Two of the funds (Macquarie True Index and KIM Cruise Index) have 80% to 90% of the stocks in the index, which indicates they are more likely to be using sampling. One fund (Samsung Index Premium) actually holds more than the index, which can happen if buffering is used. No fund contains the same number of stocks as constituents in the index. Thus, it is not surprising that the funds failed to track their respective indexes perfectly. On an annualized basis, tracking error for the Australian funds is less than one-tenth the level of the Korean funds. However, the Korean funds' excess return—which is fund return less the benchmark index return—is positive in all three cases. The negative excess returns for two of the Australian funds are relatively close and possibly attributable to their management fees of 18–20 basis points.

## 7.2. Potential Causes of Tracking Error and Excess Return

Tracking error in an indexed equity fund can arise for several reasons. A major reason involves the fees charged. Although tracking error is expressed as an absolute value, fees are always negative because they represent a cost and drive down the excess return. Therefore, higher fees will contribute to lower excess returns and higher tracking error.

A second issue to consider is the number of securities held by the portfolio versus the benchmark index. Stock indexes that are liquid and investable may be fully replicated, while indexes with hard-to-find securities or a great number of securities are sampled. Sampled portfolios typically report greater tracking error than those that are fully replicated.

The intra-day trading of the constituent stocks of an indexed portfolio also presents an important issue to consider when attributing tracking error. The effect of intra-day trading can be positive or negative for a portfolio's returns compared to its benchmark index. The price levels used to report index returns are struck at the close of the trading day, so any securities that are bought or sold at a different price than that of the index will contribute to portfolio tracking error. Index fund managers can minimize this type of tracking error by transacting at the market-on-close price or as near to the closing time as feasible.

A secondary component of trading costs that contributes to tracking error is the trading commission paid to brokers. Commission costs make excess returns more negative and also affect tracking error. According to [Perold and Salomon \(1991\)](#), the trading cost for passive portfolio managers is likely to be lower than the trading cost for active managers who are suspected by their counterparties to possess an information advantage.

Another issue to consider is the cash holding of the portfolio. Equity indexes do not have a cash allocation, so any cash balance creates tracking error for the index fund manager. Cash can be accumulated in the portfolio from a variety of sources, such as dividends received, sale proceeds, investor contributions, and other sources of income. Cash flows from investors and from the constituent companies may not be invested immediately, and investing them often entails a commission cost. Both may affect tracking error. The tracking error caused by temporarily uninvested cash is known as **cash drag**. The effect of cash drag on portfolio value is negative when the market is rising and positive when it is falling.

[Hill and Cheong \(1996\)](#) discuss how to equitize a portfolio that would otherwise suffer from cash drag. One method is to use futures contracts. ETFs have been used widely for this purpose. Some portfolio managers establish a futures commission merchant relationship to offset their cash positions with a futures contract that represents the replicated index. When a manager does this, she will calculate the accrued dividends as well to hedge the dividend drag, which is cash drag attributable to accrued cash dividends paid to shareholders.

## 7.3. Controlling Tracking Error

The process of controlling tracking error involves trade-offs between the benefits and costs of maintaining complete faithfulness to the benchmark index, as illustrated in [Exhibit 10](#). Portfolio managers who are unconstrained would keep the number of constituent securities and their weights as closely aligned to the benchmark index as possible. Even so, trading costs and other fees cause actual investment performance to deviate from index performance. Passive investing does not mean that the fund does not trade. Managers trade to accommodate inflows and outflows of cash from investors, to reinvest dividends, and to reflect changes in constituents of the underlying index.

As discussed in Section 7.2, most passive portfolio managers attempt to minimize cash held because a cash position generally creates undesirable tracking error. To keep tracking error low, portfolio managers need to invest cash flows received at the same valuations used by the benchmark index provider. Of course, because this is not always feasible, portfolio managers aim to maintain a beta of 1.0 relative to the benchmark index, while keeping other risk factor exposures similar to those of the index.

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## 8. SOURCES OF RETURN AND RISK IN PASSIVE EQUITY PORTFOLIOS

- f. explain sources of return and risk to a passively managed equity portfolio.

Indexed portfolios began as a representation of market performance, and some investors accept the returns of the indexed portfolio without judgment. However, understanding both positive and negative sources of return through attribution analysis is an important step in the passive equity investment process.

### 8.1. Attribution Analysis

An investor has many choices across the investable spectrum of assets. An investor must first choose between stocks, bonds, and other asset classes and then partition each asset class by its sub-categories. In partitioning stocks, the process begins with choosing what countries to invest in, what market-cap sizes and investment style to use, and whether to weight the constituents using market cap or an alternative weighting method.

The return on an indexed portfolio can come from any of the aforementioned criteria. Return analyses are conducted ex-post, which means that the returns of the portfolio are studied after



they have been experienced.

The sources of return for an equity index replication portfolio are the same as for any actively managed fund and include company-specific returns, sector returns, country returns, and currency returns. Beyond the traditional methods of grouping the risk and returns of the indexed portfolio, portfolio managers can group their indexed portfolios according to the stated portfolio objective. For example, a high dividend yield indexed portfolio may be grouped against the broad market benchmark by dividend yield. A low volatility portfolio could be grouped by volatility buckets to show how the lowest volatility stocks performed in the indexed portfolio as well as the broad market.

Most portfolio managers will rely on their portfolio attribution system to help them in understanding the sources of return. Index fund managers who track a broad market index need to understand what factors are driving the returns of that portfolio and its underlying index. Index fund managers of passive factor-based strategies should understand both the sources of return for their indexed portfolios and how those returns relate to the broad market index from which the constituents were chosen. In this way, passive factor-based strategies are very similar to actively managed funds in the sense that they are actively chosen.

**Exhibit 13** shows an example of a portfolio attribution analysis using annual returns. Portfolio X is an index fund that seeks to replicate the performance of its benchmark. The manager of Portfolio X confirms that the portfolio, which has a return of 5.62%, is closely replicating the performance of the benchmark, which has a return of 5.65%.

Using **Exhibit 13**, the manager analyzes the relative sector weights and sources of the three basis points of return difference. A portfolio that is within three basis points of its benchmark index is undoubtedly tracking the index closely. Beyond seeking the source of the tracking error, the portfolio manager will also seek to understand the source of the positive returns.

**Exhibit 13. Example of Sector Attribution Analysis (All figures in %)**

Sector	Portfolio X			Benchmark for Portfolio X	
	Sector Return (A)	Sector Weight (B)	Contribution to Return (C) = (A) × (B)	Sector Weight (D)	Contribution to Return (E) = (A) × (D)



Total	5.62	100.00	5.62
Telecom. Services	16.94	2.25	0.38
Utilities	15.45	12.99	2.01
Consumer Discretionary	12.09	3.89	0.47
Materials	9.61	2.08	0.20
Information Technology	7.03	2.82	0.20
Consumer Staples	6.82	15.07	1.03
Industrials	3.93	16.08	0.63
Financials	0.50	19.85	0.10
Health Care	0.31	12.70	0.04
Real Estate	0.80	5.04	0.04
Energy	7.21	7.23	0.52
[Cash]	0.00	0.00	0.00

Attribution analyses like the one in [Exhibit 13](#) can be structured in many ways. In this example, the analysis is grouped by economic sector. Sector attribution can be useful to evaluate a portfolio against expectations about how a portfolio might perform in different economic environments. For example, during an era of low interest rates, high-dividend stocks might be expected to be more likely to outperform while financial stocks such as banks are likely to underperform. If all other things held equal. To the extent the portfolio holds financial stocks in greater proportion than the benchmark, the portfolio will likely outperform. If the portfolio has a lower concentration than the benchmark, the portfolio will likely underperform or stay low.

Column A in [Exhibit 13](#) shows the total return for each sector. The Telecommunications sector posted a return of 16.94% over this period.

Column B shows Portfolio's X's sector weight. The portfolio is heavily weighted in Financials, because this is the largest sector in the benchmark portfolio.

Column C shows each sector's contribution to the overall return. This is calculated by multiplying each sector weight in Portfolio X by the sector's return. The sum of the eleven sectors' contributions to return is equal to the total return of the portfolio.













































# Study Session 8

## Equity Portfolio Management (2)

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This study session takes an in-depth look at active equity portfolio management. It begins with a discussion of quantitative and fundamental equity strategies, including the underlying rationale for the investment approach and how they are created, whether top-down or bottom-up. Factor-based investing, as well as key specialized equity strategies such as activist investing and statistical arbitrage, are explored. The study session concludes with a discussion of issues important in active equity portfolio construction, including active share, active risk, risk budgeting, and constraints on portfolio construction.

## READING ASSIGNMENTS

- Reading 17** Active Equity Investing: Strategies  
by Bing Li, PhD, CFA, Yin Luo, CPA, PStat, CFA, and Pranay Gupta, CFA
- Reading 18** Active Equity Investing: Portfolio Construction  
by Jacques Lussier, PhD, CFA, and Marc R. Reinganum, PhD

# Reading 17

## Active Equity Investing: Strategies

by Bing Li, PhD, CFA, Yin Luo, CPA, PStat, CFA, and Pranay Gupta, CFA

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## LEARNING OUTCOMES

The candidate should be able to:

- a. compare fundamental and quantitative approaches to active management;
- b. analyze bottom-up active strategies, including their rationale and associated processes;
- c. analyze top-down active strategies, including their rationale and associated processes;
- d. analyze factor-based active strategies, including their rationale and associated processes;
- e. analyze activist strategies, including their rationale and associated processes;
- f. describe active strategies based on statistical arbitrage and market microstructure;
- g. describe how fundamental active investment strategies are created;
- h. describe how quantitative active investment strategies are created;
- i. discuss equity investment style classifications.

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## 1. INTRODUCTION

This reading provides an overview of active equity investing and the major types of active equity strategies. The reading is organized around a classification of active equity strategies into two broad approaches: fundamental and quantitative. Both approaches aim at outperforming a passive benchmark (for example, a broad equity market index), but they tend to make investment decisions differently. Fundamental approaches stress the use of human judgment in processing information and making investment decisions, whereas quantitative approaches tend to rely more heavily on rules-based quantitative models. As a result, some practitioners and academics refer to the fundamental, judgment-based approaches as “discretionary” and to the rules-based, quantitative approaches as “systematic.”

This reading is organized as follows. Section 2 introduces fundamental and quantitative approaches to active management. Sections 3–9 discuss bottom-up, top-down, factor-based, and activist investing strategies. Section 10 describes the process of creating fundamental active investment strategies, including the parameters to consider as well as some of the pitfalls. Section 11 describes the steps required to create quantitative active investment strategies, as well as the pitfalls in a quantitative investment process. Section 12 discusses style classifications of active strategies and the uses and limitations of such classifications. A summary of key points completes the reading.

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## 2. APPROACHES TO ACTIVE MANAGEMENT

### a. compare fundamental and quantitative approaches to active management

Active equity investing may reflect a variety of ideas about profitable investment opportunities. However, with regard to how these investment ideas are implemented—for example, how securities are selected—active strategies can be divided into two broad categories: fundamental and quantitative. Fundamental approaches are based on research into companies, sectors, or markets and involve the application of analyst discretion and judgment. In contrast, quantitative approaches are based on quantitative models of security returns that are applied systematically with limited involvement of human judgment or discretion. The labels *fundamental* and *quantitative* in this context are an imperfect shorthand that should not be misunderstood. The contrast with quantitative approaches does not mean that fundamental approaches do not use quantitative tools. Fundamental approaches often make use of valuation models (such as the free cash flow model), quantitative screening tools, and statistical techniques (e.g., regression analysis). Furthermore, quantitative approaches often make use of variables that relate to company fundamentals. Some investment disciplines may be viewed as hybrids in that they combine elements of both fundamental and quantitative disciplines. In the next sections, we examine these two



approaches more closely.

Fundamental research forms the basis of the fundamental approach to investing. Although it can be organized in many ways, fundamental research consistently involves and often begins with the analysis of a company's financial statements. Through such an analysis, this approach seeks to obtain a detailed understanding of the company's current and past profitability, financial position, and cash flows. Along with insights into a company's business model, management team, product lines, and economic outlook, this analysis provides a view on the company's future business prospects and includes a valuation of its shares. Estimates are typically made of the stock's intrinsic value and/or its relative value compared to the shares of a peer group or the stock's own history of market valuations. Based on this valuation and other factors (including overall portfolio considerations), the portfolio manager may conclude that the stock should be bought (or a position increased) or sold (or a position reduced). The decision can also be stated in terms of overweighting, market weighting, or underweighting relative to the portfolio's benchmark.

In the search for investment opportunities, fundamental strategies may have various starting points. Some strategies start at a top or macro level—with analyses of markets, economies, or industries—to narrow the search for likely areas for profitable active investment. These are called top-down strategies. Other strategies, often referred to as bottom-up strategies, make little or no use of macro analysis and instead rely on individual stock analysis to identify areas of opportunity. Research distributed by investment banks and reports produced by internal analysts, organized by industry or economic sector, are also potential sources of investment ideas. The vetting of such ideas may be done by portfolio managers, who may themselves be involved in fundamental research, or by an investment committee.

Quantitative strategies, on the other hand, involve analyst judgment at the design stage, but they largely replace the ongoing reliance on human judgment and discretion with systematic processes that are often dependent on computer programming for execution. These systematic processes search for security and market characteristics and patterns (“factors”) that have predictive power in order to identify securities or trades that will earn superior investment returns, in the sense of expected added value relative to risk or expected return relative to a benchmark—for example, an index benchmark or peer benchmark.

Factors that might be considered include valuation (e.g., earnings yield), size (e.g., market capitalization), profitability (e.g., return on equity), financial strength (e.g., debt-to-equity ratio), market sentiment (e.g., analyst consensus on companies' long-term earnings growth), industry membership (e.g., stocks' GICS classification), and price-related attributes (e.g., price momentum). While a wide range of security characteristics have been used to define “factors,” some factors (e.g., the aforementioned size, valuation, momentum, and profitability) have been shown to be positively associated with a long-term return premium. We call these *rewarded* factors. Many other factors are used in portfolio construction but have not been empirically proven to offer a persistent return premium, and are thus called *unrewarded* factors.

Once a pattern or relationship between a given variable (or set of variables) and security prices has been established by analysis of past data, a quantitative model is used to predict future expected returns of securities or baskets of securities. Security selection then flows from expected returns, which reflect securities’ exposures to the selected variables with predictive power. From a quantitative perspective, investment success depends not on individual company insights but on model quality.

**Exhibit 1** presents typical differences between the main characteristics of fundamental and quantitative methodologies.

Exhibit 1. Differences between Fundamental and Quantitative Approaches		
	Fundamental	Quantitative
Style	Subjective	Objective
Decision-making process	Discretionary	Systematic, non-discretionary
Primary resources	Human skill, experience, judgment	Expertise in statistical modeling
Information used	Research (company/industry/economy)	Data and statistics
Analysis focus	Conviction (high depth) in stock-, sector-, or region-based selection	A selection of variables, subsequently applied broadly over a large number of securities
Orientation to data	Forecast future corporate parameters and establish views on companies	Attempt to draw conclusions from a variety of historical data
Portfolio construction	Use judgment and conviction within permissible risk parameters	Use optimizers

In the following section, we take a closer look at some of the distinguishing characteristics listed in **Exhibit 1** and how they are evolving with the advent of new technologies available to investors.

## 2.1. Differences in the Nature of the Information Used

To contrast the information used in fundamental and quantitative strategies, we can start by describing typical activities for fundamental investors with a bottom-up investment discipline. Bottom-up fundamental analysts research and analyze a company, using data from company financial statements and disclosures to assess attributes such as profitability, leverage, and absolute or peer-relative valuation. They typically also assess how those metrics compare to their historical values to identify trends and scrutinize such characteristics as the company's management competence, its future prospects, and the competitive position of its product lines. Such analysts usually focus on the more recent financial statements (which include current and previous years' accounting data), notes to the financial statements and assumptions in the accounts, and management discussion and analysis disclosures. Corporate governance is often taken into consideration as well as wider environmental, social, and governance (ESG) characteristics.

Top-down fundamental investors' research focuses first on region, country, or sector information (e.g., economic growth, money supply, and market valuations). Some of the data used by fundamental managers can be measured or expressed numerically and therefore "quantified." Other items, such as management quality and reputation, cannot.

Quantitative approaches often use large amounts of historical data from companies' financial reports (in addition to other information, such as return data) but process those data in a systematic rather than a judgmental way. Judgment is used in model building, particularly in deciding which variables and signals are relevant. Typically, quantitative approaches use historical stock data and statistical techniques to identify variables that may have a statistically significant relationship with stock returns; then these relationships are used to predict individual security returns. In contrast to the fundamental approach, the quantitative approach does not normally consider information or characteristics that cannot be quantified. In order to minimize survivorship and look-ahead biases, historical data used in quantitative research should include stocks that are no longer listed, and accounting data used should be the original, un-restated numbers that were available to the market at that point in time.

### Investment Process: Fundamental vs. Quantitative

The goal of the investment process is to construct a portfolio that best reflects the stated investment objective and risk tolerance, with an optimal balance between expected return and risk exposure, subject to the constraints imposed by the investment policy. The investment processes under both fundamental and quantitative approaches involve a

number of considerations, such as the methodology and valuation process, which are the subject of this reading. Other considerations, such as portfolio construction and risk management, trade execution, and ongoing performance monitoring, are the subjects of subsequent curriculum readings.

	Fundamental	Quantitative
Methodology	Determine methodology to evaluate stocks (bottom-up or top-down, value or growth, income or deep value, intrinsic or relative value, etc.)	Define model to estimate expected stock returns (choose time-series macro-level factors or cross-sectional stock-level factors, identify factors that have a stable positive information coefficient IC, use a factor combination algorithm, etc.)
Valuation process	<ul style="list-style-type: none"> <li>■ Prescreen to identify potential investment candidates with stringent financial and market criteria</li> <li>■ Perform in-depth analysis of companies to derive their intrinsic values</li> <li>■ Determine buy or sell candidates trading at a discount or premium to their intrinsic values</li> </ul>	<ul style="list-style-type: none"> <li>■ Construct factor exposures across all shares in the same industry</li> <li>■ Forecast IC and/or its volatility for each factor by using algorithms (such as artificial intelligence or time-series analysis) or fundamental research</li> <li>■ Combine factor exposures to estimate expected returns</li> </ul>
Portfolio construction and rebalancing	<ul style="list-style-type: none"> <li>■ Allocate assets by determining industry and country/region exposures</li> <li>■ Set limits on maximum sector, country, and</li> </ul>	<ul style="list-style-type: none"> <li>■ Determine which factors to underweight or overweight</li> <li>■ Use risk model to measure <i>ex ante</i> active risk</li> <li>■ Run portfolio optimization with risk model, investment, and risk constraints, as well as the structure of</li> </ul>

individual stock  
positions

transaction costs

- Determine buy-and-sell list
  - Monitor portfolio holdings continuously
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- Rebalance at regular intervals

## 2.2. Differences in the Focus of the Analysis

Fundamental investors usually focus their attention on a relatively small group of stocks and perform in-depth analysis on each one of them. This practice has characteristically given fundamental (or “discretionary”) investors an edge of depth in understanding individual companies’ businesses over quantitative (or “systematic”) investors, who do not focus on individual stocks. Quantitative investors instead usually focus on factors across a potentially very large group of stocks. Therefore, fundamental investors tend to take larger positions in their selected stocks, while quantitative investors tend to focus their analysis on a selection of factors but spread their selected factor bets across a substantially larger group of holdings.<sup>1</sup>

## 2.3. Difference in Orientation to the Data: Forecasting Fundamentals vs. Pattern Recognition

Fundamental analysis places an emphasis on forecasting future prospects, including the future earnings and cash flows of a company. Fundamental investors use judgment and in-depth analysis to formulate a view of the company’s outlook and to identify the catalysts that will generate future growth. They rely on knowledge, experience, and their ability to predict future conditions in a company to make investment decisions. Conceptually, the fundamental approach aims at forecasting forward parameters in order to make investment decisions. That said, many fundamental investors use a quantitative component in their investment process, such as a quantitative screen or a commercial quantitative risk model such as those produced

by Axioma, MSCI, Northfield, and Bloomberg.

In contrast, the quantitative approach aims to predict future returns using conclusions derived from analyzing historical data and patterns therein. Quantitative investors construct models by back-testing on historical data, using what is known about or has been reported by a company, including future earnings estimates that have been published by analysts, to search for the best company characteristics for purposes of stock selection. Once a model based on historical data has been finalized, it is applied to the latest available data to determine investment decisions. While the process is distinct from the fundamental approach, the active return and risk profiles of many fundamentals managers have been explained or replicated using well-known quantitative factors. See, for example, Ang, Goetzman, and Schaefer 2009 and Frazzini, Kabiller, and Pedersen 2013.

## Forestalling Look-Ahead Bias

Satyam Computers is an India-based company that provides IT consulting and solutions to its global customers. In the eight years preceding 2009, Satyam overstated its revenues and profits and reported a cash holdings total of approximately \$1.04 billion that did not exist. The falsification of the accounts came to light in early 2009, and Satyam was removed from the S&P CNX Nifty 50 index on 12 January.

If a quantitative analyst runs a simulation benchmarked against the S&P CNX Nifty 50 index on 31 December 2008, he or she should include the 50 stocks that were in the index on 31 December 2008 and use only the data for the included stocks that were available to investors as of that date. The analyst should therefore include Satyam as an index constituent and use the original accounting data that were published by the company at that time. While it was subsequently proved that these accounting data were fraudulent, this fact was not known to analysts and investors on 31 December 2008. As a result, it would not have been possible for any analyst to incorporate the true accounting data for Satyam on that date.

## 2.4. Differences in Portfolio Construction: Judgment vs. Optimization

Fundamental investors typically select stocks by performing extensive research on individual companies, which results in a list of high-conviction stocks. Thus, fundamental investors see

risk at the company level. There is a risk that the assessment of the company's fair value is inaccurate, that the business's performance will differ from the analyst's expectations, or that the market will fail to recognize the identified reason for under- or overvaluation.

Construction of a fundamental portfolio therefore often depends on judgment, whereby the absolute or index-relative sizes of positions in stocks, sectors, or countries are based on the manager's conviction of his or her forecasts. The portfolio must, of course, still comply with the risk parameters set out in the investment agreements with clients or in the fund prospectus.

In quantitative analysis, on the other hand, the risk is that factor returns will not perform as expected. Because the quantitative approach invests in baskets of stocks, the risks lie at the portfolio level rather than at the level of specific stocks. Construction of a quantitative portfolio is therefore generally done using a portfolio optimizer, which controls for risk at the portfolio level in arriving at individual stock weights.

The two approaches also differ in the way that portfolio changes or rebalancings are performed. Managers using a fundamental approach usually monitor the portfolio's holdings continuously and may increase, decrease, or eliminate positions at any time. Portfolios managed using a quantitative approach are usually rebalanced at regular intervals, such as monthly or quarterly. At each interval, the program or algorithm, using pre-determined rules, automatically selects positions to be sold, reduced, added, or increased.

## EXAMPLE 1

### Fundamental vs. Quantitative Approach

Consider two equity portfolios with the same benchmark index, the MSCI Asia ex Japan. The index contains 627 stocks as of December 2016. One portfolio is managed using a fundamental approach, while the other is managed using a quantitative approach. The fundamental approach-based portfolio is made up of 50 individually selected stocks, which are reviewed for potential sale or trimming on an ongoing basis. In the fundamental approach, the investment universe is first pre-screened by valuation and by the fundamental metrics of earnings yield, dividend yield, earnings growth, and financial leverage. The quantitative approach-based portfolio makes active bets on 400 stocks with monthly rebalancing. The particular approach used is based on a five-factor model of equity returns.

Contrast fundamental and quantitative investment processes with respect to the following:

1. Constructing the portfolio
2. Rebalancing the portfolio

## Solution to 1:

**Fundamental:** Construct the portfolio by overweighting stocks that are expected to outperform their peers or the market as a whole. Where necessary for risk reduction, underweight some benchmark stocks that are expected to underperform. The stocks that fell out in the pre-screening process do not have explicit forecasts and will not be included in the portfolio.

**Quantitative:** Construct the portfolio by maximizing the objective function (such as portfolio alpha or information ratio) with risk models.

## Solution to 2:

**Fundamental:** The manager monitors each stock continuously and sells stocks when their market prices surpass the target prices (either through appreciation of the stock price or through reduction of the target price due to changes in expectations).

**Quantitative:** Portfolios are usually rebalanced at regular intervals, such as monthly.

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## 3. BOTTOM-UP STRATEGIES

### **b. analyze bottom-up active strategies, including their rationale and associated processes**

Equity investors have developed many different techniques for processing all the information necessary to arrive at an investment decision. Multiple approaches may be taken into account in formulating an overall opinion of a stock; however, each analyst will have his or her own set of favorite techniques based on his or her experience and judgment. Depending on the specifics of the investment discipline, most fundamental and quantitative strategies can be characterized as either bottom-up or top-down.

### **3.1. Bottom-Up Strategies**

Bottom-up strategies begin the asset selection process with data at the individual asset and



company level, such as price momentum and profitability. Bottom-up quantitative investors harness computer power to apply their models to this asset- and company-level information (with the added requirement that the information be quantifiable). The balance of this section illustrates the bottom-up process as used by fundamental investors. These investors typically begin their analysis at the company level before forming an opinion on the wider sector or market. The ability to identify companies with strong or weak fundamentals depends on the analyst's in-depth knowledge of each company's industry, product lines, business plan, management abilities, and financial strength. After identifying individual companies, the bottom-up approach uses economic and financial analysis to assess the intrinsic value of a company and compares that value with the current market price to determine which stocks are undervalued or overvalued. The analyst may also find companies operating efficiently with good prospects even though the industry they belong to is deteriorating. Similarly, companies with poor prospects may be found in otherwise healthy and prosperous industries.

Fundamental investors often focus on one or more of the following parameters for a company, either individually or in relation to its peers:

- business model and branding
- competitive advantages
- company management and corporate governance

Valuation is based on either a discounted cash flow model or a preferred market multiple, often earnings-related. We address each of these parameters and valuation approaches in turn.

## **Business Model and Branding.**

The business model of a company refers to its overall strategy for running the business and generating profit. The business model details how a company converts its resources into products or services and how it delivers those products or services to customers. Companies with a superior business model compete successfully, have scalability, and generate significant earnings. Further, companies with a robust and adaptive business model tend to outperform their peers in terms of return on shareholder equity. The business model gives investors insight into a company's value proposition, its operational flow, the structure of its value chain, its branding strategy, its market segment, and the resulting revenue generation and profit margins. This insight helps investors evaluate the sustainability of the company's competitive advantages and make informed investment decisions.

Corporate branding is a way of defining the company's business for the market in general and retail customers in particular and can be understood as the company's identity as well as its promise to its customers. Strong brand names convey product quality and can give the company an edge over its competitors in both market share and profit margin. It is widely

recognized that brand equity plays an important role in the determination of product price, allowing companies to command price premiums after controlling for observed product differentiation. Apple in consumer technology and BMW in motor vehicles, for example, charge more for their products, but customers are willing to pay the premium because of brand loyalty.

## **Competitive Advantages.**

A competitive advantage typically allows a company to outperform its peers in terms of the return it generates on its capital. There are many types of competitive advantage, such as access to natural resources, superior technology, innovation, skilled personnel, corporate reputation, brand strength, high entry barriers, exclusive distribution rights, and superior product or customer support.

For value investors, who search for companies that appear to be trading below their intrinsic value (often following earnings disappointments), it is important to understand the sustainability of the company's competitive position when assessing the prospects for recovery.

## **Company Management.**

A good management team is crucial to a company's success. Management's role is to allocate resources and capital to maximize the growth of enterprise value for the company's shareholders. A management team that has a long-term rather than a short-term focus is more likely to add value to an enterprise over the long term.

To evaluate management effectiveness, one can begin with the financial statements. Return on assets, equity, or invested capital (compared either to industry peers or to historical rates achieved by the company) and earnings growth over a reasonable time period are examples of indicators used to gauge the value added by management.

Qualitative analysis of the company's management and governance structures requires attention to (1) the alignment of management's interests with those of shareholders to minimize agency problems; (2) the competence of management in achieving the company's objectives (as described in the mission statement) and long-term plans; (3) the stability of the management team and the company's ability to attract and retain high-performing executives; and (4) increasingly, risk considerations and opportunities related to a company's ESG attributes. Analysts also monitor management insider purchases and sales of the company's shares for potential indications of the confidence of management in the company's future.

The above qualitative considerations and financial statement analysis will help in making earnings estimates, cash flow estimates, and evaluations of risk, providing inputs to company valuation. Fundamental strategies within the bottom-up category may use a combination of

approaches to stock valuation. Some investors rely on discounted cash flow or dividend models. Others focus on relative valuation, often based on earnings-related valuation metrics such as a P/E, price to book (P/B), and enterprise value (EV)/EBITDA. A conclusion that a security's intrinsic value is different from its current market price means the valuation is using estimates that are different from those reflected in current market prices. Conviction that the analyst's forecasts are, over a particular time period, more accurate than the market's is therefore important, as is the belief that the market will reflect the more accurate estimates within a time frame that is consistent with the strategy's investment horizon.

Bottom-up strategies are often broadly categorized as either value-based (or value-oriented) or growth-based (or growth-oriented), as the following section explains.

### **3.1.1. Value-Based Approaches**

Benjamin Graham is regarded as the father of value investing. Along with David Dodd, he wrote the book *Security Analysis* (1934), which laid the basic framework for value investing. Graham posited that buying earnings and assets relatively inexpensively afforded a “margin of safety” necessary for prudent investing. Consistent with that idea, value-based approaches aim to buy stocks that are trading at a significant discount to their estimated intrinsic value. Value investors typically focus on companies with attractive valuation metrics, reflected in low earnings (or asset) multiples. In their view, investors' sometimes irrational behavior can make stocks trade below the intrinsic value based on company fundamentals. Such opportunities may arise due to a variety of behavioral biases and often reflect investors' overreaction to negative news. Various styles of value-based investing are sometimes distinguished; for example, “relative value” investors purchase stocks on valuation multiples that are high relative to historical levels but that compare favorably to those of the peer group.

#### **3.1.1.1. Relative Value**

Investors who pursue a relative value strategy evaluate companies by comparing their value indicators (e.g., P/E or P/B multiples) to the average valuation of companies in the same industry sector with the aim of identifying stocks that offer value relative to their sector peers. As different sectors face different market structures and different competitive and regulatory conditions, average sector multiples vary.

**Exhibit 2** lists the key financial ratios for sectors in the Hang Seng Index on the last trading day of 2016. The average P/E for companies in the energy sector is almost five times the average P/E for those in real estate. A consumer staples company trading on a P/E of 12 would appear undervalued relative to its sector, while a real estate company trading on the same P/E multiple of 12 would appear overvalued relative to its sector.

## Exhibit 2. Key Financial Ratios of Hang Seng Index (30 December 2016)

	Weight	Dividend Yield	Price-to- Earnings Ratio (P/E)	Price- to- Cash- Flow Ratio (P/CF)	Price- to- Book Ratio (P/B)	Total Debt Comm Equi (%)
<b>Hang Seng Index</b>	<b>100.0</b>	<b>3.5</b>	<b>12.2</b>	<b>6.1</b>	<b>1.1</b>	<b>128.4</b>
Consumer discretionary	2.9	4.1	21.3	12.5	3.0	26.3
Consumer staples	1.6	2.6	16.8	14.3	3.3	62.1
Energy	7.0	2.6	39.5	3.7	0.9	38.5
Financials	47.5	4.3	10.1	5.0	1.1	199.0
Industrials	5.5	3.8	11.8	6.0	0.9	158.9
Information technology	11.4	0.6	32.7	19.9	8.2	60.2
Real estate	10.6	3.9	8.3	8.0	0.7	30.3
Telecommunication services	7.8	3.2	13.3	4.6	1.4	11.5
Utilities	5.6	3.7	14.2	10.8	1.7	47.0



Source: Bloomberg.

Investors usually recognize that in addition to the simple comparison of a company's multiple to that of the sector, one needs a good understanding of why the valuation is what it is. A premium or discount to the industry may well be justified by the company's fundamentals.

### 3.1.1.2. Contrarian Investing

Contrarian investors purchase and sell shares against prevailing market sentiment. Their investment strategy is to go against the crowd by buying poorly performing stocks at valuations they find attractive and then selling them at a later time, following what they expect to be a recovery in the share price. Companies in which contrarian managers invest are frequently depressed cyclical stocks with low or even negative earnings or low dividend

payments. Contrarians expect these stocks to rebound once the company's earnings have turned around, resulting in substantial price appreciation.

Contrarian investors often point to research in behavioral finance suggesting that investors tend to overweight recent trends and to follow the crowd in making investment decisions. A contrarian investor attempts to determine whether the valuation of an individual company, industry, or entire market is irrational—that is, undervalued or overvalued at any time—and whether that irrationality represents an exploitable mispricing of shares. Accordingly, contrarian investors tend to go against the crowd.

Both contrarian investors and value investors who do not describe their style as contrarian aim to buy shares at a discount to their intrinsic value. The primary difference between the two is that non-contrarian value investors rely on fundamental metrics to make their assessments, while contrarian investors rely more on market sentiment and sharp price movements (such as 52-week high and low prices as sell and buy prices) to make their decisions.

#### **3.1.1.3. High-Quality Value**

Some value-based strategies give valuation close attention but place at least equal emphasis on financial strength and demonstrated profitability. For example, one such investment discipline requires a record of consistent earnings power, above-average return on equity, financial strength, and exemplary management. There is no widely accepted label for this value style, the refinement of which is often associated with investor Warren Buffett.<sup>2</sup>

#### **3.1.1.4. Income Investing**

The income investing approach focuses on shares that offer relatively high dividend yields and positive dividend growth rates. Several rationales for this approach have been offered. One argument is that a secure, high dividend yield tends to put a floor under the share price in the case of companies that are expected to maintain such a dividend. Another argument points to empirical studies that demonstrate the higher returns to equities with these characteristics and their greater ability to withstand market declines.

#### **3.1.1.5. Deep-Value Investing**

A value investor with a deep-value orientation focuses on undervalued companies that are available at extremely low valuation relative to their assets (e.g., low P/B). Such companies are often those in financial distress. The rationale is that market interest in such securities may be limited, increasing the chance of informational inefficiencies. The deep-value investor's special area of expertise may lie in reorganizations or related legislation, providing a better position from which to assess the likelihood of company recovery.

### **3.1.1.6. Restructuring and Distressed Investing**

While the restructuring and distressed investment strategies are more commonly observed in the distressed-debt space, some equity investors specialize in these disciplines. Opportunities in restructuring and distressed investing are generally counter cyclical relative to the overall economy or to the business cycle of a particular sector. A weak economy generates increased incidence of companies facing financial distress. When a company is having difficulty meeting its short-term liabilities, it will often propose to restructure its financial obligations or change its capital structure.

Restructuring investors seek to purchase the debt or equity of companies in distress. A distressed company that goes through restructuring may still have valuable assets, distribution channels, or patents that make it an attractive acquisition target. Restructuring investing is often done before an expected bankruptcy or during the bankruptcy process. The goal of restructuring investing is to gain control or substantial influence over a company in distress at a large discount and then restructure it to restore a large part of its intrinsic value.

Effective investment in a distressed company depends on skill and expertise in identifying companies whose situation is better than the market believes it to be. Distressed investors assume that either the company will survive or there will be sufficient assets remaining upon liquidation to generate an appropriate return on investment.

### **3.1.1.7. Special Situations**

The “special situations” investment style focuses on the identification and exploitation of mispricings that may arise as a result of corporate events such as divestitures or spinoffs of assets or divisions or mergers with other entities. In the opinion of many investors such situations represent short-term opportunities to exploit mispricing that result from such special situations. According to [Greenblatt \(2010\)](#), investors often overlook companies that are in such special situations as restructuring (involving asset disposals or spinoffs) and mergers, which may create opportunities to add value through active investing. To take advantage of such opportunities, this type of investing requires specific knowledge of the industry and the company, as well as legal expertise.

## **3.1.2. Growth-Based Approaches**

Growth-based investment approaches focus on companies that are expected to grow faster than their industry or faster than the overall market, as measured by revenues, earnings, or cash flow. Growth investors usually look for high-quality companies with consistent growth or companies with strong earnings momentum. Characteristics usually examined by growth investors include historical and estimated future growth of earnings or cash flows, underpinned by attributes such as a solid business model, cost control, and exemplary

management able to execute long-term plans to achieve higher growth. Such companies typically feature above-average return on equity, a large part of which they retain and reinvest in funding future growth. Because growth companies may also have volatile earnings and cash flows going forward, the intrinsic values calculated by discounting expected future cash flows are subject to relatively high uncertainty. Compared to value-focused investors, growth-focused investors have a higher tolerance for above-average valuation multiples.

GARP (growth at a reasonable price) is a sub-discipline within growth investing. This approach is used by investors who seek out companies with above-average growth that trade at reasonable valuation multiples, and is often referred to as a hybrid of growth and value investing. Many investors who use GARP rely on the P/E-to-growth (PEG) ratio—calculated as the stock’s P/E divided by the expected earnings growth rate (in percentage terms)—while also paying attention to variations in risk and duration of growth.

EXAMPLE 2

Characteristic Securities for Bottom-Up Investment Disciplines

The following table provides information on four stocks.

Company	Price	12-Month Forward EPS	3-Year EPS Growth Forecast	Dividend Yield	Industry Sector	Sector Average P/E
A	50	5	20%	1%	Industrial	10
B	56	2	2%	0%	Information technology	35
C	22	10	−5%	2%	Consumer staples	15
D	32	2	2%	8%	Utilities	16

Using only the information given in the table above, for each stock, determine which fundamental investment discipline would most likely select it.

Solution:

■ Company A’s forward P/E is  $50/5 = 10$ , and its P/E-to-growth ratio (PEG) is  $10/20$

= 0.5, which is lower than the PEGs for the other companies ( $28/2 = 14$  for Company B, negative for Company C, and  $16/2 = 8$  for Company D). Given the favorable valuation relative to growth, the company is a good candidate for investors who use GARP.

- Company B's forward P/E is  $56/2 = 28$ , which is lower than the average P/E of 35 for its sector peers. The company is a good candidate for the relative value approach.
- Company C's forward P/E is  $22/10 = 2.2$ , which is considered very low in both absolute and relative terms. Assuming the investor pays attention to company circumstances, the stock could be a good candidate for the deep-value approach.
- Company D's forward P/E is  $32/2 = 16$ , which is the same as its industry average. Company D's earnings are growing slowly at 2%, but the dividend yield of 8% appears high. This combination makes the company a good candidate for income investing.

### EXAMPLE 3

## Growth vs. Value

Tencent Holdings Limited is a leading provider of value-added internet services in China. The company's services include social networks, web portals, e-commerce, and multiplayer online games.

Exhibit 3 shows an excerpt from an analyst report on Tencent published following the release of the company's Q3 2016 results on 16 November 2016.

### Exhibit 3. Financial Summary and Valuation for Tencent Holdings Limited

Market Data: 16 November 2016			2014	2015	2016E
Closing price	196.9	Revenue (RMB millions)	78,932	102,863	150,996
Price target	251.5	YOY (%)	30.60	30.32	46.79



HSCEI	9,380	Net income (RMB millions)	23,810	28,806	42,292
HSCCI	3,669	YOY (%)	53.49	21.85	46.76
52-Week high/low	132.10/220.8	EPS (RMB)	2.58	3.10	4.56
Market cap (USD millions)	240,311	Diluted EPS (RMB)	2.55	3.06	4.51
Market cap (HKD millions)	1,864,045	ROE (%)	29.09	23.84	26.11
Shares outstanding (millions)	9,467	Debt/Assets (%)	52.02	60.20	61.33
Exchange rate (RMB/HKD)	0.8857	Dividend yield (%)	0.20	0.20	0.28
		P/E	54.78	55.17	38.27
		P/B	22.31	19.35	13.39
		EV/EBITDA	40.79	35.88	28.06

Notes: Market data are quoted in HKD; the company's filing is in RMB. Diluted EPS is calculated as if all outstanding convertible securities (such as convertible preferred shares, convertible debentures, stock options, and warrants) were exercised. P/E is calculated as closing price divided by each year's EPS.

Source: SWS Research.

From the perspective of the date of [Exhibit 3](#):

1. Which metrics would support a decision to invest by a growth investor?
2. Which characteristics would a growth investor tend to weigh less heavily than a high-quality value investor?

### Solution to 1:

A growth investor would focus on the following:

- The year-over-year change in revenue exceeded 30% in 2014 and 2015 and is expected to accelerate over 2016–2018.
- Past and expected net income growth rates are also high.

### **Solution to 2:**

A growth investor would tend to be less concerned about the relatively high valuation levels (high P/E, P/B, and EV/EBITDA) and low dividend yield.

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## **4. TOP-DOWN STRATEGIES**

### **c. analyze top-down active strategies, including their rationale and associated processes**

As the name suggests, in contrast to bottom-up strategies, top-down strategies use an investment process that begins at a top or macro level. Instead of focusing on individual company- and asset-level variables in making investment decisions, top-down portfolio managers study variables affecting many companies, such as the macroeconomic environment, demographic trends, and government policies. These managers often use instruments such as futures contracts, ETFs, swaps, and custom baskets of individual stocks to capture macro dynamics and generate portfolio return. Some bottom-up stock pickers also incorporate top-down analysis as part of their process for arriving at investment decisions. A typical method of incorporating both top-down macroeconomic and bottom-up fundamental processes is to have the portfolio strategist set the target country and sector weights. Portfolio managers then construct stock portfolios that are consistent with these preset weights.

### **4.1. Country and Geographic Allocation to Equities**

Investors using country allocation strategies form their portfolios by investing in different geographic regions depending on their assessment of the regions' prospects. For example, the manager may have a preference for a particular region and may establish a position in that region while limiting exposure to others. Managers of global equity funds may, for example, make a decision based on a tradeoff between the US equity market and the European equity

market, or they may allocate among all investable country equity markets using futures or ETFs. Such strategies may also seek to track the overall supply and demand for equities in regions or countries by analyzing the aggregate volumes of share buybacks, investment fund flows, the volumes of initial public offerings, and secondary share issuance.

The country or geographic allocation decision itself can be based on both top-down macroeconomic and bottom-up fundamental analysis. For example, just as economic data for a given country are available, the market valuation of a country can be calculated by aggregating all company earnings and market capitalization.

## **4.2. Sector and Industry Rotation**

Just as one can formulate a strategy that allocates to different countries or regions in an investment universe, one can also have a view on the expected returns of various sectors and industries across borders. Industries that are more integrated on a global basis—and therefore subject to global supply and demand dynamics—are more suitable to global sector allocation decisions. Examples of such industries include information technology and energy. On the other hand, sectors and industries that are more local in nature to individual countries are more suitable to sector allocation within a country. Examples of these industries are real estate and consumer staples. The availability of sector and industry ETFs greatly facilitates the implementation of sector and industry rotation strategies for those portfolio managers who cannot or do not wish to implement such strategies by investing in individual stocks.

As with country and geographic allocation, both top-down macroeconomic and bottom-up fundamental variables can be used to predict sector/industry returns. Many bottom-up portfolio managers also add a top-down sector overlay to their portfolios.

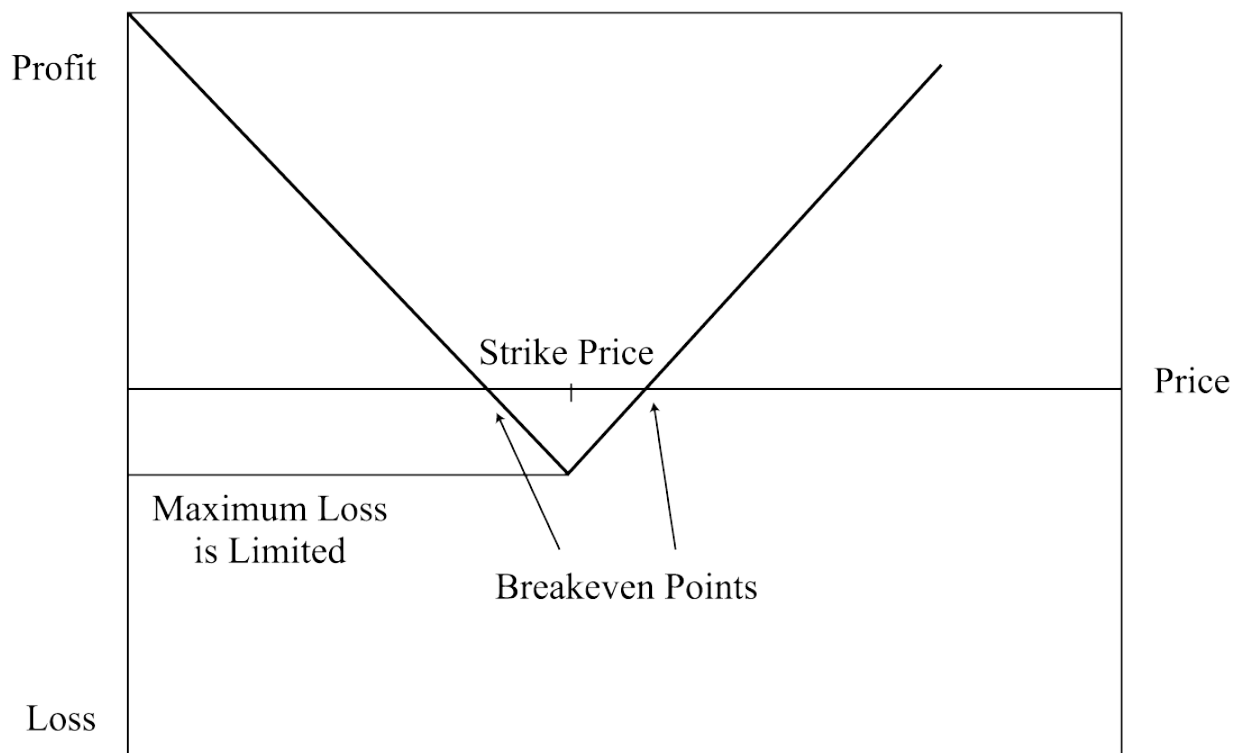
## **4.3. Volatility-Based Strategies**

Another category of top-down equity strategies is based on investors' view on volatility and is usually implemented using derivative instruments. Those managers who believe they have the skill to predict future market volatility better than option-implied volatility (reflected, for example, in the VIX Index) can trade the VIX futures listed on the CBOE Futures Exchange (CFE), trade instruments such as index options, or enter into volatility swaps (or variance swaps).

Let's assume that an investor predicts a major market move, not anticipated by others, in the near term. The investor does not have an opinion on the direction of the move and only expects the index volatility to be high. The investor can use an index straddle strategy to capitalize on his or her view. Entering into an index straddle position involves the purchase

of call and put options (on the same underlying index) with the same strike price and expiry date. The success of this long straddle strategy depends on whether or not volatility turns out to be higher than anticipated by the market; the strategy incurs losses when the market stays broadly flat. [Exhibit 4](#) shows the payoff of such an index straddle strategy. The maximum loss of the long straddle is limited to the total call and put premiums paid.

**Exhibit 4. Payoff Pattern of a Classic Long Straddle Strategy**



## 4.4. Thematic Investment Strategies

Thematic investing is another broad category of strategies. Thematic strategies can use broad macroeconomic, demographic, or political drivers, or bottom-up ideas on industries and sectors, to identify investment opportunities. Disruptive technologies, processes, and regulations; innovations; and economic cycles present investment opportunities and also pose challenges to existing companies. Investors constantly search for new and promising ideas or themes that will drive the market in the future.

It is also important to determine whether any new trend is structural (and hence long-term) or short-term in nature. Structural changes can have long-lasting impacts on the way people behave or a market operates. For example, the development of smartphones and tablets and

the move towards cloud computing are probably structural changes. On the other hand, a manager might attempt to identify companies with significant sales exposure to foreign countries as a way to benefit from short-term views on currency movements. The success of a structural thematic investment depends equally on the ability to take advantage of future trends and the ability to avoid what will turn out to be merely fashionable for a limited time, unless the strategy specifically focuses on short-term trends. Further examples of thematic investment drivers include new technologies, mobile communication and computing devices, clean energy, fintech, and advances in medicine.

## Implementation of Top-Down Investment Strategies

A global equity portfolio manager with special insights into particular countries or regions can tactically choose to overweight or underweight those countries or regions on a short-term basis. Once the country or region weights are determined by a top-down process, the portfolio can be constructed by selecting stocks in the relevant countries or regions.

A portfolio manager with expertise in identifying drivers of sector or industry returns will establish a view on those drivers and will set weights for those sectors in a portfolio. For example, the performance of the energy sector is typically driven by the price of crude oil. The returns of the materials sector rest on forecasts for commodity prices. The consumer and industrials sectors require in-depth knowledge of the customer–supplier chains and a range of other dynamics. Once a view is established on the return and risk of each sector, a manager can then decide which industries to invest in and what weightings to assign to those industries relative to the benchmark.

The significant growth of passive factor investing—sometimes marketed as “smart beta” products—has given portfolio managers more tools and flexibility for investing in different equity styles. One can exploit the fact, for example, that high-quality stocks tend to perform well in recessions, or that cyclical deep-value companies are more likely to deliver superior returns in a more “risk-on” environment, in which the market becomes less risk-averse. For example, where the investment mandate permits, top-down managers can choose among different equity style ETFs and structured products to obtain risk exposures that are consistent with their views on different stages of the economic cycle or their views on market sentiment.

# Portfolio Overlays

Bottom-up fundamental strategies often lead to unintended macro (e.g., sector or country) risk exposures. However, bottom-up fundamental investors can incorporate some of the risk control benefits of top-down investment strategies via portfolio overlays. (A **portfolio overlay** is an array of derivative positions managed separately from the securities portfolio to achieve overall portfolio characteristics that are desired by the portfolio manager.) The fundamental investor's sector weights, for example, may vary from the benchmark's weights as a result of the stock selection process even though the investor did not intend to make sector bets. In that case, the investor may be able to adjust the sector weights to align with the benchmark's weights via long and short positions in derivatives. In this way, top-down strategies can be effective in controlling risk exposures. Overlays can also be used to attempt to add active returns that are not correlated with those generated by the underlying portfolio strategy.

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## 5. FACTOR-BASED STRATEGIES: OVERVIEW

### **d. analyze factor-based active strategies, including their rationale and associated processes**

A factor is a variable or characteristic with which individual asset returns are correlated. It can be broadly defined as any variable that is believed to be valuable in ranking stocks for investment and in predicting future returns or risks. A wide range of security characteristics have been used to define “factors.” Some factors (most commonly, size, value, momentum, and quality) have been shown to be positively associated with a long-term return premium and are often referred to as *rewarded* factors. In fact, hundreds of factors have been identified and used in portfolio construction, but a large number have not been empirically proven to offer a persistent return premium (some call these *unrewarded* factors).

Broadly defined, a factor-based strategy aims to identify significant factors that can predict future stock returns and to construct a portfolio that tilts towards such factors. Some strategies rely on a single factor, are transparent, and maintain a relatively stable exposure to that factor with regular rebalancing (as is explained in the curriculum reading on passive

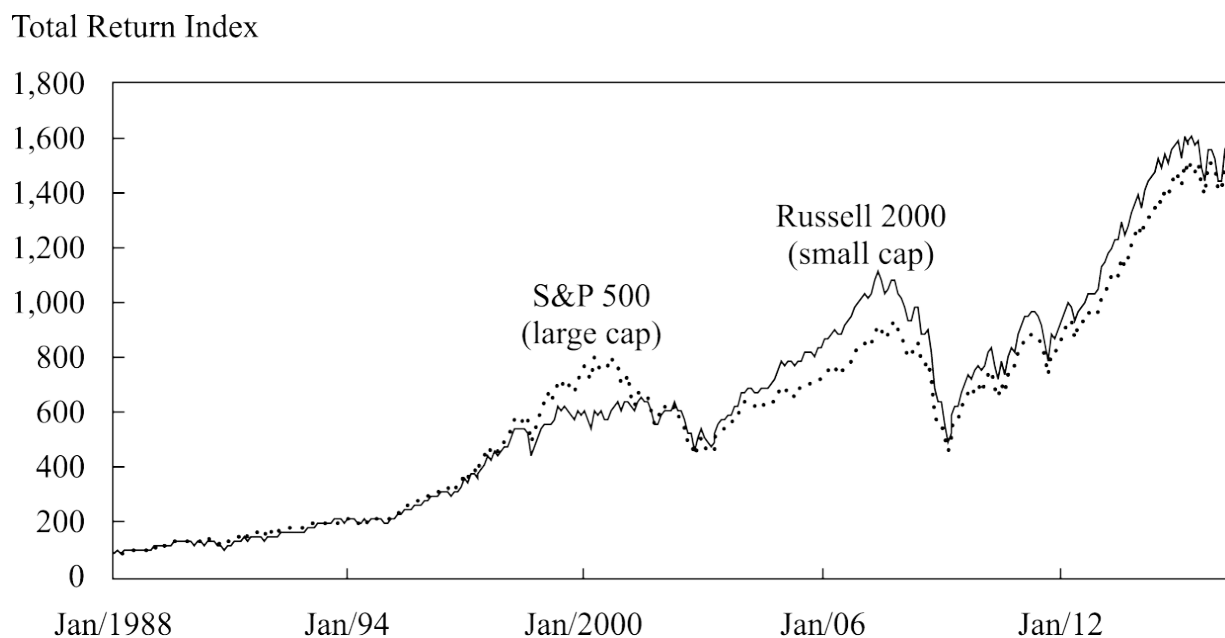
equity investing). Other strategies rely on a selection of factors. Yet other strategies may attempt to time the exposure to factors, recognizing that factor performance varies over time.

For new factor ideas, analysts and managers of portfolios that use factor strategies often rely on academic research, working papers, in-house research, and external research performed by entities such as investment banks. The following exhibits illustrate how some of the traditional style factors performed in recent decades, showing the varying nature of returns.

**Exhibit 5** shows the cumulative performance of large-cap versus small-cap US equities, using the S&P 500 and Russell 2000 total return indexes. **Exhibit 6** presents the total returns of value (Russell 1000 Value Index) versus growth (Russell 1000 Growth Index) styles. Over the 28 years from January 1988 to April 2016, small-cap stocks earned marginally higher returns than large-cap stocks, but with significantly higher risk. Value and growth styles produce about the same return, but growth equities seem to be slightly more volatile (see **Exhibit 7**).

Equity style rotation strategies, a subcategory of factor investing, are based on the belief that different factors—such as size, value, momentum, and quality—work well during some time periods but less well during other time periods. These strategies use an investment process that allocates to stock baskets representing each of these styles when a particular style is expected to offer a positive excess return compared to the benchmark. While style rotation as a strategy can be used in both fundamental and quantitative investment processes, it is generally more in the domain of quantitative investing. Unlike sector or country allocation, discussed earlier, the classification of securities into style categories is less standardized.

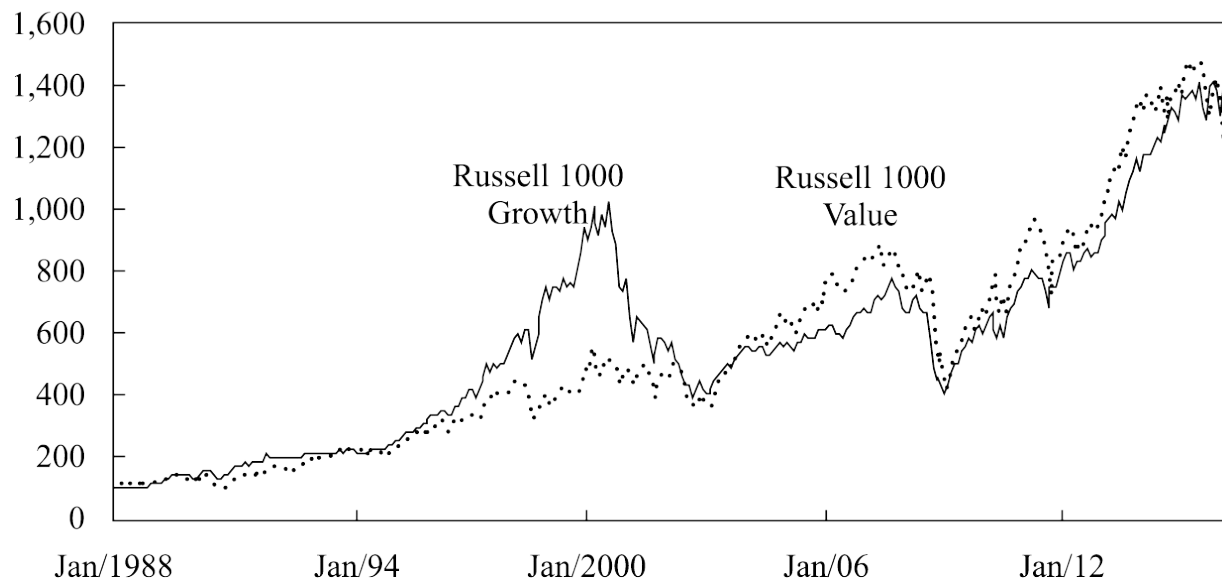
### Exhibit 5. Large-Cap vs. Small-Cap Equities



Sources: S&P, FTSE Russell.

## Exhibit 6. Value vs. Growth Equities

Total Return Index



Sources: S&P, FTSE Russell.

## Exhibit 7. Summary Statistics

	<b>S&amp;P 500</b>	<b>Russell 2000</b>	<b>Russell 1000 Value</b>	<b>Russell 1000 Growth</b>
Annual return (%)	10.7	11.1	10.9	10.7
Annual volatility (%)	14.4	18.7	14.2	16.4
Sharpe Ratio	0.74	0.59	0.77	0.65

Sources: S&P, FTSE Russell.

The most important test, however, is the “smell” test: Does the factor make intuitive sense? A factor can often pass statistical backtesting, but if it does not make common sense—if justification for the factor’s efficacy is lacking—then the manager may be data-mining.



Investors should always remember that impressive performance in backtesting does not necessarily imply that the factor will continue to add value in the future.

An important step is choosing the appropriate investment universe. Practitioners mostly define their investment universe in terms of well-known broad market indexes—for the United States, for example, the S&P 500, Russell 3000, and MSCI World Index. Using a well-defined index has several benefits: Such indexes are free from look-ahead and survivorship biases, the stocks in the indexes are investable with sufficient liquidity, and the indexes are also generally free from foreign ownership restrictions.

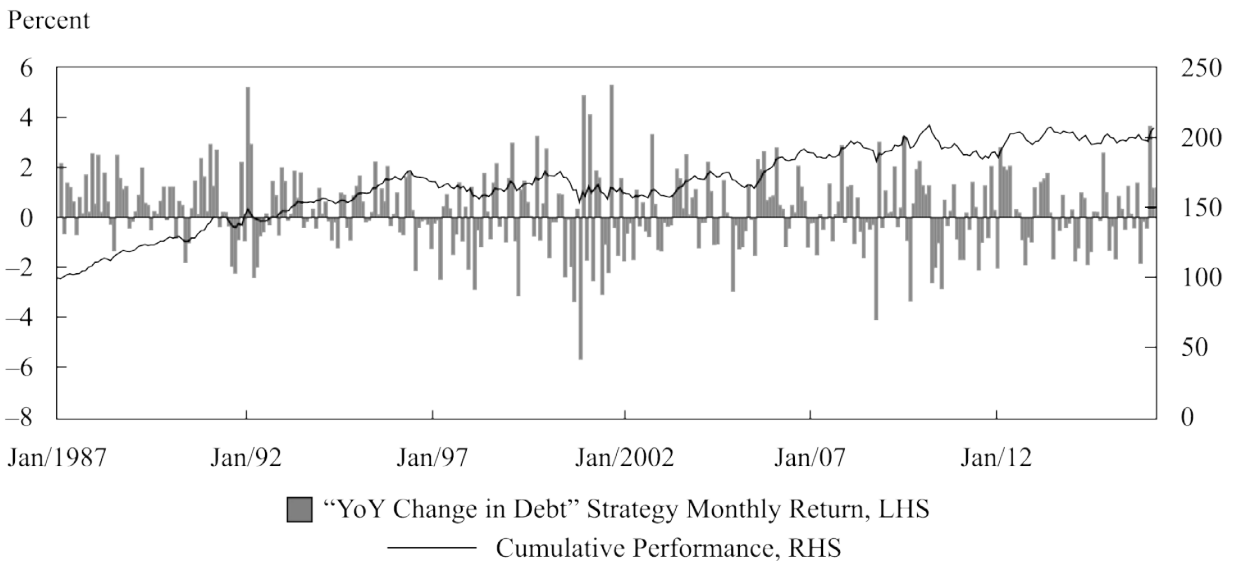
The most traditional and widely used method for implementing factor-based portfolios is the hedged portfolio approach, pioneered and formulated by [Fama and French \(1993\)](#). In this approach, after choosing the factor to be scrutinized and ranking the investable stock universe by that factor, investors divide the universe into groups referred to as *quantiles* (typically quintiles or deciles) to form quantile portfolios. Stocks are either equally weighted or capitalization weighted within each quantile. A long/short hedged portfolio is typically formed by going long the best quantile and shorting the worst quantile. The performance of the hedged long/short portfolio is then tracked over time.

There are a few drawbacks to this “hedged portfolio” approach. First, the information contained in the middle quantiles is not utilized, as only the top and bottom quantiles are used in forming the hedged portfolio. Second, it is implicitly assumed that the relationship between the factor and future stock returns is linear (or at least monotonic), which may not be the case.<sup>3</sup> Third, portfolios built using this approach tend to be concentrated, and if many managers use similar factors, the resulting portfolios will be concentrated in specific stocks. Fourth, the hedged portfolio requires managers to short stocks. Shorting may not be possible in some markets and may be overly expensive in others. Fifth, and most important, the hedged portfolio is not a “pure” factor portfolio because it has significant exposures to other risk factors.

[Exhibit 8](#) shows the performance of a factor called “year-over-year change in debt outstanding.” The factor is calculated by taking the year-over-year percentage change in the per share long-term debt outstanding on the balance sheet, using all stocks in the Russell 3000 universe. The portfolio is constructed by buying the top 10% of companies that reduce their debt and shorting the bottom 10% of companies that issue the most debt. Stocks in both the long and short portfolios are equally weighted.<sup>4</sup> The bars in the chart indicate the monthly portfolio returns. The average monthly return of the strategy is about 0.22% (or 2.7% per year), and the Sharpe ratio is 0.53 over the test period. All cumulative performance

is computed on an initial investment in the factor of \$100, with monthly rebalancing and excluding transaction costs.

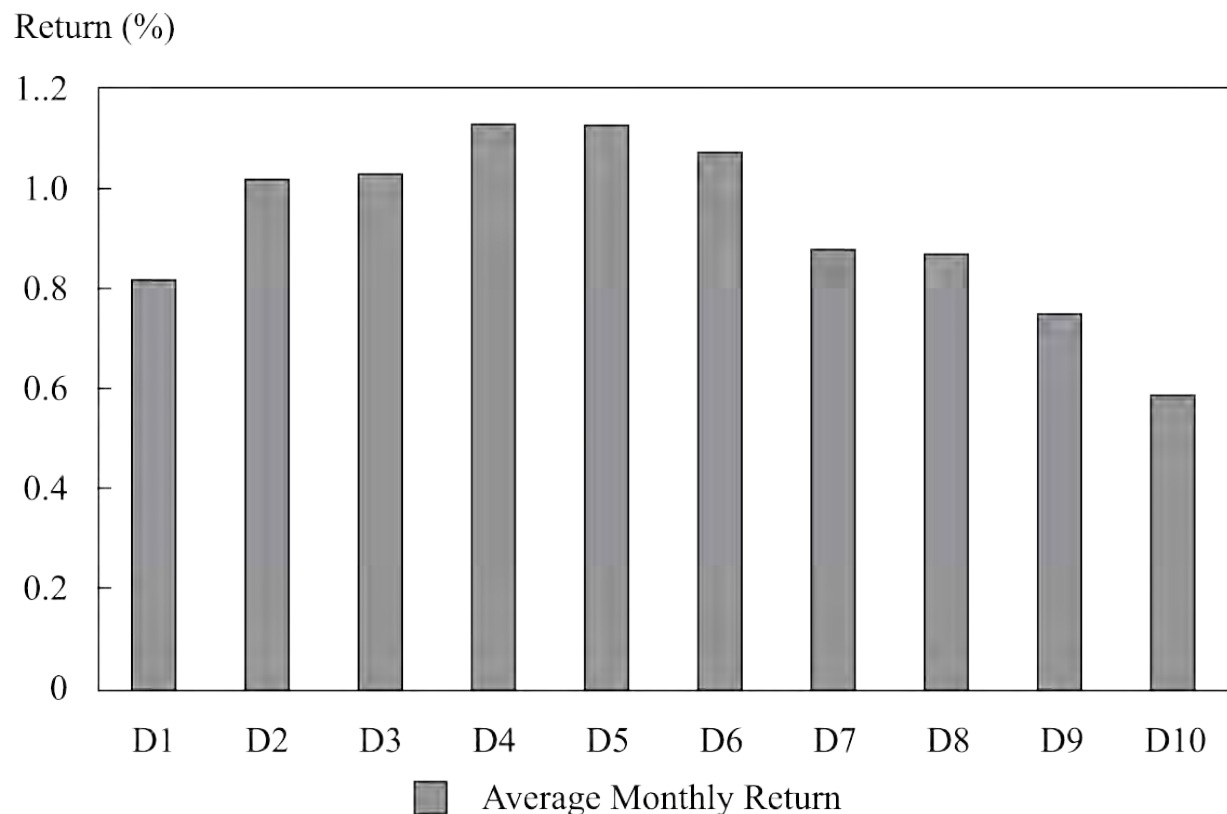
### Exhibit 8. Hedged Portfolio Return, “Year-over-Year Change in Debt Outstanding” Strategy



Sources: Compustat, FTSE Russell.

Exhibit 9 shows the average monthly returns of the 10 decile portfolios. It shows that companies with the highest year-over-year increase in debt financing (D10 category) marginally underperform companies with the lowest year-over-year increase in debt financing (average monthly return of 0.6% versus average monthly return of 0.8%). However, it can also be seen that the best-performing companies are the ones with reasonable financial leverage in Deciles 3 to 6. A long/short hedged portfolio approach based on the 1st and 10th deciles (as illustrated in Exhibit 9) would not take advantage of this information, as stocks in these deciles would not be used in such a portfolio. Portfolio managers observing this pattern concerning the different deciles could change the deciles used in the strategy if they believed the pattern would continue into the future.

### Exhibit 9. Average Decile Portfolio Return Based on Year-over-Year Change in Debt Outstanding



Sources: Compustat, FTSE Russell.

For investors who desire a long-only factor portfolio, a commonly used approach is to construct a factor-tilting portfolio, where a long-only portfolio with exposures to a given factor can be built with controlled tracking error. The factor-tilting portfolio tracks a benchmark index closely but also provides exposures to the chosen factor. In this way, it is similar to an enhanced indexing strategy.

A “factor-mimicking portfolio,” or FMP, is a theoretical implementation of a pure factor portfolio. An FMP is a theoretical long/short portfolio that is dollar neutral with a unit exposure to a chosen factor and no exposure to other factors. Because FMPs invest in almost every single stock, entering into long or short positions without taking into account short availability issues or transaction costs, they are very expensive to trade. Managers typically construct the pure factor portfolio by following the FMP theory but adding trading liquidity and short availability constraints.

## 6. FACTOR-BASED STRATEGIES: STYLE FACTORS

#### **d. analyze factor-based active strategies, including their rationale and associated processes**

Factors are the raw ingredients of quantitative investing and are often referred to as signals. Quantitative managers spend a large amount of time studying factors. Traditionally, factors have been based on fundamental characteristics of underlying companies. However, many investors have recently shifted their attention to unconventional and unstructured data sources in an effort to gain an edge in creating strategies.

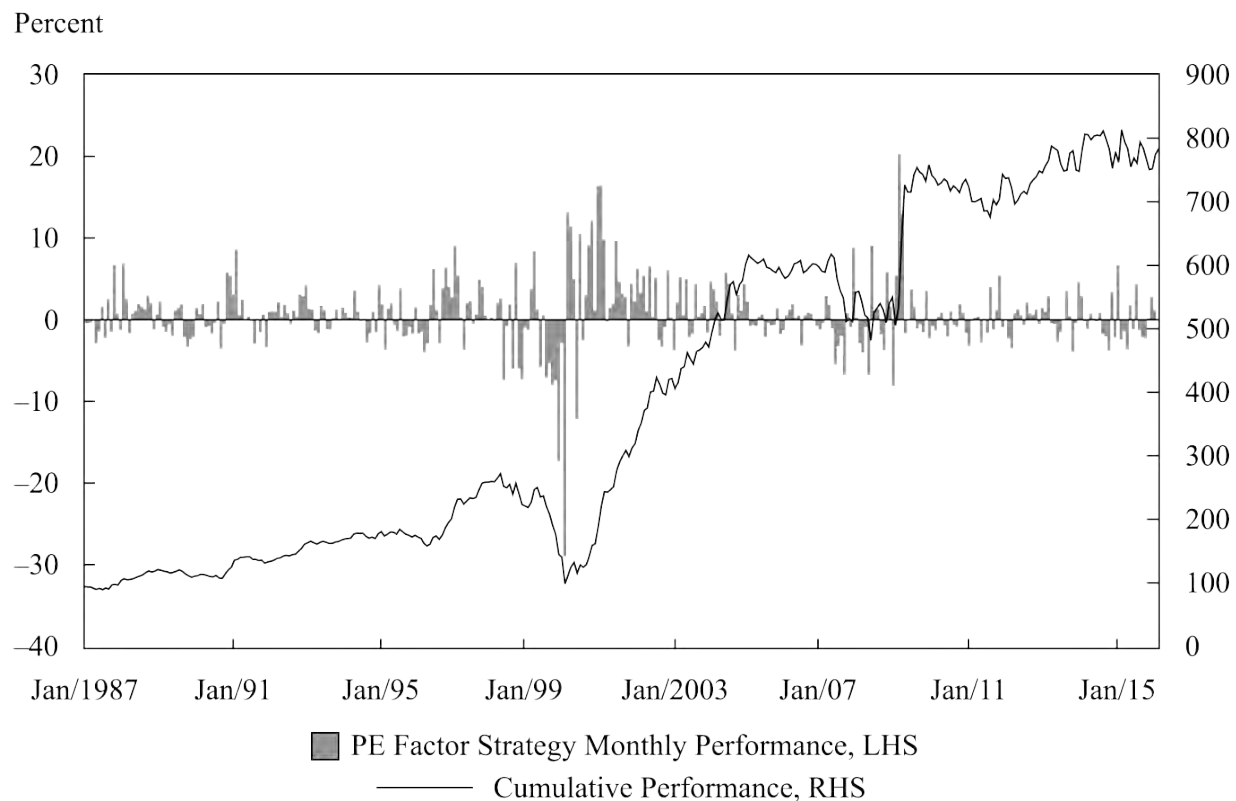
## **6.1. Value**

Value is based on [Graham and Dodd's \(1934\)](#) concept and can be measured in a number of ways. The academic literature has a long history of documenting the value phenomenon. [Basu \(1977\)](#) found that stocks with low P/E or high earnings yield tend to provide higher returns. [Fama and French \(1993\)](#) formally outlined value investing by proposing the book-to-market ratio as a way to measure value and growth.

Although many academics and practitioners believe that value stocks tend to deliver superior returns, there has been considerable disagreement over the explanation of this effect. [Fama and French \(1992, 1993, 1996\)](#) suggested that the value premium exists to compensate investors for the greater likelihood that these companies will experience financial distress. [Lakonishok, Shleifer, and Vishny \(1994\)](#) cited behavioral arguments, suggesting that the effect is a result of behavioral biases on the part of the typical investor rather than compensation for higher risk.

Value factors can also be based on other fundamental performance metrics of a company, such as dividends, earnings, cash flow, EBIT, EBITDA, and sales. Investors often add two more variations on most value factors by adjusting for industry (and/or country) and historical differences. Most valuation ratios can be computed using either historical (also called *trailing*) or forward metrics. [Exhibit 10](#) shows the performance of the price-to-earnings multiple factor implemented as a long/short decile portfolio.

### **Exhibit 10. Performance of the P/E Factor (Long/Short Decile Portfolio)**



Sources: Compustat, FTSE Russell.

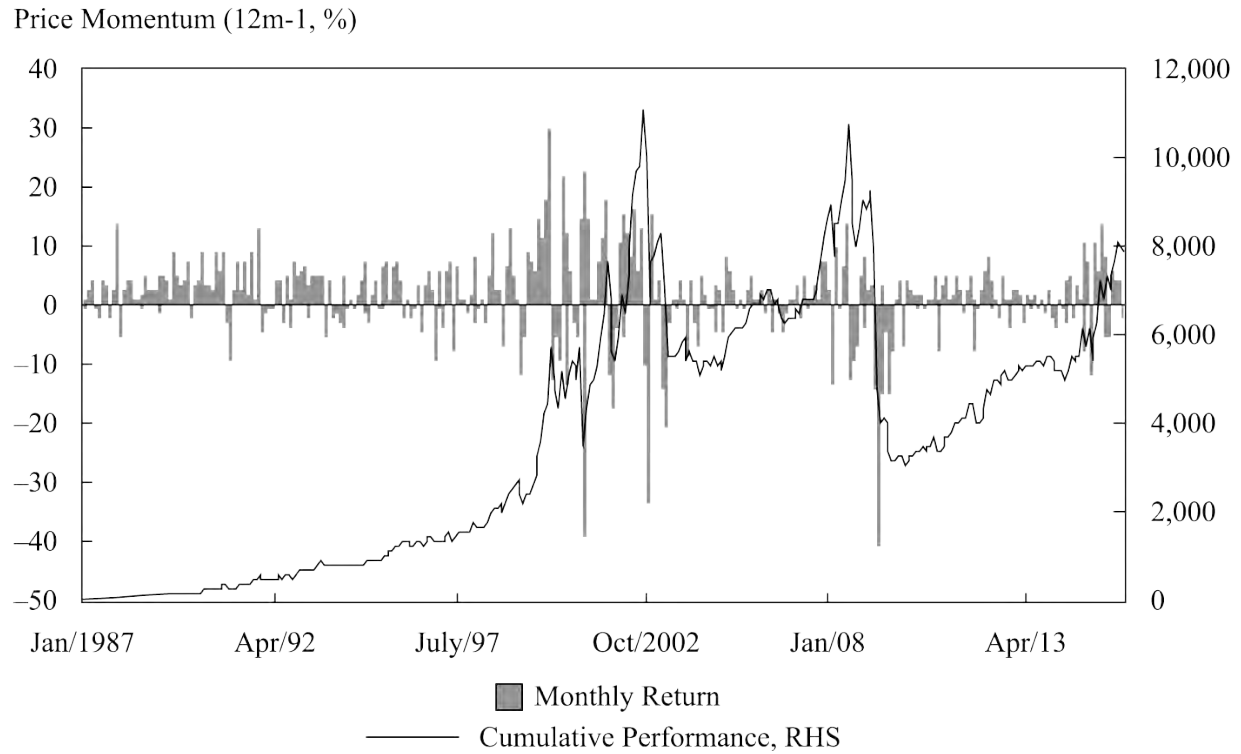
## 6.2. Price Momentum

Researchers have also found a strong price momentum effect in almost all asset classes in most countries. In fact, value and price momentum have long been the two cornerstones of quantitative investing.

**Jegadeesh and Titman (1993)** first documented that stocks that are “winners” over the previous 12 months tend to outperform past “losers” (those that have done poorly over the previous 12 months) and that such outperformance persists over the following 2 to 12 months. The study focused on the US market during the 1965–1989 period. The authors also found a short-term reversal effect, whereby stocks that have high price momentum in the previous month tend to underperform over the next 2 to 12 months. This price momentum anomaly is commonly attributed to behavioral biases, such as overreaction to information.<sup>5</sup> It is interesting to note that since the academic publication of these findings, the performance of the price momentum factor has become much more volatile (see [Exhibit 11](#)). Price momentum is, however, subject to extreme tail risk. Over the three-month March–May 2009 time period, the simple price momentum strategy (as measured by the long/short decile portfolio) lost 56%. For this data period, some reduction in downside risk can be achieved by removing the effect of sector exposure from momentum factor returns: We will call this

modified version the “sector-neutralized price momentum factor.”<sup>6</sup> The results are shown in Exhibits 12 and 13 for US, European, and Japanese markets.

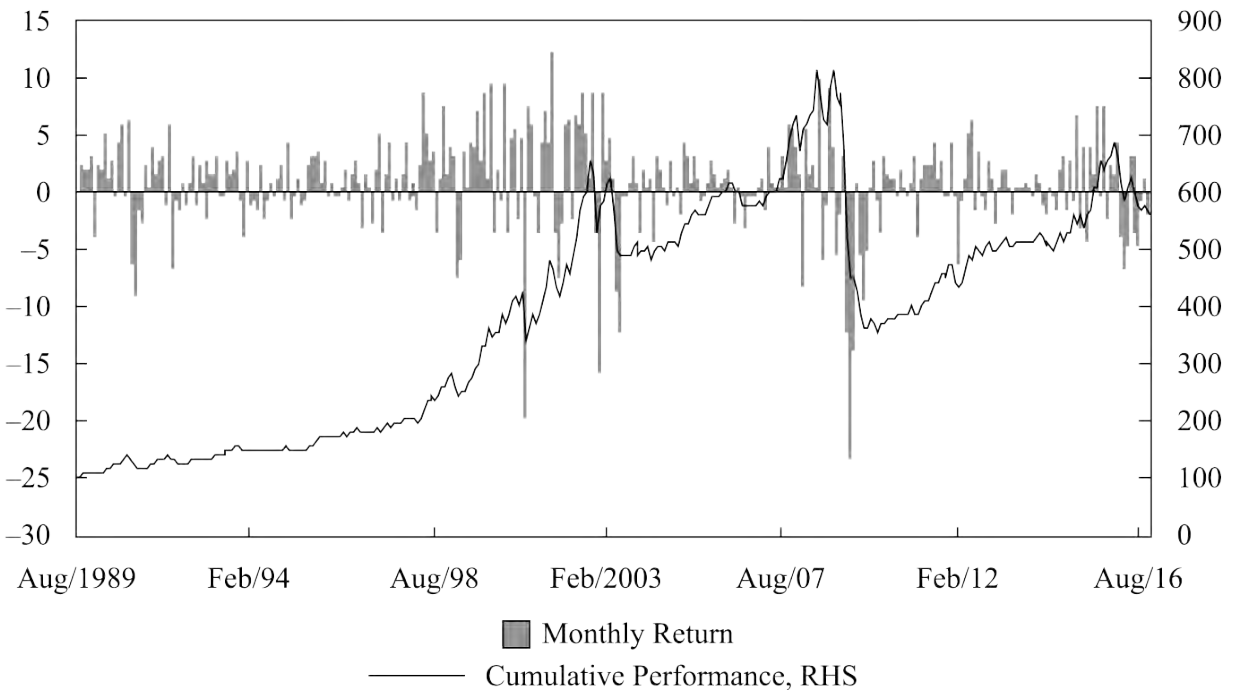
### Exhibit 11. Performance of the Price Momentum Factor (Long/Short Decile Portfolio)



Sources: Compustat, FTSE Russell.

### Exhibit 12. Performance of the Sector-Neutralized Price Momentum Factor (Long/Short Decile Portfolio)

### Sector Neutral Momentum

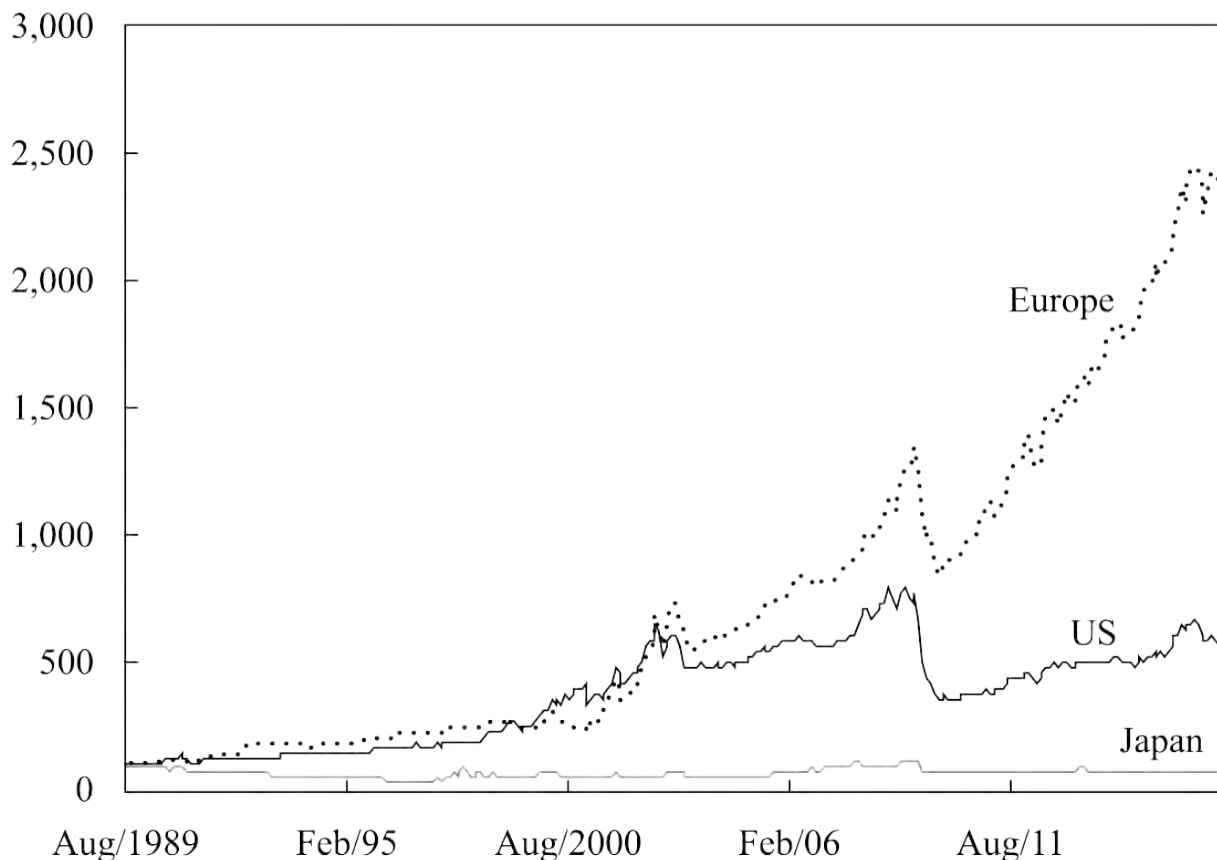


Sources: Compustat, FTSE Russell.

**Exhibit 13** extends the analysis to include European and Japanese markets, where a similar effect on downside risk can be shown to have been operative over the period.

**Exhibit 13. Performance of the Sector-Neutralized Price Momentum Factor in US, European, and Japanese Markets (Long/Short Decile Portfolio)**

## Cumulative Performance



Sources: Compustat, FTSE Russell.

### EXAMPLE 4

## Factor Investing

A quantitative manager wants to expand his current strategy from US equities into international equity markets. His current strategy uses a price momentum factor. Based on [Exhibit 13](#):

1. State whether momentum has been a factor in European and Japanese equity returns overall in the time period examined.
2. Discuss the potential reasons why neutralizing sectors reduces downside risk.

### Solution to 1:

As shown in [Exhibit 13](#), price momentum has performed substantially better in Europe than in the United States. On the other hand, there does not appear to be any meaningful



pattern of price momentum in Japan. **Exhibit 13** suggests that the price momentum factor could be used for a European portfolio but not for a Japanese portfolio. However, managers need to perform rigorous backtesting before they can confidently implement a factor model in a market that they are not familiar with. Managers should be aware that what appears to be impressive performance in backtests does not necessarily imply that the factor will continue to add value in the future.

### **Solution to 2:**

Using the simple price momentum factor means that a portfolio buys past winners and shorts past losers. The resulting portfolio could have exposure to potentially significant industry bets. Sector-neutral price momentum focuses on stock selection without such risk exposures and thus tends to reduce downside risk.

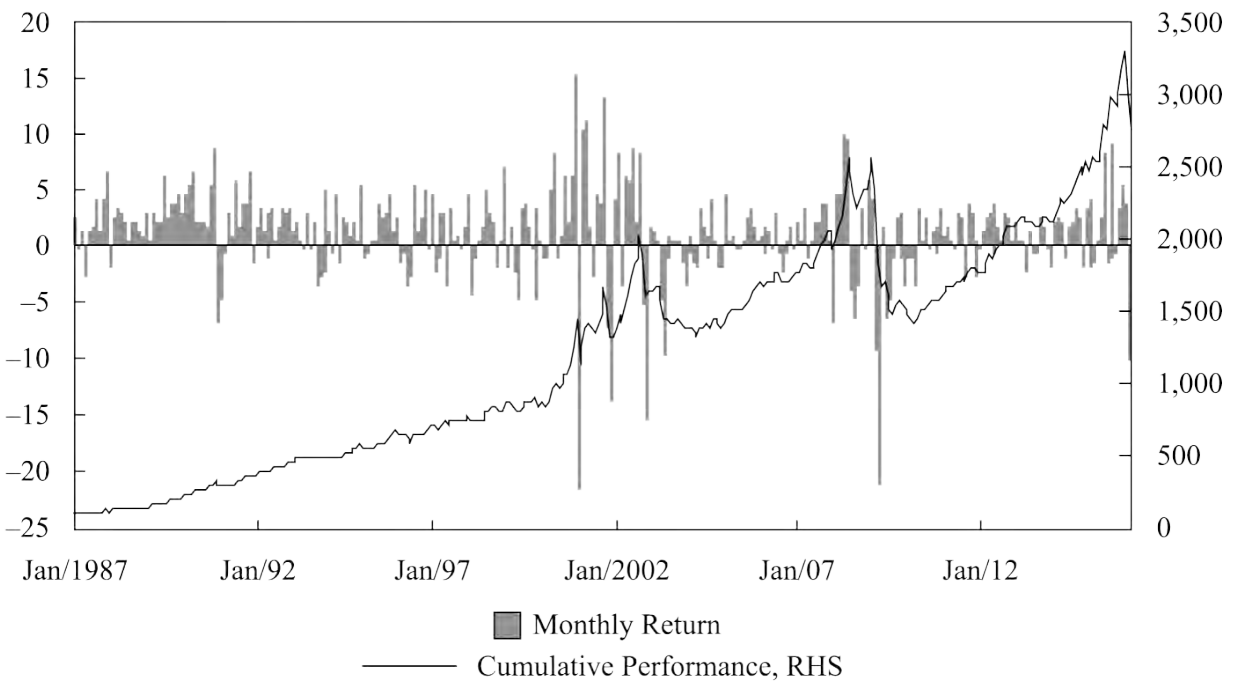
## **6.3. Growth**

Growth is another investment approach used by some style investors. Growth factors aim to measure a company's growth potential and can be calculated using the company's historical growth rates or projected forward growth rates. Growth factors can also be classified as short-term growth (last quarter's, last year's, next quarter's, or next year's growth) and long-term growth (last five years' or next five years' growth). While higher-than-market or higher-than-sector growth is generally considered to be a possible indicator for strong future stock price performance, the growth of some metrics, such as assets, results in weaker future stock price performance.

**Exhibit 14** shows the performance of the year-over-year earnings growth factor. The exhibit is based on a strategy that invests in the top 10% of companies with the highest year-over-year growth in earnings per share and shorts all the stocks in the bottom 10%.

### **Exhibit 14. Performance of Year-over-Year Earnings Growth Factor (Long/Short Decile Portfolio)**

Year-over-Year Earnings Growth (%)



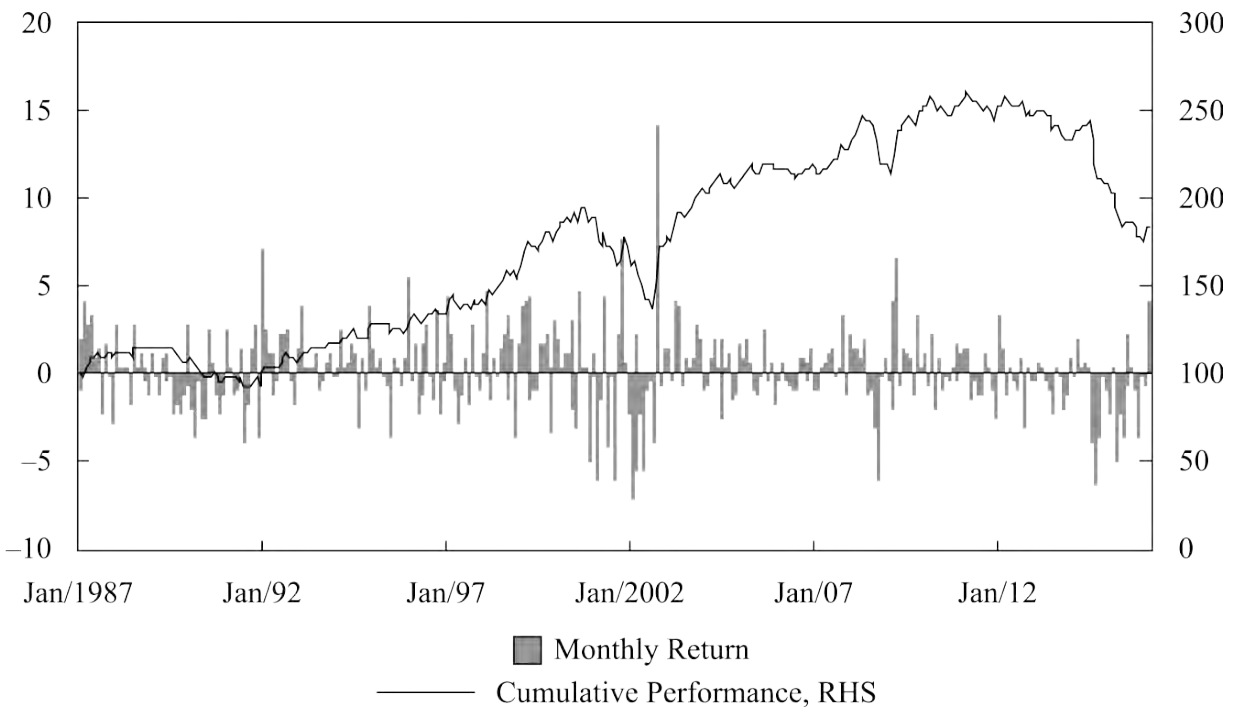
Sources: Compustat, FTSE Russell.

## 6.4. Quality

In addition to using accounting ratios and share price data as fundamental style factors, investors have continued to create more complex factors based on the variety of accounting information available for companies. One of the best-known examples of how in-depth accounting knowledge can impact investment performance is Richard Sloan's (1996) seminal paper on earnings quality, with its proposition of the accruals factor. Sloan suggests that stock prices fail to reflect fully the information contained in the accrual and cash flow components of current earnings.<sup>7</sup> The performance of the accruals anomaly factor, however, appears to be quite cyclical.

### Exhibit 15. Performance of Earnings Quality Factor

Accruals (Sloan 1996, %)



Sources: Compustat, FTSE Russell.

In addition to the accruals anomaly, there are many other potential factors based on a company's fundamental data, such as profitability, balance sheet and solvency risk, earnings quality, stability, sustainability of dividend payout, capital utilization, and management efficiency measures. Yet another, analyst sentiment, refers to the phenomenon of sell-side analysts revising their forecasts of corporate earnings estimates, which is called *earnings revision*. More recently, with the availability of more data, analysts have started to include cash flow revisions, sales revisions, ROE revisions, sell-side analyst stock recommendations, and target price changes as variables in the "analyst sentiment" category.

A new and exciting area of research involves news sentiment. Rather than just relying on the output of sell-side analysts, investors could use natural language processing (NLP) algorithms to analyze the large volume of news stories and quantify the news sentiment on stocks.

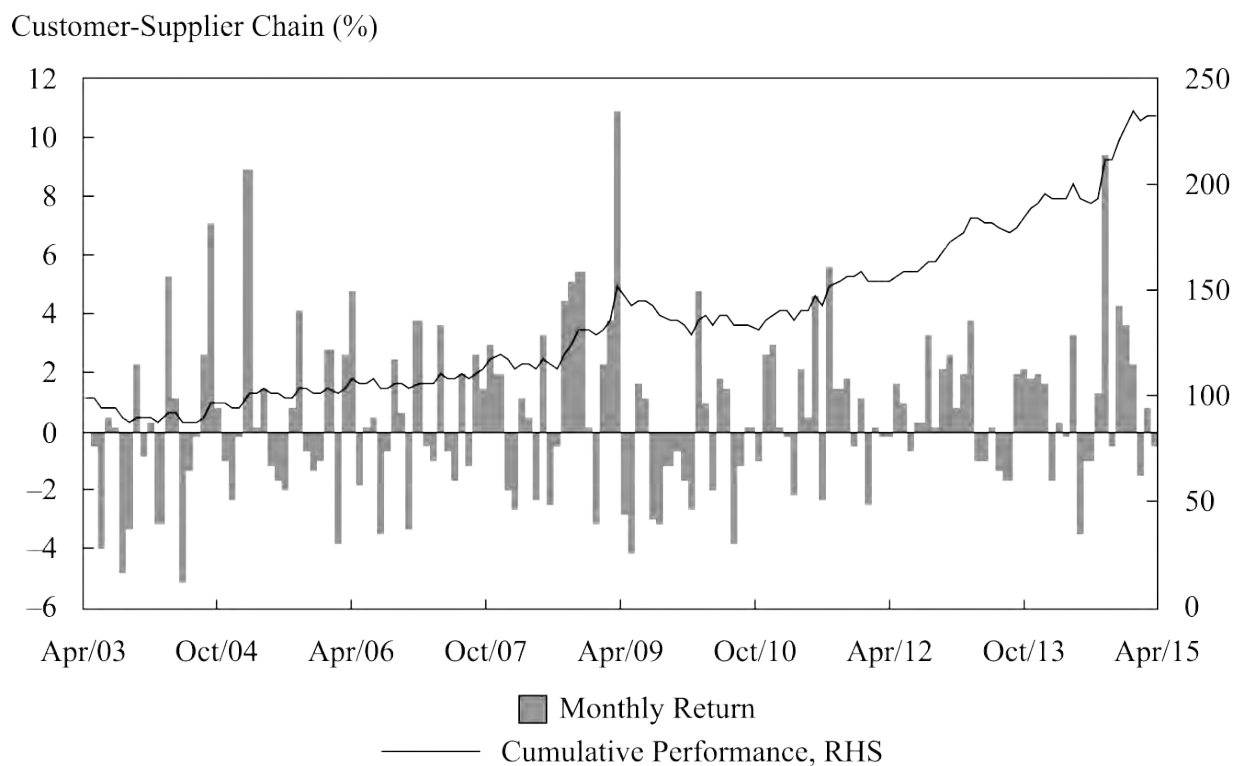
## 7. FACTOR-BASED STRATEGIES: UNCONVENTIONAL FACTORS

**d. analyze factor-based active strategies, including their rationale and associated processes**

With the rapid growth in technology and computational algorithms, investors have been embracing big data. “Big data” is a broad term referring to extremely large datasets that may include structured data—such as traditional financial statements and market data—as well as unstructured or “alternative” data that has previously not been widely used in the investment industry because it lacks recognizable structure. Examples of such alternative data include satellite images, textual information, credit card payment information, and the number of online mentions of a particular product or brand.

**Exhibit 16** shows the performance (as measured by the long/short quintile portfolio) of a factor based on customer–supplier chain data.<sup>8</sup> The signal is based on the trailing one-month stock price return of a company’s largest customer. Stocks are ranked by largest customer performance, and the portfolio goes long the top quintile and shorts the lowest quintile. The positions are held until the following month’s stock ranking and rebalancing. The intuition is that the positive performance of customers is likely to benefit the supplier company in subsequent periods. Indeed, compared to many traditional factors, the supply-chain signal seems to have shown more consistent returns, especially in recent years.

**Exhibit 16. Performance of Customer–Supplier-Chain Factor**



Sources: Compustat, FactSet Revere, FTSE Russell.

Portfolio construction is covered in the curriculum reading titled “Active Equity Portfolio Construction.”

## EXAMPLE 5

### Researching Factor Timing

An analyst is exploring the relationship between interest rates and style factor returns for the purpose of developing equity style rotation strategies for the US equity market. The analysis takes place in early 2017. The first problem the analyst addresses is how to model the interest rate variable. The data in [Exhibit 17](#) show an apparent trend of declining US government bond yields over the last 30 years. Trends may or may not continue into the future. The analyst decides to normalize the yield data so that they do not incorporate a prediction on continuation of the trend and makes a simple transformation by subtracting the yield’s own 12-month moving average:

$$\text{Normalized yield}_t = \text{Nominal yield}_t - \frac{1}{12} \sum_{\tau=1}^{12} \text{Nominal yield}_{t-\tau+1}$$

The normalized yield data are shown in [Exhibit 18](#). Yields calculated are as of the beginning of the month. Do the fluctuations in yield have any relationship with style factor returns? The analyst explores possible contemporaneous (current) and lagged relationships by performing two regressions (using the current month’s and the next month’s factor returns, respectively) against the normalized long-term bond yield:

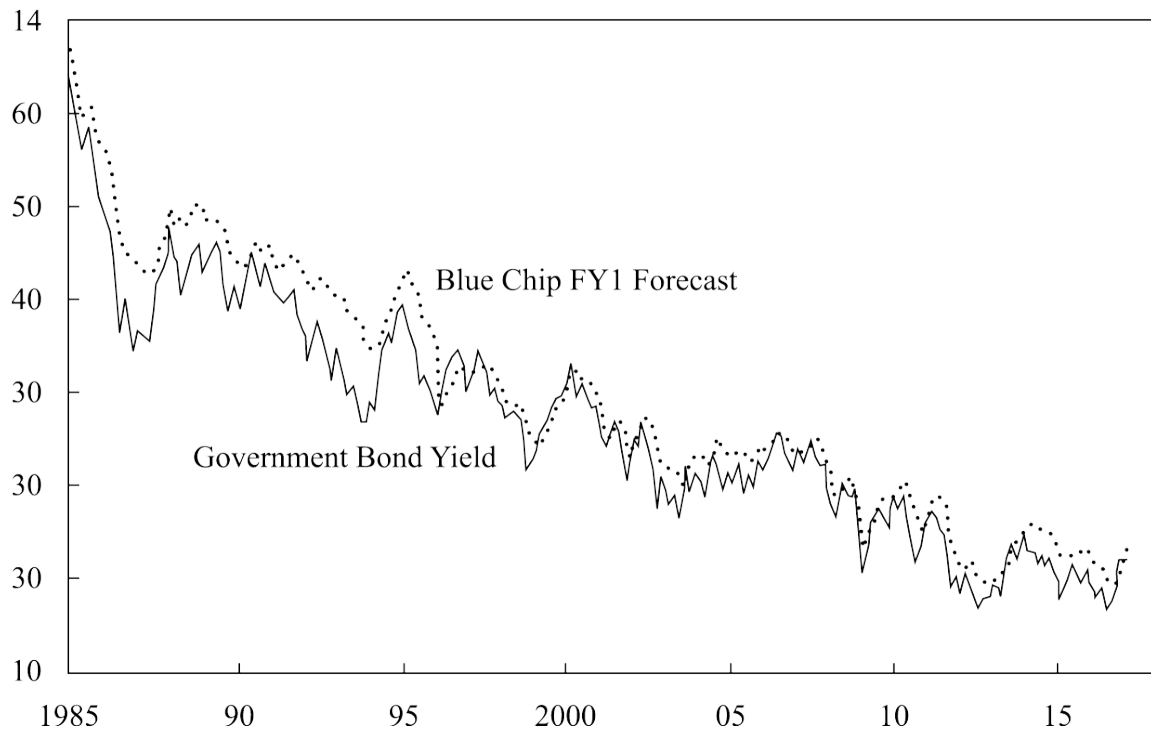
$$f_{i,t} = \beta_{i,0} + \beta_{i,1} \text{Normalized yield}_t + \varepsilon_{i,t}$$

and

$$f_{i,t+1} = \beta_{i,0} + \beta_{i,1} \text{Normalized yield}_t + \varepsilon_{i,t}$$

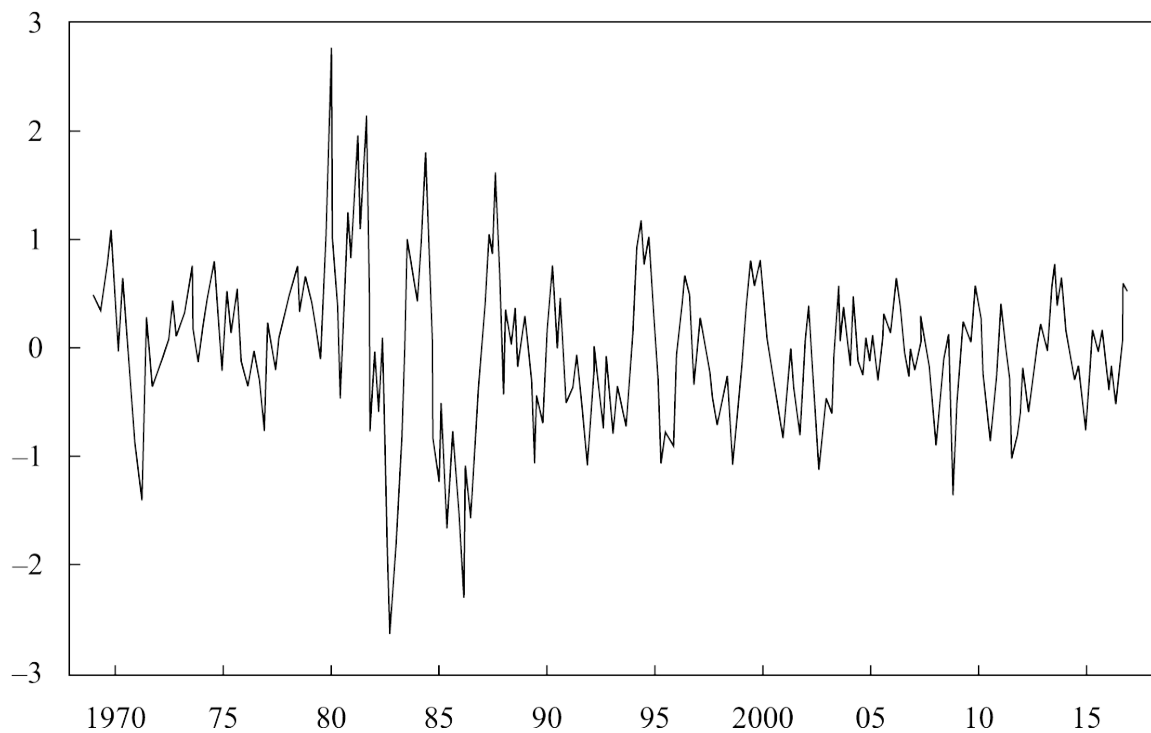
where  $f_{i,t}$  is the return of style factor  $i$  at time  $t$  and  $f_{i,t+1}$  is the subsequent (next) month’s return to style factor  $i$ . The first regression reveals the contemporaneous relationship between interest rate and factor performance—that is, how well the current interest rate relates to the current factor performance. The second equation states whether the current interest rate can predict the next month’s factor return. [Exhibit 19](#) shows the findings.

Percent



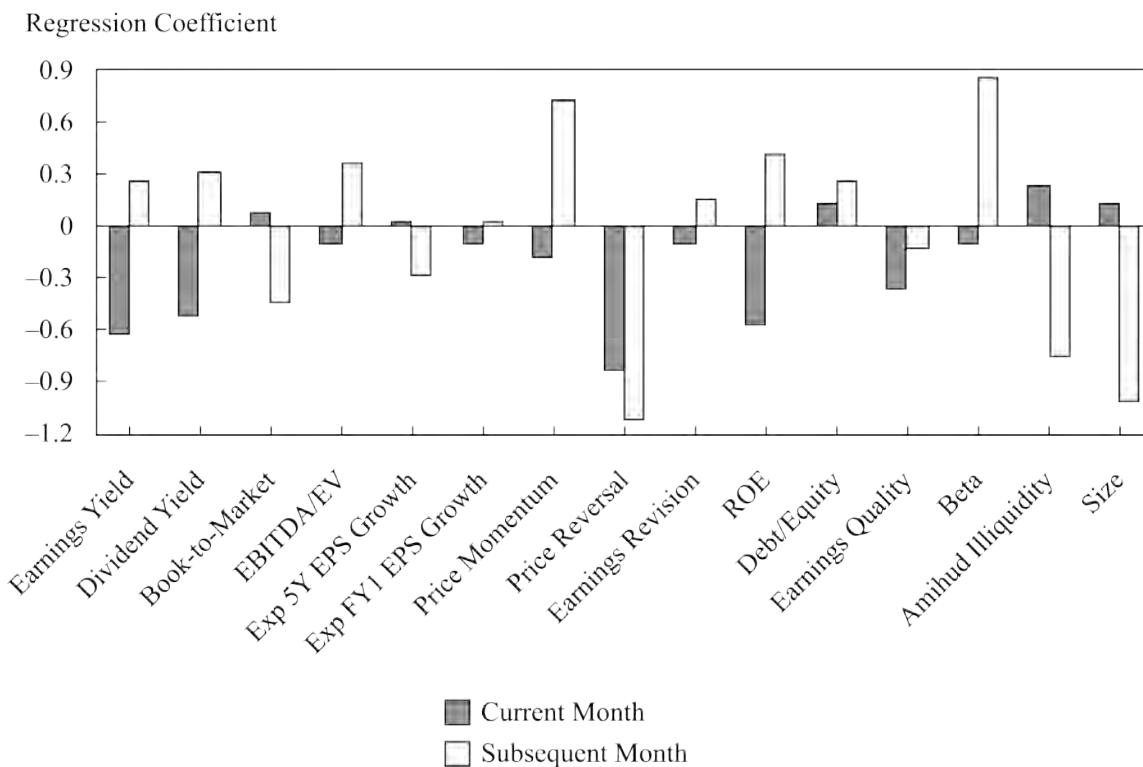
### Exhibit 18. Normalized 10-Year Treasury Bond Yield, US

Percent



Source: Haver Analytics.

### Exhibit 19. Normalized Bond Yield and Style Factor Returns



Source: Haver Analytics.

Using only the information given, address the following:

1. Interpret [Exhibit 19](#).
2. Discuss the relevance of contemporaneous and forward relationships in an equity factor rotation strategy.
3. What concerns could the analyst have in relation to an equity factor rotation strategy, and what possible next steps could the analyst take to address those concerns?

### Solution to 1:

[Exhibit 19](#) suggests an inverse relationship between concurrent bond yields and returns to the dividend yield, price reversal, and ROE factors. For some factors (such as

earnings quality), the relationship between bond yields and forward (next month's) factor returns is in the same direction as the contemporaneous relationship.

### **Solution to 2:**

Attention needs to be given to the timing relationship of variables to address this question. A contemporaneous style factor return becomes known as of the end of the month. If the known value of bond yields at the beginning of the month is correlated with factor returns, the investor may be able to gain some edge relative to investors who do not use that information. The same conclusion holds concerning the forward relationship. If the contemporaneous variable were defined so that it is realized at the same time as the variable we want to predict, the forward but not the contemporaneous variable would be relevant.

### **Solution to 3:**

The major concern is the validity of the relationships between normalized interest rates and the style variables. Among the steps the analyst can take to increase his or her conviction in the relationships' validity are the following:

- Establish whether the relationships have predictive value out of sample (that is, based on data not used to model the relationship).
- Investigate whether or not there are economic rationales for the relationships such that those relationships could be expected to persist into the future.

**Exhibit 19** shows both weak relationships (e.g., for earnings revision) and strong relationships (e.g., for size and beta) in relation to the subsequent month's returns. This fact suggests some priorities in examining this question.

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## **8. ACTIVIST STRATEGIES**

### **e. analyze activist strategies, including their rationale and associated processes**

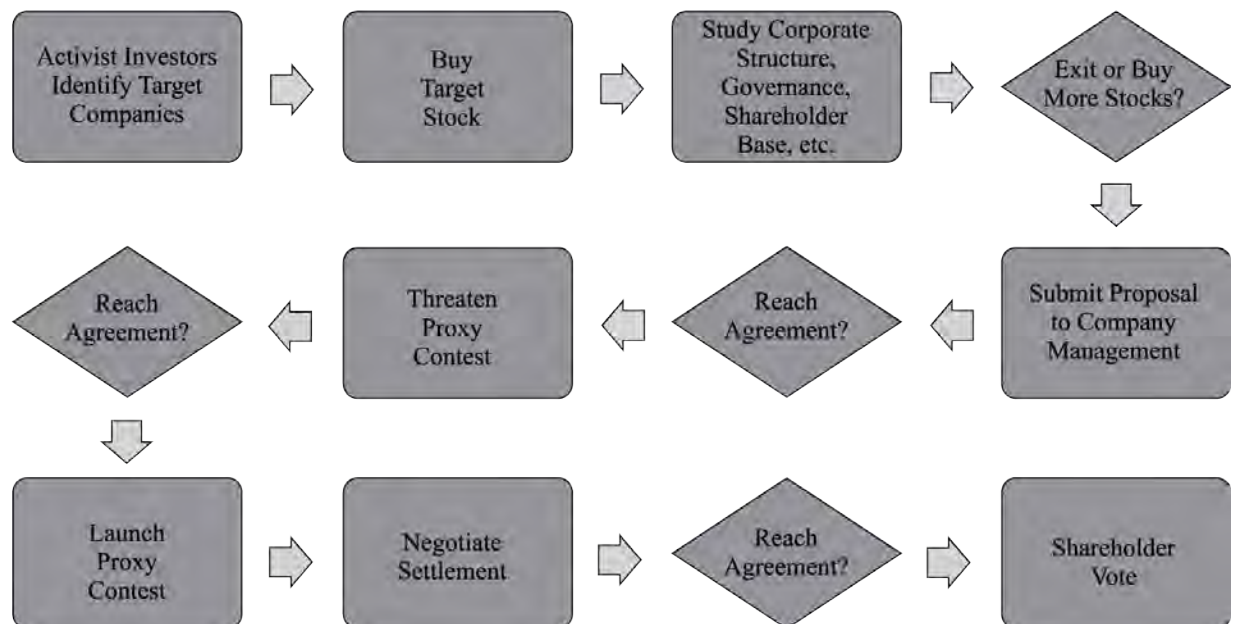
Activist investors specialize in taking stakes in listed companies and advocating changes for the purpose of producing a gain on the investment. The investor may wish to obtain



representation on the company's board of directors or use other measures in an effort to initiate strategic, operational, or financial structure changes. In some cases, activist investors may support activities such as asset sales, cost-cutting measures, changes to management, changes to the capital structure, dividend increases, or share buybacks. Activists—including hedge funds, public pension funds, private investors, and others—vary greatly in their approaches, expertise, and investment horizons. They may also seek different outcomes. What they have in common is that they advocate for change in their target companies.

Shareholder activism typically follows a period of screening and analysis of opportunities in the market. The investor usually reviews a number of companies based on a range of parameters and carries out in-depth analysis of the business and the opportunities for unlocking value. Activism itself starts when an investor buys an equity stake in the company and starts advocating for change (i.e., pursuing an activist campaign). These equity stakes are generally made public. Stakes above a certain threshold must be made public in most jurisdictions. [Exhibit 20](#) shows a typical activist investing process. The goal of activist investing could be either financial gain (increased shareholder value) or a non-financial cause (e.g., environmental, social, and governance issues). Rather than pursuing a full takeover bid, activist investors aim to achieve their goals with smaller stakes, typically of less than 10%. Activist investors' time horizon is often shorter than that of buy-and-hold investors, but the whole process can last for a number of years.

### Exhibit 20. A Typical Shareholder Activist Investing Process



Source: Deutsche Bank.

## 8.1. The Popularity of Shareholder Activism

Shareholder (or investor) activism is by no means a new investment strategy. It goes back to the 1970s and 1980s, when investors known as corporate raiders acquired large stakes in companies in order to influence their operations, unlock value, and thereby raise the value of their shares. Proponents view it as an important and necessary activity that helps monitor and discipline management to the benefit of all shareholders. Opponents argue that such intervention is a distraction and negatively impact management performance.

Activist hedge funds—among the most prominent activist investors—have enjoyed great popularity for a number of years, with assets under management in 2007<sup>9</sup> before falling sharply during the global financial crisis. Since then, their activity has strongly recovered, with AUM close to \$120 billion. The activity of such investors can be tracked by following the activist events they are launching a campaign seeking to influence companies. Exhibit 21 shows the number of activist events reported by the industry. Hedge funds that specialize in activist investing are subject to lighter regulation than other types of funds, and their fee structure justifies concerted campaigns for change at the companies they have invested in. The viability of investor activism is influenced by the legal framework of the jurisdiction, shareholder structures, and cultural considerations. In the United States, the greatest amount of activist activity is initiated by hedge funds, followed by pension funds, but there have been a number of activist events in Europe. In Asia, there has been far less activity on the part of activist investors. Countries with concentrated shareholder ownership of companies are two frequent targets of activist campaigns.

### Exhibit 21. Number of Global Activist Events













































































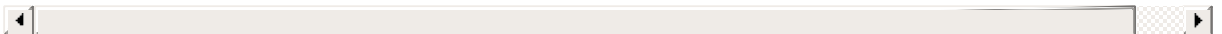
































































# Reading 18

## Active Equity Investing: Portfolio Construction

by Jacques Lussier, PhD, CFA, and Marc R. Reinganum, PhD

*Jacques Lussier, PhD, CFA (Canada). Marc R. Reinganum, PhD (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** describe elements of a manager's investment philosophy that influence the portfolio construction process;
- b.** discuss approaches for constructing actively managed equity portfolios;
- c.** distinguish between Active Share and active risk and discuss how each measure relates to a manager's investment strategy;
- d.** discuss the application of risk budgeting concepts in portfolio construction;
- e.** discuss risk measures that are incorporated in equity portfolio construction and describe how limits set on these measures affect portfolio construction;
- f.** discuss how assets under management, position size, market liquidity, and portfolio turnover affect equity portfolio construction decisions;
- g.** evaluate the efficiency of a portfolio structure given its investment mandate;
- h.** discuss the long-only, long extension, long/short, and equitized market-neutral approaches to equity portfolio construction, including their risks, costs, and effects on potential alphas.

---

# 1. INTRODUCTION

Active equity investing is based on the concept that a skilled portfolio manager can both identify and differentiate between the most attractive securities and the least attractive securities—typically relative to a pre-specified benchmark. If this is the case, why is a portfolio—a collection of securities—even necessary? Why shouldn't the portfolio manager just identify the most attractive security and invest all assets in this one security? Or in a long/short context, why not buy the “best” security and sell the “worst” one? Although very simple, this one-stock approach is not likely to be optimal or even feasible. No manager has perfect foresight, and his predictions will likely differ from realized returns. What he predicted would be the “best security” may quite likely turn out *not* to be the best. Active equity portfolio managers, even those with great skill, cannot avoid this risk. Security analysis is the process for ranking the relative attractiveness of securities, whereas portfolio construction is about selecting the securities to be included and carefully determining what percentage of the portfolio is to be held in each security—balancing superior insights regarding predicted returns against some likelihood that these insights will be derailed by events unknown or simply prove to be inaccurate.

Active managers rely on a wide array of investment strategies and methodologies to build portfolios of securities that they expect to outperform the benchmark. The challenges faced by active managers are similar whether they manage long-only traditional strategies, systematic/quantitative strategies, or long/short opportunistic strategies. Managers may differ in their investment style, operational complexity, flexibility of investment policy, ability to use leverage and short positions, and implementation methodologies, but predictions about returns and risk are essential to most active equity management styles.

In Section 2, we introduce the “building blocks” of portfolio construction, and in Sections 3–5, we discuss the different approaches to portfolio construction. In Sections 6–9, we discuss risk budgeting concepts relevant to portfolio construction and the measures used to evaluate portfolio risk. Section 10 looks at how issues of scale may affect portfolio construction. Section 11 addresses the attributes of a well-constructed portfolio. Section 12 looks at certain specialized equity strategies and how their approaches to portfolio construction may differ from a long-only equity strategy. The reading concludes with a summary.

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## 2. BUILDING BLOCKS OF ACTIVE EQUITY PORTFOLIO CONSTRUCTION

- a. describe elements of a manager’s investment philosophy that influence the portfolio construction process

Investors who pursue active management are looking to generate portfolio returns in excess of benchmark returns (adjusted for all costs) for an appropriate level of risk. The excess return—also called **active return** ( $R_A$ )—of an actively managed portfolio is driven by the difference in weights between the active portfolio and the benchmark. It can be mathematically expressed as

### Equation (1)

$$R_A = \sum_{i=1}^N \Delta W_i R_i$$

where

$R_i$  = the return on security  $i$  and

$\Delta W_i$  = the difference between the portfolio weights  $W_{Pi}$  and the benchmark weights  $W_{Bi}$ .  
 $\Delta W_i$  is also referred to as the active weight.

An active manager will generate positive active returns if:

The gains generated by	The losses generated by
<ul style="list-style-type: none"> <li>■ overweighting the securities that outperform the benchmark and</li> <li>■ underweighting the securities that underperform the benchmark.</li> </ul>	<ul style="list-style-type: none"> <li>■ underweighting the securities that outperform the benchmark and</li> <li>■ overweighting the securities that underperform the benchmark.</li> </ul>

## 2.1. Fundamentals of Portfolio Construction

Conceptually, a manager can generate active returns by

- strategically adjusting the active weights of the securities to create long-term exposures to rewarded risks that are different from those of his benchmark;
- tactically adjusting the active weights of the securities using his skills/expertise in identifying mispricing in securities, sectors, rewarded risks, and so on, to generate alpha that cannot be explained by long-term exposure to rewarded risks; and
- assuming excessive idiosyncratic risk that may result in lucky or unlucky returns.

Historically, any excess return over the benchmark was often termed “alpha.” More sophisticated investors then moved to evaluating managers on the basis of excess *risk-adjusted* returns, where risk was assessed relative to a cap-weighted index. The information ratio became an important measure of the manager’s value-added. Today, research supports the argument that much of what was historically viewed as alpha is, in fact, “alternative beta”—exposure to rewarded risks (often referred to as “priced factors” or “rewarded factors”) that can be obtained at much lower cost.<sup>1</sup> In this reading, we use “rewarded factors” as a generic term that refers specifically to investment risks for which investors expect to be compensated through a long-run return premium, such as exposure to market risk and liquidity risk. The existence of numerous rewarded factors is well documented in the literature and supported by strong empirical evidence. The recognition of this phenomenon is fundamentally altering the investment management industry, with large asset owners negotiating fee structures that compensate active managers for returns above and beyond those that can be generated by simple exposure to rewarded factors.<sup>2</sup>

These three sources of active return remain the same whether a manager follows a fundamental/discretionary or quantitative/systematic approach, a bottom-up or top-down strategy, or a style such as value or growth at a reasonable price. Of course, the proportion of return sourced from exposure to rewarded factors, alpha, and luck will vary among managers and portfolio management approaches. Equation 2 expresses the decomposition of *ex post* active returns in terms of these components:

### Equation (2)

$$R_A = \sum (\beta_{pk} - \beta_{bk}) \times F_k + (\alpha + \varepsilon)$$

where

$\beta_{pk}$  = the sensitivity of the portfolio ( $p$ ) to each rewarded factor ( $k$ )

$\beta_{bk}$  = the sensitivity of the benchmark to each rewarded factor<sup>3</sup>

$F_k$  = the return of each rewarded factor

$(\alpha + \varepsilon)$  = the part of the return that cannot be explained by exposure to rewarded factors. The volatility of this component is very much dependent on how a manager sizes individual positions in his portfolio. The alpha ( $\alpha$ ) is the active return of the portfolio that can be attributed to the specific skills/strategies of the manager—skills such as security selection and factor timing.  $\varepsilon$  is the idiosyncratic return, often resulting from a random shock, such as a company announcing unexpected earnings. It could also be called noise or luck (good or bad). Although managers generate returns above or below those that can be explained by the exposure to rewarded factors, it is very difficult to isolate how much of this return differential can be attributed to alpha/skill or to noise/luck.<sup>4</sup>

Although not all active managers expressly employ a factor methodology in creating active returns, the growth of exchange-traded funds, coupled with the disappointing after-fee performance of many active managers, is expanding the factor-based view of the investment landscape. It is important to understand the components of active returns (exposure to rewarded risks, alpha, and luck) and how Equation 2 explicitly or implicitly relates to various management styles and approaches.

To illustrate, let's consider two hypothetical managers: a systematic manager (Quanto) and a discretionary manager (Evolò). Each claims to have a "Value" orientation.

Quanto estimates the "Value" characteristics of each security in his investment universe using such proxies as the ratios of price to book and forward earnings to price. He then uses a systematic allocation methodology that determines the specific active weights that can be expected to deliver the desired exposure to the Value factor. Quanto holds a large number of securities to limit the impact of idiosyncratic risks on performance. Quanto attempts to outperform the benchmark by choosing factor exposures that differ from those of the benchmark.

Evolò has developed a comprehensive measure of value using a forward-looking free cash flow model. This allows Evolò to compare her own estimates of security valuation to the current market price for each security covered by the firm. The manager uses her judgment to determine the appropriate active weights based on her own level of confidence in each estimate. She runs a concentrated portfolio because she believes she has an edge in setting the appropriate active weights.

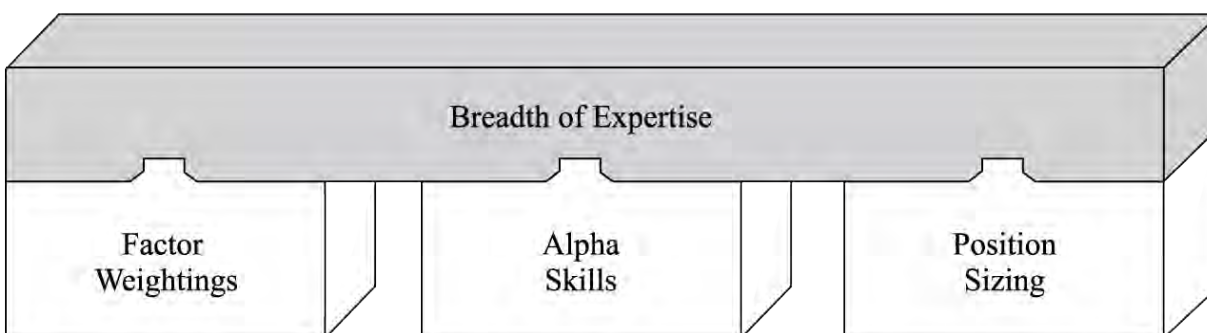
Although Evolò is not using a systematic approach to determine the active security weights and the overall portfolio exposure to the Value factor, she is driven by a Value philosophy and is exposed to the Value factor. Her returns will be driven in part by this factor exposure, even if she has never seen Equation 2. Indeed, if her portfolio is not exposed to the Value factor, clients and consultants may question her claim to run a value-oriented portfolio. If Evolò has developed a better Value proxy than her competitors and if she is skilled at identifying the best and worst securities and setting appropriate active weights, part of her active return will be attributed to her alpha skills. Because Evolò runs a more concentrated portfolio, the portion of her active performance attributed to idiosyncratic risk will likely be

greater.

## 2.2. Building Blocks Used in Portfolio Construction

This section introduces the three main building blocks of portfolio construction—*rewarded factor weightings*, *alpha skills*, and *position sizing* (shown in [Exhibit 1](#))—and explains how each relates to the three broad sources of active returns. A fourth critical component of portfolio construction, *breadth of expertise*, is necessary to assemble these three building blocks into a successful portfolio construction process.

**Exhibit 1. Building Blocks Used in Portfolio Construction**



### 2.2.1. First Building Block: Overweight or Underweight Rewarded Factors

Let's begin by considering the market portfolio as our benchmark. The market portfolio encompasses all securities, and the weight of each security is proportional to its market capitalization. Our benchmark would have an exposure (or beta,  $\beta$ ) of 1 to the Market factor and no net exposure to other rewarded factors, such as Size, Value, and Momentum.<sup>5</sup>

However, most individual securities have a  $\beta$  less than or greater than 1 to the Market factor and most will also have a non-zero exposure to the other factors. Indeed, one way an active manager can try to add value over and above the market portfolio is to choose, explicitly or implicitly, exposures to rewarded risks that differ from those of the market.

Practically speaking, most investors use narrower market proxies as a benchmark: the S&P 500 Index for a US mandate, the FTSE 100 Index for a UK mandate, or the MSCI All Country World Index (ACWI)<sup>6</sup> for a global mandate, for example. These indexes, although quite broad, do not include all securities that are publicly traded. Thus, these well-known

indexes may not have a  $\beta$  of exactly 1 to the Market factor and could very well have a net exposure to other rewarded factors. For example, although most large-cap indexes usually have a  $\beta$  close to 1 to the Market factor, they usually have a negative sensitivity to the Size factor, indicating their large-cap tilt. When a manager is creating an exposure to a rewarded risk, the exposure must be established relative to that of his benchmark to achieve an expected excess return.

The growing understanding of rewarded factors is profoundly changing the view of active and passive investing. There are many investment products that allow investors to directly access such factors as Value, Size, Momentum, and Quality, and the bar for active managers is rising: An active value manager not only needs to outperform a passive value benchmark but may also need to outperform a rules-based value-tilted product. In the following discussion, we illustrate the concept of returns to factors and the application of this concept to portfolio management.

**Exhibit 2** illustrates the factor exposures of the Russell 1000 Index, the Russell 1000 Value Index, and a discretionary mid-cap value fund (using the four Fama–French and Carhart factors). The performance of the actively managed fund is presented before the deduction of fees to make the comparison with benchmark returns fair.

The average monthly performance of each factor from February 1990 to December 2016 is specified in the last column.<sup>7</sup> All four factors showed positive returns over the period. Most regression coefficients are statistically significant at the 5% level (not shown); the momentum coefficients of the Russell 1000 and the Russell 1000 Value are the exceptions.

## Exhibit 2. Risk Factor Exposure (February 1990–December 2016)

	<b>Russell 1000 Index</b>	<b>Russell 1000 Value Index</b>	<b>Value Fund</b>	<b>Factor Performance US Market</b>
Monthly performance in excess of the risk-free rate	0.64%	0.66%	0.40%	—
	$\beta$ to specified factor:			
Market*	0.99	0.92	0.90	0.64%
Size	−0.16	−0.23	0.13	0.16%
Value	0.02	0.41	0.59	0.18%
Momentum	−0.01	0.13	0.09	0.61%
“Alpha” (monthly)	0.05%	−0.05%	−0.35%	—



$R^2$ 

0.99

0.95

0.74

\* As mentioned in footnote 3, the Market factor is built from a much larger universe of securities than are traditional benchmarks, such as the Russell 1000. Therefore, we should not expect the  $\beta$  of indexes to the Market factor to be necessarily equal to one.

*Note:* All data are measured in US dollars.

*Sources:* Factor data for the United States are from AQR Capital Management, market data are from Bloomberg, and calculations are from the authors.

The Russell 1000 Index has a Market  $\beta$  close to 1, a negative exposure to the Size factor (indicating it has a large-cap tilt), and almost no sensitivity to the Value and Momentum factors. This is what we would expect for a capitalization-weighted large-cap index. In comparison, the Russell 1000 Value Index has a lower Market  $\beta$  and a significant exposure to the Value factor, also in line with expectations. Finally, the mid-cap value fund has positive exposure to the Size factor (consistent with its mid-cap tilt) and a very significant exposure to the Value factor.

In these regression specifications, there is still a component of return that cannot be explained by the rewarded factors alone. It is often labeled “alpha.” This may be true alpha, or it may be simply noise/luck. The two indexes have a relatively small alpha, whereas the value fund has a significantly negative alpha of  $-0.35\%$  per month. An alpha of this magnitude is unlikely to be explained by a small misspecification in the factor model. An investor considering this fund would need to investigate the causes of this negative alpha.

In [Exhibit 3](#), we show the sources of performance of each product in terms of its exposure to each of the four factors and its respective alpha. In all cases, the Market factor is the dominant source of performance. The Value and Momentum factors did contribute positively to performance for the Russell 1000 Value, but much of this performance was lost because of the large-cap tilt and the negative alpha. The value fund did get a significant performance boost from the Value tilt, but much of it was lost to the very poor alpha in this period.

### Exhibit 3. Sources of Performance (February 1990–December 2016)

Source of Performance	Russell 1000	Russell 1000 Value	Value Fund
Market	0.63%	0.59%	0.57%
Size	−0.03%	−0.04%	0.02%
Value	0.00%	0.08%	0.11%



Momentum	−0.01%	0.08%	0.05%
Alpha	0.05%	−0.05%	−0.35%
Total monthly performance	0.64%	0.66%	0.40%

Source: Calculations by authors.

These examples illustrate the components of Equation 2. Irrespective of the manager's investment approach—whether she explicitly targets factors or focuses only on securities she believes to be attractively priced—her portfolio performance can be analyzed in terms of factors. Some portion of returns will not be explained by factors, which may be attributable to

- the unique skills and strategies of the manager (alpha),
- an incomplete factor model that ignores relevant factors, or
- exposure to idiosyncratic risks that either helped or hurt performance.

The next section discusses the alpha skills building block.

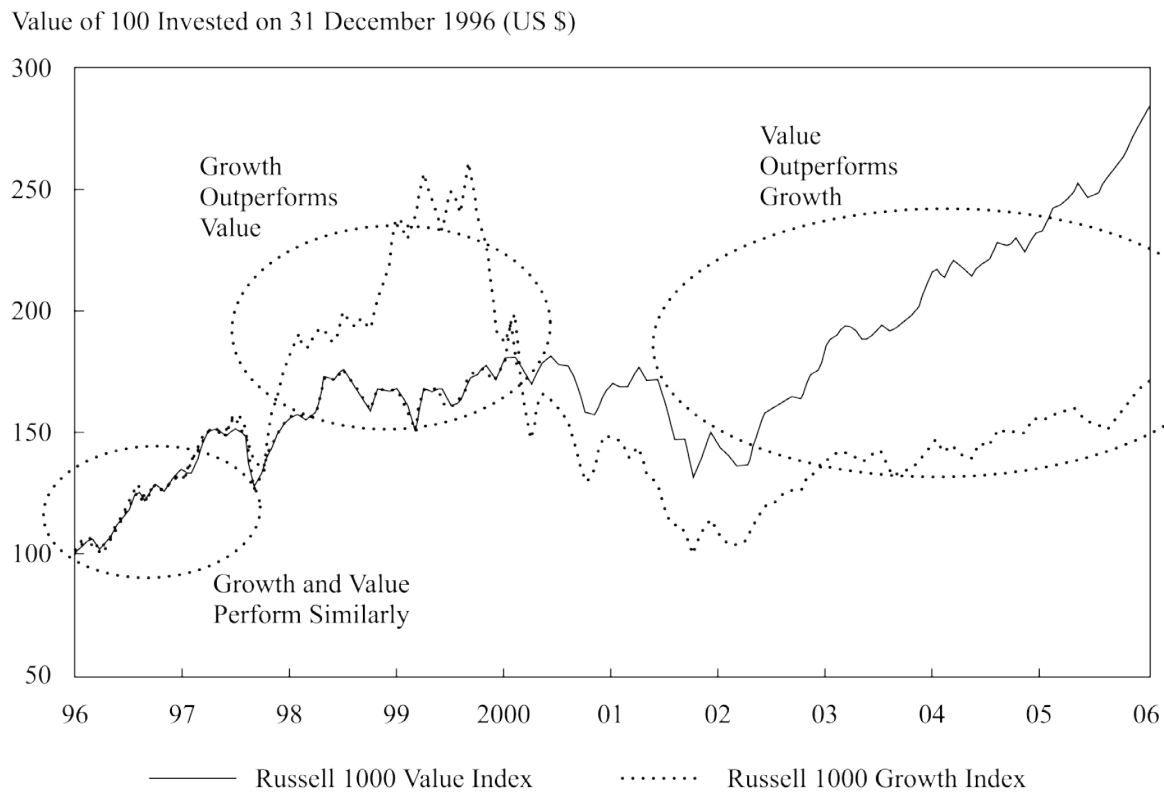
### 2.2.2. Second Building Block: Alpha Skills

In principle, there are many approaches that can be used to generate alpha, but in practice, generating positive alpha in a zero-sum game environment (before fees) is a challenge.<sup>8</sup> Furthermore, the alpha generated by active managers must be sufficient to cover the higher fees usually associated with active management.

Let's initially consider rewarded factors. With exposures to rewarded factors increasingly accessible via rule-based indexes, simple static exposure to known rewarded factors is no longer widely considered a source of alpha. However, successfully timing that exposure *would* be a source of alpha. For example, some managers believe part of their skill emanates from an understanding of when rewarded factor returns might be greater than or less than their average returns (factor timing). Hence, in periods when the market return is negative, a manager with an exposure ( $\beta$ ) to the Market factor substantially less than 1 will outperform the market and will probably also outperform many other managers. Similarly, a beta greater than 1 in a rising market would drive strong portfolio performance relative to the market. Exposure to the Market factor can be adjusted by investing in securities having, on average, Market betas less than or greater than 1.

The same can be said for the other rewarded factors. [Exhibit 4](#) shows the cumulative value of \$100 invested in both the Russell 1000 Growth Index and the Russell 1000 Value Index over a 10-year period ending in 2006. The Value index produced superior performance over the full 10-year time span, although it underperformed the growth index in 1998 and 1999. A manager skilled at timing his exposure to the Value factor would have owned the Growth index until the late 1990s and the Value index afterward, outperforming a manager with static exposure to the Value factor. However, as we have indicated, factor timing is difficult, and there is no consensus on the ability to generate alpha from factor timing.<sup>9</sup>

#### Exhibit 4. Cumulative Value—Russell 1000 Growth and Russell 1000 Value



Source: [Langlois and Lussier \(2017, p. 44\)](#).

In principle, alpha can also be generated from timing exposure to *unrewarded* factors, such as regional exposure, sector exposure, the price of commodities, or even security selection. For example, there is no theoretical basis supporting an expectation that a portfolio with greater-than-benchmark sensitivity to oil prices will be rewarded in the long term. Oil price fluctuations are certainly a risk, but oil price is not a rewarded factor. However, a manager who held a very specific view about the future of oil prices and correctly anticipated the decline in the price of oil that started in June 2014 and ended in March 2016 would have had a strong incentive to reduce his exposure to the energy sector and especially to smaller, less

integrated, and more indebted energy companies, which performed poorly as a result of the price movement. A discretionary manager might refer to these as *thematic exposures*. Although oil prices are not a rewarded “factor,” his skill in timing that exposure would have been amply rewarded. The literature thus far has found little evidence of an ability to consistently time rewarded factors, but it is conceivable that a skillful manager could have identified a factor that has yet to be recognized by the academic or investment community.

In summary, active returns arising from skillful timing of exposure to rewarded factors, unrewarded factors, or even other asset classes (such as cash) constitute a manager’s alpha—the second building block.

### 2.2.3. Third Building Block: Sizing Positions

Position sizing is about balancing managers’ confidence in their alpha and factor insights while mitigating idiosyncratic risks. Although position sizing influences all three components of Equation 2, its most dramatic impact is often on idiosyncratic risk. For example, consider a manager seeking to create a greater exposure to the Value and Size factors. She could achieve the same average exposure (beta) to these factors by allocating her portfolio to 20 securities or 200 securities. However, the level of idiosyncratic risk and the potential impact of luck on performance will be much greater in the concentrated portfolio. In concentrated portfolios, the volatility of the active return ( $\sigma_{R_A}$ ) attributed to idiosyncratic risks ( $\sigma_\epsilon$ ) will likely be more significant. In other words, there may be greater deviations between realized portfolio returns and expected returns.

A manager’s choices with respect to portfolio concentration are a function of his beliefs regarding the nature of his investment skill. The factor-oriented manager believes that she is skilled at properly setting and balancing her exposure to rewarded factors. She targets specific exposure to factors (the  $\sum(\beta_{pk} - \beta_{bk}) \times F_k$  part of Equation 2) and maintains a diversified portfolio to minimize the impact of idiosyncratic risk. The stock picker believes that he is skilled at forecasting security-specific performance over a specific horizon and expresses his forward-looking views using a concentrated portfolio, assuming a higher degree of idiosyncratic risk (the  $\alpha + \epsilon$  part of Equation 2).

## Diversification, Volatility, and Idiosyncratic risk

The stock picker must carefully consider influences that can substantially alter the

absolute or relative risk profile of his portfolio. Consider, for example, the absolute volatility of the Russell 1000 Index and its underlying securities over the 12 months ending in October 2016. During this period:

- the index had an annualized daily volatility of 15.7%;
- the weighted average volatility of all securities in the index was substantially higher, about 26.7%;
- the average volatility of the 100 smallest securities in the index was approximately 41%;
- the average volatility of the 100 largest securities in the index was approximately 24%.

This disparity in individual stock volatility illustrates the potential of diversification. A concentrated portfolio is unlikely to achieve the low volatility of the Russell 1000 unless the manager specifically emphasizes investing in stocks that have a lower average volatility than that of the average security in the index.

**Exhibit 5** illustrates the effect of diversification on total portfolio risk at two different levels of average individual stock volatility. (We use the standard deviation of returns as our measure of risk here.) Total portfolio volatility is a function of the average individual stock volatility and the number of securities in the portfolio. The calculations assume an average cross correlation of 0.24, consistent with the historical average correlation for Russell 1000 securities since 1979.

**Exhibit 5. Total Portfolio Volatility as a Function of Concentration and Single Stock Volatility<sup>10</sup>**

	Single Stock Volatility	
	25%	30%
Number of Securities	Portfolio Volatility	
10	14.1%	16.9%
30	12.9%	15.5%
50	12.6%	15.2%
100	12.4%	14.9%
500	12.3%	14.7%

Examining this table closely, we can see that diversification is a powerful tool but that it has its limitations. Even the most diversified portfolio of high-volatility stocks (the 500-stock portfolio with an average single-stock volatility of 30%) cannot achieve the same level of volatility inherent in the portfolios of lower-volatility stocks. Even the most concentrated portfolio of lower-volatility stocks displays a portfolio volatility lower than that of the highly diversified portfolio of higher-volatility stocks.

The concentrated portfolio, however, bears higher idiosyncratic risk, which can substantially influence portfolio performance. The manager's choices with respect to the magnitude of his active weights and the volatility of the securities with the highest active weights will be significant determinants of the portfolio's active return and active risk.

**Active risk** is a measure of the volatility of portfolio returns relative to the volatility of benchmark returns. It is expressed as follows:

**Equation (3)**

$$\text{Active risk } (\sigma_{R_A}) = \sqrt{\frac{\sum_{t=1}^T (R_{At})^2}{T-1}}$$

where  $R_{At}$  represents the active return at time  $t$  and  $T$  equals the number of return periods. Active risk is often referred to as “tracking error.”

All else being equal, a 1.0% allocation to a security that has a 0.2% weighting in the benchmark (Security A) will have a greater effect on the active risk of the portfolio than a 2.0% allocation to a security that has a 2.5% weighting in the benchmark (Security B). Despite the overall smaller position size of Security A, the active decision the manager made with respect to the weighting of Security A (an 80 bp difference from the benchmark weight) is significantly larger than the active decision with respect to the weight of Security B (a 50 bp difference). If Security A also has a higher volatility than Security B, the effect of the active decision will be magnified.

Similarly, all else equal, an active weight of 1.0% on a single security will have a greater impact on active risk than will an active weight of 0.2% on five separate securities. The imperfect cross correlations of active returns of the basket of five stocks would contribute to lowering the level of active risk.

To summarize, a manager's choice with respect to position sizing is influenced by her investment approach and the level of confidence she places on her analytic work. On the one

hand, the stock picker with high confidence in her analysis of individual securities may be willing to assume high levels of idiosyncratic risk. This is consistent with her emphasis on the “ $\alpha + \varepsilon$ ” part of Equation 2. On the other hand, a manager focused on creating balanced exposures to rewarded factors is unlikely to assume a high level of idiosyncratic risk and is, therefore, quite likely to construct a highly diversified portfolio of individual securities.

#### ***2.2.4. Integrating the Building Blocks: Breadth of Expertise***

The three foregoing building blocks encompass all of Equation 2, which we used to describe the sources of a manager’s active returns:

- exposure to rewarded risks,
- timing of exposures to rewarded and unrewarded risks, and
- position sizing and its implications for idiosyncratic risk.

A manager may be more or less successful at combining these three sources of return into a portfolio. Success is a function of a manager’s breadth of expertise. Broader expertise may increase the manager’s likelihood of generating consistent, positive active returns.

The importance of breadth of expertise is implicit in the fundamental law of active management (covered extensively in the Level II reading “Analysis of Active Portfolio Management”), which implies that confidence in a manager’s ability to outperform his benchmark increases when that performance can be attributed to a larger sample of independent decisions. Independent decisions are not the same thing as individual securities. Independent decisions are uncorrelated decisions, much like two uncorrelated stocks are diversifying. Thus, overweighting both General Motors and Toyota, two auto companies, relative to their benchmark weights are not fully independent decisions because much of their respective returns are driven by common influences—the strength of consumer spending, the price of gasoline, and the price of steel and aluminum, for example. In evaluating portfolio construction, one must distinguish between the nominal number of decisions a manager makes about his active weights and the effective number of independent decisions. Without truly independent decisions, performance may be influenced more significantly by common exposures to specific factors.<sup>11</sup> According to the fundamental law, the expected active portfolio return  $E(R_A)$  is determined by the following:<sup>12</sup>

#### **Equation (4)**

$$E(R_A) = IC\sqrt{BR}\sigma_{R_A}TC$$

where

$IC$  = Expected **information coefficient** of the manager—the extent to which a manager's forecasted active returns correspond to the managers realized active returns

$BR$  = **Breadth**—the number of truly independent decisions made each year

$TC$  = **Transfer coefficient**, or the ability to translate portfolio insights into investment decisions without constraint (a truly unconstrained portfolio would have a transfer coefficient of 1)

$\sigma_{R_A}$  = the manager's active risk

For example, assuming an active risk of 6% (which many institutional investors would consider to be high), a transfer coefficient of 0.25 (representative of a constrained long-only investor), and an information coefficient of 0.10, the manager could expect to generate an active return of 15 bps yearly, on average, if she makes a single independent decision. If the manager wanted to achieve excess return of 1%, she would need to make approximately 40 fully independent decisions. Even if a manager does have positive information and transfer coefficients, it does not necessarily follow that excess return will be positive every year. A horizon of many years is required to have a reasonable probability of generating the expected excess return. However, a larger number of independent decisions will increase the probability of outperforming over a shorter horizon.

What is the implication of making multiple independent decisions? Assume two managers hold similarly diversified portfolios in terms of the number of securities and that both managers have outperformed the market over a specific period. Manager A has a pure value style and favors securities that have a low price-to-book ratio (a single valuation metric), whereas Manager B has a multidimensional, factor-based approach. Manager B's approach includes considerations related to valuation, price momentum, growth, balance sheet sustainability, quality of management, and so on, and considers a much larger set of metrics for each dimension (such as several metrics for valuation). Manager A's performance is largely attributed to a single dimension: his narrowly defined value bias. Although he holds 100 securities, he did not make 100 independent decisions.<sup>13</sup>

Manager B may not have 100 independent decisions embedded in her portfolio, but she likely has more than Manager A. Thus, the historical performance of Manager B may be a more reliable indicator of her ability to outperform in the future because her portfolio construction process integrates several dimensions and metrics, as well as their interactions. Her performance is less likely to be explained by how the market has recently favored a specific management style.

Let's take this example a bit further. Suppose Manager A makes 20 independent decisions and Manager B makes 40 independent decisions. Assume they both have the same information coefficient (0.2), the same active risk (4%), and the same transfer coefficient (0.6). What would be the expected active return of each manager? Using Equation 4:



### Manager A

$$0.2 \times \sqrt{20} \times 4\% \times 0.6 = 2.15\%$$

### Manager B

$$0.2 \times \sqrt{40} \times 4\% \times 0.6 = 3.04\%$$

What if Manager A's information coefficient was only 0.1? How many independent decisions would the manager need to make to generate the same 2.15% expected active return?

$$\text{Manager A: } 0.1 \times \sqrt{x} \times 4\% \times 0.6 = 2.15\% \\ x \approx 80$$

Assuming Manager A maintains a concentrated portfolio of twenty securities, what information coefficient would be required for Manager A to match the expected performance of Manager B?

$$\text{Manager A: } x \times \sqrt{20} \times 4\% \times 0.6 = 3.04\% \\ x \approx 0.28$$

Equation 4 illustrates the importance of breadth of expertise. As a practical matter, long-term success is not achieved by being right all the time but, rather, by being right often through small victories achieved consistently over long periods.

## EXAMPLE 1

### The Building Blocks of Asset Management

Proteus was launched as an asset management firm 20 years ago, after receiving assets of \$100 million from a seed investor. Today, the firm has grown into a large organization with more than \$30 billion in assets. Although the investment process has evolved, the firm has remained true to its core philosophy. It has also delivered strong risk-adjusted performance to its investors.

Proteus's emphasis has always been to invest in quality companies, appropriately priced, which are benefiting from positive and sustained price momentum. Although fairly agnostic in terms of portfolio weights compared with benchmark weights, the managers of Proteus believe in avoiding extreme views. For example, sector deviations are limited to between 80% and 120% of benchmark weights plus or minus 500 bps; for example, a sector with a 20% weight in the index could have a weight in the portfolio ranging from 11%  $[(0.8 \times 20\%) - 5\%]$  to 29%  $[(1.2 \times 20\%) + 5\%]$ . An individual security position can be no more than the lesser of (1) 10 times its weight in the index or (2) its weight in



the index + 1%. On average, Proteus's portfolios hold between 120 and 150 securities. The active risk is above 5%.

As the firm grew in experience, research, and resources, the process of defining and measuring what is a quality company, appropriately priced, and benefiting from positive momentum evolved. Initially, the firm avoided companies that were the most indebted within their sector and favored those that generated strong cash flows to sales. It also favored companies that had a lower price-to-book value and had positive price momentum in the last 12 months.

Today, Proteus still emphasizes quality, valuation, and price momentum but has considerably improved how those characteristics are measured and weighed. It now evaluates 45 metrics related to the financial health of the companies, the quality of its financial reporting, its valuation within its sector, and its short- and medium-term price momentum. It also developed its own weighting mechanism to appropriately weight each metric. The managers at Proteus believe their competitive advantage is the effort they invest in identifying, measuring, and weighing these metrics.

Discuss the contributions of rewarded factors, alpha skills, position sizing, and breadth of expertise for Proteus.

## **Solution:**

Overall, Proteus has integrated all the primary dimensions of the investment process.

- **Rewarded factors:** Proteus recognizes the existence of rewarded factors, and it has significantly enhanced its measures of Quality, Value, and Momentum over time.
- **Alpha skills:** Given the commercial success of Proteus as a firm, we might safely assume that there is an alpha component in the process.
- **Position sizing:** Position size limits are integrated into the investment process to ensure diversification limits idiosyncratic risks.
- **Breadth of expertise:** Proteus has 20 years of experience refining and improving an investment process based on a consistent investment philosophy.

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## **3. THE IMPLEMENTATION PROCESS:**

# PORTFOLIO CONSTRUCTION APPROACHES

## b. discuss approaches for constructing actively managed equity portfolios

Portfolio construction is part art and part science. It is about investment philosophy and the implementation of that philosophy. It requires an understanding of the technical principles of portfolio construction, filtered through a manager's core beliefs regarding her ability to add value using the building blocks discussed earlier:

- *Factor exposures*: How does she create her factor exposures? Does the manager believe she is skilled at extracting return premiums from rewarded factors? Or are her exposures to rewarded factors a residual of her in-depth research into the securities' fundamentals?
- *Timing*: Does she believe that she has skill in generating alpha through timing of portfolio exposures to rewarded and unrewarded factors or to security selection uncorrelated with exposures to either rewarded or unrewarded factors?
- *Position sizing*: How does she size portfolio positions? Is she confident about her expected return forecasts, and therefore runs a high-conviction portfolio? Or does she seek to reduce idiosyncratic risk by running a highly diversified portfolio?
- *Breadth or depth*: Does she rely on a specialized but narrower skill set or on a greater breadth of expertise?

A manager's portfolio construction process should reflect her beliefs with respect to the nature of her skills in each of these areas. The majority of investment approaches can be classified as either

- *systematic or discretionary* (the degree to which a portfolio construction process is subject to a set of predetermined rules or is left to the discretionary views of the manager)

and

- *bottom-up or top-down* (the degree to which security-specific factors, rather than macroeconomic factors, drive portfolio construction).

In addition, these approaches can vary in the extent to which they are *benchmark aware* versus *benchmark agnostic*. Each manager's investment approach is implemented within a framework that specifies the acceptable levels of active risk and **Active Share** relative to a clearly articulated benchmark. (Active Share is a measure of how similar a portfolio is to its benchmark.) A manager may emphasize these dimensions to varying degrees as he attempts to differentiate his portfolio from the benchmark.

## 3.1. The Implementation Process: The Choice of Portfolio Management Approaches

We previously identified three primary building blocks that managers can use in constructing a portfolio that reflects their core beliefs. Let's look at these in a little more detail, beginning with the systematic–discretionary continuum.

### 3.1.1. *Systematic vs. Discretionary*

How are a manager's beliefs regarding rewarded factor exposures, timing of factor exposures, exposure to unrewarded factors, and willingness to assume idiosyncratic risk reflected in a systematic investment process and in a discretionary investment process?

- Systematic strategies are more likely to be designed around the construction of portfolios seeking to extract return premiums from a balanced exposure to known, rewarded factors.
- Discretionary strategies search for active returns by building a greater depth of understanding of a firm's governance, business model, and competitive landscape, through the development of better factor proxies (e.g., a better definition of Quality), or through successful timing strategies. Factor timing is a challenging endeavor, and few factor-based systematic strategies have integrated a factor timing approach.
- Systematic strategies typically incorporate research-based rules across a broad universe of securities. For example, a simple systematic value methodology could filter out the 50% of securities that have the highest price-to-book ratio and then equally weight the remaining securities, leading to small individual portfolio positions. A more comprehensive approach might integrate a much larger number of considerations and balance total portfolio risk equally across them.
- Discretionary strategies integrate the judgment of the manager, usually on a smaller subset of securities. While a discretionary value manager might also rely on financial metrics to estimate the value characteristics of each security, she is likely to use her judgment to evaluate the relative importance of this information and assign appropriate weights to each security. A discretionary manager is also likely to integrate nonfinancial variables to the equation, such as the quality of management, the competitive landscape, and the pricing power of the firm. (Systematic strategies also integrate judgment, but their judgment is largely expressed up front through the design of the strategy and the learning process that comes with its implementation.)
- Systematic strategies seek to reduce exposure to idiosyncratic risk and often use broadly diversified portfolios to achieve the desired factor exposure while minimizing security-

specific risk.

- Discretionary strategies are generally more concentrated portfolios, reflecting the depth of the manager's insights on company characteristics and the competitive landscape.
- Systematic strategies are typically more adaptable to a formal portfolio optimization process. The systematic manager must, however, carefully consider the parameters of that optimization. What objective function is he seeking to maximize (information ratio, Sharpe ratio, index or factor exposure, etc.) or minimize (volatility, downside risk, etc.)? Will elements of his investment style (such as performance and valuation metrics) be incorporated into the objective function or into the constraints?
- Discretionary portfolio managers typically use a less formal approach to portfolio construction, building a portfolio of securities deemed attractive, subject to a set of agreed-upon risk constraints.

## Bridging the Divide

The philosophical divide between systematic and discretionary managers seems to be shrinking. Systematic and discretionary strategies were commonly differentiated in terms of their breadth and depth (discretionary managers conducting more in-depth research on a sub-set of the securities universe) and systematic managers having more breadth (less in-depth research across the entire universe of securities). Although this remains generally true today, research and technology have been narrowing the gap. Advancements in and the accessibility of technology, together with the greater range of quality data available, are allowing discretionary managers to extend their in-depth analyses across a broader universe of securities. Technology also allows systematic managers to design strategies that can capture risk premiums in rewarded factors, a source of active returns that was previously considered to be part of the alpha of discretionary managers.

### 3.1.2. *Bottom-Up vs. Top-Down*

A top-down approach seeks to understand the overall geo-political, economic, financial, social, and public policy environment and then project how the expected environment will affect countries, asset classes, sectors, and then securities. An investment manager who projects that growth companies will outperform value companies, that financials will

outperform industrials, that the US market will outperform the European market, that oil prices will increase, or that cash will outperform equity and then targets individual securities and/or a cash/stock allocation to reflect these views is following a top-down approach.

A manager following a bottom-up approach develops his understanding of the environment by first evaluating the risk and return characteristics of individual securities. The aggregate of these risk and return expectations implies expectations for the overall economic and market environment. An investment manager who expects Ford to outperform GM, AstraZeneca (a bio-pharmaceutical company) to outperform Ford, and Sony to outperform AstraZeneca and builds a portfolio based on these stock-specific forecasts is following a bottom-up approach. Although the resulting portfolio will contain an implicit expectation for sector, style, and country performance, this is nonetheless a bottom-up approach.

- Both top-down and bottom-up strategies typically rely on returns from factors. However, top-down managers are more likely to emphasize macro factors, whereas bottom-up managers emphasize security-specific factors.
- A top-down investment process contains an important element of factor timing. A manager who opportunistically shifts the portfolio to capture returns from rewarded or unrewarded factors, such as country, sectors, and styles, is following a top-down investment process. They may also embrace the same security characteristics sought by bottom-up managers as they translate their macro views into security-specific positions. A top-down investment process is also more likely to raise cash opportunistically when the overall view of the Market factor is unfavorable.
- Bottom-up managers may embrace such styles as Value, Growth at Reasonable Price, Momentum, and Quality. These strategies are often built around documented rewarded factors, whether explicitly or implicitly.
- A top-down manager is likely to run a portfolio concentrated with respect to macro factor exposures. Bottom-up managers and top-down managers can run portfolios that are either diversified or concentrated in terms of securities. Both a bottom-up stock picker and a top-down sector rotator can run concentrated portfolios. Both a bottom-up value manager and a top-down risk allocator can run diversified portfolios.

Some managers will incorporate elements of both top-down and bottom-up investment approaches.

### ***3.1.3. A Summary of the Different Approaches***

While most managers make some use of all the building blocks, we can make some general assertions about the relative importance and use of these building blocks to each of the implementation choices. They are summarized in the four quadrants of [Exhibit 6](#).

## Exhibit 6. Approaches and Their Use of Building Blocks

Top-Down	
Systematic	<ul style="list-style-type: none"><li>• Emphasizes macro factors</li><li>• Factor timing</li><li>• Diversified</li></ul>
	<ul style="list-style-type: none"><li>• Emphasizes macro factors</li><li>• Factor timing</li><li>• Diversified or concentrated depending on strategy and style</li></ul>
Discretionary	<ul style="list-style-type: none"><li>• Emphasizes security specific factors</li><li>• No factor timing</li><li>• Diversified</li></ul>
	<ul style="list-style-type: none"><li>• Emphasizes firm specific characteristics or factors</li><li>• Potential factor timing</li><li>• Diversified or concentrated depending on strategy and style</li></ul>
Bottom-Up	

- Exposure to rewarded factors can be achieved with either a systematic or discretionary approach.
- Bottom-up managers first emphasize security-specific factors, whereas top-down managers first emphasize macro factors.
- Factor timing is more likely to be implemented among discretionary managers, especially those with a top-down approach.
- Systematic managers are unlikely to run concentrated portfolios. Discretionary managers can have either concentrated or diversified portfolios, depending on their strategy and portfolio management style.
- In principle, a systematic top-down manager would emphasize macro factors and factor timing and would have diversified portfolios. However, there are few managers in this category.

## 4. THE IMPLEMENTATION PROCESS: MEASURES OF BENCHMARK-RELATIVE RISK

- b. discuss approaches for constructing actively managed equity portfolios
- c. contrast Active Share with active risk and discuss how each measure relates to a manager's investment strategy

Managers have very specific beliefs about the level of security concentration and the absolute or relative risk that they (and their investors) are willing to tolerate. Relative risk is measured with respect to the benchmark that the manager has adopted as representative of his investment universe. We know that a manager must have active weights different from zero in order to outperform his benchmark. How do we measure these weights?

There are two measures of benchmark-relative risk used to evaluate a manager's success—Active Share and active risk—and they do not always move in tandem. A manager can pursue a higher Active Share without necessarily increasing active risk (and vice versa).

Active Share is easier to calculate than active risk; one only needs to know the weight of each security in the portfolio and the weight of the security in the benchmark. The formula for Active Share is shown in Equation 5. It measures the extent to which the number and sizing positions in a manager's portfolio differ from the benchmark.

#### Equation (5)

$$\text{Active Share} = \frac{1}{2} \sum_{i=1}^n \left| \text{Weight}_{\text{portfolio},i} - \text{Weight}_{\text{benchmark},i} \right|$$

where  $n$  represents the total number of securities that are in either the portfolio or the benchmark.

The Active Share calculation involves no statistical analysis or estimation; it is simple arithmetic. Active Share is a measure of the differentiation of the holdings of a portfolio from the holdings of a chosen benchmark portfolio. It measures the proportion of a portfolio's holdings that is different from the benchmark for that portfolio. The Active Share is 0 for a portfolio that matches the benchmark and 100% for a portfolio that shares no investments with those of the benchmark. The percentage of portfolio assets deployed in the same way as the benchmark is equal to 100% minus the portfolio's Active Share. For example, an Active Share of 80% implies that 20% of the portfolio capital was invested in a similar way as the index. There are only two sources of Active Share:

- Including securities in the portfolio that are not in the benchmark
- Holding securities in the portfolio that are in the benchmark but at weights different than the benchmark weights



If two portfolios are managed against the same benchmark (and if they invest only in securities that are part of the benchmark), the portfolio with fewer securities will have a higher level of Active Share than the highly diversified portfolio. A portfolio manager has complete control over his Active Share because he determines the weights of the securities in his portfolio.

**Active risk** is a more complicated calculation. Like Active Share, active risk depends on the differences between the security weights in the portfolio and the security weights in the benchmark. There are two different measures of active risk. One is realized active risk, which is the actual, historical standard deviation between the portfolio return and the benchmark return as described in Equation 3. This number relies on historical returns and is easy to calculate. But portfolio construction is a forward-looking exercise, and in this context, the relevant measure is predicted active risk, which requires a forward-looking estimate of correlations and variances.<sup>14</sup> As the accuracy of the forward-looking estimates of correlations and variances improves, the likelihood of better portfolio outcomes also improves.

The variance–covariance matrix of returns is very important in the calculation of active risk. Although portfolios that have higher active risk tend to have higher Active Share (and vice versa), this is not always the case. For example, underweighting one bank stock to overweight another bank stock will likely have less effect on active risk than underweighting one bank stock and overweighting an information technology stock. Active risk is affected by the degree of cross correlation, but Active Share is not. Active Share is not concerned with the efficiency of diversification.<sup>15</sup> If the extent of underweighting and overweighting is the same in the bank/bank over-/underweight and in the bank/technology over-/underweight, the effect on Active Share would be identical. The effect on active risk would be different, however, because the correlation of the bank/technology pair is most likely lower than the correlation of the bank/bank pair. This highlights an important difference in Active Share versus active risk. A portfolio manager can completely control Active Share, but she cannot completely control active risk because active risk depends on the correlations and variances of securities that are beyond her control. Recall that in Equation 2, we decomposed active return into returns to factors, alpha, and idiosyncratic risk.

### Equation (6)

$$\sigma_{R_A} = \sqrt{\sigma^2 \left( \sum (\beta_{pk} - \beta_{bk}) \times F_k \right) + \sigma_e^2}$$

Here, we show that the active risk of a portfolio ( $\sigma_{R_A}$ ) is a function of the *variance* attributed to the factor exposure  $\sigma^2 \left( \sum (\beta_{pk} - \beta_{bk}) \times F_k \right)$  and of the *variance* attributed to the idiosyncratic risk ( $\sigma_e^2$ ).<sup>16</sup> Although realized active risk will almost never be identical to predicted active risk, existing risk forecasting methodologies allow the manager to predict



active risk over a short horizon with a high level of accuracy. Managers can then control the level of active risk through portfolio structure.

[Sapra and Hunjan \(2013\)](#) derived a relationship between active risk, Active Share, and factor exposure for an unconstrained investor, assuming a single-factor model. They found that

- high net exposure to a risk factor will lead to a high level of active risk, irrespective of the level of idiosyncratic risk;
- if the factor exposure is fully neutralized, the active risk will be entirely attributed to Active Share;
- the active risk attributed to Active Share will be smaller if the number of securities is large and/or average idiosyncratic risk is small; and
- the level of active risk will rise with an increase in factor and idiosyncratic volatility (such as occurred in 2008).<sup>17</sup>

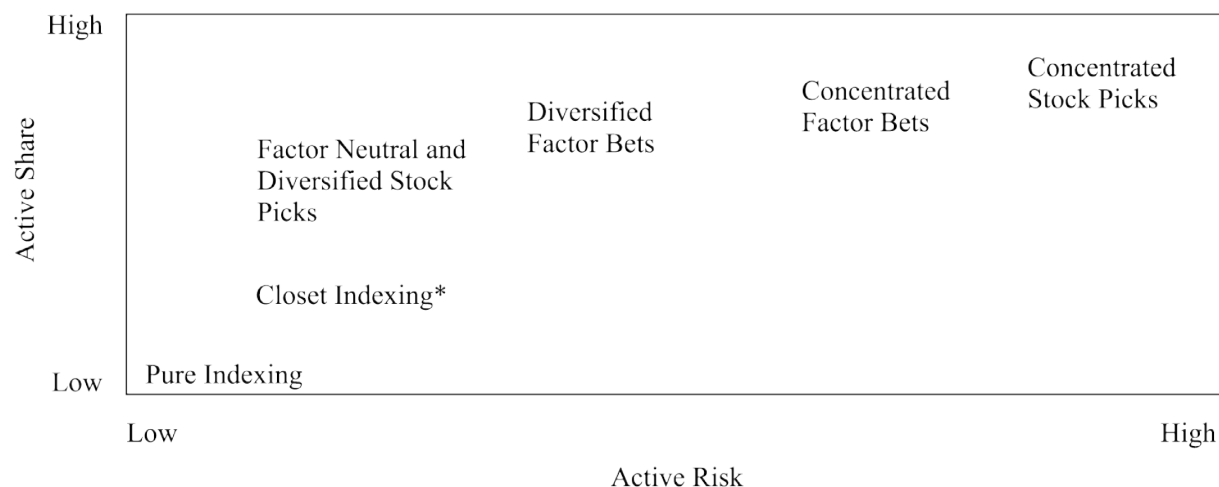
These observations are very intuitive: Active risk increases when a portfolio becomes more uncorrelated with its benchmark. As discussed previously, although overweighting or underweighting GM relative to Ford will generate some Active Share, it will typically not generate much active risk. However, overweighting or underweighting energy firms versus financial firms, small-cap firms versus large-cap firms, or growth firms versus value firms will certainly contribute more to active risk.

So how do we use these two measures to discriminate between different portfolio management approaches and management styles? Using the observations from [Sapra and Hunjan \(2013\)](#), we could characterize a manager as

- factor neutral, factor diversified, or factor concentrated and as
- diversified (with low security concentration and low idiosyncratic risk) or concentrated (with high security concentration and high idiosyncratic risk).<sup>18</sup>

[Exhibit 7](#) illustrates how various combinations of factor exposure and idiosyncratic risk affect Active Share and active risk.<sup>19</sup>

## **Exhibit 7. Investment Styles, Active Share, and Active Risk**



\*A **closet indexer** is defined as a fund that advertises itself as being actively managed but is substantially similar to an index fund in its exposures.

Using this framework, we can classify most equity strategies in terms of active risk and Active Share by analyzing the specific management style of the manager. For example, most multi-factor products have a low concentration among securities, often holding more than 250 positions (the purpose of these products is to achieve a balanced exposure to risk factors and minimize idiosyncratic risks). They are diversified across factors and securities. Thus, they typically have a high Active Share, such as 0.70, but they have reasonably low active risk (tracking error), often in the range of  $\pm 3\%$ .

The concentrated stock picker, in contrast, has both a high Active Share (typically above 0.90) and a high active risk (such as 8%–12% or higher).<sup>20</sup> (The average active manager owns about 100 stocks, and fewer than 20% of managers own more than 200 stocks.) It follows, then, that the level of idiosyncratic risk in the average active discretionary portfolio is greater than that of the average multi-factor fund, with its 250+ positions. Therefore, on average, we could expect the portfolio of a typical discretionary manager to display higher active risk.

Consequently, a manager can increase his degree of control over the level of Active Share and/or active risk in his portfolio by decreasing his security concentration. For example, it would not be uncommon for a sector rotator—typically a high-active-risk strategy—to have an active risk above 8%. If he chooses to run a concentrated portfolio, he might also have high Active Share. Or he can diversify his portfolio and reduce his Active Share.<sup>21</sup>

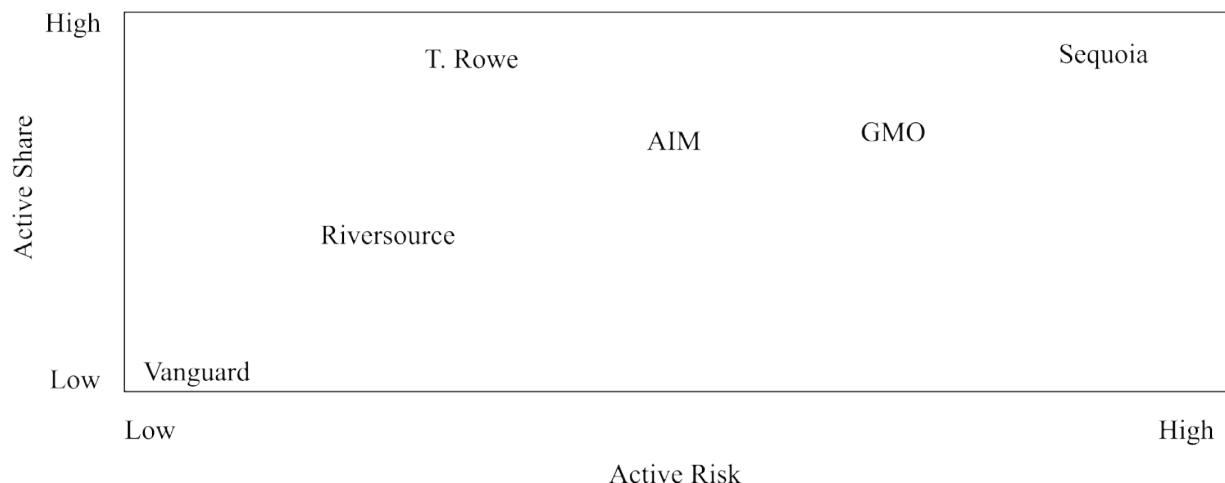
Petajisto (2013) provided examples of funds of different styles and their corresponding active risk and Active Share; see [Exhibit 8A](#). The risk tolerance and portfolio construction approach of each manager is partially revealed by his Active Share and active risk. [Exhibit 8B](#) presents the same information but plots it in the Active Share/active risk dimension using the format of [Exhibit 7](#).

## Exhibit 8A. Active Risk, Active Share, and Portfolio Styles, 2009

Name of Fund	Style/Comments	Active Risk	Active Share
Vanguard Index Fund	Indexed	0.0%	0.00
RiverSource Disciplined Equity Fund	Large-Cap Growth (Small active weight, limited factor timing)	4.4%	0.54
T. Rowe Price Mid-Cap Value Fund	Mid-Cap Value (Limited active weights on sectors but significant stock picking)	5.4%	0.93
AIM Constellation Fund	Large-Cap Growth (Significant sector bets )	9.7%	0.66
GMO Quality Fund	Mega-Cap Core (Timing on a number of factors and cash)	12.9%	0.65
Sequoia	Stock Picker (Highly concentrated positions)	14.1%	0.97

Source: Petajisto (2013).

## Exhibit 8B. Active Risk, Active Share, and Portfolio Styles



Active risk and Active Share provide information about the level of managers’ activism against their benchmark, but there is little research on the relative efficiency of different asset management styles translating higher active risk or Active Share into higher active returns. However, many investors are using Active Share to assess the fees that they pay per unit of active management. For example, a fund with an Active Share of 0.25 (a closet indexer) would be considered expensive relative to a fund with an Active Share of 0.75 if both funds were charging the same fees.

Not all investment products neatly fall into the categorization we have just presented. Niche equity strategies, such as statistical arbitrage, event-driven investing, and activist investing, focus on generating alpha returns generally without regard to factor exposures or factor timing. These strategies do, however, typically assume a high level of idiosyncratic risk.

EXAMPLE 2

Portfolio Construction—Approaches and Return Drivers

- 1. You are evaluating two equity managers. Explain how Manager A, with his high level of Active Share, is able to achieve such a low active risk. What are the implications for Manager B’s performance relative to that of Manager A?

	Manager A	Manager B
Active Share	0.73	0.71
Active risk	2.8%	6.0%
Number of positions	120	125

- 2. Discuss the drivers of return for Managers A and B.

	Manager A	Manager B	Factor Returns
Monthly performance in excess of the risk-free rate	0.65%	0.65%	
“Alpha” (monthly)	0.00%	0.20%	
Beta to:			
Market*	0.99	1.05	0.45%

<b>Size</b>	0	-0.2	0.20%
<b>Value</b>	0.15	0.05	0.35%
<b>Momentum</b>	0.25	0	0.60%
<b>R-squared</b>	0.99	0.78	

\* Market factor is built from a much larger universe of securities than traditional benchmarks such as the Russell 1000. Therefore, we should not expect the  $\beta$  of indexes to the Market factor to be necessarily equal to one.

3. Based on the information provided below regarding four managers benchmarked against the MSCI World Index, identify the manager most likely to be a:
- closet indexer.
  - concentrated stock picker.
  - diversified multi-factor investor.
  - sector rotator.

Justify your response.

<b>Manager Constraints:</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
Target active risk	10%	1%	4%	7%
Max. sector deviations	0%	3%	10%	15%
Max. risk contribution, single security	5%	1%	1%	3%

4. Discuss the main differences between top-down and bottom-up portfolio management approaches and how they relate to two of the building blocks: exposure to rewarded factors and alpha.

## Solution to 1:

Managers A and B have a similar number of positions and similar Active Share. Manager B has much higher active risk. A high Active Share says only that a manager's security-level weights are quite different from those of the index. A 0.5% underallocation to one security and a 0.5% over-allocation to another security will have the same impact on Active Share whether these two securities are in the same sector or in different sectors. Given similar levels of Active Share, it is likely that Manager B's

active risk is driven by active decisions at the sector level rather than at the security level. Clearly, they implement very different investment strategies. Although we cannot draw a direct conclusion about the ability of Manager B to outperform Manager A, we can assume that the realized outcomes of Manager B are likely to be much more dispersed about the benchmark (both in positive and negative directions) given the higher level of active risk.

## **Solution to 2:**

Both managers generated the same absolute return, but they achieved their performance in very different ways. All of Manager A's performance can be explained from exposure to rewarded factors. There is no alpha, and the high  $R^2$  shows that the four factors explain much of the monthly variability in returns. Manager A did outperform the Market factor by 20 bps ( $0.65\% - 0.45\%$ ). The excess return can be attributed to the significant exposure (0.25) to the strong-performing Momentum factor (0.60%). Exposure to the Value factor explains the balance.

Manager B generated significant alpha (20 bps per month). The relatively low  $R^2$  indicates that much of the variability of returns is unexplained by the factors. Manager B's performance must, therefore, be attributed to either her alpha skills or idiosyncratic risks that favored the manager's investment approach during the period.

## **Solution to 3:**

Manager B is a closet indexer. The low targeted active risk combined with the narrow sector deviation constraint indicates that the manager is making very few active bets.

Manager A is likely a concentrated stock picker. The 10% active risk target indicates a willingness to tolerate significant performance deviations from the market. The 5% limit on a single security's contribution to portfolio risk indicates he is willing to run a concentrated portfolio. The unwillingness to take sector deviations combined with the high tolerance for idiosyncratic risk indicates that the manager likely focuses on stock selection and is, therefore, a stock picker.

Manager C limits single-security risk contribution to no more than 1%, which implies a highly diversified portfolio. The significant sector deviations despite this high diversification are often indicative of a multi-factor manager. The relatively low tracking error further supports the argument that Manager C is a multi-factor manager.

Manager D has characteristics consistent with a sector rotator. The significant active risk and high tolerance for sector deviations and security concentration are what one would expect to find with a sector rotator.

## Solution to 4:

### *Factor exposure.*

Bottom-up managers look at characteristics of securities to build their portfolios. The factor exposure inherent in their portfolios may be intentional, or it may be a by-product of their security selection process. Top-down managers articulate a macro view of the investment universe and build a portfolio emphasizing the macro factors that reflect those views. Although their macro views could then be translated into security views using a bottom-up approach, their performance will likely be dominated by their macro-level factor exposures.

### *Alpha.*

In the context of Equation 2, the alpha of bottom-up managers is most likely attributable to their security selection skills. Some portion of their active return can also be explained through exposure to rewarded factors. Top-down managers' alphas are largely derived from factor timing.

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## 5. THE IMPLEMENTATION PROCESS: OBJECTIVES AND CONSTRAINTS

- b. discuss approaches for constructing actively managed equity portfolios
- c. contrast Active Share with active risk and discuss how each measure relates to a manager's investment strategy

The simplest conceptual way to think about portfolio construction is to view it as an optimization problem. A standard optimization problem has an objective function and a set of constraints. The objective function defines the desired goal while the constraints limit the actions one can take to achieve that goal. Portfolio managers are trying to achieve desirable outcomes within the bounds of permissible actions. The nature of the objective function and the nature and specifics of the constraints can be indicative of an investment manager's philosophy and style.

A common objective function in portfolio management is to maximize a risk-adjusted return.

If risk is being measured by predicted active risk, then the objective function is seeking to maximize the information ratio (the ratio of active return to active risk). If risk is being measured by predicted portfolio volatility, then the objective function is seeking to maximize the Sharpe ratio (the ratio of return in excess of the risk-free rate to portfolio volatility). Ideally, these objective functions would specify *net* returns—adjusted for the costs associated with implementation.

Typical constraints in the portfolio optimization problem may include limits on geographic, sector, industry, and single-security exposures and may also specify limits on transaction costs (to limit turnover and/or help manage liquidity issues). They may also include limits on exposure to specific factors; for example, the investment process may specify a required minimum market capitalization for any single security or a minimum weighted average capitalization for the portfolio as a whole. Or it may specify a maximum price-to-book ratio for any single security or a maximum weighted average price-to-book ratio for the portfolio. Constraints can be defined relative to the benchmark or without regard to it. Setting constraints that properly express the risk dimensions being monitored, the desired level of risk taking, and the preferred portfolio structure while still allowing sufficient flexibility to achieve the risk and return goals is a challenging task. In principle, the active equity manager’s portfolio is the final blend that maximizes the objective function subject to the portfolio constraints.

Not all portfolio managers engage in such a formalistic, scientific approach to portfolio construction. The objectives and constraints of systematic managers are explicitly specified, whereas those of discretionary managers are less explicitly specified. However, most managers at least conceptually optimize their portfolios using the expected returns for each security, their own view of risk, and constraints imposed by the stated portfolio construction process or by the client. For our purposes, it is useful to frame the problem in this technical manner to provide a framework for discussion of the portfolio construction process.

Objectives and constraints may be stated in absolute terms or relative to a benchmark. [Exhibit 9](#) illustrates two generic objective functions—one that is absolute and one that is relative. Each is subject to a few specific constraints.

**Exhibit 9. Objective Functions and Constraints**

	Absolute Framework	Relative Framework
Objective Function:	Maximize Sharpe Ratio	Maximize Information Ratio
Constraint		
Individual security weights		



(w)	$w_i \leq 2\%$	$ w_{ip} - w_{ib}  \leq 2\%$
Sectors weights (S)	$S_i \leq 20\%$	$ S_{ip} - S_{ib}  \leq 10\%$
Portfolio volatility ( $\sigma$ )	$\sigma_p < 0.9 \sigma_b$	—
Active risk (TE)	—	$TE \leq 5\%$
Weighted average capitalization (Z)	$Z \geq 20\text{bn}$	$Z \geq 20\text{bn}$

- The absolute approach seeks to maximize the Sharpe ratio; the relative approach seeks to maximize the information ratio.
- The absolute approach limits any single security position to no more than 2% of the portfolio and any single sector to no more than 20% of the portfolio; the relative approach imposes a constraint that a security must remain within  $\pm 2\%$  of its index weight and sector weights must remain within  $\pm 10\%$  of the index weights.
- The absolute approach imposes a portfolio volatility limit equal to 90% of the estimated benchmark volatility and imposes a minimum weighted average security capitalization of \$20 billion; the relative approach imposes a 5% active risk limit and the same capitalization constraint.
- Managers can also combine relative and absolute constraints in the same framework, such as limiting sector deviations against a benchmark while imposing absolute limits on security positions.

Other optimization approaches specify their objectives in terms of the risk metrics, such as portfolio volatility, downside risk, maximum diversification, and drawdowns. These approaches do not integrate an explicit expected return component. However, they do implicitly create an exposure to risk factors. For example, products built using a risk-based objective function (such as minimum variance or maximum diversification)<sup>22</sup> often exhibit a Market beta below 1.0 and have a statistically significant exposure to the Value factor and to the low-minus-high- $\beta$  factor.<sup>23</sup> This occurs because an objective function that seeks to manage or minimize risk will tend to favor value and low-beta securities.

Finally, not all objective functions are explicitly concerned with risk or returns. For example, Equation 7 shows an explicit objective function that might be specified by a quantitative manager seeking to maximize exposure to rewarded factors:

### Equation (7)

$$\text{MAX} \left( \sum_{i=1}^N \frac{1}{3} \text{Size}_i + \frac{1}{3} \text{Value}_i + \frac{1}{3} \text{Momentum}_i \right)$$

where  $\text{Size}_i$ ,  $\text{Value}_i$ , and  $\text{Momentum}_i$  are standardized<sup>24</sup> proxy measures of Size, Value, and Momentum for security  $i$ .<sup>25</sup> The portfolio may also be subject to additional constraints similar to those in [Exhibit 9](#).

Of course, articulating an explicit objective of maximizing the Sharpe ratio or the information ratio or minimizing a given risk measure implies that we have information about expected returns and expected risk. Some managers—typically discretionary managers—do not make explicit return and risk forecasts and instead seek to “maximize” their exposure to securities having specific characteristics. Embedded in their investment process is an implicit return-to-risk objective.

For example, the objective function of a discretionary manager may be expressed in a mission statement such as: “We are a deep value manager in large-cap US equity with a concentrated, best ideas style.” They then identify securities possessing deep value characteristics (as they define value). The portfolio construction process will balance security concentration and sector exposure as the manager seeks to maximize the return at an acceptable level of risk. The allocation may be driven by the manager’s judgment about the risk and return trade-offs, or a formal risk management protocol may be used to drive the allocation process, or a feedback mechanism may be put in place to ensure that constraints are being respected as the portfolio is being assembled or rebalanced by the manager.

When an explicit objective function is not used, many heuristic methodologies can be considered to determine security weighting in a portfolio. We list a few examples below.

- Identify securities that have the desired characteristics and weight them relative to their scoring on these characteristics. For example, a security with a price-to-book ratio of 8 would have half the weight of a security with a price-to-book ratio of 4.
- Identify securities that have the desired characteristics and weight them per their ranking or risk on these characteristics. For example, if there are five securities ranked on their price-to-book ratios, the security with the lowest price-to-book ratio would constitute 33% of the portfolio value  $[5/(5 + 4 + 3 + 2 + 1)]$  and the security with the highest price-to-book ratio would constitute 6.7% of the portfolio value  $[1/(5 + 4 + 3 + 2 + 1)]$ .
- Identify stocks that have the desired characteristics, rank them according to how strongly they adhere to these characteristics, select the top  $x\%$  of these stocks, and assign them portfolio weights based on one of several methodologies, such as equal weight, equal risk, scoring, or ranking on these characteristics. For example, if there are 1,000 securities in an index, the 500 securities with the lowest price-to-book ratios could be selected. Each security would then be weighted using the chosen methodology.

Although these alternative methodologies may be intuitively appealing, they may not allocate active risk as efficiently as a formal optimization framework would. The constraints and objective function will be strongly reflective of the philosophy and style of a manager. For example, a stock picker is likely to have fewer and more permissive constraints on security weights than a multi-factor manager seeking to minimize idiosyncratic risks. A manager specializing in sector rotation will have more permissive constraints with respect to sector concentration than a value manager.

### EXAMPLE 3

## Approaches to Portfolio Construction

Marc Cohen is a portfolio manager whose primary skill is based on having a good understanding of rewarded sources of risk. He does not believe in factor timing. Sophie Palmer is a portfolio manager who believes she has skill in anticipating shifts in sector performance. She does not profess to have skill in individual security selection but tolerates significant deviations in sector exposure. Sean Christopher is a stock picker running a high-turnover strategy based on recent movements in market price among the Russell 1000 stock universe. He is highly sector and size agnostic and has significant active risk. Discuss the expected profile of each manager in terms of

- the sensitivity of their performance to risk factors,
- the level of security concentration, and
- the contribution of idiosyncratic risk to the total active risk of their portfolios.

### Solution:

We should be able to explain a large part of Cohen's excess return using the performance of rewarded factors. We would not expect alpha to be a significant component of his performance. His exposure to risk factors would be relatively stable across time periods because he does not believe in factor timing. Because his primary emphasis is on long-term exposure to risk factors, he would hold a highly diversified portfolio to minimize idiosyncratic risk. As a multi-factor manager running a diversified portfolio, his active risk should be relatively low.

Palmer's performance is likely to be explained by tactical exposures to sectors, which we have said are unrewarded risks, rather than static exposures to known rewarded factor returns. Her excess performance against her benchmark will likely be attributed to alpha. With no professed skill in security selection, she is likely to hold a large number of securities in each sector to minimize idiosyncratic risk. The active risk arising from

her sector weightings will overshadow the active risk from security weightings. Her active risk is likely to be higher than that of Marc Cohen.

Christopher's portfolio is more difficult to assess. His focus on recent price movements indicates a sensitivity to the Momentum factor, although the sensitivity to this factor may depend on the time horizons and methodologies he uses to measure price momentum. He is size agnostic and may at times have exposure to the Size factor, a smaller-cap bias. With the information given, we cannot make an inference regarding the diversification of his portfolio. As a discretionary manager, he is to run a concentrated portfolio in order to more closely monitor his positions. However, if he makes extensive use of quantitative tools in monitoring his portfolio, he may be able to hold a more diversified portfolio. His active risk will be high, and his performance is likely to have a significant alpha component, whether positive or negative.

## EXAMPLE 4

### Approaches to Portfolio Construction

*Manager A* uses a scoring process and seeks to maximize the portfolio score based on the factor characteristics of individual securities. His purpose is not to time factor exposure but to achieve an appropriate diversification of factor risks. His approach is fully systematic, and he has a tracking error constraint of less than 4%. No one position can be greater than 2%, irrespective of its benchmark weight.

*Manager B* has a strong fundamental process based on a comprehensive understanding of the business model and competitive advantages of each firm. However, Manager B also uses sophisticated models to make explicit three-year forecasts of the growth of free cash flow to determine the attractiveness of each security's current valuation. A committee of portfolio managers meets once a month to debate the portfolio allocation. The manager has a large staff of portfolio managers and analysts and thus can maintain wide coverage of companies within each industry. Individual positions are constrained to the lower of (1) benchmark weight + 2% or (2) five times the benchmark weight.

*Manager C* specializes in timing sector exposure and has little appetite for idiosyncratic risks within sectors. Using technical analyses and econometric methodologies, she produces several types of forecasts. The manager uses this information to determine appropriate sector weights. The risk contribution from any single sector is limited to 30% of total portfolio risk. The final decision on sector allocations rests with the manager.

Discuss each manager's implementation approach, security selection approach, portfolio concentration, objective function, and constraints.

## Solution:

Manager A is best characterized as a systematic, bottom-up manager.

- *Implementation approach.* An implementation approach that is fully quantitative (allocations are unaffected by a portfolio manager's judgment) is systematic.
- *Security selection approach.* A scoring process that ranks individual securities based on their factor characteristics is a bottom-up approach.
- *Concentration.* Although the limit of no more than 2% of the portfolio in any single position means the portfolio could hold as few as 50 securities, the tracking error constraint of 4% indicates that the portfolio is likely diversified.
- *Objective function.* A process that aims to maximize the portfolio's score based on the factor characteristics of single securities is an example of an explicit objective function.
- *Constraints.* The tracking error constraint of less than 4% is a relative constraint function. The limit on any single position to no more than 2% of the portfolio is an absolute—not a relative—constraint. It does not depend on benchmark weights.

The following table summarizes this information for all three managers:

	Manager A	Manager B	Manager C
Implementation approach	Systematic	Discretionary	Discretionary
Security selection approach	Bottom-up	Bottom-up	Top-down
Portfolio concentration	Diversified	Diversified	Security diversified Factor concentrated
Objective function	Explicit	Explicit	Explicit
Constraints	Relative and absolute	Relative	Absolute

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## 6. ABSOLUTE VS. RELATIVE MEASURES OF RISK

- d. discuss the application of risk budgeting concepts in portfolio construction
- e. discuss risk measures that are incorporated in equity portfolio construction and describe how limits set on these measures affect portfolio construction

Risk budgeting is a process by which the total risk appetite of the portfolio is allocated among the various components of portfolio choice. As an example, if the portfolio manager has an *ex ante* active risk budget explicitly provided by the client, with risk budgeting, she seeks to optimize the portfolio's exposures relative to the benchmark to ensure that the choices she makes among stocks, sectors, or countries make efficient use of the active risk budget. But *ex ante* active risk is just one possible measure of risk. An effective risk management process requires that the portfolio manager do the following:

- Determine which type of risk measure is most appropriate to her strategy.
  - For example, a long/short equity manager benchmarked against a cash plus target will usually prefer an absolute risk measure (such as total volatility of portfolio returns), whereas a long-only equity manager benchmarked against a capitalization-weighted index may prefer a relative risk measure (such as active risk).
- Understand how each aspect of the strategy contributes to its overall risk.
  - Total portfolio variance may be dominated by exposure to rewarded risk factors or by allocations to countries, sectors, or securities. If these exposures are dynamic, the timing of portfolio exposures also introduces risk. An important step in risk budgeting is to understand what drives a portfolio's risk and to ensure the portfolio has the right kinds of specific risks.
- Determine what level of risk budget is appropriate.
  - Targeted levels of risk vary widely among managers and strategies. Although there are general principles that limit the level of advisable risk in a specific strategy, it is also very much a policy issue.
- Properly allocate risk among individual positions/factors.
  - Whether the risk measure is absolute or relative, managers must efficiently allocate

their targeted risk budget.

## **6.1. Absolute vs. Relative Measures of Risk**

The choice between an absolute and a relative risk portfolio management orientation is driven by the mandate of the manager and the goals of investors. If the mandate is to outperform a market index over a horizon, such as three years, then the manager will focus on active risk. If the investment objective is expressed in terms of total returns, then the manager will likely focus on the volatility of portfolio returns.

Managers' beliefs about how they add value can influence the choice between an absolute and a relative risk measure. Some managers may believe that the benchmark-relative constraints so common in the world of investment management today inhibit the ability of their investment approach to realize its full potential. To address this issue, they may prefer either an absolute risk measure or a relative risk measure with a wide range of allowed deviations. An absolute risk measure is just that: Whatever the risk threshold, the portfolio risk must remain at or below that level. The manager is free to construct his portfolio without regard to the characteristics of the benchmark. A relative risk measure with wide bands around a central target implies a benchmark-relative approach with significant degrees of freedom to diverge from the characteristics of the benchmark. Ultimately, however, risk and reward will be measured relative to that benchmark. Although some large institutional investors have adopted investment strategies in recent years that are agnostic to the benchmark (an absolute/total return approach) or have had a very high active risk target in a benchmark-relative framework, most assets under management are managed under benchmark-relative mandates. Irrespective of whether a manager focuses on absolute risk or relative risk, the risks he chooses to take should be related to his perceived skills. All other risk should be diversified or minimized. For example,

- market timers should be concerned with timing their factor exposure,
- sector rotators should be concerned with timing their sector exposure, and
- multi-factor managers should be concerned with balancing their factor exposure.

The first step in determining how risk should be allocated is understanding the generic drivers of absolute and relative portfolio risk.

### **6.1.1. Causes and Sources of Absolute Risk**

We start with the following fundamental principles:



- If a manager adds a new asset (such as a security) to his portfolio that has a higher covariance with the portfolio than most current securities, total portfolio risk will rise. (A high covariance with the existing portfolio can be driven by a high variance or a higher correlation of the new security with the portfolio.)
- If a manager replaces an existing security with another security that has a higher covariance with the portfolio than that of the security being replaced, total portfolio risk will rise.

These principles also work in reverse. Consider the three-asset portfolio in [Exhibit 10](#).

### Exhibit 10. Absolute Risk Attribution

	Portfolio Weight	Standard Deviation	Correlation			Portfolio Risk Attribution	
			Asset A	Asset B	Asset C	Contribution to Portfolio Variance	
						Absolute	%
Asset A	40%	20%	1	0.40	0.20	0.008416	59.22%
Asset B	50%	12%	0.40	1	0.20	0.005592	39.35%
Asset C	10%	6%	0.20	0.20	1	0.000204	1.44%
Portfolio	<b>100%</b>	<b>11.92%</b>	<b>0.88</b>	<b>0.78</b>	<b>0.20</b>	<b>0.014212</b>	<b>100%</b>

◀		▶
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	Covariance		
	Asset A	Asset B	Asset C
Asset A	0.040000	0.009600	0.002400
Asset B	0.009600	0.014400	0.001440
Asset C	0.002400	0.001440	0.003600
Portfolio	<b>0.020926</b>	<b>0.011129</b>	<b>0.001427</b>

Portfolio variance is a function of the individual asset returns and the covariance of returns between assets. In this example, the total variance is 0.014212, which equates to a portfolio standard deviation of 11.92%. Equation 8a expresses the calculation of total portfolio



variance ( $V_p$ ), and Equation 8b determines the contribution of each asset to portfolio variance ( $CV_i$ ).

#### Equation (8a)

$$V_p = \sum_{i=1}^n \sum_{j=1}^n x_i x_j C_{ij}$$

#### Equation (8b)

$$CV_i = \sum_{j=1}^n x_i x_j C_{ij} = x_i C_{ip}$$

where

$x_j$  = the asset's weight in the portfolio

$C_{ij}$  = the covariance of returns between asset  $i$  and asset  $j$

$C_{ip}$  = the covariance of returns between asset  $i$  and the portfolio

In other words, the contribution of an asset to total portfolio variance is equal to the product of the weight of the asset and its covariance with the entire portfolio. For example, Asset A's contribution to total portfolio variance is calculated as follows:

Weight of Asset A × Weight of Asset A × Covariance of Asset A with Asset A	0.40 × 0.40 × 0.04
+ Weight of Asset A × Weight of Asset B × Covariance of Asset B with Asset A	+ 0.40 × 0.50 × 0.0096
+ Weight of Asset A × Weight of Asset C × Covariance of Asset C with Asset A	+ 0.40 × 0.10 × 0.0024
= Asset A's contribution to total portfolio variance	= 0.008416

The proportion of total portfolio variance contributed by Asset A is, therefore,  $0.008416/0.014212 = 59.22\%$ . Asset A, which has an allocation of 40%, accounts for nearly 60% of total portfolio variance. This is not surprising, because the correlation of Asset A with the portfolio is 0.88. Asset B contributes 39.35% of total portfolio variance, and Asset C contributes 1.44%.

As you read the foregoing discussion, you naturally thought of Assets A, B, and C as securities, but the “assets” might also be sectors, countries, or pools of assets representing risk factors (Value versus Growth, Small versus Large). Hence, if a manager specializes in sector rotation and replaces an allocation to one sector with an allocation to another sector having a higher covariance with the portfolio, total portfolio risk will increase.

We have explained risk by looking at how a single asset contributes to total portfolio variance, but a manager might also seek to understand how his portfolio variance can be attributed to factor exposures versus that which is unexplained by these factors. As we noted earlier, the risks a manager chooses to take should be related to his perceived skills. If the manager’s skills can be attributed to certain factors, then he would want to minimize the level of portfolio risk not explained by those factors. The segmentation of absolute portfolio variance into these two components—variance attributed to factor exposure and variance unexplained—is expressed by Equation 9:<sup>26</sup>

**Equation (9)**

$$V_p = \text{Var}\left(\sum_{i=1}^K (\beta_{ip} \times F_i)\right) + \text{Var}(\varepsilon_p)$$

If the manager’s portfolio were the market portfolio, all the variance of the portfolio returns would be explained by a beta of 1 to the Market factor. Idiosyncratic risks would be fully diversified. However, as we move away from the market portfolio, total portfolio variance will be influenced by other factor exposures and other risks unexplained by factors.<sup>27</sup>

[Exhibit 11](#) presents the risk factor attribution (as measured by the variance of returns) of the three products presented earlier in [Exhibit 2](#): the Russell 1000 Index, the Russell 1000 Value Index, and a Value fund. [Exhibit 11](#) shows that more than 100% of the absolute risk of the Russell 1000 Index is explained by the Market factor. The size exposure (the large-cap tilt of the Russell 1000 relative to the market) has a slight negative contribution to total risk.

The risk of the Russell 1000 Value Index is also dominated by the Market factor, and unsurprisingly, the Value factor explains 12.5% of total risk.

The Value fund appears to have much idiosyncratic risk. Its sensitivity to the Market factor is only 57.7%, whereas the Value factor accounts for 18.1% of total risk. Overall, the four factors account for slightly more than 74% of total portfolio risk, and almost 26% remains unexplained. The percentage of total variance that is explained corresponds to the  $R^2$  of the regressions as reported in [Exhibit 2](#).

	<b>Russell 1000 Index</b>	<b>Russell 1000 Value Index</b>	<b>Value Fund</b>
Market	100.4%	88.9%	57.7%
Size	−1.8%	−1.6%	1.8%
Value	0.2%	12.5%	18.1%
Momentum	0.5%	−5.2%	−3.5%
Total explained risk	99.3%	94.6%	74.1%
Total unexplained risk	0.7%	5.4%	25.9%
Total absolute risk (standard deviation annualized)	14.5%	14.2%	18.0%

Source: Calculations by authors.

### 6.1.2. Causes and Sources of Relative/Active Risk

Relative risk becomes an appropriate measure when the manager is concerned with her performance relative to a benchmark. One measure of relative risk is the variance of the portfolio's active return ( $AV_p$ ):

#### Equation (10a)

$$AV_p = \sum_{i=1}^n \sum_{j=1}^n (x_i - b_i)(x_j - b_j) RC_{ij}$$

where

$x_i$  = the asset's weight in the portfolio

$b_i$  = the benchmark weight in asset  $i$

$RC_{ij}$  = the covariance of relative returns between asset  $i$  and asset  $j$

The contribution of each asset to the portfolio active variance ( $CAV_i$ ) is

#### Equation (10b)

$$CAV_i = (x_i - b_i)RC_{ip}$$

where  $RC_{ip}$  is the covariance of relative returns between asset  $i$  and the portfolio  $p$ .

If you are assessing risk using a relative risk construct, you can conclude that a lower-risk asset reduces active risk or that a higher-risk asset increases active risk. If the composition of the benchmark, a lower-risk asset could increase active risk and a higher-risk asset might reduce it.

Let's consider a simple example. Assume a benchmark is composed of two equity indexes. The portfolio is composed of allocations to the two equity indexes and a third asset—cash. What happens to the active risk of the portfolio if the manager changes the allocation to the two indexes, the portfolio allocation is 40/40 and the benchmark is still 50/50. Let's look at the contribution of the active risk to the variance of the portfolio. [Exhibit 12](#) presents the relevant information.

### Exhibit 12. Relative Risk Attribution

	Benchmark Weight	Portfolio Weight	Standard Deviation	Active Risk	Index
Index A	50%	40%	16%	5.0%	-
Index B	50%	40%	10%	5.0%	-
Cash	0%	20%	0.5%	12.0%	-
Total	100%	100%		2.4%	-

Index A and Index B have absolute volatilities of 16% and 10%, respectively. Cash has a very low volatility. The manager is concerned with active risk. Both Index A and Index B have an active risk of 5% and Cash has higher active risk because it has a low correlation with the benchmark.

[Exhibit 12](#) shows that the correlations of active returns between the portfolio and the benchmark are 0.5 for Index A and 0.5 for Index B.





























































































































































# GLOSSARY

## A

### **Absolute return benchmark**

A minimum target return that an investment manager is expected to beat.

### **Accounting defeasance**

Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

### **Accumulation phase**

Phase where the government predominantly contributes to a sovereign wealth pension reserve fund.

### **Active management**

A portfolio management approach that allows risk factor mismatches relative to a benchmark index causing potentially significant return differences between the active portfolio and the underlying benchmark.

### **Active return**

Portfolio return minus benchmark return.

### **Active risk**

The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

### **Active risk budgeting**

Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

## **Active share**

A measure of how similar a portfolio is to its benchmark. A manager who precisely replicates the benchmark will have an Active Share of zero; a manager with no holdings in common with the benchmark will have an Active Share of one.

## **Activist short selling**

A hedge fund strategy in which the manager takes a short position in a given security and then publicly presents his/her research backing the short thesis.

## **After-tax excess return**

Calculated as the after-tax return of the portfolio minus the after-tax return of the associated benchmark portfolio.

## **Agency trade**

A trade in which the broker is engaged to find the other side of the trade, acting as an agent. In doing so, the broker does not assume any risk for the trade.

## **Alpha decay**

In a trading context, alpha decay is the erosion or deterioration in short term alpha after the investment decision has been made.

## **Alternative trading systems**

(ATS) Non-exchange trading venues that bring together buyers and sellers to find transaction counterparties. Also called *multilateral trading facilities (MTF)*.

## **Anchoring and adjustment**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anchoring and adjustment bias**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anomalies**

Apparent deviations from market efficiency.

## **Arithmetic attribution**

An attribution approach which explains the arithmetic difference between the portfolio return and its benchmark return. The single-period attribution effects sum to the excess return, however, when combining multiple periods, the sub-period attribution effects will not sum to the excess return.

## **Arrival price**

In a trading context, the arrival price is the security price at the time the order was released to the market for execution.

## **Asset location**

The type of account an asset is held within, e.g., taxable or tax deferred.

## **Asset-only**

With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

## **Asset swap spread (ASW)**

The spread over MRR on an interest rate swap for the remaining life of the bond that is equivalent to the bond's fixed coupon.

## **Asset swaps**

Convert a bond's fixed coupon to MRR plus (or minus) a spread.

## **Authorized participants**

Institutional investors who create and redeem ETF shares using an OTC primary market with an ETF sponsor.

## **Availability bias**

An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

# **B**

## **Back-fill bias**

The distortion in index or peer group data which results when returns are reported to a database only after they are known to be good returns.

## **Barbell**

A fixed-income investment strategy combining short- and long-term bond positions.

## **Base**

With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in “one unit of a currency.”

## **Base-rate neglect**

A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

## **Basis risk**

The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

## **Bear flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in short-term bond yields-to-maturity.

## **Bear spread**

An option strategy that becomes more valuable when the price of the underlying asset declines, so requires buying one option and writing another with a *lower* exercise price. A put bear spread involves buying a put with a higher exercise price and selling a put with a lower exercise price. A bear spread can also be executed with calls.

## **Bear steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in long-term bond yields-to-maturity.

## **Behavioral finance macro**

A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

## **Behavioral finance micro**

A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

## **Bequest**

The transferring, or bequeathing, of assets in some other way upon a person's death. Also referred to as a testamentary bequest or testamentary gratuitous transfer.

## **Best-in-class**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *positive screening*.

## **Bid price**

In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

## **Breadth**

The number of truly independent decisions made each year.

## **Buffering**

Establishing ranges around breakpoints that define whether a stock belongs in one index or another.

## **Bull flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in long-term bond yields-to-maturity.

## **Bull spread**

An option strategy that becomes more valuable when the price of the underlying asset rises, so requires buying one option and writing another with a *higher* exercise price. A call bull spread involves buying a call with a lower exercise price and selling a call with a higher exercise price. A bull spread can also be executed with puts.

## **Bull steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in short-term bond yields-to-maturity.

## **Bullet**

A fixed-income investment strategy that focuses on the intermediate term (or “belly”) of the yield curve.

## **Business cycle**

Fluctuations in GDP in relation to long-term trend growth, usually lasting 9-11 years.

## **Butterfly spread**

A measure of yield curve shape or curvature equal to double the intermediate yield-to-maturity less the sum of short- and long-term yields-to-maturity.

## **Butterfly strategy**

A common yield curve shape strategy that combines a long or short bullet position with a barbell portfolio in the opposite direction to capitalize on expected yield curve shape changes.

# **C**

## **Calendar rebalancing**

Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

## **Calendar spread**

A strategy in which one sells an option and buys the same type of option but with different expiration dates, on the same underlying asset and with the same strike. When the investor buys the more distant (near-term) call and sells the near-term (more distant) call, it is a long (short) calendar spread.

## **Canada model**

Characterized by a high allocation to alternatives. Unlike the endowment model, however, the Canada model relies more on internally managed assets. The innovative features of the Canada model are the: a) reference portfolio, b) total portfolio approach, and c) active management.

## **Capital gain or loss**

For tax purposes equals the selling price (net of commissions and other trading costs) of the asset less its tax basis.

## **Capital market expectations**

(CME) Expectations concerning the risk and return prospects of asset classes.

## **Capital needs analysis**

See *capital sufficiency analysis*.

## **Capital sufficiency analysis**

The process by which a wealth manager determines whether a client has, or is likely to accumulate, sufficient financial resources to meet his or her objectives; also known as *capital needs analysis*.

## **Capture ratio**

A measure of the manager's gain or loss relative to the gain or loss of the benchmark.

## **Carhart model**

A four factor model used in performance attribution. The four factors are: market (RMRF), size (SMB), value (HML), and momentum (WML).

## **Carry trade**

A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

## **Carry trade across currencies**

A strategy seeking to benefit from a positive interest rate differential across currencies by combining a short position (or borrowing) in a low-yielding currency and a long position (or lending) in a high-yielding currency.

## **Cash drag**

Tracking error caused by temporarily uninvested cash.

## **Cash flow matching**

Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives.



## **Cash-secured put**

An option strategy involving the writing of a put option and simultaneously depositing an amount of money equal to the exercise price into a designated account (this strategy is also called a fiduciary put).

## **CDS curve**

Plot of CDS spreads across maturities for a single reference entity or group of reference entities in an index.

## **Cell approach**

See *stratified sampling*.

## **Charitable gratuitous transfers**

Asset transfers to not-for-profit or charitable organizations. In most jurisdictions charitable donations are not subject to a gift tax and most jurisdictions permit income tax deductions for charitable donations.

## **Charitable remainder trust**

A trust setup to provide income for the life of named-beneficiaries. When the last named-beneficiary dies any remaining assets in this trust are distributed to the charity named in the trust, hence the term *charitable remainder* trust.

## **Closet indexer**

A fund that advertises itself as being actively managed but is substantially similar to an index fund in its exposures.

## **Cognitive cost**

The effort involved in processing new information and updating beliefs.

## **Cognitive dissonance**

The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

## **Cognitive errors**

Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

## **Collar**

An option position in which the investor is long shares of stock and then buys a put with an exercise price below the current stock price and writes a call with an exercise price above the current stock price. Collars allow a shareholder to acquire downside protection through a protective put but reduce the cash outlay by writing a covered call.

## **Completion overlay**

A type of overlay that addresses an indexed portfolio that has diverged from its proper exposure.

## **Completion portfolio**

Is an index-based portfolio that when added to a given concentrated asset position creates an overall portfolio with exposures similar to the investor's benchmark.

## **Conditional value at risk**

(CVaR) Also known as expected loss The average portfolio loss over a specific time period conditional on that loss exceeding the value at risk (VaR) threshold.

## **Confirmation bias**

A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

## **Conjunction fallacy**

An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

## **Conservatism bias**

A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

## **Contingent immunization**

Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

## **Controlled foreign corporation (CFC)**

A company located outside a taxpayer's home country in which the taxpayer has a controlling interest as defined under the home country law.

## **Covered call**

An option strategy in which a long position in an asset is combined with a short position in a call on that asset.

## **Covered interest rate parity**

The relationship among the spot exchange rate, the forward exchange rate, and the interest rate in two currencies that ensures that the return on a hedged (i.e., covered) foreign risk-free investment is the same as the return on a domestic risk-free investment. Also called *interest rate parity*.

## **Credit cycle**

The expansion and contraction of credit over the business cycle, which translates into asset price changes based on default and recovery expectations across maturities and rating categories.

## **Credit default swap (CDS) basis**

Yield spread on a bond, as compared to CDS spread of same tenor.

## **Credit loss rate**

The realized percentage of par value lost to default for a group of bonds equal to the bonds' default rate multiplied by the loss severity.

## **Credit migration**

The change in a bond's credit rating over a certain period.

## **Credit valuation adjustment (CVA)**

The present value of credit risk for a loan, bond, or derivative obligation.

## **Cross-currency basis swap**

An interest rate swap involving the periodic exchange of floating payments in one currency for another based upon respective market reference rates with an initial and final exchange of notional principal.

## **Cross hedge**

A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

## **Cross-sectional consistency**

A feature of expectations setting which means that estimates for all classes reflect the same underlying assumptions and are generated with methodologies that reflect or preserve important relationships among the asset classes, such as strong correlations. It is the internal consistency across asset classes.

## **Cross-sectional momentum**

A managed futures trend following strategy implemented with a cross-section of assets (within an asset class) by going long those that are rising in price the most and by shorting those that are falling the most. This approach generally results in holding a net zero (market-neutral) position and works well when a market's out- or underperformance is a reliable predictor of its future performance.

## **Currency overlay**

A type of overlay that helps hedge the returns of securities held in foreign currency back to the home country's currency.

## **Currency overlay programs**

A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

## **Custom security-based benchmark**

Benchmark that is custom built to accurately reflect the investment discipline of a particular investment manager. Also called a *strategy benchmark* because it reflects a manager's particular strategy.

## **D**

## **Decision price**

In a trading context, the decision price is the security price at the time the investment decision was made.

### **Decision-reversal risk**

The risk of reversing a chosen course of action at the point of maximum loss.

### **Decumulation phase**

Phase where the government predominantly withdraws from a sovereign wealth pension reserve fund.

### **Dedicated short-selling**

A hedge fund strategy in which the manager takes short-only positions in equities deemed to be expensively priced versus their deteriorating fundamental situations. Short exposures may vary only in terms of portfolio sizing by, at times, holding higher levels of cash.

### **Default intensity**

POD over a specified time period in a reduced form credit model.

### **Default risk**

Likelihood that a borrower will default or fail to meet its obligation to make full and timely payments of principal and interest according to the terms of a debt obligation.

### **Deferred annuity**

An annuity that enables an individual to purchase an income stream that will begin at a later date.

### **Defined benefit**

A retirement plan in which a plan sponsor commits to paying a specified retirement benefit.

### **Defined contribution**

A retirement plan in which contributions are defined but the ultimate retirement benefit is not specified or guaranteed by the plan sponsor.

### **Delay cost**

The (trading related) cost associated with not submitting the order to the market in a timely manner.

## **Delta**

The change in an option's price in response to a change in price of the underlying, all else equal.

## **Delta hedging**

Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

## **Demand deposits**

Accounts that can be drawn upon regularly and without notice. This category includes checking accounts and certain savings accounts that are often accessible through online banks or automated teller machines (ATMs).

## **Diffusion index**

An index that measures how many indicators are pointing up and how many are pointing down.

## **Direct market access**

(DMA) Access in which market participants can transact orders directly with the order book of an exchange using a broker's exchange connectivity.

## **Disability income insurance**

A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

## **Discount margin**

The discount (or required) margin is the yield spread versus the MRR such that the FRN is priced at par on a rate reset date.

## **Discretionary portfolio management**

An arrangement in which a wealth manager has a client's pre-approval to execute investment decisions.

## **Discretionary trust**

A trust that enables the trustee to determine whether and how much to distribute based on a beneficiary's general welfare.

## **Disposition effect**

As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

## **Dividend capture**

A trading strategy whereby an equity portfolio manager purchases stocks just before their ex-dividend dates, holds these stocks through the ex-dividend date to earn the right to receive the dividend, and subsequently sells the shares.

## **Domestic asset**

An asset that trades in the investor's domestic currency (or home currency).

## **Domestic currency**

The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

## **Domestic-currency return**

A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

## **Double taxation**

A term used to describe situations in which income is taxed twice. For example, when corporate earnings are taxed at the company level and then that portion of earnings paid as dividends is taxed again at the investor level.

## **Drawdown**

A decline in value (represented by a series of negative returns only) following a peak fund valuation.

## **Drawdown duration**

The total time from the start of the drawdown until the cumulative drawdown recovers to zero.

## **Due diligence**

Investigation and analysis in support of an investment action, decision, or recommendation.

## **Duration matching**

Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

## **Duration times spread**

Weighting of spread duration by credit spread in order to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage, rather than absolute, basis.

## **Duration Times Spread (DTS)**

Weighting of spread duration by credit spread to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage rather than absolute basis.

## **Dynamic asset allocation**

A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

## **Dynamic hedge**

A hedge requiring adjustment as the price of the hedged asset changes.

# **E**

## **Earnings risk**

The risk associated with the earning potential of an individual.

## **Econometrics**

The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.



## **Economic balance sheet**

A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet*.

## **Economic indicators**

Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

## **Economic net worth**

The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

## **Effective federal funds (FFE) rate**

The fed funds rate actually transacted between depository institutions, not the Fed's target federal funds rate.

## **Emotional biases**

Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

## **Empirical duration**

Estimation of the price-yield relationship using historical bond market data in statistical models.

## **Endowment bias**

An emotional bias in which people value an asset more when they hold rights to it than when they do not.

## **Endowment model**

Characterized by a high allocation to alternative investments (private investments and hedge funds), significant active management, and externally managed assets.

## **Enhanced indexing approach**

Maintains a close link to the benchmark but attempts to generate a modest amount of outperformance relative to the benchmark.

## **Enhanced indexing strategy**

Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

## **Equity monetization**

A group of strategies that allow investors to receive cash for their concentrated stock positions without an outright sale. These transactions are structured to avoid triggering the capital gains tax.

## **Estate**

Consists of all of the property a person owns or controls, which may consist of financial assets (e.g., bank accounts, stocks, bonds, business interests), tangible personal assets (e.g., artwork, collectibles, vehicles), immovable property (e.g., residential real estate, timber rights), and intellectual property (e.g., royalties).

## **Estate planning**

The process of preparing for the disposition of one's estate upon death and during one's lifetime.

## **Estate tax**

Levied on the total value of a deceased person's assets and paid out of the estate before any distributions to beneficiaries.

## **Evaluated pricing**

*See matrix pricing.*

## **Excess return**

Used in various senses appropriate to context: 1) The difference between the portfolio return and the benchmark return; 2) The return in excess of the risk-free rate.

## **Excess spread**

Credit spread return measure that incorporates both changes in spread and expected credit losses for a given period.

## **Exchange fund**

A partnership in which each of the partners have each contributed low cost-basis stock to the fund. Used in the United States as a mechanism to achieve a tax-free exchange of a concentrated asset position.

## **Execution cost**

The difference between the (trading related) cost of the real portfolio and the paper portfolio, based on shares and prices transacted.

## **Exhaustive**

An index construction strategy that selects every constituent of a universe.

## **Expected shortfall**

The average loss conditional on exceeding the VaR cutoff; sometimes referred to as *conditional VaR* or *expected tail loss*.

## **Expected tail loss**

See *expected shortfall*.

## **Extended portfolio assets and liabilities**

Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

# **F**

## **Factor-model-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

## **Family constitution**

Typically a non-binding document that sets forth an agreed-upon set of rights, values, and responsibilities of the family members and other stakeholders. Used by many wealth- and business-owning families as the starting point of conflict resolution

procedures.

## **Family governance**

The process for a family's collective communication and decision making designed to serve current and future generations based on the common values of the family.

## **Financial capital**

The tangible and intangible assets (excluding human capital) owned by an individual or household.

## **Fixed trust**

Distributions to beneficiaries of a fixed trust are specified in the trust document to occur at certain times or in certain amounts.

## **Forced heirship**

Is the requirement that a certain proportion of assets must pass to specified family members, such as a spouse and children.

## **Foreign assets**

Assets denominated in currencies other than the investor's home currency.

## **Foreign currency**

Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

## **Foreign-currency return**

The return of the foreign asset measured in foreign-currency terms.

## **Forward rate bias**

An empirically observed divergence from interest rate parity conditions that active investors seek to benefit from by borrowing in a lower-yield currency and investing in a higher-yield currency.

## **Foundation**

A legal entity available in certain jurisdictions. Foundations are typically set up to hold assets for a specific charitable purpose, such as to promote education or for

philanthropy. When set up and funded by an individual or family and managed by its own directors, it is called a *private foundation*. The term *family foundation* usually refers to a private foundation where donors or members of the donors' family are actively involved.

## **Framing**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Framing bias**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Fulcrum securities**

Partially-in-the-money claims (not expected to be repaid in full) whose holders end up owning the reorganized company in a corporate reorganization situation.

## **Full replication approach**

When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

## **Fund-of-funds**

A fund of hedge funds in which the fund-of-funds manager allocates capital to separate, underlying hedge funds (e.g., single manager and/or multi-manager funds) that themselves run a range of different strategies.

## **Funding currencies**

The low-yield currencies in which borrowing occurs in a carry trade.

# **G**

## **G-spread**

Yield spread for a fixed-rate bond over a government benchmark.

## **Gamblers' fallacy**

A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

## **Gamma**

The change in an option's delta for a change in price of the underlying, all else equal.

## **General account**

Account holding assets to fund future liabilities from traditional life insurance and fixed annuities, the products in which the insurer bears all the risks—particularly mortality risk and longevity risk.

## **Generation-skipping tax**

Taxes levied in some jurisdictions on asset transfers (gifts) that skip one generation such as when a grandparent transfers assets to their grandchildren. (see related Gift Tax).

## **Gift tax**

Depending on the tax laws of the country, assets gifted by one person to another during the giftor's lifetime may be subject to a gift tax.

## **Goals-based**

With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

## **Goals-based investing**

An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

## **Green bonds**

Fixed-income instruments issued by private or public sector borrowers that directly fund ESG initiatives.

## **Grinold–Kroner model**

An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

# H

## **Halo effect**

An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

## **Hard-catalyst event-driven approach**

An event-driven approach in which investments are made in reaction to an already announced corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) in which security prices related to the event have yet to fully converge.

## **Hazard rate**

The conditional POD, or the likelihood that default will occur given that it has not already occurred in a prior period.

## **Health insurance**

A type of insurance used to cover health care and medical costs.

## **Health risk**

The risk associated with illness or injury.

## **Hedge ratio**

The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

## **Herding**

When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

## **High-water mark**

A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

## **Hindsight bias**

A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

### **Holdings-based attribution**

A “buy and hold” attribution approach which calculates the return of portfolio and benchmark components based upon the price and foreign exchange rate changes applied to daily snapshots of portfolio holdings.

### **Holdings-based style analysis**

A bottom-up style analysis that estimates the risk exposures from the actual securities held in the portfolio at a point in time.

### **Holistic balance sheet**

*See economic balance sheet.*

### **Home bias**

A preference for securities listed on the exchanges of one’s home country.

### **Home-country bias**

The favoring of domestic over non-domestic investments relative to global market value weights.

### **Home currency**

*See domestic currency.*

### **Human capital**

An implied asset; the net present value of an investor’s future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital*.

## **I**

### **I-spread (interpolated spread)**

Yield spread measure using swaps or constant maturity Treasury YTM as a benchmark.



## **Illusion of control**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Illusion of control bias**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Immediate annuity**

An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

## **Immunization**

An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

## **Impact investing**

Investment approach that seeks to achieve targeted social or environmental objectives along with measurable financial returns through engagement with a company or by direct investment in projects or companies.

## **Implementation shortfall**

(IS) The difference between the return for a notional or paper portfolio, where all transactions are assumed to take place at the manager's decision price, and the portfolio's actual return, which reflects realized transactions, including all fees and costs.

## **Implied volatility**

The outlook for the future volatility of the underlying asset's price. It is the value (i.e., standard deviation of underlying's returns) that equates the model (e.g., Black–Scholes–Merton model) price of an option to its market price.

## **Implied volatility surface**

A three-dimensional plot, for put and call options on the same underlying asset, of days to expiration ( $x$ -axis), option strike prices ( $y$ -axis), and implied volatilities ( $z$ -axis). It

simultaneously shows the volatility skew (or smile) and the term structure of implied volatility.

### **Incremental VaR (or partial VaR)**

The change in the minimum portfolio loss expected to occur over a given time period at a specific confidence level resulting from increasing or decreasing a portfolio position.

### **Information coefficient**

Formally defined as the correlation between forecast return and actual return. In essence, it measures the effectiveness of investment insight.

### **Inheritance tax**

Paid by each individual beneficiary of a deceased person's estate on the value of the benefit the individual received from the estate.

### **Input uncertainty**

Uncertainty concerning whether the inputs are correct.

### **Interaction effect**

The attribution effect resulting from the interaction of the allocation and selection decisions.

### **Intertemporal consistency**

A feature of expectations setting which means that estimates for an asset class over different horizons reflect the same assumptions with respect to the potential paths of returns over time. It is the internal consistency over various time horizons.

### **Intestate**

A person who dies without a valid will or with a will that does not dispose of their property are considered to have died intestate.

### **Intrinsic value**

The difference between the spot exchange rate and the strike price of a currency option.

### **Investment currencies**

The high-yielding currencies in a carry trade.

## **Investment policy statement**

A written planning document that describes a client's investment objectives and risk tolerance over a relevant time horizon, along with the constraints that apply to the client's portfolio.

## **Investment style**

A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

## **Irrevocable trust**

The person whose assets are used to create the trust gives up the right to rescind the trust relationship and regain title to the trust assets.

# **K**

## **Key person risk**

The risk that results from over-reliance on an individual or individuals whose departure would negatively affect an investment manager.

## **Key rate duration**

A method of measuring interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

## **Knock-in/knock-out**

Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

# **L**

## **Leading economic indicators**

A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

## **Liability-based mandates**

Mandates managed to match or cover expected liability payments (future cash outflows) with future projected cash inflows.

## **Liability-driven investing**

An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

## **Liability driven investing (LDI) model**

In the LDI model, the primary investment objective is to generate returns sufficient to cover liabilities, with a focus on maximizing expected surplus return (excess return of assets over liabilities) and managing surplus volatility.

## **Liability glide path**

A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

## **Liability insurance**

A type of insurance used to manage liability risk.

## **Liability-relative**

With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

## **Liability risk**

The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

## **Life-cycle finance**

A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

## **Life insurance**

A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

## **Life settlement**

The sale of a life insurance contract to a third party. The valuation of a life settlement typically requires detailed biometric analysis of the individual policyholder and an understanding of actuarial analysis.

## **Limited-life foundations**

A type of foundation where founders seek to maintain control of spending while they (or their immediate heirs) are still alive.

## **Liquidity budget**

The portfolio allocations (or weightings) considered acceptable for the liquidity categories in the liquidity classification schedule (or time-to-cash table).

## **Liquidity classification schedule**

A liquidity management classification (or table) that defines portfolio liquidity “buckets” or categories based on the estimated time it would take to convert assets in that particular category into cash.

## **Longevity risk**

The risk of outliving one’s financial resources.

## **Loss-aversion bias**

A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

## **Loss severity**

Also known as loss given default (LGD). The amount of loss if a default occurs, usually expressed as a percentage in annual terms.

# **M**

## **Macro attribution**

Attribution at the sponsor level.

## **Manager peer group**

See *manager universe*.

## **Manager universe**

A broad group of managers with similar investment disciplines. Also called *manager peer group*.

## **Matrix pricing**

An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

## **Matrix pricing (or evaluated pricing)**

Methodology for pricing infrequently traded bonds using bonds from similar issuers and actively traded government benchmarks to establish a bond's fair value.

## **Mental accounting bias**

An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

## **Micro attribution**

Attribution at the portfolio manager level.

## **Minimum-variance hedge ratio**

A mathematical approach to determining the optimal cross hedging ratio.

## **Mission-related investing**

Aims to direct a significant portion of assets in excess of annual grants into projects promoting a foundation's mission.

## **Model uncertainty**

Uncertainty as to whether a selected model is correct.

## **Mortality table**

A table that indicates individual life expectancies at specified ages.

## **Multi-class trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and involves buying and selling different classes of shares of the same company, such as voting and non-voting shares.

### **Multi-manager fund**

Can be of two types—one is a multi-strategy fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund; the second type is a fund of hedge funds (or fund-of-funds) in which the manager allocates capital to separate, underlying hedge funds that themselves run a range of different strategies.

### **Multi-strategy fund**

A fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund.

### **Multilateral trading facilities**

(MTF) See *Alternative trading systems (ATS)*.

## **N**

### **Negative butterfly**

An increase in the butterfly spread due to lower short- and long-term yields-to-maturity and a higher intermediate yield-to-maturity.

### **Negative screening**

An ESG implementation approach that excludes certain sectors or companies that deviate from an investor's accepted standards.

### **Non-deliverable forwards**

Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

### **Nonstationarity**

A characteristic of series of data whose properties, such as mean and variance, are not constant through time. When analyzing historical data it means that different parts of a

data series reflect different underlying statistical properties.

## **Norway model**

Characterized by an almost exclusive reliance on public equities and fixed income (the traditional 60/40 equity/bond model falls under the Norway model), with largely passively managed assets and with very little to no allocation to alternative investments.

## **O**

### **OAS duration**

The change in bond price for a given change in OAS.

### **Offer price**

The price at which a counterparty is willing to sell one unit of the base currency.

### **Opportunity cost**

The (trading related) cost associated with not being able to transact the entire order at the decision price.

### **Option-adjusted spread (OAS)**

A generalization of the Z-spread yield spread calculation that incorporates bond option pricing based on assumed interest rate volatility.

### **Optional stock dividends**

A type of dividend in which shareholders may elect to receive either cash or new shares.

### **Options on bond futures contracts**

Instruments that involve the right, but not the obligation, to enter into a bond futures contract at a pre-determined strike (bond price) on a future date in exchange for an up-front premium.

### **Overbought**

When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.



## **Overconfidence bias**

A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

## **Overlay**

A derivative position (or positions) used to adjust a pre-existing portfolio closer to its objectives.

## **Oversold**

The opposite of overbought; see *overbought*.

# **P**

## **Packeting**

Splitting stock positions into multiple parts.

## **Pairs trading**

An equity market-neutral strategy that capitalizes on the misalignment in prices of pairs of similar under- and overvalued equities. The expectation is the differential valuations or trading relationships will revert to their long-term mean values or their fundamentally-correct trading relationships, with the long position rising and the short position declining in value.

## **Parameter uncertainty**

Uncertainty arising because a quantitative model's parameters are estimated with error.

## **Participant/cohort option**

Pools the DC plan member with a cohort that has a similar target retirement date.

## **Participant-switching life-cycle options**

Automatically switch DC plan members into a more conservative asset mix as their age increases. There may be several automatic de-risking switches at different age targets.

## **Passive investment**

In the fixed-income context, it is investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

## **Passive management**

A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

## **Percent-range rebalancing**

An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

## **Performance attribution**

Attribution, including return attribution and risk attribution; often used as a synonym for return attribution.

## **Permanent life insurance**

A type of life insurance that provides lifetime coverage.

## **Portfolio overlay**

An array of derivative positions managed separately from the securities portfolio to achieve overall intended portfolio characteristics.

## **Position delta**

The overall or portfolio delta. For example, the position delta of a covered call, consisting of long 100 shares and short one at-the-money call, is +50 (= +100 for the shares and -50 for the short ATM call).

## **Positive butterfly**

A decrease in the butterfly spread due to higher short- and long-term yields-to-maturity and a lower intermediate yield-to-maturity.

## **Positive screening**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *best-in-class*.

## **Post-liquidation return**

Calculates the return assuming that all portfolio holdings are sold as of the end date of the analysis and that the resulting capital gains tax that would be due is deducted from the ending portfolio value.

## **Potential capital gain exposure (PCGE)**

Is an estimate of the percentage of a fund's assets that represents gains and measures how much the fund's assets have appreciated. It can be an indicator of possible future capital gain distributions.

## **Premature death risk**

The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

## **Present value of distribution of cash flows methodology**

Method used to address a portfolio's sensitivity to rate changes along the yield curve. This approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

## **Principal trade**

A trade in which the market maker or dealer becomes a disclosed counterparty and assumes risk for the trade by transacting the security for their own account. Also called *broker risk trades*.

## **Probability of default**

The likelihood that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest.

## **Probate**

The legal process to confirm the validity of the will so that executors, heirs, and other interested parties can rely on its authenticity.

## **Program trading**

A strategy of buying or selling many stocks simultaneously.

## **Progressive tax rate schedule**

A tax regime in which the tax rate increases as the amount of income or wealth being taxed increases.

## **Property insurance**

A type of insurance used by individuals to manage property risk.

## **Property risk**

The possibility that a person's property may be damaged, destroyed, stolen, or lost.

## **Protective put**

An option strategy in which a long position in an asset is combined with a long position in a put on that asset.

## **Pure indexing**

Attempts to replicate a bond index as closely as possible, targeting zero active return and zero active risk.

## **Put spread**

A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

# **Q**

## **Qualified dividends**

Generally dividends from shares in domestic corporations and certain qualified foreign corporations which have been held for at least a specified minimum period of time.

## **Quantitative market-neutral**

An approach to building market-neutral portfolios in which large numbers of securities are traded and positions are adjusted on a daily or even an hourly basis using algorithm-based models.

## **Quoted margin**

The yield spread over the MRR established upon issuance of an FRN to compensate investors for assuming an issuer's credit risk.

# R

## Re-base

With reference to index construction, to change the time period used as the base of the index.

## Realized volatility

Historical volatility, the square root of the realized variance of returns, which is a measure of the range of past price outcomes for the underlying asset.

## Rebalancing

In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

## Rebalancing overlay

A type of overlay that addresses a portfolio's need to sell certain constituent securities and buy others.

## Rebalancing range

A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

## Rebate rate

The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

## Reduced form credit models

Credit models that solve for default probability over a specific time period using observable company-specific variables such as financial ratios and macroeconomic variables.

## Reduced-form models

Models that use economic theory and other factors such as prior research output to describe hypothesized relationships. Can be described as more compact representations of underlying structural models. Evaluate endogenous variables in terms of observable

exogenous variables.

## **Regime**

The governing set of relationships (between variables) that stem from technological, political, legal, and regulatory environments. Changes in such environments or policy stances can be described as changes in regime.

## **Regret**

The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

## **Regret-aversion bias**

An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

## **Relative value**

A concept that describes the selection of the most attractive individual securities to populate the portfolio with, using ranking and comparing.

## **Relative value volatility arbitrage**

A volatility trading strategy that aims to source and buy cheap volatility and sell more expensive volatility while netting out the time decay aspects normally associated with options portfolios.

## **Relative VaR**

The minimum portfolio loss expected to occur over a given time period at a specific confidence level based on a portfolio containing active positions minus benchmark holdings.

## **Repo rate**

The interest rate on a repurchase agreement.

## **Representativeness bias**

A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

## **Repurchase agreements**

In repurchase agreements, or *repos*, a security owner agrees to sell a security for a specific cash amount while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

## **Request for quote**

(RFQ) A non-binding quote provided by a market maker or dealer to a potential buyer or seller upon request. Commonly used in fixed income markets these quotes are only valid at the time they are provided.

## **Reserve portfolio**

The component of an insurer's general account that is subject to specific regulatory requirements and is intended to ensure the company's ability to meet its policy liabilities. The assets in the reserve portfolio are managed conservatively and must be highly liquid and low risk.

## **Resistance levels**

Price points on dealers' order boards where one would expect to see a clustering of offers.

## **Return attribution**

A set of techniques used to identify the sources of the excess return of a portfolio against its benchmark.

## **Returns-based attribution**

An attribution approach that uses only the total portfolio returns over a period to identify the components of the investment process that have generated the returns. The Brinson–Hood–Beebower approach is a returns-based attribution approach.

## **Returns-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

## **Returns-based style analysis**

A top-down style analysis that involves estimating the sensitivities of a portfolio to security market indexes.

## **Reverse repos**

Repurchase agreements from the standpoint of the lender.

## **Revocable trust**

The person whose assets are used to create the trust retains the right to rescind the trust relationship and regain title to the trust assets.

## **Risk attribution**

The analysis of the sources of risk.

## **Risk aversion**

The degree of an investor's unwillingness to take risk; the inverse of risk tolerance.

## **Risk budgeting**

The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

## **Risk capacity**

The ability to accept financial risk.

## **Risk perception**

The subjective assessment of the risk involved in the outcome of an investment decision.

## **Risk premium**

An extra return expected by investors for bearing some specified risk.

## **Risk reversal**

A strategy used to profit from the existence of an implied volatility skew and from changes in its shape over time. A combination of long (short) calls and short (long) puts on the same underlying with the same expiration is a long (short) risk reversal.

## **Risk tolerance**

The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.



# S

## **Sample-size neglect**

A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or “real” data).

## **Scenario analysis**

What-if analysis that involves changing multiple assumptions at the same time in order to evaluate the change in an investment’s value.

## **Seagull spread**

An extension of the risk reversal foreign exchange option strategy that limits downside risk.

## **Securities lending**

A form of collateralized lending that may be used to generate income for portfolios.

## **Selective**

An index construction methodology that targets only those securities with certain characteristics.

## **Self-attribution bias**

A bias in which people take personal credit for successes and attribute failures to external factors outside the individual’s control.

## **Self-control bias**

A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

## **Separate accounts**

Accounts holding assets to fund future liabilities from variable life insurance and variable annuities, the products in which customers make investment decisions from a menu of options and themselves bear investment risk.

## **Sharpe ratio**

The average return in excess of the risk-free rate divided by the standard deviation of return; a measure of the average excess return earned per unit of standard deviation of return. Also known as the *reward-to-variability ratio*.

## **Short-biased**

A hedge fund strategy in which the manager uses a less extreme version of dedicated short-selling. It involves searching for opportunities to sell expensively priced equities, but short exposure may be balanced with some modest value-oriented, or index-oriented, long exposure.

## **Shortfall probability**

The probability of failing to meet a specific liability or goal.

## **Shrinkage estimation**

Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

## **Single-manager fund**

A fund in which one portfolio manager or team of portfolio managers invests in one strategy or style.

## **Smart beta**

Involves the use of transparent, rules-based strategies as a basis for investment decisions.

## **Smart order routers**

(SOR) Smart systems used to electronically route small orders to the best markets for execution based on order type and prevailing market conditions.

## **Social proof**

A bias in which individuals tend to follow the beliefs of a group.

## **Soft-catalyst event-driven approach**

An event-driven approach in which investments are made proactively in anticipation of a corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) that has yet to occur.

## Special dividends

A dividend paid by a company that does not pay dividends on a regular schedule, or a dividend that supplements regular cash dividends with an extra payment.

## Spread duration

The change in bond price for a given change in yield spread. Also referred to as *OAS duration* when the option-adjusted spread (OAS) is the yield measure used.

## Staged diversification strategy

The simplest approach to managing the risk of a concentrated position involves selling the concentrated position over some period of time, paying associated tax, and reinvesting the proceeds in a diversified portfolio.

## Static hedge

A hedge that is not sensitive to changes in the price of the asset hedged.

## Status quo bias

An emotional bias in which people do nothing (i.e., maintain the “status quo”) instead of making a change.

## Stock lending

Securities lending involving the transfer of equities.

## Stop-losses

A trading order that sets a selling price below the current market price with a goal of protecting profits or preventing further losses.

## Stops

Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

## Straddle

An option combination in which one buys *both* puts and calls, with the same exercise price and same expiration date, on the same underlying asset. In contrast to this long straddle, if someone *writes* both options, it is a short straddle.

## **Strangle**

A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

## **Stratified sampling**

A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

## **Structural credit models**

Credit models that apply market-based variables to estimate the value of an issuer's assets and the volatility of asset value.

## **Structural models**

Models that specify functional relationships among variables based on economic theory. The functional form and parameters of these models are derived from the underlying theory. They may include unobservable parameters.

## **Structural risk**

Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

## **Stub trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and entails buying and selling stock of a parent company and its subsidiaries, typically weighted by the percentage ownership of the parent company in the subsidiaries.

## **Support levels**

Price points on dealers' order boards where one would expect to see a clustering of bids.

## **Surplus**

The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

## **Surplus portfolio**

The component of an insurer's general account that is intended to earn higher expected returns than the reserve portfolio and so can assume more risk. Surplus portfolio assets are often managed aggressively with high-risk assets.

## **Survivorship bias**

Bias that arises in a data series when managers with poor track records are dropped from the database whereas managers with good track records remain. A data series of a given date reflects only entities that have survived to that date.

## **Swaption**

This instrument grants a party the right, but not the obligation, to enter into a rate swap at a pre-determined strike (fixed swap rate) on a future date, for a fixed up-front premium.

## **Synthetic long forward position**

The combination of a long call and a short put with identical strike prices, both traded at the same time on the same underlying.

## **Synthetic short forward position**

The combination of a short call and a long put at the same strike price, both traded at the same time on the same underlying.

# **T**

## **Tactical asset allocation**

Asset allocation that involves making short-term adjustments to the portfolio based on short-term predictions of relative performance among asset classes.

## **Tax alpha**

Calculated by subtracting the pre-tax excess return from the total return. Tax alpha isolates the benefit of tax management of the portfolio.

## **Tax avoidance**

The legal activity of understanding the tax laws and finding ways to minimize tax liability.

















# ALTERNATIVE INVESTMENT, PORTFOLIO MANAGEMENT, AND PRIVATE WEALTH MANAGEMENT

CFA® Program Curriculum  
**2022 • LEVEL III • VOLUME 4**

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#### 13.1.3. Confidentiality

#### 13.1.4. Conflicts of Interest

### 13.2. Compliance Considerations

## 14. Private Client Segments

### 14.1. Mass Affluent Segment

### 14.2. High-Net-Worth Segment

### 14.3. Ultra-High-Net-Worth Segment

### 14.4. Robo-Advisors

## Summary

## References

## Practice Problems

## Solutions

## Reading 22. Topics in Private Wealth Management

### Learning Outcomes

#### 1. Introduction

#### 2. General Principles of Taxation: Components of Return and Tax Status of the Account

##### 2.1. Taxation of the Components of Return

###### 2.1.1. Interest, Dividends, and Withholding Taxes

###### 2.1.2. Capital Gains Taxes

###### 2.1.3. Real Estate Taxes

##### 2.2. The Tax Status of the Account

#### 3. The Jurisdiction that Applies to the Investor

#### 4. Measuring Tax Efficiency with After-Tax Returns

##### 4.1. Tax Efficiency of Various Asset Classes and Investment Strategies

- 4.2. Calculating After-Tax Returns
  - 4.2.1. After-Tax Holding Period Returns
  - 4.2.2. After-Tax Post-Liquidation Returns
  - 4.2.3. After-Tax Excess Returns
  - 4.2.4. Tax-Efficiency Ratio
- 5. Taxable, Tax-Exempt, and Tax-Deferred Accounts: Capital Accumulation and Asset Location
  - 5.1. Capital Accumulation in Taxable, Tax-Deferred, and Tax-Exempt Accounts
  - 5.2. Asset Location
- 6. Taxable, Tax-Exempt, and Tax-Deferred Accounts: Decumulation Strategies and Charitable Giving Strategies
  - 6.1. Tax Considerations in Charitable Giving
- 7. Tax Management Strategies and Basic Tax Strategies
  - 7.1. Basic Portfolio Tax Management Strategies
- 8. Application of Tax Management Strategies
  - 8.1. Investment Vehicles
  - 8.2. Tax Loss Harvesting
  - 8.3. Quantitative Tax Management
- 9. Managing Concentrated Portfolios and Risk and Tax Considerations in Managing Concentrated Single-Asset Positions
  - 9.1. Risk and Tax Considerations in Managing Concentrated Single-Asset Positions
    - 9.1.1. Approaches to Managing the Risk of Concentrated Positions
- 10. Strategies for Managing Concentrated Positions in Public Equities
  - 10.1. Staged Diversification and Completion Portfolios
    - Let's explore how this might work using Michael Stark's situation.
  - 10.2. Tax-Optimized Equity Strategies—Equity Monetization, Collars, and Call Writing
  - 10.3. Tax-Free Exchanges
  - 10.4. Charitable Remainder Trust
- 11. Strategies for Managing Concentrated Positions in Privately Owned Businesses and Strategies for Managing Concentrated Positions in Real Estate
  - 11.1. Personal Line of Credit Secured by Company Shares
  - 11.2. Leveraged Recapitalization
  - 11.3. Employee Stock Ownership Plan
  - 11.4. Strategies for Managing Concentrated Positions in Real Estate

- 11.5. Mortgage Financing
- 11.6. Real Estate Monetization for the Charitably Inclined—An Asset Location Strategy
- 12. Directing and Transferring Wealth and Objectives of Gift and Estate Planning
  - 12.1. Objectives of Gift and Estate Planning
- 13. Gift and Estate Planning Strategies, Introduction to Estate Planning: Wills, Probate and Legal Systems, and Lifetime Gifts and Testamentary Bequests
  - 13.1. Introduction to Estate Planning: Wills, Probate, and Legal Systems
  - 13.2. Lifetime Gifts and Testamentary Bequests
  - 13.3. Efficiency of Lifetime Gifts versus Testamentary Bequests
- 14. Estate Planning Tools: Trusts, Foundations, Life Insurance, Companies
- 15. Managing Wealth Across Generations, General Principles of Family Governance, Family Conflict Resolution, and Family Dynamics in the Context of Business Exit
  - 15.1. General Principles of Family Governance
  - 15.2. Family Conflict Resolution
  - 15.3. Family Dynamics in the Context of Business Exit
- 16. Planning for the Unexpected
  - 16.1. Divorce
  - 16.2. Incapacity
- Summary
- References
- Practice Problems
- Solutions

## Study Session 11. Private Wealth Management (2)

### Reading Assignments

#### Reading 23. Risk Management for Individuals

##### Learning Outcomes

- 1. Introduction
- 2. Human Capital, Financial Capital, and Economic Net Worth
  - 2.1. Human Capital
  - 2.2. Financial Capital
    - 2.2.1. Personal Assets
    - 2.2.2. Investment Assets
    - 2.2.3. Publicly Traded Marketable Assets
    - 2.2.4. Non-Publicly Traded Marketable Assets
      - 2.2.4.1. Real Estate

- 2.2.4.2. Annuities
    - 2.2.4.3. Cash-Value Life Insurance
    - 2.2.4.4. Business Assets
    - 2.2.4.5. Collectibles
  - 2.2.5. Non-Marketable Assets
    - 2.2.5.1. Employer Pension Plans (Vested)
    - 2.2.5.2. Government Pensions
  - 2.2.6. Account Type
- 2.3. Economic Net Worth
- 3. A Framework for Individual Risk Management
  - 3.1. The Risk Management Strategy for Individuals
    - 3.1.1. Specify the Objective
    - 3.1.2. Identify Risks
    - 3.1.3. Evaluate Risks and Select Appropriate Methods to Manage the Risks
    - 3.1.4. Monitor Outcomes and Risk Exposures and Make Appropriate Adjustments in Methods
  - 3.2. Financial Stages of Life
    - 3.2.1. Education Phase
    - 3.2.2. Early Career
    - 3.2.3. Career Development
    - 3.2.4. Peak Accumulation
    - 3.2.5. Pre-retirement
    - 3.2.6. Early Retirement
    - 3.2.7. Late Retirement
- 4. The Individual Balance Sheet
  - 4.1. Traditional Balance Sheet
  - 4.2. Economic (Holistic) Balance Sheet
  - 4.3. Changes in Economic Net Worth
- 5. Individual Risk Exposures
  - 5.1. Earnings Risk
  - 5.2. Premature Death Risk
  - 5.3. Longevity Risk
  - 5.4. Property Risk
  - 5.5. Liability Risk
  - 5.6. Health Risk
- 6. Life Insurance: Uses, Types and Elements
  - 6.1. Life Insurance
    - 6.1.1. Uses of Life Insurance
    - 6.1.2. Types of Life Insurance
    - 6.1.3. Basic Elements of a Life Insurance Policy

- 7. Life Insurance - Pricing, Policy Cost Comparison and Determining Amount Needed
  - 7.1. Mortality Expectations
  - 7.2. Calculation of the Net Premium and Gross Premium
  - 7.3. Cash Values and Policy Reserves
  - 7.4. Consumer Comparisons of Life Insurance Costs
  - 7.5. How Much Life Insurance Does One Need?
- 8. Other Types of Insurance
  - 8.1. Property Insurance
    - 8.1.1. Homeowner's Insurance
    - 8.1.2. Automobile Insurance
  - 8.2. Health/Medical Insurance
  - 8.3. Liability Insurance
  - 8.4. Other Types of Insurance
- 9. Annuities: Types, Structure and Classification
  - 9.1. Parties to an Annuity Contract
  - 9.2. Classification of Annuities
    - 9.2.1. Deferred Variable Annuities
    - 9.2.2. Deferred Fixed Annuities
    - 9.2.3. Immediate Variable Annuities
    - 9.2.4. Immediate Fixed Annuities
    - 9.2.5. Advanced Life Deferred Annuities
- 10. Annuities: Advantages and Disadvantages of Fixed and Variable Annuities
  - 10.1. Volatility of Benefit Amount
  - 10.2. Flexibility
  - 10.3. Future Market Expectations
  - 10.4. Fees
  - 10.5. Inflation Concerns
  - 10.6. Payout Methods
  - 10.7. Annuity Benefit Taxation
  - 10.8. Appropriateness of Annuities
- 11. Risk Management Implementation: Determining the Optimal Strategy and Case Analysis
  - 11.1. Determining the Optimal Risk Management Strategy
  - 11.2. Analyzing an Insurance Program
    - 11.2.1. Current Insurance Plan
      - Life Insurance.
      - Health Insurance.
      - Disability Insurance.
      - Long-Term Care Insurance.



Property Insurance.

11.2.2. Program Review

Life Insurance.

11.2.3. Recommendations

Health Insurance.

Disability Insurance.

Long-Term Care Insurance.

Property Insurance.

Longevity Insurance.

12. The Effect of Human Capital on Asset Allocation and Risk Reduction

12.1. Asset Allocation and Risk Reduction

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# How to Use the CFA Program Curriculum

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Congratulations on your decision to enter the Chartered Financial Analyst (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities (competencies) it develops. Your commitment should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. CFA Program enrollment represents the first step toward a career-long commitment to professional education.

The CFA exam measures your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major CFA Program topic areas ([www.cfainstitute.org/programs/cfa/curriculum/cbok](http://www.cfainstitute.org/programs/cfa/curriculum/cbok));
- Topic area weights that indicate the relative exam weightings of the top-level topic areas ([www.cfainstitute.org/programs/cfa/curriculum](http://www.cfainstitute.org/programs/cfa/curriculum));
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- CFA Program curriculum that candidates receive upon exam registration.

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, features of the curriculum, and tips for designing an effective personal study program.

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# BACKGROUND ON THE CBOK

CFA Program is grounded in the practice of the investment profession. CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the competencies that are relevant to the profession, beginning with the Global Body of Investment Knowledge (GBIK®). Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback about the GBIK. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

The CFA Institute staff—in conjunction with the Education Advisory Committee and Curriculum Level Advisors, who consist of practicing CFA charterholders—designs the CFA Program curriculum in order to deliver the CBOK to candidates. The exams, also written by CFA charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into six topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected. It is then divided into one or more study sessions. These study sessions should form the basic structure of your reading and preparation. Each study session includes a statement of its structure and objective and is further divided into assigned readings. An outline illustrating the organization of these study sessions can be found at the front of each volume of the curriculum.

The readings are commissioned by CFA Institute and written by content experts, including investment professionals and university professors. Each reading includes LOS and the core material to be studied, often a combination of text, exhibits, and in-text examples and questions. End of Reading Questions (EORQs) followed by solutions help you understand and master the material. The LOS indicate what you should be able to accomplish after

studying the material. The LOS, the core material, and the EORQs are dependent on each other, with the core material and EORQs providing context for understanding the scope of the LOS and enabling you to apply a principle or concept in a variety of scenarios.

*The entire readings, including the EORQs, are the basis for all exam questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK.*

You should use the LOS to guide and focus your study because each exam question is based on one or more LOS and the core material and practice problems associated with the LOS. As a candidate, you are responsible for the entirety of the required material in a study session.

We encourage you to review the information about the LOS on our website ([www.cfainstitute.org/programs/cfa/curriculum/study-sessions](http://www.cfainstitute.org/programs/cfa/curriculum/study-sessions)), including the descriptions of LOS “command words” on the candidate resources page at [www.cfainstitute.org](http://www.cfainstitute.org).

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## FEATURES OF THE CURRICULUM

### End of Reading Questions/Solutions

*All End of Reading Questions (EORQs) as well as their solutions are part of the curriculum and are required material for the exam.* In addition to the in-text examples and questions, these EORQs help demonstrate practical applications and reinforce your understanding of the concepts presented. Some of these EORQs are adapted from past CFA exams and/or may serve as a basis for exam questions.

### Glossary

For your convenience, each volume includes a comprehensive Glossary. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the Glossary.

Note that the digital curriculum that is included in your exam registration fee is searchable for key words, including Glossary terms.

### LOS Self-Check

We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

## Source Material

The CFA Institute curriculum cites textbooks, journal articles, and other publications that provide additional context or information about topics covered in the readings. As a candidate, you are not responsible for familiarity with the original source materials cited in the curriculum.

Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written or updated but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*<sup>®</sup>, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and several Nobel laureates have contributed articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this, and other, CFA Institute practice-oriented publications through the Research & Analysis webpage ([www.cfainstitute.org/en/research](http://www.cfainstitute.org/en/research)).

## Errata

The curriculum development process is rigorous and includes multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, there are times when we must make corrections. Curriculum errata are periodically updated and posted

by exam level and test date online ([www.cfainstitute.org/en/programs/submit-errata](http://www.cfainstitute.org/en/programs/submit-errata)). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

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## DESIGNING YOUR PERSONAL STUDY PROGRAM

### Create a Schedule

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all assigned readings and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skills, and abilities described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will probably spend more time on some study sessions than on others.

You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

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## CFA INSTITUTE LEARNING ECOSYSTEM (LES)

As you prepare for your exam, we will email you important exam updates, testing policies, and study tips. Be sure to read these carefully.

Your exam registration fee includes access to the CFA Program Learning Ecosystem (LES). This digital learning platform provides access, even offline, to all of the readings and End of Reading Questions found in the print curriculum organized as a series of shorter online

lessons with associated EORQs. This tool is your one-stop location for all study materials, including practice questions and mock exams.

The LES provides the following supplemental study tools:

## **Structured and Adaptive Study Plans**

The LES offers two ways to plan your study through the curriculum. The first is a structured plan that allows you to move through the material in the way that you feel best suits your learning. The second is an adaptive study plan based on the results of an assessment test that uses actual practice questions.

Regardless of your chosen study path, the LES tracks your level of proficiency in each topic area and presents you with a dashboard of where you stand in terms of proficiency so that you can allocate your study time efficiently.

## **Flashcards and Game Center**

The LES offers all the Glossary terms as Flashcards and tracks correct and incorrect answers. Flashcards can be filtered both by curriculum topic area and by action taken—for example, answered correctly, unanswered, and so on. These Flashcards provide a flexible way to study Glossary item definitions.

The Game Center provides several engaging ways to interact with the Flashcards in a game context. Each game tests your knowledge of the Glossary terms a in different way. Your results are scored and presented, along with a summary of candidates with high scores on the game, on your Dashboard.

## **Discussion Board**

The Discussion Board within the LES provides a way for you to interact with other candidates as you pursue your study plan. Discussions can happen at the level of individual lessons to raise questions about material in those lessons that you or other candidates can clarify or comment on. Discussions can also be posted at the level of topics or in the initial Welcome section to connect with other candidates in your area.

## **Practice Question Bank**

The LES offers access to a question bank of hundreds of practice questions that are in addition to the End of Reading Questions. These practice questions, only available on the LES, are intended to help you assess your mastery of individual topic areas as you progress through your studies. After each practice question, you will receive immediate feedback



noting the correct response and indicating the relevant assigned reading so you can identify areas of weakness for further study.

## Mock Exams

The LES also includes access to three-hour Mock Exams that simulate the morning and afternoon sessions of the actual CFA exam. These Mock Exams are intended to be taken after you complete your study of the full curriculum and take practice questions so you can test your understanding of the curriculum and your readiness for the exam. If you take these Mock Exams within the LES, you will receive feedback afterward that notes the correct responses and indicates the relevant assigned readings so you can assess areas of weakness for further study. We recommend that you take Mock Exams during the final stages of your preparation for the actual CFA exam. For more information on the Mock Exams, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## PREP PROVIDERS

You may choose to seek study support outside CFA Institute in the form of exam prep providers. After your CFA Program enrollment, you may receive numerous solicitations for exam prep courses and review materials. When considering a prep course, make sure the provider is committed to following the CFA Institute guidelines and high standards in its offerings.

Remember, however, that there are no shortcuts to success on the CFA exams; reading and studying the CFA Program curriculum *is* the key to success on the exam. The CFA Program exams reference only the CFA Institute assigned curriculum; no prep course or review course materials are consulted or referenced.

### SUMMARY

Every question on the CFA exam is based on the content contained in the required readings and on one or more LOS. Frequently, an exam question is based on a specific example highlighted within a reading or on a specific practice problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the exam.

2. All questions, problems, and their solutions are part of the curriculum and are required study material for the exam. These questions are found at the end of the readings in the print versions of the curriculum. In the LES, these questions appear directly after the lesson with which they are associated. The LES provides immediate feedback on your answers and tracks your performance on these questions throughout your study.
3. We strongly encourage you to use the CFA Program Learning Ecosystem. In addition to providing access to all the curriculum material, including EORQs, in the form of shorter, focused lessons, the LES offers structured and adaptive study planning, a Discussion Board to communicate with other candidates, Flashcards, a Game Center for study activities, a test bank of practice questions, and online Mock Exams. Other supplemental study tools, such as eBook and PDF versions of the print curriculum, and additional candidate resources are available at [www.cfainstitute.org](http://www.cfainstitute.org).
4. Using the study planner, create a schedule and commit sufficient study time to cover the study sessions. You should also plan to review the materials, answer practice questions, and take Mock Exams.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

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## FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and investment professional comments and feedback as we work to improve the curriculum, supplemental study tools, and candidate resources.

Please send any comments or feedback to [info@cfainstitute.org](mailto:info@cfainstitute.org). You can be assured that we will review your suggestions carefully. Ongoing improvements in the curriculum will help you prepare for success on the upcoming exams and for a lifetime of learning as a serious investment professional.



# Portfolio Management

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## STUDY SESSIONS

<b>Study Session 1</b>	Behavioral Finance
<b>Study Session 2</b>	Capital Market Expectations
<b>Study Session 3</b>	Asset Allocation and Related Decisions in Portfolio Management
<b>Study Session 4</b>	Derivatives and Currency Management
<b>Study Session 5</b>	Fixed-Income Portfolio Management (1)
<b>Study Session 6</b>	Fixed-Income Portfolio Management (2)
<b>Study Session 7</b>	Equity Portfolio Management (1)
<b>Study Session 8</b>	Equity Portfolio Management (2)
<b>Study Session 9</b>	Alternative Investments Portfolio Management
<b>Study Session 10</b>	Private Wealth Management (1)
<b>Study Session 11</b>	Private Wealth Management (2)
<b>Study Session 12</b>	Portfolio Management for Institutional Investors
<b>Study Session 13</b>	Trading, Performance Evaluation, and Manager Selection
<b>Study Session 14</b>	Cases in Portfolio Management and Risk Management

This volume includes Study Sessions 9–11.

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## TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; and evaluate portfolio performance.

# Study Session 9

## Alternative Investments for Portfolio Management

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Alternative investments comprise groups of investments with risk and return characteristics that differ from those of traditional stock and bond investments. For the purposes of this study session, private equity, hedge funds, real assets (including energy and commodity investments), commercial real estate, and private credit are included as alternative assets.

The first reading presents distinctive regulatory and investment characteristics of the major categories of hedge fund strategies. It also provides a conditional risk factor model as a unifying framework for understanding and analyzing the risk exposures of these strategies.

The second reading discusses the role alternative assets play in a multi-asset portfolio and explores how alternatives may serve to mitigate long-only equity risk. Approaches to asset allocation when incorporating alternatives in the opportunity set—whether through the traditional asset class lens or, more recently, using a risk- or factor-based lens—are examined. The reading concludes with a discussion of the need for liquidity planning in private investment alternatives and the unique monitoring requirements of an alternatives portfolio.

## READING ASSIGNMENTS

- Reading 19** Hedge Fund Strategies  
by Barclay T. Leib, CFE, CAIA, Kathryn M. Kaminski, PhD, CAIA, and  
Mila Getmansky Sherman, PhD
- Reading 20** Asset Allocation to Alternative Investments  
by Adam Kobor, PhD, CFA, and Mark D. Guinney, CFA

# Reading 19

## Hedge Fund Strategies

by Barclay T. Leib, CFE, CAIA, Kathryn M. Kaminski, PhD, CAIA, and Mila Getmansky Sherman, PhD

*Barclay T. Leib, CFE, CAIA, is at Sand Spring Advisors LLC (USA). Kathryn M. Kaminski, PhD, CAIA, is at Alpha Simplex Group, LLC (USA). Mila Getmansky Sherman, PhD, is at Isenberg School of Management, UMASS Amherst (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss how hedge fund strategies may be classified;
- b.** discuss investment characteristics, strategy implementation, and role in a portfolio of *equity-related* hedge fund strategies;
- c.** discuss investment characteristics, strategy implementation, and role in a portfolio of *event-driven* hedge fund strategies;
- d.** discuss investment characteristics, strategy implementation, and role in a portfolio of *relative value* hedge fund strategies;
- e.** discuss investment characteristics, strategy implementation, and role in a portfolio of *opportunistic* hedge fund strategies;
- f.** discuss investment characteristics, strategy implementation, and role in a portfolio of *specialist* hedge fund strategies;
- g.** discuss investment characteristics, strategy implementation, and role in a portfolio of *multi-manager* hedge fund strategies;
- h.** describe how factor models may be used to understand hedge fund risk exposures;

- i. evaluate the impact of an allocation to a hedge fund strategy in a traditional investment portfolio.

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# 1. INTRODUCTION AND CLASSIFICATION OF HEDGE FUND STRATEGIES

- a. discuss how hedge fund strategies may be classified;

Hedge funds form an important subset of the alternative investments opportunity set, but they come with many pros and cons in their use and application across different asset classes and investment approaches. The basic tradeoff is whether the added fees typically involved with hedge fund investing result in sufficient additional alpha and portfolio diversification benefits to justify the high fee levels. This is an ongoing industry debate.

Some argue that investing in hedge funds is a key way to access the very best investment talent—those individuals who can adroitly navigate investment opportunities across a potentially wider universe of markets. Others argue that hedge funds are important because the alpha that may be produced in down markets is hard to source elsewhere.

The arguments against hedge funds are also non-trivial. In addition to the high fee levels, the complex offering memorandum documentation needs to be understood by investors (i.e., the limited partners). Other issues include lack of full underlying investment transparency/attribution, higher cost allocations associated with the establishment and maintenance of the fund investment structures, and generally longer-lived investment commitment periods with limited redemption availability.

In addition, each hedge fund strategy area tends to introduce different types of added portfolio risks. For example, to achieve meaningful return objectives, arbitrage-oriented hedge fund strategies tend to utilize significant leverage that can be dangerous to limited partner investors, especially during periods of market stress. Long/short equity and event-driven strategies may have less beta exposure than simple, long-only beta allocations, but the higher hedge fund fees effectively result in a particularly expensive form of embedded beta. Such strategies as managed futures or global macro investing may introduce natural benefits of asset class and investment approach diversification, but they come with naturally higher volatility in the return profiles typically delivered. Extreme tail risk in portfolios may be managed with the inclusion of relative value volatility or long volatility strategies, but it comes at the cost of a return drag during more normal market periods. In other words, some hedge fund strategies may have higher portfolio diversification benefits, while others may



simply be return enhancers rather than true portfolio diversifiers.

Also, the hedge fund industry continues to evolve in its overall structure. Over the past decade, traditional limited partnership formats have been supplemented by offerings of liquid alternatives (liquid alts)—which are mutual fund, closed-end fund, and ETF-type vehicles that invest in various hedge fund-like strategies. Liquid alts are meant to provide daily liquidity, transparency, and lower fees while opening hedge fund investing to a wider range of investors. However, empirical evidence shows that liquid alts significantly underperform similar strategy hedge funds, which suggests that traditional hedge funds may be benefiting from an illiquidity premium phenomenon that cannot be easily transported into a mutual fund format.

Investors must understand the various subtleties involved with investing in hedge funds. Although secular bull market trends have arguably made “hedged” strategies less critical for inclusion in portfolio allocations than they were during the mid-to-late 2000s, the overall popularity of hedge funds tends to be somewhat cyclical. Notably, as demonstrated by the endowment model of investing, placing hedge funds as a core allocation can increase net returns and reduce risk.

This reading presents the investment characteristics and implementation for the major categories of hedge fund strategies. It also provides a framework for classifying and evaluating these strategies based on their risk profiles. Section 1 summarizes some distinctive regulatory and investment characteristics of hedge funds and discusses ways to classify hedge fund strategies. Sections 2 through 12 present investment characteristics and strategy implementation for each of the following hedge fund strategy categories: equity-related; event-driven; relative value; opportunistic; specialist; and multi-manager strategies. Section 13 introduces a conditional factor model as a unifying framework for understanding and analyzing the risk exposures of these strategies. Section 16 evaluates the contributions of each hedge fund strategy to the return and risk profile of a traditional portfolio of stocks and bonds. The reading concludes with a summary.

## 1.1. Classification of Hedge Funds and Strategies

The most important characteristics of hedge funds are summarized as follows:

1. **Legal/Regulatory Overview:** Different countries have varying requirements for investor eligibility to access hedge fund investments. These regulations are typically intended to limit access to traditional hedge funds to sophisticated investors with a minimum income or net-worth requirement, and they allow hedge fund managers to accept only a limited number of investment subscriptions. Most traditional hedge funds in the United States are offered effectively as private placement offerings. Whether the underlying fund manager must register with regulatory authorities depends on assets

under management (AUM); however, regardless of AUM, all US hedge funds are subject to regulatory oversight against fraudulent conduct. Hedge funds offered in other jurisdictions—attractive, tax-neutral locales like the Cayman Islands, the British Virgin Islands, or Bermuda—are typically presented to investors as stand-alone corporate entities subject to the rules and regulations of the particular locality.

From a regulatory perspective, the advent of liquid alts has likely caused the greatest shift in the industry over the past decade. Some of the more liquid hedge fund strategies that meet certain liquidity and diversification requirements (generally long/short equity and managed futures strategies) are offered by many fund sponsors in mutual fund-type structures in the United States and in the undertakings for collective investment in transferable securities (UCITs) format in Europe and Asia. By law, these liquid alts vehicles can be more widely marketed to retail investors. Whereas traditional hedge funds typically offer only limited periodic liquidity, liquid alts funds may be redeemed by investors on a daily basis. Also, traditional hedge funds typically involve both a management fee and an incentive fee; however, liquid alts in most countries are prohibited from charging an incentive fee.

Finally, the overall regulatory constraints for hedge funds are far less than those for regulated investment vehicles—except for the liquid alts versions, which have much higher constraints to provide liquidity to investors.

- 2. Flexible Mandates—Few Investment Constraints:** Given the relatively low legal and regulatory constraints faced by hedge funds, their mandates are flexible; thus, they are relatively unhindered in their trading and investment activities in terms of investable asset classes and securities, risk exposures, and collateral. The fund prospectus (i.e., offering memorandum) will specify the hedge fund's mandate and objectives and will include constraints, if any, on investment in certain asset classes as well as in the use of leverage, shorting, and derivatives.
- 3. Large Investment Universe:** Lower regulatory constraints and flexible mandates give hedge funds access to a wide range of assets outside the normal set of traditional investments. Examples include private securities, non-investment-grade debt, distressed securities, derivatives, and more-esoteric contracts, such as life insurance contracts and even music or film royalties.
- 4. Aggressive Investment Styles:** Hedge funds may use their typically flexible investment mandates to undertake strategies deemed too risky for traditional investment funds. These strategies may involve significant shorting and/or concentrated positions in domestic and foreign securities that offer exposure to credit, volatility, and liquidity risk premiums.
- 5. Relatively Liberal Use of Leverage:** Hedge funds generally use leverage more extensively than regulated investment funds. Their leveraged positions are implemented

either by borrowing securities from a prime broker or by using implied leverage via derivatives. In many instances, such leverage is necessary to make the return profile of the strategy meaningful. In other instances, derivatives may be used to hedge away unwanted risks (e.g., interest rate or credit risk) that may create high “notional leverage” but result in a less risky portfolio. Within long/short equity trading, leverage is most often applied to quantitative approaches in which small statistical valuation aberrations—typically over short windows of time—are identified by a manager or an algorithm. Such quant managers will typically endeavor to be market neutral but will apply high leverage levels to make the opportunities they identify meaningful from a return perspective.

6. **Hedge Fund Liquidity Constraints:** Limited partnership-format hedge funds involve initial lock-up periods, liquidity gates, and exit windows. These provide hedge fund managers with a greater ability to take and maintain positions than vehicles that allow investors to withdraw their investment essentially at will. It is thus not surprising that empirical evidence shows that such privately-placed hedge funds significantly outperform similar-strategy liquid alts products by approximately 100 bps–200 bps, on average, per year.
7. **Relatively High Fee Structures:** Hedge funds have traditionally imposed relatively high investment fees on investors, including both management fees and incentive fees. These have historically been 1% or more of AUM for management fees and 10%–20% of annual returns for incentive fees. The incentive fee structure is meant to align the interests of the hedge fund manager with those of the fund’s investors.

With this background, we now address how hedge funds are classified. One distinction is between single manager hedge funds and multi-manager hedge funds. A **single-manager fund** is a fund in which one portfolio manager or team of portfolio managers invests in one strategy or style. A **multi-manager fund** can be of two types. One type is a **multi-strategy fund**, in which teams of portfolio managers trade and invest in multiple different strategies within the same fund. The second type, a fund-of-hedge funds, often simply called a **fund-of-funds** (FoF), is a fund in which the fund-of-funds manager allocates capital to separate, underlying hedge funds (e.g., single manager and/or multi-manager funds) that themselves run a range of different strategies.

At the single manager and single strategy level, hedge fund strategies can be classified in various ways. The taxonomy is often based on some combination of:

1. the instruments in which the managers invest (e.g., equities, commodities, foreign exchange, convertible bonds);
2. the trading philosophy followed by the managers (e.g., systematic, discretionary); and
3. the types of risk the managers assume (e.g., directional, event driven, relative value).

Most prominent hedge fund data vendors use a combination of these criteria to classify hedge fund strategies. For example, Hedge Fund Research, Inc. (HFR) reports manager performance statistics on more than 30 strategies and divides funds into six single strategy groupings that are widely used in the hedge fund industry. HFR's six main single strategy groupings are 1) equity hedge; 2) event driven; 3) fund-of-funds; 4) macro; 5) relative value; and 6) risk parity.

Lipper TASS, another well-known data vendor, classifies funds into the following ten categories: 1) dedicated short bias; 2) equity market neutral; 3) long/short equity hedge; 4) event driven; 5) convertible arbitrage; 6) fixed-income arbitrage; 7) global macro; 8) managed futures; 9) fund-of-funds; and 10) multi-strategy.

Morningstar CISDM goes even further and separates hedge funds in its database into finer categories, like merger arbitrage and systematic futures, among others. In addition, the Morningstar CISDM Database separates fund-of-funds strategies into several different sub-categories, such as debt, equity, event driven, macro/systematic, multi-strategy, and relative value.

Eurekahedge, an important index provider with its roots in Asia, has grown to include many smaller hedge fund managers globally. Its main strategy indexes include nine categories: 1) arbitrage; 2) commodity trading adviser (CTA)/managed futures; 3) distressed debt; 4) event driven; 5) fixed income; 6) long/short equities; 7) macro; 8) multi-strategy; and 9) relative value.

A final example of a prominent hedge fund data vendor is Credit Suisse. Its Credit Suisse Hedge Fund Index is an asset-weighted index that monitors approximately 9,000 funds and consists of funds with a minimum of US\$50 million AUM, a 12-month track record, and audited financial statements. The index is calculated and rebalanced monthly, and it reflects performance net of all performance fees and expenses. Credit Suisse also subdivides managers into nine main sub-indexes for strategy areas: 1) convertible arbitrage; 2) emerging markets; 3) equity market neutral; 4) event driven; 5) fixed income; 6) global macro; 7) long/short equity; 8) managed futures; and 9) multi-strategy.

These different data providers use different methodologies for index calculation. HFR produces both the HFRX Index of equally weighted hedge funds, which includes those that are open or closed to new investment, and its HFRI index series, which tracks only hedge funds open to new investment. Because managers who have closed their funds to new investment are typically superior managers who are limited in their capacity to manage additional funds, the HFRX series regularly outperforms the HFRI series. However, the mix of managers represented by the HFRX Index would obviously not be replicable in real-time by an investor, thus limiting its usefulness. Meanwhile, the Credit Suisse Hedge Fund Index is weighted by fund size (i.e., AUM), so its overall performance is more reflective of the performance of the larger hedge funds, such as the multi-strategy managers.

Notably, less overlap exists in manager reporting to the different index providers than one might expect or is likely optimal. In fact, less than 1% of hedge fund managers self-report to all the index service providers mentioned. Clearly, no single index is all-encompassing.

Generally consistent with the above data vendor groupings and with a practice-based risk factor perspective, this reading groups single hedge fund strategies into the following six categories: 1) equity; 2) event-driven; 3) relative value; 4) opportunistic; 5) specialist; and 6) multi-manager.

- **Equity-related hedge fund strategies** focus primarily on the equity markets, and the majority of their risk profiles involve equity-oriented risk. Within this equity-related bucket, long/short equity, dedicated short bias, and equity market neutral are the main strategies that will be discussed further.
- **Event-driven hedge fund strategies** focus on corporate events, such as governance events, mergers and acquisitions, bankruptcy, and other key events for corporations. The primary risk for these strategies is event risk, the possibility that an unexpected event will negatively affect a company or security. Unexpected events include unforeseen corporate reorganization, a failed merger, credit rating downgrades, or company bankruptcy. The most common event-driven hedge fund strategies, merger arbitrage and distressed securities, will be discussed in detail.
- **Relative value hedge fund strategies** focus on the relative valuation between two or more securities. These strategies are often exposed to credit and liquidity risks because the valuation differences from which these strategies seek to benefit often are due to differences in credit quality and/or liquidity across different securities. The two common relative value hedge fund strategies to be covered further are fixed-income arbitrage and convertible bond arbitrage.
- **Opportunistic hedge fund strategies** take a top-down approach, focusing on a multi-asset (often macro-oriented) opportunity set. The risks for opportunistic hedge fund strategies depend on the opportunity set involved and can vary across time and asset classes. The two common opportunistic hedge fund strategies that are discussed in further detail are global macro and managed futures.
- **Specialist hedge fund strategies** focus on special or niche opportunities that often require a specialized skill or knowledge of a specific market. These strategies can be exposed to unique risks that stem from particular market sectors, niche securities, and/or esoteric instruments. We will explore two specialist strategies in further detail: volatility strategies involving options and reinsurance strategies.
- **Multi-manager hedge fund strategies** focus on building a portfolio of diversified hedge fund strategies. Managers in this strategy bucket use their skills to combine diverse strategies and dynamically re-allocate among them over time. The two most

common types of multi-manager hedge funds are multi-strategy funds and fund-of-funds, which we will discuss in further detail.

**Exhibit 1** shows the five single strategy hedge fund buckets that will be covered individually. Multi-strategy funds and fund-of funds—two types of multi-manager strategies—will also be covered. A discussion of each strategy’s contributions to portfolio risk and return will follow.

**Exhibit 1. Hedge Fund Strategies by Category**

Equity	Event-Driven	Relative Value	Opportunistic	Specialist	Multi-Manager
<ul style="list-style-type: none"><li>• Long/Short Equity</li><li>• Dedicated Short Bias</li><li>• Equity Market Neutral</li></ul>	<ul style="list-style-type: none"><li>• Merger Arbitrage</li><li>• Distressed Securites</li></ul>	<ul style="list-style-type: none"><li>• Fixed Income Arbitrage</li><li>• Convertible Bond Arbitrage</li></ul>	<ul style="list-style-type: none"><li>• Global Macro</li><li>• Managed Futures</li></ul>	<ul style="list-style-type: none"><li>• Volatility Strategies</li><li>• Reinsurance Strategies</li></ul>	<ul style="list-style-type: none"><li>• Multi-strategy</li><li>• Fund-of-Funds</li></ul>

## 2. EQUITY STRATEGIES: LONG/SHORT EQUITY

- b. discuss investment characteristics, strategy implementation, and role in a portfolio of *equity-related* hedge fund strategies;

Equity hedge fund strategies invest primarily in equity and equity-related instruments. As mentioned previously, the alpha related to equity strategies tends to derive from the wide variety of equity investments available globally combined with astute long and short stock picking. The size and sign of equity market exposure often dictate the classification of equity hedge fund strategies. As the name suggests, long-only equity hedge fund strategies focus on holding only long positions in equities, and they sometimes use leverage. Long/short equity hedge fund strategies hold both long and short positions in equities that typically result in more-hedged, less-volatile overall portfolios. Short-biased strategies focus on strategic short selling of companies that are expected to lose value in the future (sometimes with an activist inclination, sometimes with long positions in other securities as an offset). Equity market-neutral strategies hold balanced long and short equity exposures to maintain zero (or close to zero) net exposure to the equity market and such factors as sector and size (i.e., market cap). They then focus on, for example, pairs of long and short securities whose prices are out of historical alignment and are expected to experience mean reversion. The following sections

discuss long/short equity, dedicated short bias, and equity market-neutral hedge fund strategies.

## **2.1. Long/Short Equity**

Long/short (L/S) equity managers buy equities of companies they expect will rise in value (i.e., they take long positions in undervalued companies) and sell short equities of companies they think will fall in value (i.e., they take short positions in overvalued companies). The objective of long/short equity strategies is to be flexible in finding attractive opportunities on both the long and short sides of the market and to size them within a portfolio. Depending on their specific mandates, long/short equity strategies can shift between industry sectors (e.g., from technology to consumer goods), factors (e.g., from value to growth), and geographic regions (e.g., from Europe to Asia). In practice, however, managers tend to maintain their philosophical biases and areas of focus, typically with a heavy emphasis on fundamental research.

Although market timing using “beta tilts” can play a factor in manager performance, studies have shown that most fundamental long/short equity managers offer little added alpha from such adjustments. They are typically either too net long at market highs or not net long enough at market lows. Most L/S equity managers are not known for their portfolio-level market-timing abilities, but those with such market-timing skills may be particularly valuable from a portfolio allocation perspective.

L/S equity managers also are typically able to take concentrated positions in high conviction buys or sells and can readily apply leverage to increase these positions (although higher levels of leverage are used mostly by quantitatively-oriented managers, not fundamental managers). As a result, stock selection defines manager skill for most L/S equity managers—with market-timing ability being an additive, but generally secondary, consideration. L/S equity is one of the most prevalent hedge fund strategies. It accounts for about 30% of all hedge funds.

### **2.1.1. Investment Characteristics**

Because manager skill derives mainly from stock selection, it is not surprising that individual long/short equity managers tend to have a focus based on their own unique skill sets. As a result, many long/short equity managers specialize in either a specific geographic region, sector, or investment style. However, several key characteristics define long/short equity managers: their strategy focus, their flexibility in holding long and short positions over time, and their use of leverage. Given the specific mandate for a long/short equity manager, his/her exposures to various equity factors can be very different from other long/short equity



managers. For example, a manager focusing on small-cap growth stocks would have a positive exposure to the size factor and a negative exposure to the value factor. Conversely, a manager with a focus on large-cap value stocks would have a negative exposure to the size factor and a positive exposure to the value factor.

Given that equity markets tend to rise over the long run, most long/short equity managers typically hold net long equity positions. Some managers maintain their short positions as a hedge against unexpected market downturns. Other managers are more opportunistic; they tend to take on more short positions after uncovering negative issues with a company's management, strategies, and/or financial statements or whenever their valuation models suggest selling opportunities in certain stocks or sectors. As a result, performance during market crisis periods is important for differentiating between hedge fund managers. Given that hedge funds typically carry high fees, it is important to avoid paying such added fees just for embedded beta exposure that could be achieved more cheaply by investing in traditional long-only strategies. The goal in long/short equity investing is generally to find more sources of idiosyncratic alpha (primarily via stock picking and secondarily by market timing) rather than embedded systematic beta. [Exhibit 2](#) presents some key aspects of this important strategy area.

## **Exhibit 2. Long/Short Equity—Risk, Liquidity, Leverage, and Benchmarking**

### **Risk Profile and Liquidity**

- Diverse opportunities globally create a wide universe from which to create alpha through astute stock picking.
- Diverse investment styles include value/growth, large cap/small cap, discretionary/quantitative, and industry specialized.
- They typically have average exposures of 40%–60% net long, composed of gross exposures of 70%–90% long, vs. 20%–50% short, but they can vary widely. Return profiles are typically aimed to achieve average annual returns roughly equivalent to a long-only approach but with a standard deviation 50% lower than a long-only approach.
- Some managers use index-based short hedges to reduce market risk, but most search for single-name shorts for portfolio alpha and added absolute return.
- Some managers are able to add alpha via market timing of portfolio beta tilt, but evidence suggests that most L/S managers do this poorly.



- This strategy can typically be handled by both limited partner and mutual fund-type vehicles.
- Attractiveness: Liquid, diverse, with mark-to-market pricing driven by public market quotes; added short-side exposure typically reduces beta risk and provides an additional source of potential alpha and reduced portfolio volatility.

## Leverage Usage

- Variable: The more market-neutral or quantitative the strategy approach, the more levered the strategy application tends to be to achieve a meaningful return profile.

## Benchmarking

- L/S equity benchmarks include HFRX and HFRI Equity Hedge Indices; Lipper TASS L/S Equity Hedge; Morningstar/CISDM Equity L/S Index; and Credit Suisse L/S Equity Index.
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### 2.1.2. Strategy Implementation

When long and short stock positions are placed together into a portfolio, the market exposure is the net of the beta-adjusted long and short exposures. For example, with many strong sells and a relatively large short position, the strategy could be net short for brief periods of time. Typically, most long/short equity managers end up with modest net long exposures averaging between 40%–60% net long. Many long/short equity managers are naturally sector-specific, often designing their funds around their industry specialization. Such specialist L/S fund managers analyze fundamental situations that they know well from both a top-down and bottom-up analytical perspective. Natural areas of specialization include potentially more complex sectors, such as telecom/media/technology (TMT), financial, consumer, health care, and biotechnology sectors. Conversely, generalist L/S managers search further afield, thus having flexibility to invest across multiple industry groups. Typically, these generalists avoid complex sectors; for example, they may avoid biotechnology because corporate outcomes may be deemed too binary depending on the success or failure of drug trials. Although generalist managers do take a more balanced and flexible approach, they may miss detailed industry subtleties that are increasingly important to understand in a world where news flows 24/7 and is increasingly nuanced.

Overall, long/short equity investing in most instances is a mix of extracting alpha on the long

and short sides from single-name stock selection combined with some naturally net long embedded beta.

## EXAMPLE 1

# Long/Short Equity Investing Dilemma

The Larson family office views L/S equity investing as a significant portion of the hedge fund universe and would like to access managers talented not only at long investing but also at short selling. However, it does not want to pay high hedge fund fees just for long-biased beta because it has access to long-biased beta at lower fees elsewhere in its portfolio. But, Larson will pay hedge fund fees for strategies that can produce strong risk-adjusted performance in a unique and differentiated fashion.

1. Discuss some potential hedge fund strategies the Larson family office should consider adding to its existing portfolio.
2. Discuss some of the problems and risks that it may encounter.

## Solution to 1:

The Larson family office should consider managers focused on an L/S equity strategy with a sector-specialization as opposed to a generalist fundamental L/S strategy. Generalist L/S managers can benefit from the flexibility to scan a wide universe of stocks to find investments, but they may not be able to develop a sufficient information edge in their analysis to dependably deliver sufficient alpha relative to their fees and natural long beta positioning. However, managers running specialist L/S equity strategies—especially in such complex sectors as technology, finance, and biotechnology/health care—are more likely to have the specialized capabilities to perform the “deep-dive” differentiated analysis required to develop more original views and stronger portfolio performance.

## Solution to 2:

A key problem with selecting sector-specialist L/S equity hedge funds is that they are more difficult to analyze and assess. There are also fewer to choose from compared to generalist L/S hedge funds. Sectors can fall out of favor, risking an allocation to a good fund but in the wrong area given dynamic macroeconomic and financial market conditions. Moreover, generalist L/S strategies, by definition, can readily reallocate capital more efficiently as opportunities emerge in different sectors. Put another way, the Larson family office could potentially find itself with too much single sector, short-sided, or idiosyncratic exposure at the wrong time if it chooses a sector-specialist L/S

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## 3. EQUITY STRATEGIES: DEDICATED SHORT SELLING AND SHORT-BIASED

- b. discuss investment characteristics, strategy implementation, and role in a portfolio of *equity-related* hedge fund strategies;

**Dedicated short-selling** hedge fund managers take short-only positions in equities deemed to be expensively priced versus their deteriorating fundamental situations. Such managers may vary their short exposures only in terms of portfolio sizing by, at times, holding higher levels of cash. **Short-biased** hedge fund managers use a less extreme version of this approach. They also search for opportunities to sell expensively priced equities, but they may balance short exposure with some modest value-oriented, or possibly index-oriented, long exposure. This latter approach can potentially help short-biased hedge funds cope with long bull market periods in equities. Both types of short sellers actively aim to create an uncorrelated or negatively correlated source of return by seeking out failing business models, fraudulent accounting, corporate mismanagement, or other factors that may sour the market's perception of a given equity. Because of the overall secular up-trend in global equity markets, especially across the past several decades, it has been very difficult to be a successful short seller. As a result, fewer such managers are in existence today than in the 1990s.

One exception is the emergence of **activist short selling**, whereby managers take a short position in a given security and then publicly present their research backing the short thesis. Typically, if the hedge fund manager has a solid reputation from its past activist short-selling forays, the release of such research causes a significant stock price plunge into which the activist short seller might cover a portion of its short position. In the United States, this practice has not been deemed to be market manipulation by securities' regulators as long as the activist short seller is not publishing erroneous information, is not charging for such information (which might create potential conflicts of interest between subscribers and investors), and is acting only in the best interests of its limited partner investors.

### 3.1. Investment Characteristics

Short-selling managers focus on situations involving overvalued equities of companies facing deteriorating fundamentals that typically have not yet been perceived by the market. They also attempt to maximize returns during periods of market declines. If these short-selling managers can achieve success with their approaches, they can provide a unique and useful source of negatively correlated returns compared to many other strategy areas.

Short selling involves borrowing securities, selling them “high,” and then after prices have declined, buying the same securities back “low” and returning them to the lender. To borrow the securities to short sell, the manager must post collateral with the securities lender to cover potential losses. The manager must also pay interest on the securities loan, which can be high if the securities are difficult for the lender to locate. One key risk is that the lender may want the securities back at an inopportune time—such as before the expected price decline has materialized, which could be disadvantageous for the hedge fund manager.

Short selling in general is a difficult investment practice to master in terms of risk management because of the natural phenomenon that positions will grow if prices advance against the short seller but will shrink if prices decline. This is the opposite of what occurs with long-only investing, and it is more difficult to manage. Additionally, access to company management for research purposes can be blocked for fund managers who become known as active short sellers.

From a regulatory perspective, many countries limit or impose stringent rules on short selling. In the United States, the “uptick rule” states that when a stock decreases by 10% or more from its prior closing price, a short sale order can be executed only at a price higher than the current best (i.e., highest) bid. This means the stock’s price must be rising to execute the short sale. Although many emerging markets have allowed short selling, particularly to enhance market liquidity (e.g., the Saudi Stock Exchange allowed short sales beginning in 2016), there is always concern that limits could be placed on short selling during extreme market environments or that regulations could change. For example, for a brief period during the global financial crisis of 2007–2009, new short sales on a designated list of financial stocks were banned by the US SEC to lessen systematic market stress.

Given the difficult operational aspects of short selling, and because equity markets tend to secularly rise over time, successful short-selling managers typically have something of a short-term “attack and retreat” style. The return profile for a successful short-biased manager might best be characterized by increasingly positive returns as the market declines and the risk-free return when the market rises. In some idealized short-selling world, this would entail being short the market during down periods and investing in low-risk government debt when the market is not declining. But, the actual goal of a short seller is to pick short-sale stocks that can still generate positive returns even when the general market trend is up. Skillful, dedicated short-biased managers look for possible short-selling targets among companies that are overvalued, that are experiencing declining revenues and/or earnings, or that have internal management conflicts, weak corporate governance, or even potential accounting frauds. Other possible short-sale candidates are companies that may have single

products under development that the short seller believes will ultimately either be unsuccessful or non-repeatable. [Exhibit 3](#) shows some important aspects of this strategy area.

### **Exhibit 3. Dedicated Short Sellers and Short-Biased—Risk, Liquidity, Leverage, and Benchmarking**

## **Risk Profile and Liquidity**

- Dedicated short sellers: They only trade with short-side exposure, although they may moderate short beta by also holding cash.
- Short-biased managers: They are focused on good short-side stock picking, but they may moderate short beta with some value-oriented long exposure or index-oriented long exposure as well as cash.
- Dedicated short sellers tend to be 60%–120% short at all times. Short-biased managers are typically around 30%–60% net short. The focus in both cases tends to be on single equity stock picking as opposed to index shorting.
- Return goals are typically less than those for most other hedge fund strategies but with a negative correlation benefit. They are more volatile than a typical L/S equity hedge fund given short beta exposure.
- Managers have some ability to add alpha via market timing of portfolio beta tilt, but it is difficult to do with consistency or added alpha.
- This strategy is typically handled best in a limited partnership because of difficult operational aspects of short selling.
- Attractiveness: Liquid, negatively correlated alpha to that of most other strategies, with mark-to-market pricing from public prices. Historic returns have been lumpy and generally disappointing.

## **Leverage Usage**

- Low: There is typically sufficient natural volatility that short-selling managers do not need to add much leverage.

## **Benchmarking**

- Short-biased indexes include EurekaHedge Equity Short Bias Hedge Fund

Index and Lipper TASS Dedicated Short-Bias Index. Some investors also compare short-biased funds' returns to the inverse of returns on related stock indexes.

*Note:* Each index has different methodologies for fund inclusion. Because there are fewer short-selling managers, the construction of an acceptably diverse index is particularly difficult. The Lipper TASS Dedicated Short-Bias Index, for example, includes just four managers.

## 3.2. Strategy Implementation

Because finding strategic selling opportunities is key to dedicated short-biased strategies, stock selection is an important part of the investment process. Short-selling managers typically take a bottom-up approach by scanning the universe of potential sell targets to uncover and sell short those companies whose shares are most likely to substantially decline in value over the relevant time horizon. Managers search for, among other factors, inherently flawed business models, unsustainable levels of corporate leverage, and indications of poor corporate governance and/or accounting gimmickry. Tools that may be helpful to dedicated short-biased managers in finding potential sell candidates include monitoring single name credit default swap spreads, corporate bond yield spreads, and/or implied volatility of exchange-traded put options. Traditional technical analysis and/or pattern recognition techniques may assist the manager in the market timing of short sales. Various accounting ratios and measures, such as the Altman Z-score for judging a company's bankruptcy potential and the Beneish M-score for identifying potentially fraudulent financial statements, may also be useful. Because of the inherent difficulty and dangers of short selling, most successful short sellers do significant "deep-dive" forensic work on their short-portfolio candidates. As such, short sellers serve as a valuable resource in creating more overall pricing efficiency in the market.

### EXAMPLE 2

## Candidate for Short-Biased Hedge Fund Strategy

Kit Stone, a short-biased hedge fund manager, is researching Generic Inc. (GI) for possible addition to his portfolio. GI was once a drug industry leader, but for the past 10 years its R&D budgets have declined. Its drug patents have all expired, so it now operates in the competitive generic drug business. GI has staked its future on a new treatment for gastro-intestinal disease. R&D was financed by debt, so GI's leverage ratio is twice the industry average. Early clinical trials were inconclusive. Final clinical trial

results for GI's new drug are to be revealed within one month. Although the market is constructive, many medical experts remain doubtful of the new drug's efficacy. Without any further insights into the trial results, Stone reviews the following information.

Generic Inc. (GI)			Industry Average		
PE (X)	PB (X)	T12M EPS Growth	PE (X)	PB (X)	T12M EPS Growth
30	3.5	3%	20	2.5	18%

Additionally, Stone notes that GI shares are very thinly traded, with a high short-interest ratio of 60%. Stone's broker has informed him that it is expensive to borrow GI shares for shorting; they are on "special" (i.e., difficult to borrow), with a high borrowing cost of 20% per year. Moreover, there is an active market for exchange-traded options on GI's shares. Prices of one-month GI options appear to reflect a positive view of the company.

1. Discuss whether Stone should add GI shares to his short-biased portfolio.
2. Discuss how Stone might instead take advantage of the situation using GI options.

### Solution to 1:

Generic Inc. appears to be substantially overvalued. Its main business relies on the competitive generic drug market; it has taken on substantial debt to fund R&D; and skepticism surrounds its new drug. GI's P/Es and P/Bs are higher than industry averages by 50% and 40%, respectively, and its trailing 12-month EPS growth is meager (3% vs. 18% industry average). However, although Stone would normally decide to add GI to his short-biased portfolio, the stock's high short-interest ratio and high cost to borrow (for shorting) are very concerning. Both factors suggest significant potential that a dangerous short-squeeze situation could develop if clinical results really do show efficacy of GI's new drug. So, based on the negative demand/supply dynamics for the stock, Stone decides not to add GI to his portfolio.

### Solution to 2:

Stone might instead consider expressing his negative view on GI by simply purchasing put options. Alternatively, Stone could purchase a long put calendar spread, where he would buy a put with expiry beyond and sell a put with expiry before the expected release date of the clinical trial results. In that case, the premium received from writing the shorter tenor put would finance, in part, the cost of buying the longer tenor put. As a



third possibility, Stone might even consider buying GI shares and then lending them at the attractive 20% rate. In that case, he would need to hedge this long stock position with the purchase of out-of-the-money puts, thereby creating a protective put position. As a final possibility, if out-of-the-money calls are deemed to be expensive because of positive sentiment, Stone could sell such calls to finance the purchase of out-of-the-money puts, creating a short risk reversal that provides synthetic short exposure.

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## 4. EQUITY STRATEGIES: EQUITY MARKET NEUTRAL

- b. discuss investment characteristics, strategy implementation, and role in a portfolio of *equity-related* hedge fund strategies;

Equity market-neutral (EMN) hedge fund strategies take opposite (i.e., long and short) positions in similar or related equities that have divergent valuations, and they also attempt to maintain a near net zero portfolio exposure to the market. EMN managers neutralize market risk by constructing their portfolios such that the expected portfolio beta is approximately equal to zero. Moreover, managers often choose to set the betas for sectors or industries as well as for such common risk factors as market size, price-to-earnings ratio, or book-to-market ratio, which are also equal to zero. Because these portfolios do not take beta risk but do attempt to neutralize so many other factor risks, they typically must apply leverage to the long and short positions to achieve a meaningful expected return from their individual stock selections. Approaches vary, but equity market-neutral portfolios are often constructed using highly quantitative methodologies; the portfolios end up being more diverse in their holdings; and the portfolios are typically modified and adjusted over shorter time horizons. The condition of zero market beta can also be achieved with the use of derivatives, including stock index futures and options. Whichever way they are constructed, the overall goal of equity market-neutral portfolios is to capture alpha while minimizing portfolio beta exposure.

Although **pairs trading** is just one subset of equity market-neutral investing, it is an intuitively easy example to consider. With this strategy, pairs are identified of similar under- and overvalued equities, divergently valued shares of a holding company and its subsidiaries, or different share classes of the same company (multi-class stocks typically having different voting rights) in which their prices are out of alignment.

In whatever manner they are created, the pairs are monitored for their typical trading patterns



relative to each other—conceptually, the degree of co-integration of the two securities’ prices. Positions are established when unusually divergent spread pricing between the two paired securities is observed. Underpinning such a strategy is the expectation that the differential valuations or trading relationships will revert to their long-term mean values or their fundamentally-correct trading relationships, with the long position rising and the short position declining in value. Situations will obviously vary, but strictly quantitative EMN pairs trading, while attempting to minimize overall beta exposure, may still have effective short volatility “tail risk” exposure to abnormal market situations of extreme stress. This is less the case if a fundamental pricing discrepancy is being exploited in anticipation of a possible event that would cause that discrepancy to correct.

Another type of EMN trading is **stub trading**, which entails buying and selling stock of a parent company and its subsidiaries, typically weighted by the percentage ownership of the parent company in the subsidiaries. Assume parent company A owns 90% and 75% of subsidiaries B and C, respectively, and shares of A are determined to be overvalued while shares of B and C are deemed undervalued, all relative to their historical mean valuations. Then, for each share of A sold short, the EMN fund would buy 0.90 and 0.75 shares of B and C, respectively.

Yet another type of EMN approach may involve **multi-class trading**, which involves buying and selling different classes of shares of the same company, such as voting and non-voting shares. As with pairs trading, the degree of co-integration of returns and the valuation metrics for the multi-class shares are determined. If/when prices move outside of their normal ranges, the overvalued shares are sold short while the undervalued shares are purchased. The goal is to gain on the change in relative pricing on the two securities as market pricing reverts to more normal ranges.

Fundamental trade setups—although not per se “equity market neutral” but still designed to be market neutral—may be created that are long or short equity hedged against offsetting bond exposures if relative pricing between the stocks and bonds is deemed to be out of alignment. Such pairs trading is referred to as capital structure arbitrage and will be discussed in the event-driven strategies section. In these situations, attractive expected outcomes are often created from relative security mispricings designed to exploit potential event situations (e.g., a potential merger or bankruptcy) that would have an impact on relative pricing. Moreover, when two bonds are positioned relative to each other (e.g., to exploit a misunderstood difference in bond covenants or a potential differential asset recovery), a market-neutral strategy can also be employed.

When building market-neutral portfolios, sometimes large numbers of securities are traded and positions are adjusted on a daily or even an hourly basis using algorithm-based models. Managers following this approach are referred to as **quantitative market-neutral** managers. The frequent adjustments implemented by such managers are driven by the fact that market prices change faster than company fundamental factors. This price movement

triggers a rebalancing of the EMN portfolio back to a market neutrality. When the time horizon of EMN trading shrinks to even shorter intervals and mean reversion and relative momentum characteristics of market behavior are emphasized, quantitative market-neutral trading becomes what is known as statistical arbitrage trading. With EMN and statistical arbitrage trading, a natural push/pull occurs between maintaining an optimal beta-neutral portfolio and the market impacts and brokerage costs of nearly continuous adjusting of the portfolio. So, many EMN managers use trading-cost hurdle models to determine if and when they should rebalance a portfolio.

Overall, the main source of skill for an EMN manager is in security selection, with market timing being of secondary importance. Sector exposure also tends to be constrained, although this can vary by the individual manager's approach. Managers that are overall beta neutral and specialize in sector rotation exposure as their source of alpha are known as market-neutral tactical asset allocators or macro-oriented market-neutral managers.

## **4.1. Investment Characteristics**

Equity market-neutral fund managers seek to insulate their portfolios from movements in the overall market, and they can take advantage of divergent valuations by trading specific securities. As discussed, this is often a quantitatively driven process that uses a substantial amount of leverage to generate meaningful return objectives. However, many discretionary EMN managers implement their positions with significantly less leverage.

Overall, EMN managers generally are more useful for portfolio allocation during periods of non-trending or declining markets because they typically deliver returns that are steadier and less volatile than those of many other hedge strategy areas. Over time, their conservative and constrained approach typically results in less-volatile overall returns than those of managers who accept beta exposure. The exception to this norm is when the use of significant leverage may cause forced portfolio downsizing. By using portfolio margining techniques offered by prime brokers, market-neutral managers may run portfolios with up to 300% long versus 300% short exposures. Prime broker portfolio margining rules generally allow managers to maintain such levered positioning until a portfolio loss of a specified magnitude (i.e., excess drawdown) is incurred. At the time of such excess drawdown, the prime broker can force the manager to downsize his/her overall portfolio exposure. This is a key strategy risk, particularly for quantitative market-neutral managers.

Despite the use of substantial leverage and because of their more standard and overall steady risk/return profiles, equity market-neutral managers are often considered as preferred replacements for (or at least a complement to) fixed-income managers during periods when fixed-income returns are unattractively low/and or the yield curve is flat. EMN managers are, of course, sourcing a very different type of alpha with very different risks than in fixed-

income investing. EMN managers must deal with leverage risk, including the issues of availability of leverage and at what cost, and tail risk, particularly the performance of levered portfolios during periods of market stress. [Exhibit 4](#) presents important aspects of this strategy area.

## **Exhibit 4. Equity Market Neutral—Risk, Liquidity, Leverage, and Benchmarking**

### **Risk Profile and Liquidity**

- They have relatively modest return profiles, with portfolios aimed to be market neutral, and differing constraints to other factors and sector exposures are allowed.
- They generally have high levels of diversification and liquidity and lower standard deviation of returns than many other strategies across normal market conditions.
- Many different types of EMN managers exist, but many are purely quantitative managers (vs. discretionary managers).
- Time horizons vary, but EMN strategies are typically oriented toward mean reversion, with shorter horizons than other strategies and more active trading.
- Because of often high leverage, EMN strategies typically do not meet regulatory leverage limits for mutual fund vehicles. So, limited partnerships are the preferred vehicle.
- Attractiveness: EMN strategies typically take advantage of idiosyncratic short-term mispricing between securities whose prices should otherwise be co-integrated. Their sources of return and alpha, unlike those of many other strategies, do not require accepting beta risk. So, EMN strategies are especially attractive during periods of market vulnerability and weakness.

### **Leverage Usage**

- High: As many beta risks (e.g., market, sector) are hedged away, it is generally deemed acceptable for EMN managers to apply higher levels of leverage while striving for meaningful return targets.

### **Benchmarking**

- Market-neutral indexes include HFRX and HFRI Equity Market Neutral Indices; Lipper TASS Equity Market Neutral Index; Morningstar/CISDM Equity Market Neutral Index; and Credit Suisse Equity Market Neutral Index.

## 4.2. Strategy Implementation

Equity market-neutral portfolios are constructed in four main steps. First, the investment universe is evaluated to include only tradable securities with sufficient liquidity and adequate short-selling potential. Second, securities are analyzed for buy and sell opportunities using fundamental models (which use company, industry, and economic data as inputs for valuation) and/or statistical and momentum-based models. Third, a portfolio is constructed with constraints to maintain market risk neutrality, whereby the portfolio's market value-weighted beta is approximately zero and there is often dollar (i.e., money), sector, or other factor risk neutrality. Fourth, the availability and cost of leverage are considered in terms of desired return profile and acceptable potential portfolio drawdown risk. The execution costs of the strategy rebalancing are also introduced as a filter for decision making as to how often the portfolio should be rebalanced. Markets are dynamic because volatility and leverage are always changing; therefore, the exposure to the market is always changing. Consequently, EMN managers must actively manage their funds' exposures to remain neutral over time. However, costs are incurred every time the portfolio is rebalanced. So, EMN managers must be very careful to not allow such costs to overwhelm the security-selection alpha that they are attempting to capture.

Note that the following is a simplified example. In reality, most EMN managers would likely not hedge beta on a stock-by-stock basis but rather would hedge beta on an overall portfolio basis. They would also likely consider other security factor attributes.

### EXAMPLE 3

## Equity Market-Neutral Pairs Trading:

Ling Chang, a Hong Kong-based EMN manager, has been monitoring PepsiCo Inc. (PEP) and Coca-Cola Co. (KO), two global beverage industry giants. After examining the Asia marketing strategy for a new PEP drink, Chang feels the marketing campaign is too controversial and the overall market is too narrow. Although PEP has relatively weak earnings prospects compared to KO, 3-month valuation metrics show PEP shares are substantially overvalued versus KO shares (relative valuations have moved beyond their historical ranges). As part of a larger portfolio, Chang wants to allocate \$1 million to the PEP versus KO trade and notes the historical betas and S&P 500 Index weights, as

shown in the following table.

Stock	Beta	S&P 500 Index Weight
PEP	0.65	0.663
KO	0.55	0.718

Discuss how Chang might implement an EMN pairs trading strategy.

### Solution:

Chang should take a short position in PEP and a long position in KO with equal beta-weighted exposures. Given Chang wants to allocate \$1 million to the trade, she would take on a long KO position of \$1 million. Assuming realized betas will be similar to historical betas, to achieve an equal beta-weighted exposure for the short PEP position, Chang needs to short \$846,154 worth of PEP shares [=  $-\$1,000,000 / (0.65/0.55)$ ]. Only the overall difference in performance between PEP and KO shares would affect the performance of the strategy because it will be insulated from the effect of market fluctuations. If over the next 3 months the valuations of PEP and KO revert to within normal ranges, then this pairs trading EMN strategy should reap profits.

*Note:* The S&P 500 Index weights are not needed to answer this question.

## 5. EVENT-DRIVEN STRATEGIES: MERGER ARBITRAGE

- c. discuss investment characteristics, strategy implementation, and role in a portfolio of *event-driven* hedge fund strategies;

Event-driven (ED) hedge fund strategies take positions in corporate securities and derivatives that are attempting to profit from the outcome of mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes, and similar events. ED hedge fund managers analyze companies' financial statements and regulatory filings and closely examine corporate governance issues (e.g., management

structure, board composition, issues for shareholder consideration, proxy voting) as well as firms' strategic objectives, competitive position, and other firm-specific issues. Investments can be made either proactively in anticipation of an event that has yet to occur (i.e., a **soft-catalyst event-driven approach**), or investments can be made in reaction to an already announced corporate event in which security prices related to the event have yet to fully converge (i.e., a **hard-catalyst event-driven approach**). The hard approach is generally less volatile and less risky than soft-catalyst investing. Merger arbitrage and distressed securities are among the most common ED strategies.

## 5.1. Merger Arbitrage

Mergers and acquisitions can be classified by the method of purchase: cash-for-stock or stock-for-stock. In a cash-for-stock acquisition, the acquiring company (A) offers the target company (T) a cash price per share to acquire T. For example, assume T's share price is \$30 and A decides to purchase T for \$40 per share (i.e., A is offering a 33% premium to purchase T's shares). In a stock-for-stock acquisition, A offers a specific number of its shares in exchange for 1 T share. So, if A's share price is \$20 and it offers 2 of its shares in exchange for 1 T share, then T's shareholders would receive a value of \$40 per T share, assuming A's share price is constant until the merger is completed. Although merger deals are structured in different ways for many reasons (e.g., tax implications, corporate structure, or provisions to dissuade a merger, such as a "poison pill"<sup>1</sup>), acquiring companies are generally more likely to offer cash for their target companies when cash surpluses are high. However, if the stock prices are high and acquiring companies' shares are considered richly valued by management, then stock-for-stock acquisitions can take advantage of potentially overvalued shares as a "currency" to acquire target companies.

### 5.1.1. Investment Characteristics

In a cash-for-stock acquisition, the merger-arb manager may choose to buy just the target company (T), expecting it to increase in value once the acquisition is completed. In a stock-for-stock deal, the fund manager typically buys T and sells the acquiring company (A) in the same ratio as the offer, hoping to earn the spread on successful deal completion. If the acquisition is unsuccessful, the manager faces losses if the price of T (A) has already risen (fallen) in anticipation of the acquisition. Less often, managers take the view that the acquisition will fail—usually due to anti-competition or other regulatory concerns. In this case, he/she would sell T and buy A.

For most acquisitions, the initial announcement of a deal will cause the target company's stock price to rise toward the acquisition price and the acquirer's stock price to fall (either because of the potential dilution of its outstanding shares or the use of cash for purposes



other than a dividend payment). The considerable lag time between deal announcement and closing means that proposed merger deals can always fail for any variety of reasons, including lack of financing, regulatory hurdles, and not passing financial due diligence. Hostile takeover bids, where the target company's management has not already agreed to the terms of a merger, are typically less likely to be successfully completed than friendly takeovers, where the target's management has already agreed to merger terms.

Approximately 70%–90% of announced mergers in the United States eventually close successfully. Given the probability that some mergers will not close for whatever reason as well as the costs of establishing a merger arbitrage position (e.g., borrowing the acquiring stock, commissions) and the risk that merger terms might be changed because of market conditions (especially in stressed market environments), merger arbitrage typically offers a 3%–7% return spread depending on the deal-specific risks. Of course, a particularly risky deal might carry an even larger spread. If the average time for merger deal completion is 3–4 months—with managers recycling capital into new deals several times a year and typically applying some leverage to their portfolio positions—then attractive return/risk profiles can be created, earning net annualized returns in the range of 7%–12%, with little correlation to non-deal-specific factors. Diversifying across a variety of mergers, deals, and industries can further help hedge the risk of any one deal failing. So overall, this strategy can be a good uncorrelated source of alpha.

When merger deals do fail, the initial price rise (fall) of the target (acquirer) company is typically reversed. Arbitrageurs who jumped into the merger situation after its initial announcement stand to incur substantial losses on their long (short) position in the target (acquirer)—often as large as negative 20% to 40%. So, the strategy thus does have left-tail risk associated with it.

Corporate events are typically binary: An acquisition either succeeds or fails. The merger arbitrage strategy can be viewed as selling insurance on the acquisition. If the acquisition succeeds (no adverse event occurs), then the hedge fund manager collects the spread (like the premium an insurance company receives for selling insurance) for taking on event risk. If the acquisition fails (an adverse event occurs), then he/she faces the losses on the long and short positions (similar to an insurance company paying out a policy benefit after an insured event has occurred). Thus, the payoff profile of the merger arbitrage strategy resembles that of a riskless bond and a short put option. The merger arbitrage investor also can be viewed as owning an additional call option that becomes valuable if/when another interested acquirer (i.e., White Knight) makes a higher bid for the target company before the initial merger proposal is completed. [Exhibit 5](#) shows risk and return attributes of merger arbitrage investing.

## **Exhibit 5. Event-Driven Merger Arbitrage—Risk, Liquidity, Leverage, and Benchmarking**

# Risk Profile and Liquidity

- Merger arbitrage is a relatively liquid strategy—with defined gains from idiosyncratic single security takeover situations but occasional downside shocks when merger deals unexpectedly fail.
- To the extent that deals are more likely to fail in market stress periods, this strategy has market sensitivity and left-tail risk attributes. Its return profile is insurance-like plus a short put option.
- Because cross-border merger and acquisition (M&A) usually involves two sets of governmental approvals and M&A deals involving vertical integration often face anti-trust scrutiny, these situations carry higher risks and offer wider merger spread returns.
- Some merger arbitrage managers invest only in friendly deals trading at relatively tight spreads, while others embrace riskier hostile takeovers trading at wider spreads. In the latter case, there may be expectations of a higher bid from a White Knight.
- The preferred vehicle is limited partnership because of merger arbitrage's use of significant leverage, but some low-leverage, low-volatility liquid alt merger arbitrage funds do exist.
- Attractiveness: Relatively high Sharpe ratios with typically low double-digit returns and mid-single digit standard deviation (depending on specific levels of leverage applied), but left-tail risk is associated with an otherwise steady return profile.

## Leverage Usage

- Moderate to high: Managers typically apply 3 to 5 times leverage to this strategy to generate meaningful target return levels.

## Benchmarking

- Sub-indexes include HFRX or HFRI Merger Arbitrage Index; CISDM Hedge Fund Merger Arbitrage Index; and Credit Suisse Merger Arbitrage Index.



Merger arbitrage strategies are typically established using common equities; however, a range of other corporate securities, including preferred stock, senior and junior debt, convertible securities, options, and other derivatives, may also be used for positioning and hedging purposes. Often for a cash-for-stock acquisition, a hedge fund manager may choose to use leverage to buy the target firm. For a stock-for-stock acquisition, leverage may also often be used, but short selling the acquiring firm may be difficult due to liquidity issues or short-selling constraints, especially in emerging markets. Merger arbitrage strategies can utilize derivatives to overcome some short-sale constraints or to manage risks if the deal were to fail. For example, the manager could buy out-of-the money (O-T-M) puts on T and/or buy O-T-M call options on A (to cover the short position).

Convertible securities also provide exposure with asymmetrical payoffs. For example, the convertible bonds of T would also rise in value as T's shares rise because of the acquisition; the convertibles' bond value would provide a cushion if the deal fails and T's shares fall. When the acquiring company's credit is superior to the target company's credit, trades may be implemented using credit default swaps (CDS). In this case, protection would be sold (i.e., shorting the CDS) on the target company to benefit from its improved credit quality (and decline in price of protection and the CDS) once a merger is completed. If the pricing is sufficiently cheap, buying protection (i.e., going long the CDS) on the target may also be used as a partial hedge against a merger deal failing. Overall market risk (that could potentially disrupt a merger's consummation) might also be hedged by using added short equity index ETFs/futures or long equity index put positions.

In sum, the true source of return alpha for a merger arbitrage hedge fund manager is in the initial decision as to which deals to embrace and which to avoid. However, once involved with a given merger situation, there may be multiple ways to implement a position depending on the manager's deal-specific perspectives.

## EXAMPLE 4

### Merger Arbitrage Strategy Payoffs

An acquiring firm (A) is trading at \$45/share and has offered to buy target firm (T) in a stock-for-stock deal. The offer ratio is 1 share of A in exchange for 2 shares of T. Target firm T was trading at \$15 per share just prior to the announcement of the offer. Shortly thereafter, T's share price jumps up to \$19 while A's share price falls to \$42 in anticipation of the merger receiving required approvals and the deal closing successfully. A hedge fund manager is confident this deal will be completed, so he buys 20,000 shares of T and sells short 10,000 shares of A.

What are the payoffs of the merger arbitrage strategy if the deal is successfully completed or if the merger fails?

## Solution:

At current prices it costs \$380,000 to buy 20,000 shares of T, and \$420,000 would be received for short selling 10,000 shares of A. This provides a net spread of \$40,000 to the hedge fund manager if the merger is successfully completed. If the merger fails, then prices should revert to their pre-merger announcement levels. The manager would need to buy back 10,000 shares of A at \$45 (costing \$450,000) to close the short position, while the long position in 20,000 shares of T would fall to \$15 per share (value at \$300,000). This would cause a total loss of \$110,000 [= (A: +\$420,000 – \$450,000) + (T: –\$380,000 + \$300,000)]. In sum, this merger strategy is equivalent to holding a riskless bond with a face value of \$40,000 (the payoff for a successful deal) and a short binary put option, which expires worthless if the merger succeeds but pays out \$110,000 if the merger fails.

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## 6. EVENT-DRIVEN STRATEGIES: DISTRESSED SECURITIES

- c. discuss investment characteristics, strategy implementation, and role in a portfolio of *event-driven* hedge fund strategies;

Distressed securities strategies focus on firms that either are in bankruptcy, facing potential bankruptcy, or under financial stress. Firms face these circumstances for a wide variety of reasons, including waning competitiveness, excessive leverage, poor governance, accounting irregularities, or outright fraud. Often the securities of such companies have been sold out of long-only portfolios and may be trading at a significant discount to their eventual work-out value under proper stewardship and guidance. Because hedge funds are not constrained by institutional requirements on minimum credit quality, hedge fund managers are often natural candidates to take positions in such situations. Hedge funds, generally, also provide their investors only periodic liquidity (typically quarterly or sometimes only annually), making the illiquid nature of such securities less problematic than if such positions were held within a mutual fund. Hedge fund managers may find inefficiently priced securities before, during, or after the bankruptcy process, but typically they will be looking to realize their returns somewhat faster than the longer-term orientation of private equity firms. However, this is not always the case; for example, managers that invest in some distressed sovereign debt (e.g., Puerto Rico, Venezuela) often must face long time horizons to collect their payouts.

At times, distressed hedge fund managers may seek to own the majority or all of a certain class of securities within the capital structure, which enables them to exert creditor control in the corporate bankruptcy or reorganization process. Such securities will vary by country depending on individual bankruptcy laws and procedures. Some managers are active in their distressed investing by building concentrated positions and placing representatives on the boards of the companies they are seeking to turn around. Other distressed managers may be more “passive” in their orientation, relying on others to bear the often substantial legal costs of a corporate capital structure reorganization that may at times involve expensive proxy contests.

By nature, distressed debt and other illiquid assets may take several years to resolve, and they are generally difficult to value. Therefore, hedge fund managers running portfolios of distressed securities typically require relatively long initial lock-up periods (e.g., no redemptions allowed for the first two years) from their investors. Distressed investment managers may also impose fund-level or investor-level redemption gates that are meant to limit the amount of money that investors (i.e., limited partners) may withdraw from a partnership during any given quarter. As for valuing distressed securities, external valuation specialists may be needed to provide an independent estimate of fair value. Valuations of distressed securities with little or no liquidity (e.g., those deemed Level 3 assets for US accounting purposes) are subject to the smoothing effect of “mark-to-model” price determination.

The bankruptcy process typically results in one or two outcomes: liquidation or firm re-organization. In a liquidation, the firm’s assets are sold off over some time period; then, based on the priority of their claim, debt- and equity-holders are paid off sequentially. In this case, claimants on the firm’s assets are paid in order of priority from senior secured debt, junior secured debt, unsecured debt, convertible debt, preferred stock, and finally common stock. In a re-organization, a firm’s capital structure is re-organized and the terms for current claims are negotiated and revised. Current debtholders may agree to extend the maturity of their debt contracts or even to exchange their debt for new equity shares. In this case, existing equity would be canceled (so existing shareholders would be left with nothing) and new equity issued, which would also be sold to new investors to raise funds to improve the firm’s financial condition.

## **6.1. Investment Characteristics**

Distressed securities present new sets of risks and opportunities and thus require special skills and increased monitoring. As previously mentioned, many institutional investors, like banks and insurance companies, by their mandates cannot hold non-investment-grade securities in their portfolios. As a result, many such investors must sell off investments in firms facing financial distress. This situation may result in illiquidity and significant price

discounting when trades do occur, but it also creates potentially attractive opportunities for hedge funds. Moreover, the movement from financial distress to bankruptcy can unfold over long periods and because of the complexities of legal proceedings, informational inefficiencies cause securities to be improperly valued.

To successfully invest in distressed securities, hedge fund managers require specific skills for analyzing complicated legal proceedings, bankruptcy processes, creditor committee discussions, and re-organization scenarios. They also must be able to anticipate market reactions to these actions. At times, and depending on relative pricing, managers may establish “capital structure arbitrage” positions: For the same distressed entity, they may be long securities where they expect to receive acceptable recoveries but short other securities (including equity) where the value-recovery prospects are dim.

Current market conditions also affect the success of distressed securities strategies. In liquidation, assets may need to be sold quickly, and discounted selling prices will lower the total recovery rate. When illiquid assets must be sold quickly, forced sales and liquidity spirals may lead to fire-sale prices. For re-organizations, current market conditions partly determine whether (and how much) a firm can raise capital from asset sales and/or from the issuance of new equity. [Exhibit 6](#) provides some key attributes of distressed securities investing.

## **Exhibit 6. Distressed Securities—Risk, Liquidity, Leverage, and Benchmarking**

### **Risk Profile and Liquidity**

- The return profile for distressed securities investing is typically at the higher end of event-driven strategies but with more variability.
- Outright shorts or hedged positions are possible, but distressed securities investing is usually long-biased. It is subject to security-specific outcomes but still impacted by the health of the macro-economy.
- Distressed securities investing typically entails relatively high levels of illiquidity, especially if using a concentrated activist approach. Pricing may involve “mark-to-model” with return smoothing. Ultimate results are generally binary: either very good or very bad.
- Attractiveness: Returns tend to be “lumpy” and somewhat cyclical. Distressed investing is particularly attractive in the early stages of an economic recovery after a period of market dislocation.

# Leverage Usage

- Moderate to low: Because of the inherent volatility and long-biased nature of distressed securities investing, hedge fund managers utilize modest levels of leverage, typically with 1.2 to 1.7 times NAV invested, and with some of the nominal leverage from derivatives hedging.

## Benchmarking

- Hedge fund sub-indexes include HFRX and HFRI Distressed Indices; CISDM Distressed Securities Index; Lipper TASS Event-Driven Index; and Credit Suisse Event Driven Distressed Hedge Fund Index.

*Note:* Alpha produced by distressed securities managers tends to be idiosyncratic. Also, the strategy capitalizes on information inefficiencies and structural inabilities of traditional managers to hold such securities.

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## 6.2. Strategy Implementation

Hedge fund managers take several approaches when investing in distressed securities. In a liquidation situation, the focus is on determining the recovery value for different classes of claimants. If the fund manager's estimate of recovery value is higher than market expectations, perhaps due to illiquidity issues, then he/she can buy the undervalued debt securities in hopes of realizing the higher recovery rate. For example, assume bankrupt company X's senior secured debt is priced at 50% of par. By conducting research on the quality of the collateral and by estimating potential cash flows (and their timing) in liquidation, the hedge fund manager estimates a recovery rate of 75%. He/she can buy the senior secured debt and expect to realize the positive difference in recovery rates. However, even assuming the manager is correct, if the liquidation process drags on and/or market conditions deteriorate, then this premium may be only partly realized, if at all.

In a reorganization situation, the hedge fund manager's focus is on how the firm's finances will be restructured and on assessing the value of the business enterprise and the future value of different classes of claims. There are various avenues for investing in a re-organization. The manager will evaluate the different securities of the company in question and purchase those deemed to be undervalued given the likely re-organization outcome. The selection of security will also depend on whether the manager seeks a control position or not. If so, he/she will be active in the negotiating process and will seek to identify fulcrum securities that provide leverage (or even liquidation) in the reorganization. **Fulcrum securities** are partially-in-the-money claims (not expected to be repaid in full) whose holders end up owning the reorganized company. Assuming the re-organization is caused by excessive

financial leverage but the company's operating prospects are still good, a financial restructuring may be implemented whereby senior unsecured debt purchased by the hedge fund manager is swapped for new shares (existing debt and equity are cancelled) and new equity investors inject fresh capital into the company. As financial distress passes and the intrinsic value of the reorganized company rises, an initial public offering (IPO) would likely be undertaken. The hedge fund manager could then exit and earn the difference between what was paid for the undervalued senior unsecured debt and the proceeds received from selling the new shares of the revitalized company in the IPO.

## EXAMPLE 5

### Capital Structure Arbitrage in the Energy Crisis of 2015–2016

With a sudden structural increase in US energy reserves caused by modern fracking techniques, oil prices tumbled dramatically from more than \$60/barrel in mid-2015 to less than \$30/barrel in early 2016. Debt investors suddenly became concerned about the very survivability of the smaller, highly levered exploration and production (E&P) companies if such low energy prices were to persist. Prices of many energy-related, junior, unsecured, non-investment-grade debt securities fell dramatically. However, retail equity investors generally reacted more benignly. As a result, the shares of several such E&P companies still carried significant implied enterprise value while their debt securities traded as if bankruptcy was imminent.

1. Discuss why such a divergence in the valuation of the debt and equity securities of these E&P companies might have occurred.
2. Discuss how a hedge fund manager specializing in distressed securities might take advantage of this situation.

#### Solution to 1:

This divergence in valuation occurred because of structural differences between the natural holders of debt and equity securities. Institutional holders of the debt likely felt more compelled, or in some cases were required by investment policy, to sell these securities as credit ratings on these bonds were slashed. Retail equity investors were likely less informed as to the potential seriousness of the impact of such a sharp energy price decline on corporate survivability. With equity markets overall still moving broadly higher, retail equityholders may have been expressing a “buy the dip” mentality. Such cross-asset arbitrage situations represent a significant opportunity for nimble and flexible hedge fund managers that are unrestrained by a single asset class perspective or



other institutional constraints.

## Solution to 2:

An astute hedge fund manager would have realized three key points: 1) the junior unsecured debt securities were temporarily undervalued; 2) although bankruptcy in certain specific companies was indeed possible (depending on how long energy prices stayed low), detailed research could uncover those E&P companies for which bankruptcy was less likely; and 3) the unsecured debt securities could be purchased with some safety by shorting the still overvalued equities (or buying put options on those equities) as a hedge.

If energy prices subsequently remained low for too long and bankruptcy was indeed encountered, the equities would become worthless. However, the unsecured debt might still have some recovery value from corporate asset sales, or these securities might become the fulcrum securities that would be converted in a bankruptcy reorganization into new equity in an ongoing enterprise. Alternatively, if oil prices were to recover (as indeed transpired; oil prices closed 2017 at more than \$60/barrel), the unsecured debt securities of many of these companies would rebound far more substantially than their equity shares would rise.

In sum, a distressed securities hedge fund arbitrageur willing to take a position in the unsecured debt hedged against short equity (or long puts on the equity) could make money under a variety of possible outcomes.

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## 7. RELATIVE VALUE STRATEGIES: FIXED INCOME ARBITRAGE

- d. discuss investment characteristics, strategy implementation, and role in a portfolio of *relative value* hedge fund strategies;

We have previously described equity market-neutral investing as one specific equity-oriented relative value hedge fund approach, but other types of relative value strategies are common for hedge funds involving fixed-income securities and hybrid convertible debt. Like equity market-neutral trading, many of these strategies involve the significant use of leverage. Changes in credit quality, liquidity, and implied volatility (for securities with embedded

options) are some of the causes of relative valuation differences. During normal market conditions, successful relative value strategies can earn credit, liquidity, or volatility premiums over time. But, in crisis periods—when excessive leverage, deteriorating credit quality, illiquidity, and volatility spikes come to the fore—relative value strategies can result in losses. Fixed-income arbitrage and convertible bond arbitrage are among the most common relative value strategies.

## **7.1. Fixed-Income Arbitrage**

Fixed-income arbitrage strategies attempt to exploit pricing inefficiencies by taking long and short positions across a range of debt securities, including sovereign and corporate bonds, bank loans, and consumer debt (e.g., credit card loans, student loans, mortgage-backed securities). Arbitrage opportunities between fixed-income instruments may develop because of variations in duration, credit quality, liquidity, and optionality.

### **7.1.1. *Investment Characteristics***

In its simplest form, fixed-income arbitrage involves buying the relatively undervalued securities and short selling the relatively overvalued securities with the expectation that the mispricing will resolve itself (reversion back to normal valuations) within the specified investment horizon. Valuation differences beyond normal historical ranges can result from differences in credit quality (investment-grade versus non-investment-grade securities), differences in liquidity (on-the-run versus off-the-run securities), differences in volatility expectations (especially for securities with embedded options), and even differences in issue sizes. More generally, fixed-income arbitrage can be characterized as exploiting price differences relative to expected future price relationships, with mean reversion being one important aspect. In many instances, realizing a net positive relative carry over time may also be the goal of the relative security positioning, which may involve exploiting kinks in a yield curve or an expected shift in the shape of a yield curve.

Where positioning may involve the acceptance of certain relative credit risks across different security issuers, fixed-income arbitrage morphs into what is more broadly referred to as L/S credit trading. This version of trading tends to be naturally more volatile than the exploitation of small pricing differences within sovereign debt alone.

Unless trading a price discrepancy directly involves establishing a desired yield curve exposure, fixed-income arbitrageurs will typically immunize their strategies, which involve both long and short positions, from interest rate risk by taking duration-neutral positions. However, duration neutrality provides a hedge against only small shifts in the yield curve. To hedge against large yield changes and/or non-parallel yield curve movements (i.e., steepening



or flattening), the manager might employ a range of fixed-income derivatives, including futures, forwards, swaps, and swaptions (i.e., options on a swap). Moreover, fixed-income securities also vary in their complexity. For example, in addition to interest rate risk, straight government debt is exposed to sovereign risk (and potentially currency risk), which can be substantial in many countries, while asset-backed and mortgaged-backed securities are subject to credit risk and pre-payment risk. Derivatives are also useful for hedging such risks.

Fixed-income security pricing inefficiencies are often quite small, especially in the more-efficient developed capital markets, but the correlation aspects across different securities is typically quite high. Consequently, it may be necessary and acceptable to utilize substantial amounts of leverage to exploit these inefficiencies. Typical leverage ratios in fixed-income arbitrage strategies can be 4 to 5 times (assets to equity). In the case of some market-neutral multi-strategy funds, where fixed-income arbitrage may form just a portion of total risk, fixed-income arbitrage leverage levels can sometimes be as high as 12 to 15 times assets to equity. Of course, leverage will magnify the myriad risks to which fixed-income strategies are exposed, especially during stressed market conditions.

Another factor that has compounded the risks of fixed-income arbitrage strategies has been the inclination of financial engineers to create tranching, structured products around certain fixed-income cash flows—particularly involving residential mortgages—to isolate certain aspects of credit risk and prepayment risk. For example, within a pool of mortgages, cash flows may be divided such that some credit tranche holders have seniority over others or so that interest-only income payments flow to one set of holders and principal-only payoffs flow to another set of holders. The risks of relative value strategies involving mortgage-related securities, which are especially relevant during periods of market stress, include negative convexity aspects of many mortgage-backed securities and some of the structured products built around them; underlying default rates potentially exceeding expectations and resulting in a high-volatility environment; balance sheet leverage of hedge funds; and hedge fund investor redemption pressures.

Globally, fixed-income markets are substantially larger in total issuance size and scale than equity markets and come in a myriad of different securities types. Away from on-the-run government securities and other sovereign-backed debt securities, which in most developed financial markets are generally very liquid, the liquidity aspects of many fixed-income securities are typically poor. This creates relative value arbitrage opportunities for hedge fund managers, but it also entails positioning and liquidity risks in portfolio management. Natural price opaqueness must often be overcome—particularly for “off-the-run” securities that may trade only occasionally. Liquidity in certain municipal bond markets and corporate debt markets, for example, can be particularly thin. Some key points of fixed-income arbitrage appear in [Exhibit 7](#).

## **Exhibit 7. Fixed-Income Arbitrage—Risk, Liquidity, Leverage, and**

# Risk Profile and Liquidity

- The risk/return profile of fixed-income arbitrage trading derives from the high correlations found across different securities, the yield spread pick-up to be captured, and the sheer number of different types of debt securities across different markets with different credit quality and convexity aspects in their pricing. Structured products built around debt securities introduce added complexity that may result in mispricing opportunities.
- Yield curve and carry trades within the US government universe tend to be very liquid but typically have the fewest mispricing opportunities. Liquidity for relative value positions generally decreases in other sovereign markets, mortgage-related markets, and especially across corporate debt markets.
- Attractiveness: A function of correlations between different securities, the yield spread available, and the high number and wide diversity of debt securities across different markets.

# Leverage Usage

- High: This strategy has high leverage usage, but leverage availability typically diminishes with product complexity. To achieve the desired leverage, prime brokers offer collateralized repurchase agreements with associated leverage “haircuts” depending on the types of securities being traded. The haircut is the prime broker’s cushion against market volatility and illiquidity if posted collateral ever needs to be liquidated.

# Benchmarking

- This is a broad category that encompasses the following sub-indexes: HFRX and HFRI Fixed Income Relative Value Indices; Lipper TASS Fixed Income Arbitrage Index; CISDM Debt Arbitrage Index; and Credit Suisse Fixed Income Arbitrage Index.

*Note:* HFRX and HFRI also offer more granular hedge fund fixed-income, relative value indexes related to sovereign bonds trading, credit trading, and asset-backed trading.

The most common types of fixed-income arbitrage strategies include yield curve trades and carry trades. Considering yield curve trades, the prevalent calendar spread strategy involves taking long and short positions at different points on the yield curve where the relative mispricing of securities offers the best opportunities, such as in a curve flattening or steepening, to profit. Perceptions and forecasts of macroeconomic conditions are the backdrop for these types of trades. The positions can be in fixed-income securities of the same issuer; in that case, most credit and liquidity risks would likely be hedged, making interest rate risk the main concern. Alternatively, longs and shorts can be taken in the securities of different issuers—but typically ones operating in the same industry or sector. In this case, differences in credit quality, liquidity, volatility, and issue-specific characteristics would likely drive the relative mispricing. In either case, the hedge fund manager aims to profit as the mispricing reverses (mean reversion occurs) and the longs rise and shorts fall in value within the targeted time frame.

Carry trades involve going long a higher yielding security and shorting a lower yielding security with the expectation of receiving the positive carry and of profiting on long and short sides of the trade when the temporary relative mispricing reverts to normal. A classic example of a fixed-income arbitrage trade involves buying lower liquidity, off-the-run government securities and selling higher liquidity, duration matched, on-the-run government securities. Interest rate and credit risks are hedged because long and short positions have the same duration and credit exposure. So, the key concern is liquidity risk. Under normal conditions, as time passes the more (less) expensive on- (off-) the-run securities will decrease (increase) in price as the current on-the-runs are replaced by a more liquid issue of new on-the-run bonds that then become off-the-run bonds.

The payoff profile of this fixed-income arbitrage strategy resembles a short put option. If the strategy unfolds as expected, it returns a positive carry plus a profit from spread narrowing. But, if the spread unexpectedly widens, then the payoff becomes negative. Mispricing of government securities is generally small, so substantial leverage would typically be used to magnify potential profits. But, with highly levered positions, even a temporary negative price shock can be sufficient to set off a wave of margin calls that force fund managers to sell at significant losses. Such a scenario in the wake of the 1997 Asian Financial Crisis and the 1998 Russian Ruble Crisis led to the collapse and subsequent US Federal Reserve-supervised bailout of legendary hedge fund Long-Term Capital Management. It is important to note that there are far more complex relative value fixed-income strategies beyond just yield curve trades, carry trades, or relative credit trades.

## EXAMPLE 6

### Fixed-Income Arbitrage: Treasuries vs. Inflation Swap + TIPS

Guernsey Shore Hedge Fund closely monitors government bond markets and looks for valuation discrepancies among the different issues.

Portfolio manager Nick Landers knows that Treasury Inflation-Protected Securities (TIPS) pay a coupon (i.e., real yield) while accruing inflation into the principal, which is paid at maturity. This insulates the TIPS owner from inflation risk.

Landers also understands that because the US government issues both TIPS and Treasuries that have the same maturity, they should trade at similar yields after adjusting for inflation. Landers knows that by using OTC inflation swaps, the inflation-linked components of TIPS can be locked in, thereby fixing all payments to be similar to those of a Treasury bond.

After accounting for expected inflation in normal periods, global investors often prefer Treasuries to inflation-indexed bonds. This may be because market participants do not fully trust the way inflation may be measured over time. As such, inflation-hedged TIPS (as a package with the associated offsetting inflation swap) have typically yielded about 25 bps to 35 bps more than similar maturity Treasuries.

During a period of extreme market distress, in November 2XXX, Landers keenly observed that TIPS were particularly mispriced. Their yields, adjusted for inflation, were substantially higher than straight Treasuries, while inflation swaps were priced as if outright deflation was imminent. Landers notes the information on the relative pricing of these different products and considers whether to implement the follow trade:

<b>November 2XXX</b>	<b>Fixed Rate</b>	<b>Inflation Rate</b>	<b>Cost</b>
Buy 5-year TIPS	Receive 3.74%	Receive inflation	−1,000,000
Short 5-year Treasuries	Pay 2.56%	—	+1,000,000
Inflation swap: receive fixed rate and pay inflation index	Receive 1.36%	Pay inflation	0
Net of three trades	Receive 2.54%	—	0

Discuss whether Landers has uncovered a risk-free arbitrage, and if so, discuss some of the risks he may still face with its execution.

**Solution:**

The situation observed by Landers occurred during a period of extreme market stress. In such turbulent times, instances of very attractive, near risk-free arbitrage can occur, as in this case. Often these periods are characterized by a fear of deflation, so straight Treasury bonds are in high demand for flight-to-quality reasons. But there would be some operational hurdles to overcome. For Landers to short the expensive Treasuries and buy the more attractive TIPS, Guernsey Shore would need access as a counterparty to the interbank repurchase market to borrow the Treasury bonds. Bank credit approval [via an International Swaps and Derivatives Association (ISDA) relationship] would also be required for accessing the inflation swap market for yield enhancement and to lock in the inflation hedge. Unfortunately, during periods of extreme market distress, credit lines to hedge funds typically shrink (or are withdrawn), not expanded. Moreover, there is potential for “losing the borrow” on the short Treasuries (i.e., the lender demanding return of his/her Treasuries), which makes the trade potentially difficult to maintain. Assuming Guernsey Shore met these operational requirements, Landers would need to act quickly to capture the fixed-income arbitrage profit of 2.54%. Such extreme levels of arbitrage rarely persist for very long.

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## 8. RELATIVE VALUE STRATEGIES: CONVERTIBLE BOND ARBITRAGE

- d. discuss investment characteristics, strategy implementation, and role in a portfolio of *relative value* hedge fund strategies;

Convertible bonds are hybrid securities that can be viewed as a combination of straight debt plus a long equity call option with an exercise price equal to the strike price times the conversion ratio. The conversion ratio is the number of shares for which the bond can be exchanged. The bond's conversion value is the current stock price times the conversion ratio. The conversion price is the current convertible bond price divided by the conversion ratio. If the current conversion value is significantly below the convertible bond price (or equivalently, the current share price is significantly below the conversion price), the call is out-of-the-money and the convertible bond will behave more like a straight bond. Conversely, if the conversion value is significantly above the convertible bond price (or equivalently, the current share price is significantly above the conversion price), the call is in-the-money and the convertible bond will behave more like the underlying equity.

## 8.1. Investment Characteristics

Convertible securities are naturally complex and thus generally not well understood. They are impacted by numerous factors, including overall interest rate levels, corporate credit spreads, bond coupon and principal cash flows, and the value of the embedded stock option (which itself is influenced by dividend payments, stock price movements, and equity volatility). Convertibles are often issued sporadically by companies in relatively small sizes compared to straight debt issuances, and thus they are typically thinly-traded securities. Moreover, most convertibles are non-rated and typically have fewer covenants than straight bonds. Because the equity option value is embedded within such thinly-traded, complex securities, the embedded options within convertibles tend to trade at relatively low implied volatility levels compared to the historical volatility level of the underlying equity. Convertibles also trade cyclically relative to the amount of new issuance of such securities in the overall market. The higher the new convertible issuance that the market must absorb, the cheaper their pricing and the more attractive the arbitrage opportunities for a hedge fund manager.

The key problem for the convertible arbitrage manager is that to access and extract the relatively cheap embedded optionality of the convertible, he/she must accept or hedge away other risks that are embedded in the convertible security. These include interest rate risk, credit risk of the corporate issuer, and market risk (i.e., the risk that the stock price will decline and thus render the embedded call option less valuable). Should the convertible manager desire, all these risks can be hedged using a combination of interest rate derivatives, credit default swaps, and short sales of an appropriate delta-adjusted amount of the underlying stock. The purchase of put options can also be a stock-sale substitute. The use of any such hedging tools may also erode the very attractiveness of the targeted convertible holding.

Convertible managers who are more willing to accept credit risk may choose to not hedge the credit default risk of the corporate issuer; instead, they will take on the convertible position more from a credit risk perspective. Such managers are known as credit-oriented convertible managers. Other managers may hedge the credit risk but will take a more long-biased, directional view of the underlying stock and then underhedge the convertible's equity exposure. Yet other managers may overhedge the equity risk to create a bearish tilt with respect to the underlying stock, thus providing a more focused exposure to increased volatility. These managers are referred to as volatility-oriented convertible managers. In sum, several different ways and styles can be utilized to set up convertible arbitrage exposures. **Exhibit 8** presents some key aspects of convertible bond arbitrage.

### **Exhibit 8. Convertible Bond Arbitrage—Risk, Liquidity, Leverage, and Benchmarking**

# Risk Profile and Liquidity

- Convertible arbitrage managers strive to extract and benefit from this structurally cheap source of implied volatility by delta hedging and gamma trading short equity hedges against their long convertible holdings.
- Liquidity issues surface for convertible arbitrage strategies in two ways: 1) naturally less-liquid securities because of their relatively small issue sizes and inherent complexities; 2) availability and cost to borrow underlying equity for short selling.
- Attractiveness: Convertible arbitrage works best during periods of high convertible issuance, moderate volatility, and reasonable market liquidity. It fares less well in periods of acute credit weakness and general illiquidity, when the pricing of convertible securities is unduly impacted by supply/demand imbalances.

## Leverage Usage

- High: Because of many legs needed to implement convertible arbitrage trades (e.g., short sale, CDS transaction, interest rate hedge), relatively high levels of leverage are used to extract a modest ultimate gain from delta hedging. Managers typically run convertible portfolios at 300% long vs. 200% short, the lower short exposure being a function of the delta-adjusted equity exposure needed from short sales to balance the long convertible.

## Benchmarking

- Sub-indexes include HFRX and HFRI FI-Convertible Arbitrage Indices; Lipper TASS Convertible Arbitrage Index; CISDM Convertible Arbitrage Index; and Credit Suisse Convertible Arbitrage Index.

*Note:* Convertible bond arbitrage is a core hedge fund strategy area that is run within many multi-strategy hedge funds together with L/S equity, merger arbitrage, and other event-driven distressed strategies.

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## 8.2. Strategy Implementation

A classic convertible bond arbitrage strategy is to buy the relatively undervalued convertible bond and take a short position in the relatively overvalued underlying stock. The number of



shares to sell short to achieve a delta neutral overall position is determined by the delta of the convertible bond. For convertible bonds with low conversion prices relative to the current stock price (i.e., the long call is I-T-M), the delta will be close to 1. For convertibles with high conversion prices relative to the current stock price (i.e., the long call is O-T-M), the delta will be closer to 0. The combination of a long convertible and short equity delta exposure would create a situation where for small changes in the equity price, the portfolio will remain essentially balanced. As the underlying stock price moves further, however, the delta hedge of the convertible will change because the convertible is an instrument with the natural positive convexity attributes of positive gamma. Because stock gamma is always zero, the convertible arbitrage strategy will leave the convertible arbitrageur “synthetically” longer in total equity exposure as the underlying security price rises and synthetically less long as the equity price falls. This added gamma-driven exposure can then be hedged at favorable levels with appropriate sizing adjustments of the underlying short stock hedge—selling more stock at higher levels and buying more stock at lower levels. The convertible arbitrage strategy will be profitable given sufficiently large stock price swings and proper periodic rebalancing (assuming all else equal). If realized equity volatility exceeds the implied volatility of the convertible’s embedded option (net of hedging costs), an overall gain is achieved by the arbitrageur.

Several circumstances can create concerns for a convertible arbitrage strategy. First, when short selling, shares must be located and borrowed; as a result, the stock owner may subsequently want his/her shares returned at a potentially inopportune time, such as during stock price run-ups or more generally when supply for the stock is low or demand for the stock is high. This situation, particularly a short squeeze, can lead to substantial losses and a suddenly unbalanced exposure if borrowing the underlying equity shares becomes too difficult or too costly for the arbitrageur (of course, initially locking in a “borrow” over a “term period” can help the arbitrageur avoid short squeezes, but this may be costly to execute). Second, credit issues may complicate valuation given that bonds have exposure to credit risk; so when credit spreads widen or narrow, there would be a mismatch in the values of the stock and convertible bond positions that the convertible manager may or may not have attempted to hedge away. Third, the strategy can lose money because of time decay of the convertible bond’s embedded call option during periods of reduced realized equity volatility and/or from a general compression of market implied volatility levels.

Convertible arbitrage strategies have performed best when convertible issuance is high (implying a wider choice among convertible securities and generally cheaper prices), general market volatility levels are moderate, and the liquidity to trade and adjust positions is ample. On the other hand, extreme market volatility also typically implies heightened credit risks; given that convertibles are naturally less-liquid securities, convertible managers generally do not fare well during such periods. The fact that hedge funds have become the natural market makers for convertibles and they typically face significant redemption pressures from investors during crises implies further unattractive left-tail risk attributes to the strategy during periods of market stress.



## EXAMPLE 7

# Convertible Arbitrage Strategy

Cleopatra Partners is a Dubai-based hedge fund engaging in convertible bond arbitrage. Portfolio manager Shamsa Khan is considering a trade involving the euro-denominated convertible bonds and stock of QXR Corporation. She has assembled the following information:

QXR Convertible Bond		
Price (% of par)	120	—
Coupon (%)	5.0	—
Remaining maturity (years)	1.0	
Conversion ratio	50	—
S&P Rating	BBB	—

QXR Inc.		Industry Average
Price (per share)	30	--
P/E (x)	30	20
P/BV (x)	2.25	1.5
P/CF (x)	15	10

### Additional Information:

- It costs €2 to borrow each QXR share (paid to the stock lender) to carry the short position for a year.
  - The stock pays a €1 dividend.
1. Discuss (using only the information in the table) the basic trade setup that Khan should implement.
  2. Demonstrate (without using the additional information) that potential profits earned are the same whether QXR's share price falls to €24, rises to €36, or remains flat at €30.

3. Discuss (using also the additional information) how the re change.

### Solution to 1:

QXR's convertible bond price is €1,200 [= €1,000 × (120/100)] is 50; so, the conversion price is €24 (€1,200/50). This compared to the current share price of €30. QXR's share valuation metrics are all 50% averages. It can be concluded that in relative terms, QXR's shares and convertible bonds are undervalued. Thus, Khan should buy the convertible bonds and sell the shares.

### Solution to 2:

By implementing this trade and buying the bond at €1,200, exercising the conversion option, and selling her shares at the current market price, Khan would realize a profit of €6 per share under any of the scenarios mentioned, as shown in the following table:

QXR Share Price	Profit on:
	Long Stock via Convertible Bond
24	0
36	12
30	6

### Solution to 3:

The €2 per share borrowing costs and the €1 dividend payable represent a €3 per share outflow that Khan must pay. But, the 5% coupon on the bond is €50, which equates to an inflow of €1 per share (€50 coupon/50 shares per bond). Therefore, the total profit outcome from the trade, would each be reduced by €2. In sum, Khan would realize a profit of €4 per share on each QXR share.







































































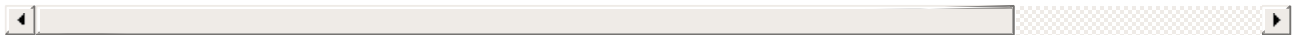






















































































































# Reading 20

## Asset Allocation to Alternative Investments

by Adam Kobor, PhD, CFA, and Mark D. Guinney, CFA

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### LEARNING OUTCOMES

The candidate should be able to:

- a.** explain the roles that alternative investments play in multi-asset portfolios;
- b.** compare alternative investments and bonds as risk mitigators in relation to a long equity position;
- c.** compare traditional and risk-based approaches to defining the investment opportunity set, including alternative investments;
- d.** discuss investment considerations that are important in allocating to different types of alternative investments;
- e.** discuss suitability considerations in allocating to alternative investments;
- f.** discuss approaches to asset allocation to alternative investments;
- g.** discuss the importance of liquidity planning in allocating to alternative investments;
- h.** discuss considerations in monitoring alternative investment programs.

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### 1. INTRODUCTION AND THE ROLE OF ALTERNATIVE INVESTMENTS IN A MULTI-

# ASSET PORTFOLIO

- a. explain the roles that alternative investments play in multi-asset portfolios;

Asset allocation is a critical decision in the investment process. The mathematical and analytical processes inherent in contemporary asset allocation techniques are complicated by the idiosyncrasies of alternative investments. Approaches to incorporating alternative assets into the strategic asset allocation have developed rapidly as allocations to assets other than stocks and bonds have accelerated in the aftermath of the 2008 Global Financial Crisis. The term “alternative” understates the prominence of alternative investment allocations in many investment programs, because institutional and private clients have been increasingly turning to these investments not just to supplement traditional long-only stocks and bonds but also sometimes to replace them altogether. For example, the Yale Endowment and the Canada Pension Plan Investment Board both have close to 50% of their assets allocated to alternatives.<sup>1</sup> Although these two funds are admittedly outliers, between 2008 and 2017 most of the pension funds around the world substantially expanded their allocations to alternative asset classes. On average, pension funds in developed markets increased their allocation from 7.2% to 11.8% of assets under management (AUM) in 2017, a 63% increase.<sup>2</sup>

“Alternative” investment has no universally accepted definition. For the purposes of this reading, alternative investments include private equity, hedge funds, real assets (including energy and commodity investments), commercial real estate, and private credit.

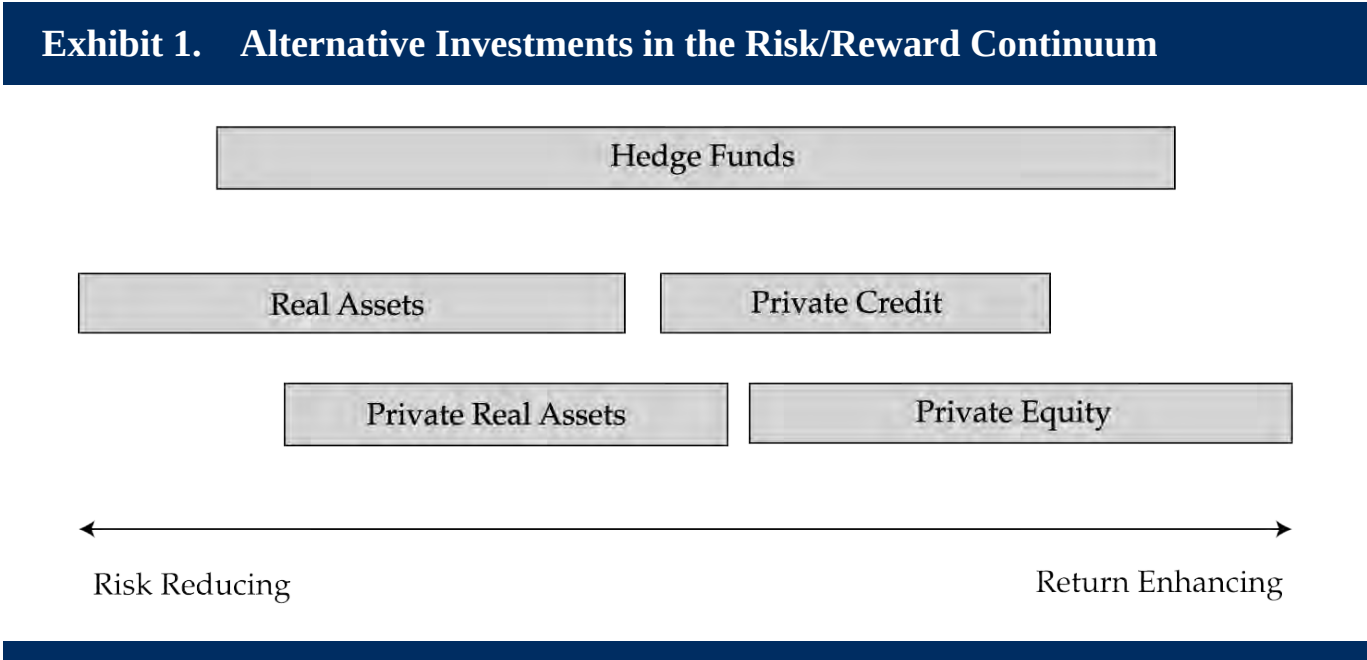
The reading begins with a discussion of the role alternative assets play in a multi-asset portfolio and explores how alternatives may serve to mitigate long-only equity risk, a role traditionally held by bonds. We then consider different ways investors may define the opportunity set—through the traditional asset class lens or, more recently, using a risk- or factor-based lens. An allocation to alternatives is not for all investors, so the reading describes issues that should be addressed when considering an allocation to alternatives. We then discuss approaches to asset allocation when incorporating alternatives in the opportunity set and the need for liquidity planning in private investment alternatives. Finally, the reading discusses the unique monitoring requirements for an alternatives portfolio.

## 1.1. The Role of Alternative Investments in a Multi-Asset Portfolio

Allocations to alternatives are playing an increasing role in investor portfolios largely driven by the belief that these investments increase the risk-adjusted return expectations for their programs. Some allocations are driven by expectations of higher returns, while others are



driven by the expected diversification (risk-reduction) benefits. In the aggregate, the portfolio’s *risk-adjusted* return is expected to improve. [Exhibit 1](#) provides a framework for how the common alternative strategies are generally perceived to affect the risk/return profile of a “typical” 60/40 portfolio of public stocks and bonds.



Although we present a simplified view, real assets are generally believed to mitigate the risks to the portfolio arising from unexpected inflation. At the other end of the spectrum, venture capital investments (private equity) are expected to provide a sufficient return premium over public equities to compensate for their illiquidity risk and heightened operational complexity. Hedge funds, the least homogenous of strategies, span the spectrum from “risk reducing” or diversifying (many arbitrage strategies) to “return enhancing” (e.g., an activist fund that takes significant positions in public companies with the goal of improving performance through management changes, capital allocation policies, and/or company strategy).

Risk reduction can mean different things to different investors. Institutions may choose to add non-correlated strategies to their portfolios to reduce the volatility of the overall investment program. Private clients are frequently concerned with reducing only downside volatility—the “left tail” risk associated with significant public equity market drawdowns. An insurance pool whose liabilities are sensitive to inflation might benefit from real assets that could reduce its asset–liability mismatch. [Exhibit 2](#) provides some guidance as to how an allocator might view alternative assets vis-à-vis traditional asset classes.

Exhibit 2. Illustrative Capital Market Assumptions

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	Traditional Assets				Alternative Assets		
	Public Equities	Cash	Govt Bonds	Broad Fixed Income	Private Credit	Hedge Funds	Commodities
Expected Return (Geometric Average)	6.5%	2.0%	2.3%	2.8%	6.5%	5.0%	4.0%
Volatility	17.0%	1.1%	4.9%	3.4%	10.0%	8.1%	25.0%
Correlation with Equities	1.00	-0.12	-0.60	-0.41	0.70	0.83	0.00
Equity Beta	1.00	-0.01	-0.17	-0.08	0.40	0.40	0.00

Source: Authors' own data.

In the context of asset allocation, investors may categorize an asset class based on the role it is expected to play in the overall portfolio. The roles and their relative importance will vary among investors, but it is common to identify the following functional roles:

- **Capital growth:** This role may be a top priority for portfolios with a long-term time horizon and relatively high-return target. Usually, public and private equity investments would be the most obvious choices for this role.
- **Income generation:** Certain asset classes, like fixed income or real estate, are capable of generating reasonably steady cash flow stream for investors.
- **Risk diversification:** In the case of an equity-oriented portfolio, investors may seek assets that diversify the dominant equity risk. Real assets and several hedge fund strategies may fit here. Similarly, fixed-income investors may be interested in diversifying pure yield curve risk via private credit.
- **Safety:** Certain asset classes may play the role of safe haven when most of the risky asset classes suffer. Government bonds or gold may potentially play such roles in a well-diversified portfolio.

**Exhibit 3** illustrates how each of the alternative assets is generally perceived to fulfill these functional roles.

### Exhibit 3. The Role of Asset Classes in a Multi-Asset Portfolio

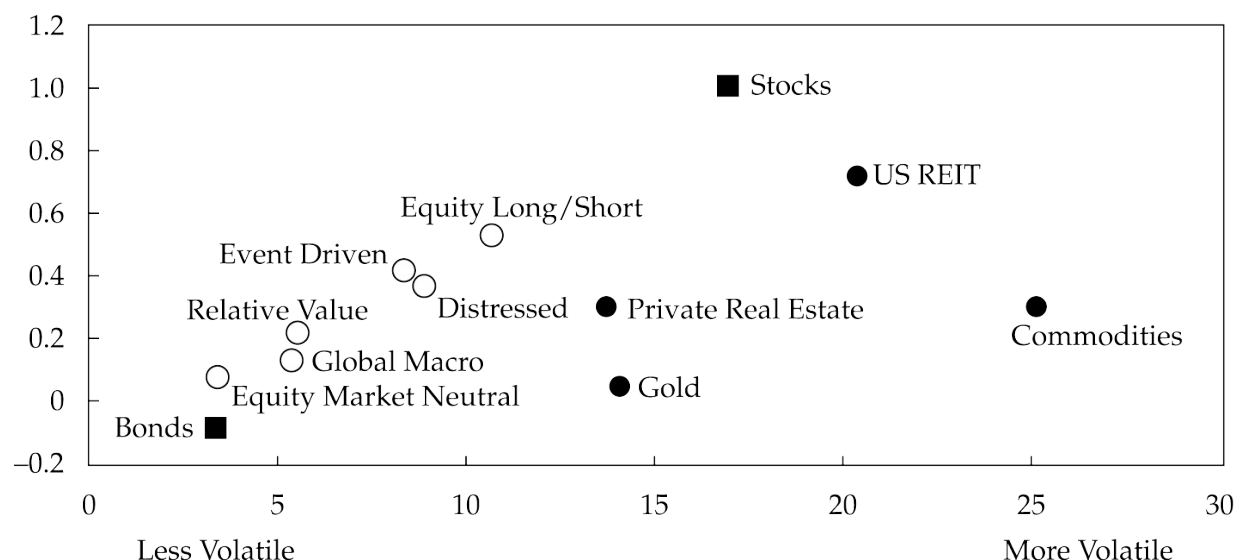
Asset Class		Role			
		Capital Growth	Income	Diversifying Public Equities	Safety
Fixed Income and Credit	Governments		M	H	H
	Inflation-Linked		M	H	H/M
	Inv.-Grade Credit		M	H	M
	High-Yield Credit		H	M	
	Private Credit		H	M	
Equities	Public Equity	H	M		
	Private Equity	H	M	M	
Real Estate	Public Real Estate	M	H	M	
	Private Real Estate	M	H	M	
Real Assets	Public Real Assets (Energy, Metal, etc.)			H	
	Private Real Assets (Timber, etc.)	H	H	H	
Hedge Funds	Absolute Return		M	H	
	Equity Long/Short			M	

Notes: H = high/strong potential to fulfill the indicated role; M = moderate potential to fulfill the indicated role.

Exhibit 4 illustrates the potential contributions the various alternative strategies might make to a portfolio dominated by equity risk. Note that the graph illustrates the *average* investment characteristics of each asset class over some extended period of time. Some assets—gold, for example—may not consistently exhibit attractive *aggregate* characteristics compared to other strategies but may serve the portfolio well during many major market shocks.

### Exhibit 4. Diversification Potential of Various Alternative Asset Classes

More Diversifying-Less Diversifying



Sources: Bloomberg and authors' own data and calculations.

### 1.1.1. The Role of Private Equity in a Multi-Asset Portfolio

Private equity investments are generally viewed as a return enhancer in a portfolio of traditional assets. The expectation for a return premium over public equities stems from the illiquidity risk that comes with most forms of private equity investment. Because of the strong link between the fundamentals of private and public companies, there are limited diversification benefits when added to a portfolio that otherwise contains significant public equity exposure. Private equity volatility is not directly observable because holdings are not publicly traded. Assets tend to be valued at the lower of cost or the value at which the company raises additional capital or when ownership changes hands (e.g., through an initial public offering or a sale to a strategic buyer or to another private equity sponsor). Consequently, private equity indexes do not provide a true picture of the strategy's risk. For asset allocation exercises, volatility is often estimated using a public equity proxy with an adjustment to better represent the nature of the private equity program. For example, a proxy for early stage venture capital might be microcap technology companies. A proxy for buyout funds might start with the volatility of a geographically relevant large-cap equity index (e.g., S&P 500, Nikkei), which is then adjusted for relative financial leverage.

### 1.1.2. The Role of Hedge Funds in a Multi-Asset Portfolio

As illustrated in [Exhibit 1](#), hedge funds span the spectrum from being risk reducers to return enhancers. Generally speaking, long/short equity strategies are believed to deliver equity-like returns with less than full exposure to the equity premium but with an additional source of return that might come from the manager's shorting of individual stocks. Short-biased equity

strategies are expected to lower a portfolio's overall equity beta while producing some measure of alpha. Arbitrage and event-driven strategies, executed properly, look to exploit small inefficiencies in the public markets while exhibiting low to no correlation with traditional asset classes. However, most hedge fund arbitrage strategies involve some degree of “short volatility” risk. Because of this “short volatility” risk, the volatility in an arbitrage strategy is non-symmetrical; the aggregate volatility may look muted if the period from which the data are drawn does not include a market stress period. “Opportunistic” strategies (e.g., global macro and managed futures), although very volatile as stand-alone strategies, provide exposures not otherwise readily accessible in traditional stock and bond strategies.

### **1.1.3. The Role of Real Assets in a Multi-Asset Portfolio**

This category includes timber, commodities, farmland, energy, and infrastructure assets. The common thread for these investments is that the underlying investment is a physical asset with a relatively high degree of correlation with inflation broadly or with a sub-component of inflation, such as oil (energy funds), agricultural products (farmland), or pulp and wood products (timber).

*Timber investments* provide both growth and inflation-hedging properties in a multi-asset portfolio. Growth is provided through the biological growth of the tree itself as well as through the appreciation in the underlying land value. Timber's inflation-hedging characteristics are derived from the unique nature in which the value of the asset is realized: If the market for timber products is weak, the owner of the asset can leave it “on the stump” waiting for prices to rise. While waiting, the volume of the asset increases—the tree continues to grow—and there is ultimately more of the asset to sell when prices recover. At the same time, the volatility of the timber asset rises; the market for more mature timber is more volatile, and the potential loss from pests and natural disasters rises.

*Commodities investments* (i.e., tradable commodities) fall into the following four categories:

- Metals (gold, silver, platinum, copper)
- Energy (crude oil, natural gas, heating oil, gasoline)
- Livestock and Meat (hogs, pork bellies, live cattle)
- Agricultural (corn, soybeans, wheat, rice, cocoa, coffee, cotton, sugar)

Although it is possible to own the commodity asset directly (e.g., corn, wheat, barrel of oil), most investors will invest in commodity derivatives (i.e., futures contracts) whose price is directly related to the price of the physical commodity. Investors generally own commodities as a hedge against a core constituent of inflation measures as well as a differentiated source of alpha. Gold and other precious metals are frequently owned directly because they are

thought to be a good store of value in the face of a depreciating currency. Storage and insurance costs come with owning commodities directly.

*Farmland investing* involves two primary approaches. The higher return/risk strategy involves owning the farmland while providing the farmer a salary for tending and selling the crops. The investor retains the commodity risk and the execution risk. This approach requires a long time horizon and has high sensitivity to natural disasters and regulatory risk, such as trade disputes. In the other main approach, the investor owns the farmland but leases the property to the farmer. The farmer retains the risk for execution and commodity prices. If an investor pursues this second strategy, farmland is more like core commercial real estate investing than a real asset (commodity) strategy.

*Energy investments* consist of strategies that focus on the exploration, development, transportation, and delivery of energy (primarily oil and natural gas-based energy sources but also increasingly wind, hydroelectric, and solar) as well as all the ancillary services that facilitate energy production. Investors usually do not own the land that holds the minerals. Most energy investments are executed through call-down, private equity-style funds and are usually long-dated, illiquid holdings. Energy assets are generally considered real assets because the investor owns the mineral rights to certain commodities (e.g., natural gas, oil, methane) that can be correlated with certain inflationary factors. Master limited partnerships (MLPs) are another frequently used vehicle for energy investments. MLPs generally construct and own the pipelines that carry oil or natural gas from the wellhead to the storage facility. MLPs rarely take ownership of the energy assets. The companies charge a fee based on the volume of oil/natural gas they transport. This fee is often pegged to the Producer Price Index.

*Infrastructure* is a strategy that typically involves the construction and maintenance of public-use projects, such as building bridges, toll roads, or airports. Because of the illiquid nature of these assets, the holding period associated with these funds can be even longer than the typical illiquid strategy, with some lasting 20 years or longer. These assets tend to generate stable or modestly growing income, and the asset itself often requires minimal upkeep or capital expenditures once built. The revenue generated by the assets tends to have high correlation with overall inflation, though it is often subject to regulatory risks because governmental agencies may be involved in price setting with certain jurisdictions and assets.

#### **1.1.4. The Role of Commercial Real Estate in a Multi-Asset Portfolio**

Real estate investing involves the development, acquisition, management, and disposition of commercial properties, including retail, office, industrial, housing (including apartments), and hotels. Strategies range from *core*, the ownership of fully occupied properties and collecting rents, to *opportunistic*, ground-up property development (land acquisition, construction, and sale) and/or the purchase of distressed assets with the intent to rehabilitate



them.

Real estate investments are believed to provide protection against unanticipated increases in inflation. Two fundamental attributes of real estate investment contribute to this inflation protection. Well-positioned properties frequently have the ability to increase rents in response to inflationary pressures, and the value of the physical buildings may increase with inflation (properties are often valued as a function of replacement cost). In this way, real estate contributes both income and capital gain potential to a portfolio. Building a diversified private commercial real estate program can be challenging for all but the largest and most sophisticated allocators. The public real estate market is a fraction of the size of the private real estate market, but it may be easier and cheaper to build a diversified real estate investment program in some geographies (e.g., United States, Europe) via the public markets. However, private real estate can offer exposures that are difficult if not impossible to achieve through publicly-traded real estate securities. Investing directly (or in a private fund) offers customization by geography, property type, and strategy (e.g., distressed, core, development).

### ***1.1.5. The Role of Private Credit in a Multi-Asset Portfolio***

Private credit includes distressed investment and direct lending. Although both strategies involve the ownership of fixed-income assets, their roles in an investment program are quite different. Direct-lending assets are income-producing, and the asset owner assumes any default or recovery risks. Direct-lending assets generally behave like their public market counterparts with similar credit profiles (i.e., high-quality, direct-lending assets behave like investment-grade bonds, and low-quality, direct-lending assets behave like high-yield bonds). Distressed debt assets have a more equity-like profile. The expected return is derived from the value of a company's assets relative to its debt. Illiquidity risks are high with both strategies. Direct-lending assets have no secondary market.

Direct-lending funds provide capital to individuals and small businesses that generally cannot access more traditional lending channels. Some loans are unsecured while others might be backed by an asset, such as a house or car. Direct lending is one of the least liquid debt strategies because there is typically no secondary market for these instruments. Investors in direct-lending strategies gain access to a high-yielding but riskier segment of the debt market that is not available via the traditional public markets.

Distressed funds typically purchase the securities of an entity that is under stress and where the stress is relieved through legal restructuring or bankruptcy. The investment can take the form of debt or equity, and in many strategies, the manager often takes an active role throughout the restructuring or bankruptcy. Because many investors are precluded from owning companies or entities that are in bankruptcy or default, managers of distressed funds are often able to purchase assets (usually the debt) at a significant discount. Experience with the bankruptcy process frequently distinguishes these managers from others. Although the

asset is usually a bond, distressed investments typically have low sensitivity to traditional bond risks (i.e., interest rate changes or changes in spreads) because the idiosyncratic risk of the company itself dominates all other risks.

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## 2. DIVERSIFYING EQUITY RISK

- b. compare alternative investments and bonds as risk mitigators in relation to a long equity position;

In this section, we examine the claim that alternative assets may be better risk mitigators than government bonds. To address this question, we must agree on *which* risks alternatives are said to mitigate and on *what* time horizon is relevant. If your investment horizon is short term, volatility may be the most important risk measure. If you are a long-term investor, not achieving the long-horizon return objective may be the most relevant concern.

### 2.1. Volatility Reduction over the Short Time Horizon

Let's look first at the short horizon investor and consider how alternative asset classes compare to bonds as a volatility reducer in an equity-dominated portfolio. Advocates of alternative investments as risk reducers sometimes argue that alternative investments' volatilities calculated based on reported returns are significantly lower than the volatility of public equities. An immediate technical challenge is that reported returns of many alternative asset classes need an adjustment called **unsmoothing** for proper risk estimation. (Various approaches have been developed to unsmooth a return series that demonstrates serial correlation. The specifics of those approaches are beyond the scope of this reading.) In the case of private investments, reported returns are calculated from appraisal-based valuations that may result in volatility and correlation estimates that are too low. (The underlying assumptions in most appraisal models tend to lead to gradual and incremental changes in appraised value that may not accurately capture the asset's true price realized in an actual transaction. The low volatility of the return stream may also dampen the reported correlation between the appraisal-based asset and the more volatile market-based asset.) Other factors may also contribute to underestimated risk across alternatives. For example, **survivorship bias** and **back-fill bias** (reporting returns to a database only after they are known to be good returns) in hedge fund databases can potentially lead to an understatement of downside risk. Additionally, a hedge fund "index" includes many managers whose returns exhibit low correlation; in the same way that combining stocks and bonds in a portfolio can be expected to lower overall portfolio volatility, so too does combining several hedge funds into an



“index.”

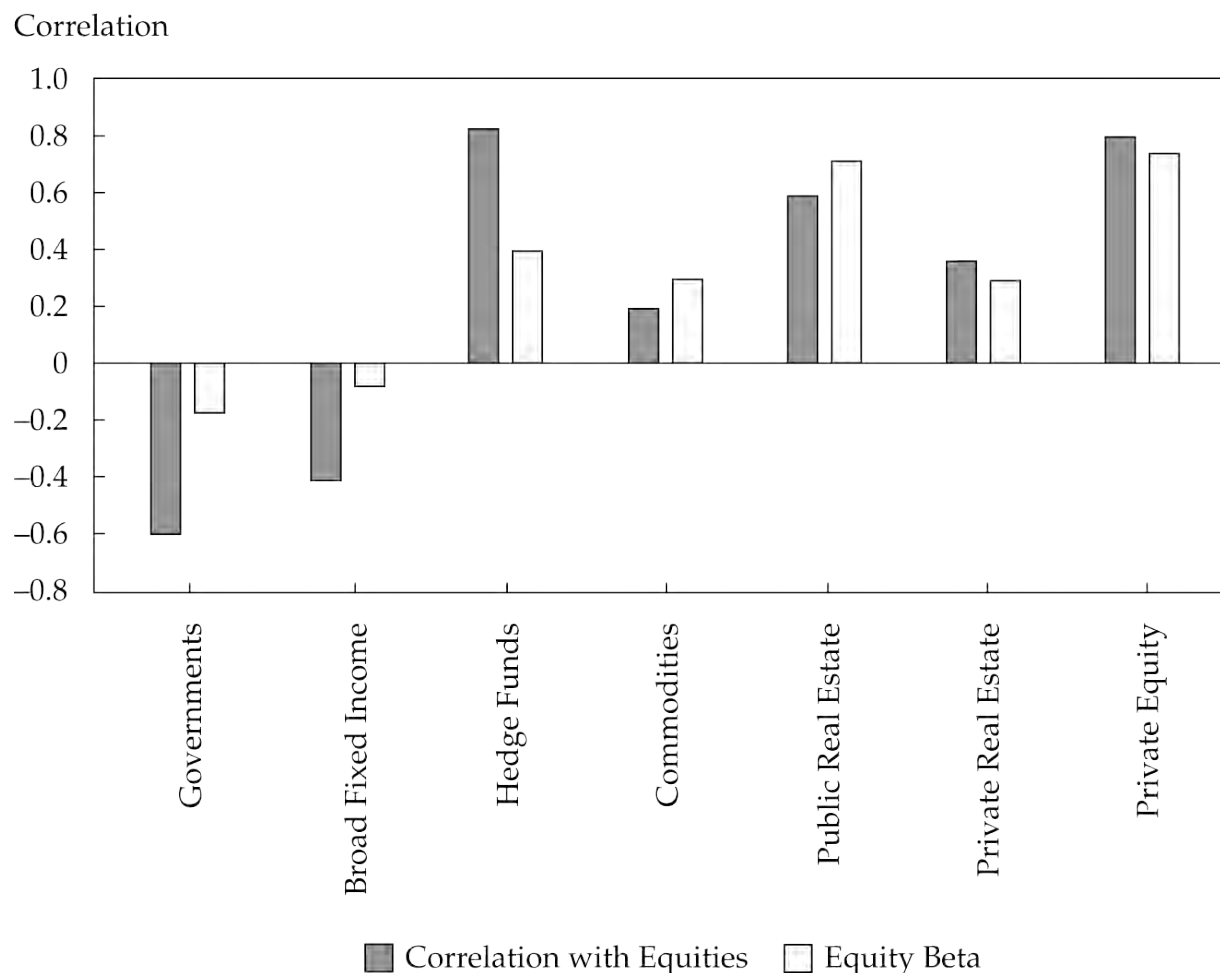
As an example, we build a hypothetical, equally-weighted index of long/short equity hedge funds with volatilities ranging from 6% to 11%. As shown in [Exhibit 5](#), given the less-than-perfect correlation among the constituents of our index, the index volatility is only 4.9%:

#### Exhibit 5. Volatility Is Less Than the Sum of Its Parts

	Fund 1	Fund 2	Fund 3	Fund 4	Fund 5	Combined
<b>Volatility</b>	10.9%	6.5%	8.5%	9.7%	8.1%	<b>4.9%</b>
<b>Correlation</b>						
Fund 1		−0.02	0.14	0.00	0.15	
Fund 2			0.27	0.39	0.29	
Fund 3				0.25	−0.03	
Fund 4					0.14	

[Exhibit 6](#) shows the correlations of fixed-income and alternative asset classes to public equities based on observed market data over 1997–2017. We also show each asset class’s estimated equity beta. To estimate correlations and betas, we used unsmoothed return data for alternative asset classes. We discuss unsmoothing of returns in more detail in a later section.

#### Exhibit 6. Fixed-Income’s and Alternative’s Equity Beta and Correlation with Equities



Sources: Bloomberg and authors' own data and calculations.

Most of the alternative investment categories had positive, but less than perfect, correlation with equities. Although certain alternatives (e.g., commodities, particularly gold) may rally during a public equity market downturn, other alternative investments—like hedge funds, private credit, or private equities—also experience drawdowns at the same time the equity market falls. Hedge funds and private equities have a correlation coefficient with equities over +0.8, and this indicates a fairly strong positive relationship between public equities and these alternative investments.

Government bonds, however, have a  $-0.6$  estimated correlation with equities, which indicates a negative relationship of moderate strength. This is consistent with the tendency for government bonds to serve as a risk haven during “risk-off” or “flight to quality” episodes.

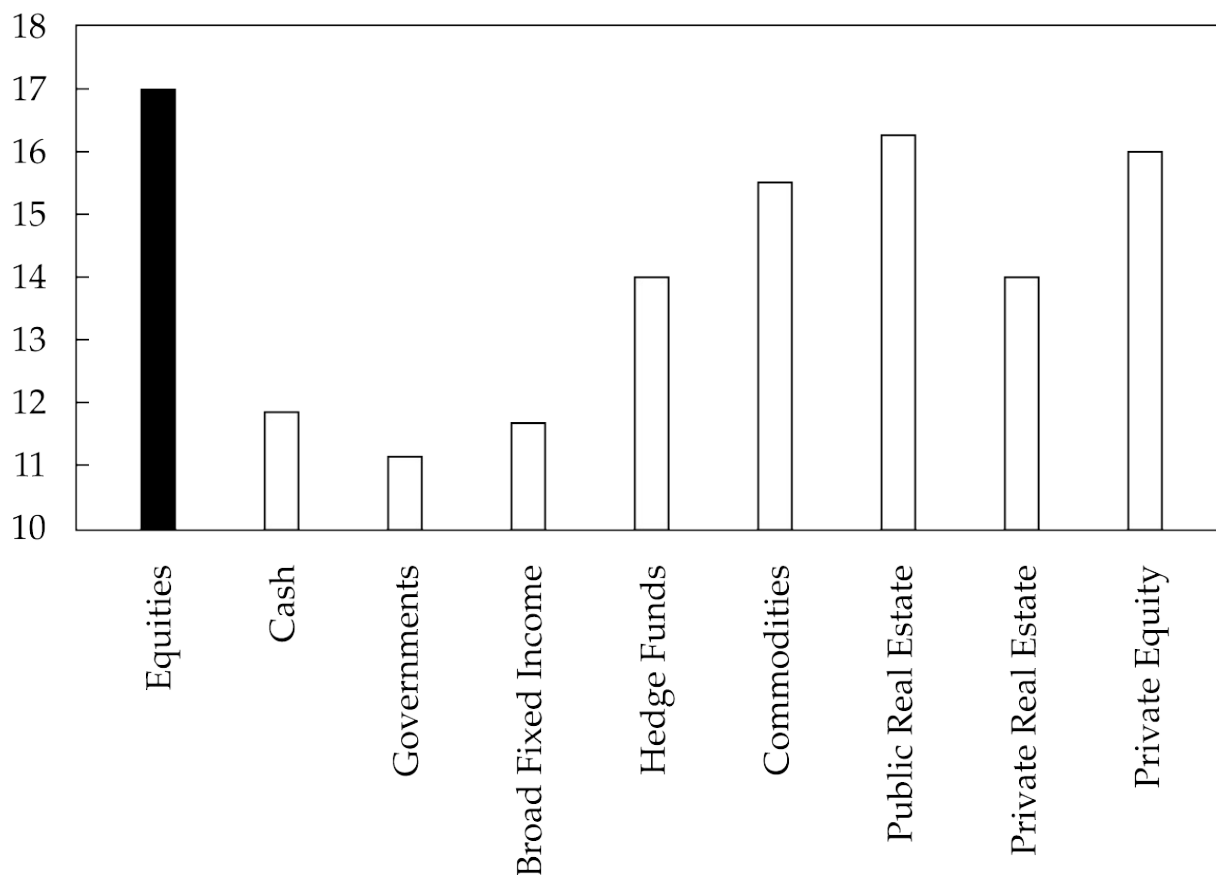
Although correlation and beta have the same sign and are statistically interrelated, we have to remember that they quantify two different things. The correlation coefficient quantifies the strength of a linear relationship between two variables, thus playing a crucial role in portfolio diversification: The lower the correlation, the stronger the asset's diversification power. Beta, however, measures the response of an asset to a unit change in a reference index; for

example, equity beta measures how various assets would respond to a 1% rise of public equities. Hedge funds' beta is estimated at around 0.4; thus, we would expect a 0.4% return (excluding manager alpha) from hedge funds if equities rose by 1%. Hedge funds' relatively low beta (0.4) and high correlation (+0.8) means that hedge funds' rise or fall is milder than those of public equities in magnitude, but this directional relationship is fairly strong in a statistical sense. Commodities also have an equity beta of similar positive magnitude (0.3), but their correlation with equities is much weaker (+0.2); so, we can expect that a much bigger portion of commodity price changes would be driven by factors unrelated to the equity markets.

In [Exhibit 7](#), we compare the total return volatility of public equities (black bar) with volatilities of portfolios comprised of 70% equity and 30% other asset classes. Using 20 years of data, the volatility of public equities is estimated at approximately 17%. A portfolio allocated 70% to equity and 30% to cash would imply a portfolio volatility of 11.9% ( $70\% \times 17\%$ ). Portfolios of 70% equities and 30% any of the alternative asset classes also reduces portfolio volatility relative to an all-equity portfolio, but the lowest volatility of 11.1% could be achieved by combining equities with government bonds because of the negative correlation between these two asset classes.

#### **Exhibit 7. Volatility of Portfolios Comprised of 70% Equities and 30% Other Asset Class**

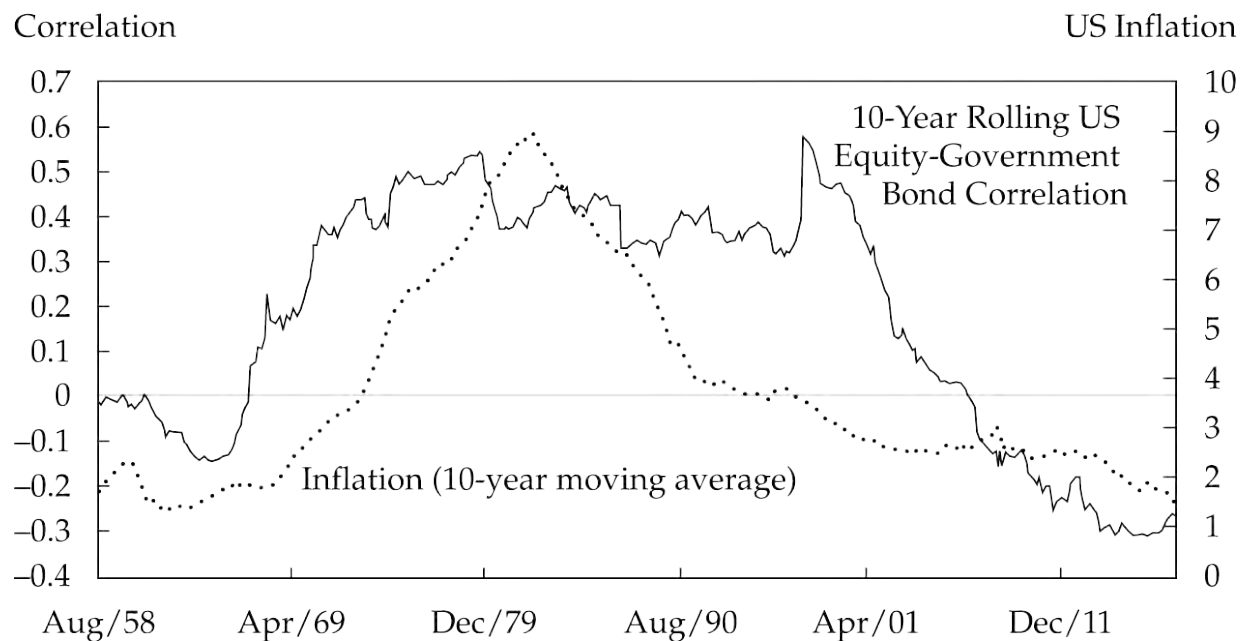
Volatility



Sources: Bloomberg and authors' own data and calculations.

Bear in mind, however, that this analysis is based on 20 years of returns ending in 2017, a period that was characterized by a persistent negative equity–bond correlation. Because there was limited inflation in developed markets over this period, economic growth prospects were the dominant influence on asset prices. Positive growth surprises are good for equities (better earnings outlook) and negative for bonds (potential central bank rate increases). If inflation becomes a threat, bonds' risk mitigation power could erode. [Exhibit 8](#) looks at the US equity–bond correlation since the 1950s. As the chart suggests, the correlation between US equities and government bonds was, in fact, positive in the 1970s through the 1990s when inflation was also more elevated.

## Exhibit 8. Long-Term Historical Equity–Bond Correlation and Inflation



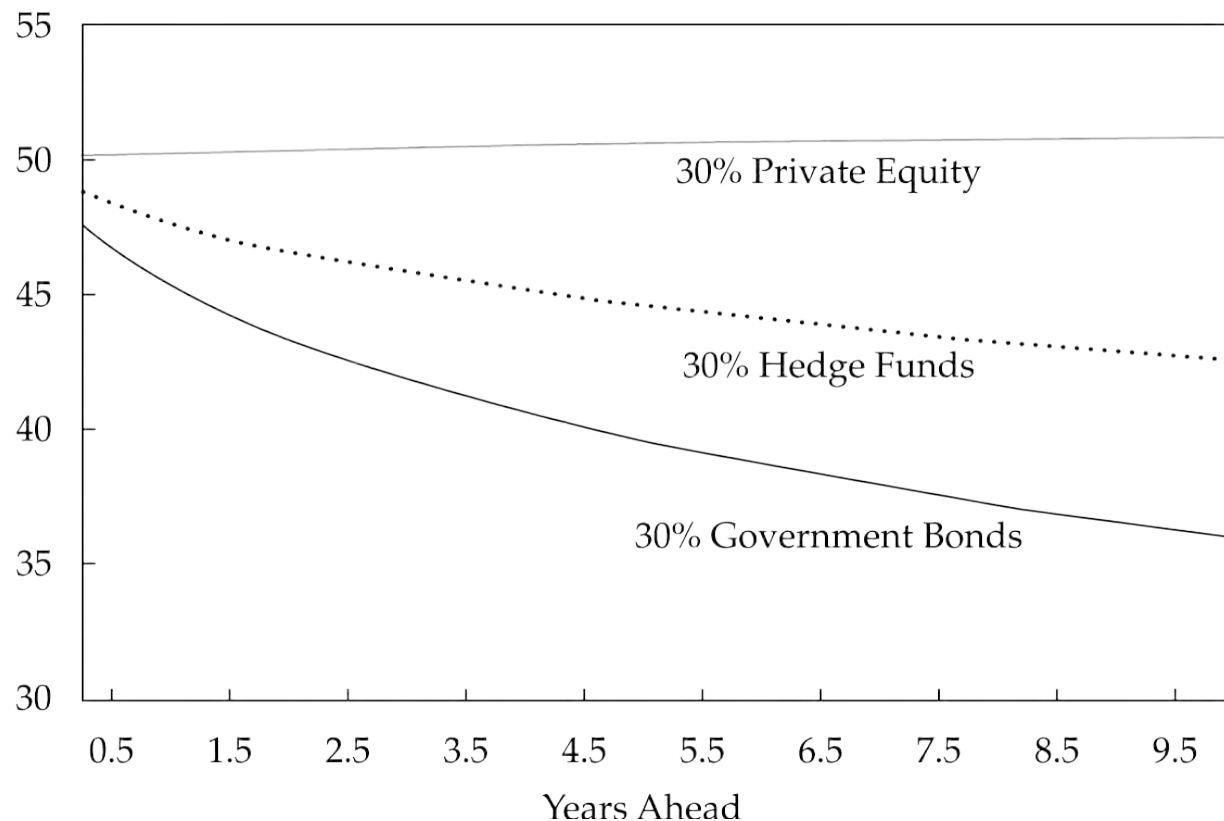
Sources: Bloomberg and the authors' own data and calculations.

## 2.2. Risk of Not Meeting the Investment Goals over the Long Time Horizon

Volatility is not always the most relevant risk measure. An endowment portfolio is often focused on generating a total return equal to at least the spending rate, say 5%, plus inflation to preserve real value of capital over a long time horizon. When bond yields are very low, the likelihood of meeting the investment objective would be reduced given a heavy allocation to bonds, simply because the portfolio's value would likely grow more slowly than the rate implied by the spending rate and inflation. [Exhibit 9](#) illustrates this point: We show the probability of achieving a 5% real (7.1% nominal<sup>3</sup>) return over various horizons up to 10-years for three 70% equity/30% other asset class portfolios. We used quarterly rebalancing. Although allocating the 30% "other" to government bonds would lead to the greatest reduction in portfolio volatility, government bonds also have lower expected return compared to hedge funds and private equity (see [Exhibit 2](#)).

### Exhibit 9. The Probability of Achieving Investment Objectives over the Longer Time Horizon

Probability



Note: Portfolios comprised of 70% equities and 30% other asset classes.

Source: Authors' calculations.

The 70% public equities/30% government bond portfolio has an expected return of 5.7%<sup>4</sup>, below the nominal return target of 7.1%. The 70% public equities/30% private equities portfolio has an expected geometric return of 7.2%, slightly over the return target. Both portfolios' expected returns are 50th percentile returns; there is a 50% probability that this is the return that would be realized over time. Thus, the 70% public equities/30% private equities portfolio, with a nominal expected return of 7.2%, has slightly better than a 50% probability of meeting the 7.1% nominal return target. The 70% public equities/30% government bond portfolio, with an expected return less than the nominal return target, therefore has less than a 50% probability of meeting the required return. Why does the 70% public equities/30% private equities portfolio maintain its 50%+ probability of meeting the return target over time while the probability that the 70% public equities/30% government bond portfolio meets the return target declines over time? As the time horizon lengthens, return accumulation (compounding) becomes more and more important. In a simplified way, return accumulates proportionally with time, whereas volatility scales with the square root of time. Thus, as we lengthen the time horizon, the gap between the cumulative return target and the expected return accumulation widens faster than the range of possible portfolio return outcomes. As a result, the likelihood of a low-returning portfolio catching up to the target

return declines over time.

To summarize, bonds have been a more effective volatility mitigator than alternatives over shorter time horizons, but over long horizons, a heavy allocation to bonds would reduce the probability of achieving the investment goal. It is important to emphasize that volatility and the probability of achieving the target return are two very different dimensions of risk. Volatility addresses interim fluctuations in portfolio return, whereas achieving a return target takes on increasing importance as we expand the time horizon over multiple years. Both risks are important, especially for a program that is distributing 7% of assets per year as in this example. Although the 30% allocation to private equity increases the chance of meeting the expected return, a severe and sustained short-term drawdown in the public equity markets could significantly handicap the fund's ability to achieve its long-term return objectives. This is why drawdowns (related to volatility) need to be considered and managed.

## EXAMPLE 1

### Mitigating Equity Risk by Allocating to Hedge Funds or Bonds

The investment committee of a major foundation is concerned about high equity valuations and would like to increase the allocation either to hedge funds or to high-grade, fixed-income assets to diversify equity risk. As the risk manager of this foundation:

1. Discuss the justifications and the limitations of using bonds to mitigate equity risk.
2. Discuss the justifications and the limitations of using hedge funds to mitigate equity risk.

#### Solution to 1:

- Supporting argument: Bonds have exhibited negative correlation and beta to equities in a low inflation environment, so as long as inflation stays at or below average historical levels, this negative equity–bond correlation should lead to the highest reduction in portfolio volatility.
- Limitations: The negative stock/bond correlation may be temporary, and amid high inflation the stock/bond correlation could turn positive. Furthermore, if bonds' expected return is low, a heavy allocation to bonds may reduce the probability of achieving the foundation's long-term return objectives.

## Solution to 2:

- Supporting argument: With an equity beta of around 0.4 (see [Exhibit 2](#)), hedge funds would reduce an equity-dominated portfolio's overall beta. With higher expected returns than bonds, an allocation to hedge funds would make achieving the long-term return target more feasible.
- Limitations: Although a well-constructed hedge fund portfolio may reduce portfolio volatility and beta, hedge funds are often highly actively managed, levered investment strategies, and individual hedge funds may suffer significant and permanent losses during turbulent times.

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## 3. TRADITIONAL APPROACHES TO ASSET CLASSIFICATION

- c. compare traditional and risk-based approaches to defining the investment opportunity set, including alternative investments;

In this section, we consider how traditional approaches to asset allocation can be adapted to include alternative investments and how investors can apply risk-based approaches to incorporate alternatives in their asset allocation. This reading extends the asset allocation framework introduced in earlier readings on asset allocation. Although the ultimate goal of meeting the investment objectives subject to the relevant constraints remains the same, investors often face several analytical and operational challenges when introducing alternative asset classes.

### 3.1. Traditional Approaches to Asset Classification

When defining asset classes for the traditional approaches to asset allocation, investors may group and classify alternative assets along several dimensions. Two common approaches (in addition to the growth–income–diversification–safety roles described earlier) are with respect to the liquidity of the asset class and with respect to asset behavior under various economic conditions.



3.1.1. A Liquidity-Based Approach to Defining the Opportunity Set

Certain alternative investments, like REITs or commodity futures, are highly liquid and can be easily traded in public markets. Private investments, however, are highly illiquid and usually require long-term commitments (more than 10 years) from the investors. Of course, there are differences among various private asset classes in this respect as well: Private equity investments may require longer than a 10-year commitment, while the term of a private credit fund can be shorter, say 5 to 8 years. Although public equity and private equity may be similar asset classes from the fundamental economic point of view, they differ significantly in their liquidity characteristics.

The long investment horizon and the lack of liquidity in many of the alternative asset classes make it difficult to accurately characterize their risk characteristics for purposes of the asset allocation exercise. One approach to dealing with this issue is to make the initial asset allocation decision using only the broad, liquid asset classes in which the underlying data that drive risk, return, and correlation assumptions are robust (e.g., stocks, bonds, and real estate). A second iteration of the asset allocation exercise would break the equity/fixed-income/real estate asset allocation down further by using the asset groupings as shown in [Exhibit 10](#), which illustrates a possible categorization of asset classes that incorporates their broad liquidity profile.

Exhibit 10. Major Asset Class Categories			
	Equity & Equity-Like	Fixed Income & Fixed Income-Like	Real Estate
Marketable/Liquid	Public Equity Long/Short Equity Hedge Funds	Fixed Income Cash	Public Real Estate Commodities
Private/Illiquid	Private Equity	Private Credit	Private Real Estate Private Real Assets

3.1.2. An Approach Based on Expected Performance under Distinct Macroeconomic Regimes

Investors may also categorize asset classes based on how they are expected to behave under

different macroeconomic environments, and investors may assign roles to them in a broad macroeconomic context:

- *Capital growth assets* would be expected to benefit from healthy economic growth. Public and private equities would belong to this category.
- *Inflation-hedging assets*—so-called “real assets” such as real estate, commodities, and natural resources but also inflation-linked bonds—would be expected to outperform other asset classes when inflation expectations rise or actual inflation exceeds expectations.
- *Deflation-hedging assets* (e.g., nominal government bonds) would be expected to outperform most of the other asset classes when the economy slows and inflation becomes very low or negative.

In [Exhibit 11](#), we illustrate how investors may think about the expected performance of various asset classes in a broad macroeconomic context. Each asset class is positioned along the continuum to illustrate the macroeconomic environment in which we would expect it to generate strong performance. Such mapping is usually based on both historical experience and qualitative judgment. Considering the fundamental economic drivers of asset classes could help investors construct portfolios that are better diversified and more robust under various economic conditions and scenarios.

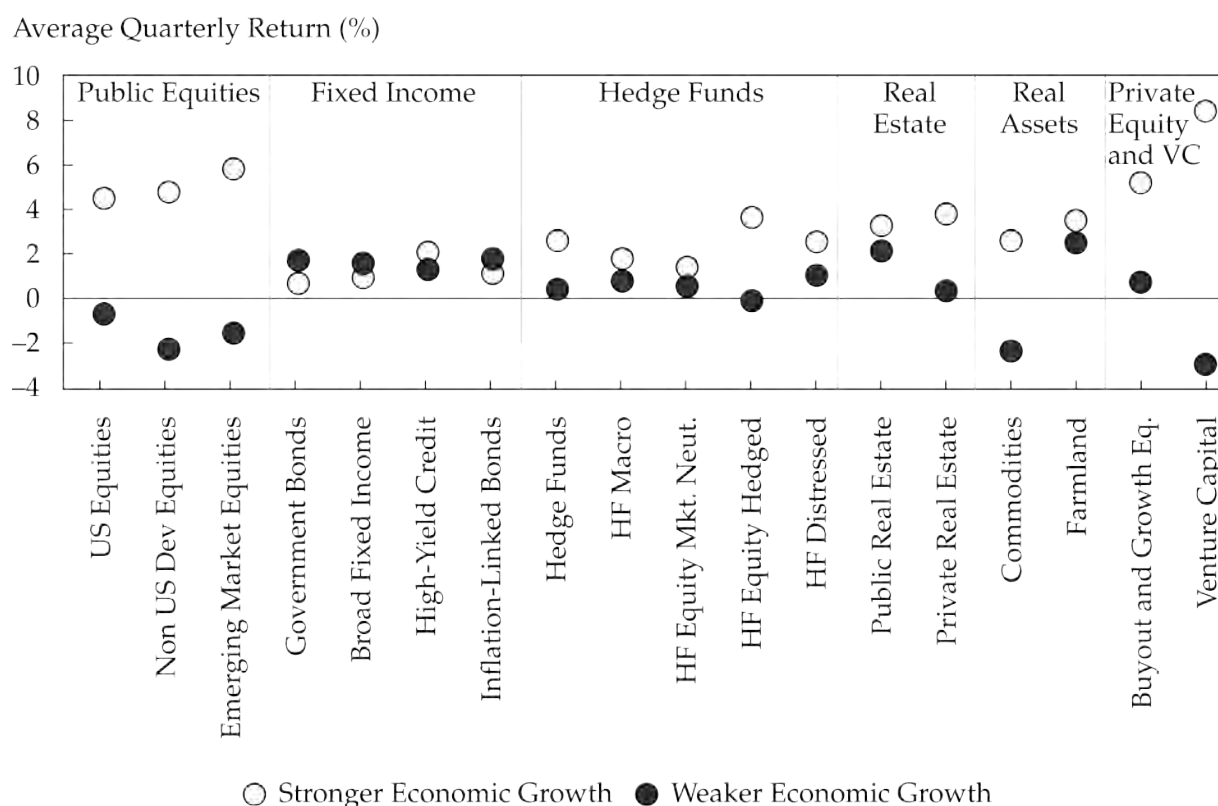
**Exhibit 11. Asset Classes Grouped by the Macroeconomic Environment under Which They Would Be Expected to Generate Strong Performance**

		Inflation Environment		
		Deflation	Moderate Inflation	High Inflation
Economic Environment	High Growth		Public Equity Private Equity High-Yield Bonds Private Credit	Real Estate Commodities
	Low Growth/Recession	Government Bonds		Inflation-Linked

Source: Authors' data.

**Exhibit 12** illustrates the average quarterly total return of various asset classes and alternative strategies under stronger and weaker economic growth environments between 1997 and 2017, a period of low to moderate inflation in developed markets.

### Exhibit 12. Historical Asset Class Performance under Stronger and Weaker Economic Growth Periods (1997–2017)



**Notes:** Strong and weak economic periods were determined using quarterly GDP data. Strong growth periods were those quarters when GDP growth exceeded the average GDP growth through the full historical sample.

**Sources:** The exhibit is based on the authors' calculations. Index data is based on the following. US Equities: Russell 3000; Non-US Developed Market Equities: MSCI EAFE USD Net unhedged; Emerging Market Equities: MSCI Emerging Markets Net USD unhedged; Governments: Bloomberg Barclays US Treasury Index; Broad Fixed Income: Bloomberg Barclays US Aggregate; High Yield: Bloomberg Barclays US Corporate High Yield; Inflation-Linked Bonds: Bloomberg Barclays US Government Inflation-Linked Bonds Index; Hedge Funds: HFRI; Public Real Estate: Dow Jones Equity REIT Index; Private Real Estate: NCREIF Property Index; Commodities: S&P GSCI Total Return Index; Farmland: NCREIF Farmland Index; Buyout and Growth Equities: Cambridge Associates US Private Equity Index; Venture Capital: Cambridge Associates

Public and private equities, hedge funds, and commodities posted strong returns amid strong economic growth conditions and weaker returns amid weaker economic conditions. Commodities exhibit a bigger disparity between returns in periods of stronger and weaker growth than does the hedge fund category.

Within fixed income, government bonds posted higher returns during periods of weaker economic growth—when investors likely reallocated from risky assets to safer assets. On the other hand, high-yield bonds (and potentially private credit, if we assume a behavior pattern similar to that of high-yield bonds) performed well during periods of stronger economic growth but posted lower returns during weaker economic periods, likely because of concerns about weakening credit quality.

Understanding how various asset classes behave under distinct macroeconomic regimes enables investors to tailor the asset allocation to align with their fundamental goals or to mitigate their fundamental risks. If the investment portfolio has a specific goal, such as hedging inflation risk, then it would be logical to build a portfolio that is dominated by asset classes that are expected to perform best amid rising inflation. Even if the portfolio's goal is to generate high return over the long run, combining “growth” asset classes with “inflation-hedging” or “deflation-hedging” asset classes could make the asset allocation more resilient to changing economic and market conditions. This approach can be extended to macroeconomic scenario analysis and stress testing when the analyst evaluates how various asset allocation options would perform under conditions of high or low economic growth and/or inflation, and it can identify which economic conditions would hurt the investment portfolio the most.

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## **4. RISK-BASED APPROACHES TO ASSET CLASSIFICATION AND COMPARING RISK-BASED AND TRADITIONAL APPROACHES**

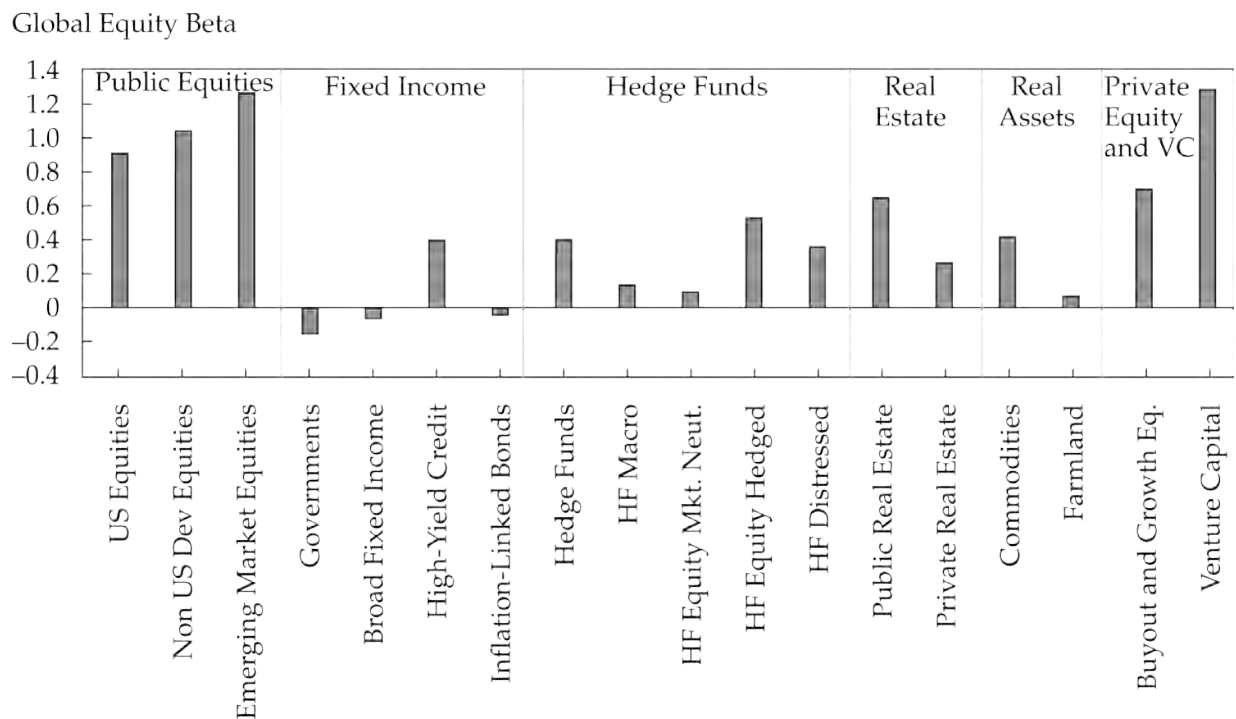
- c. compare traditional and risk-based approaches to defining the investment opportunity set, including alternative investments;

When we assign traditional and alternative asset classes to certain functional roles in the portfolio, or when we assess how different asset classes would perform under distinct

macroeconomic regimes, we can also easily realize that many traditional and alternative asset classes share similar characteristics that can result in high correlations. We may put public equities in the same functional bucket as private equity, and we may expect elevated default rates from high-yield bonds and private credit during recessionary environments.

**Exhibit 13** compares the betas of various traditional and alternative asset classes to global equities. The chart clearly shows that private equity and venture capital asset classes have global equity betas similar to public equities. On the other hand, betas of various hedge fund strategies differ significantly. Hedge fund returns, in aggregate, had a beta of 0.4. However, global macro or equity market-neutral strategies had betas as low as 0.1. The long/short “equity hedged” strategy’s beta is estimated to be much higher, around 0.5, which is consistent with its long equity bias.

**Exhibit 13. Global Equity Beta of Various Asset Classes, 1997–2017**



*Note:* Betas were estimated as a regression slope of representative index returns relative to the global equity return stream over the time period 1997–2017.

*Sources:* Authors’ calculations; index data sources are the same as those in [Exhibit 12](#).

Many investors have begun to view asset allocation through a risk factor lens to capture these similarities. In this section, we extend the risk factor asset allocation framework introduced in earlier readings to alternative investments using the following risk factors:

- *Equity market return*: representative of the general direction of global equity markets, and investors may also refer to this as the best market proxy for “growth.”
- *Size*: excess return of small-cap equities over large-cap equities.
- *Value*: excess return of value versus growth stocks (*negative* factor sensitivity = *growth* bias).
- *Liquidity*: the Pastor–Stambaugh liquidity factor<sup>5</sup>—a market-wide liquidity measure based on the excess returns of stocks with large sensitivity to changes in aggregate liquidity (less-liquid stocks) versus stocks with less sensitivity to changing liquidity (more-liquid stocks).
- *Duration*: sensitivity to 10-year government yield changes.
- *Inflation*: sensitivity to 10-year breakeven inflation changes obtained from the inflation-linked bond markets.
- *Credit spread*: sensitivity to changes in high-yield spread.
- *Currency*: sensitivity to changes in the domestic currency versus a basket of foreign currencies.

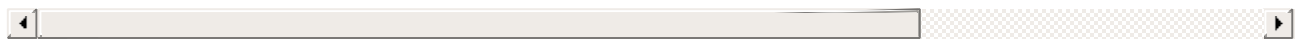
This framework can easily be extended further to other risk factors, like momentum or volatility.

**Exhibit 14** illustrates risk factor sensitivities of various traditional and alternative investment strategies using a construct as discussed by [Naik, Devarajan, Nowobilski, Page, and Pedersen \(2016\)](#). The parameters in the table are regression coefficients based on 20 years of historical data. Quarterly index returns representing each asset class were regressed on the risk factors listed previously. Note that for conventional reasons we changed the signs of the “nominal duration” and “credit spread” sensitivities: The 4.2 duration of broad fixed income, for example, means that this asset class would experience an approximate 4.2% decline in response to a 100 bps increase in the nominal interest rates.

**Exhibit 14. Factor Sensitivity Estimates across Various Asset Classes**

Asset Classes	Equity	Size	Value	Liquidity	Nominal Duration	Inflation	Credit Spread
US Equities	1.0						
Non-US Dev	0.9						

Equities					
Emerging Mkt Equities	1.1	0.5			
Government Bonds			4.8		
Broad Fixed Income			4.2		0.6
High-Yield Credit			4.1		4.2
Inflation-Linked Bonds			6.6	7.0	
Hedge Funds	0.3	0.1			0.6
HF Macro	0.2	0.2	1.9	3.1	−0.
HF Equity Mkt. Neut.	0.1				
HF Equity Hedged	0.5				
HF Distressed	0.1	0.2			1.8
Commodities				18.0	
Public Real Estate	0.9		4.6	0.9	
Private Real Estate	0.2			2.4	0.1
Buyout & Growth Equities	0.6	0.2	−0.3	0.1	
Venture Capital	0.8	0.6	−1.8	0.2	



Note: Only statistically significant slopes are displayed in the exhibit. Sources are the same as those for [Exhibit 12](#).

In a risk factor-based asset allocation framework, the factors represent the systematic risks embedded in the selected asset classes and investment strategies. The primary systematic risk

factors would fully, or almost fully, explain the behavior of broad, passive traditional public asset classes. There should be a relatively larger portion of unexplained risk in the alternative asset classes. This arises from such issues as the appraisal-based valuation in real estate, the idiosyncratic risks in the portfolio companies of private equity funds, or the idiosyncratic risks in hedge funds resulting from active management. (This last one is logically intuitive if you subscribe to the belief that returns generated by hedge fund strategies should be primarily driven by *alpha* rather than systematic risk factors.)

The extension of the risk factor framework to alternative asset classes allows every asset class to be described using the same framework. Investors can therefore more clearly understand their sources of investment risk and identify the intended and unintended tilts and biases they have in the portfolio. Furthermore, a risk factor framework enables investors to more efficiently allocate capital and risk in a multi-dimensional framework (i.e., a framework that seeks to do more than simply achieve the highest return at a given level of volatility). If an investor, for example, would like to increase the portfolio's inflation risk-mitigating exposure, decomposing this specific risk factor from inflation-linked bonds, real estate, or commodity asset classes could help the investor to identify the asset classes and exposures that are most likely to facilitate that goal.

Risk factor-based approaches improve upon the traditional approaches in identifying the investment opportunity set but do have certain limitations. As mentioned earlier, a small set of systematic risk factors is insufficient to describe the historical return stream of alternative asset classes. Note that all non-zero-risk factor coefficients displayed in the table are statistically significant based on their *t*-statistics. Although our eight illustrative factors fit the total return history of traditional asset classes with *r*-squared statistics of 0.8–1.0, the *r*-squared ratios for alternative investments are lower, ranging between 0.3 and 0.7. Increasing the number of risk factors would certainly improve the goodness of fit, but too many factors could make the risk factor-based asset allocation framework difficult to handle and interpret. In addition, certain risk factor sensitivities can be quite volatile, making a “point in time” factor-based definition of an asset class a poor descriptor of the class's expected behavior. For example, the aggregate hedge fund inflation beta typically fluctuates in the range of 0.3 to 0.4, while the inflation beta of commodities fluctuates much more widely.<sup>6</sup>

## EXAMPLE 2

### Applying Risk Factors for Inflation Hedging

1. The CIO (chief investment officer) of the United Retired Workers Plan would like to reduce inflation risk in the portfolio. Based on the data displayed in [Exhibit 14](#), which asset classes would you recommend as potential inflation-hedging tools?
2. The CIO is not only concerned about inflation but also rising interest rates. Which



alternative asset classes would you recommend for consideration?

### Solution to 1:

Commodities and inflation-linked bonds have the highest factor sensitivity to inflation, so they are the most obvious candidates. Real estate (both public and private) also has some potential to protect against inflation. Based on the data presented, macro hedge fund strategies also exhibited a positive inflation beta, but given their active nature, further analysis may be needed before choosing them as inflation-hedging vehicles.

### Solution to 2:

Commodities and private real estate would be the likely asset classes to hedge against rising interest rates, given their zero-factor sensitivity to nominal duration. Some of the hedge fund strategies also show zero-factor sensitivity to duration, but the relationship may not hold true in the future given the actively managed nature of hedge funds.

Although [Exhibit 14](#) indicates equity strategies (both public and private) also show little to no sensitivity to rising interest rates (duration) bonds and equities have been more highly correlated in the past.

## 4.1. Illustration: Asset Allocation and Risk-Based Approaches

Let's look at an example of how a risk-based approach may enhance traditional asset allocation. In [Exhibit 15](#), we show two investment portfolios, Portfolio A and Portfolio B, that have exactly the same high-level asset allocations. However, the underlying investments in the two portfolios are quite different. The fixed-income assets in Portfolio A are government bonds, while the fixed-income assets in Portfolio B are high-yield bonds. Hedge fund investments in Portfolio A are represented by very low equity beta market neutral strategies, while Portfolio B is invested in the higher beta long/short equity hedge funds. Similarly, Portfolio B's investments in real assets and private equity have higher risk than those in Portfolio A.

### Exhibit 15. Traditional Asset Allocation and Risk Contribution Comparison

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% Contribution <sup>1</sup>

Broad Asset Classes	Asset Allocation		Underlying Investments		Risk	
	Portfolio A	Portfolio B	Portfolio A	Portfolio B	Portfolio A	Portfolio B
Fixed Income	20%	20%	Government Bonds	High-Yield Bonds	-6.5%	7.6%
Public Equities	20%	20%	US Equities	Non-US Developed Equities	51.4%	18.2%
Hedge Funds	20%	20%	Equity Market Neutral	Long/Short Equity	5.4%	11.1%
Real Assets	20%	20%	Inflation-linked bonds	REITs	0.7%	13.2%
Private Equity	20%	20%	Buyout	Venture Capital	48.9%	49.8%
<b>Total</b>	<b>100%</b>	<b>100%</b>				
				<b>Expected Return</b>	<b>5.3%</b>	<b>8.8%</b>
				<b>Volatility</b>	<b>5.9%</b>	<b>16.5%</b>
				<b>Equity Beta</b>	<b>0.30</b>	<b>0.79</b>

*Notes:* The percentage contribution to risk is a result of three components: the asset allocation to a specific asset, its volatility, and its correlation with the other assets. For fixed income, the contribution to total risk is negative in the case of Portfolio A because government bonds have negative correlations with other asset classes; however, it is positive in the case of Portfolio B because high-yield bonds have positive correlations with the other asset classes.

*Source:* Authors' calculations.

As a result of these major differences between nominally similar broad asset allocations, it is not surprising that Portfolio B has higher volatility, beta, and expected return compared to Portfolio A. Let's look more closely at the risk contribution of each of the asset classes:

### **Portfolio A.**

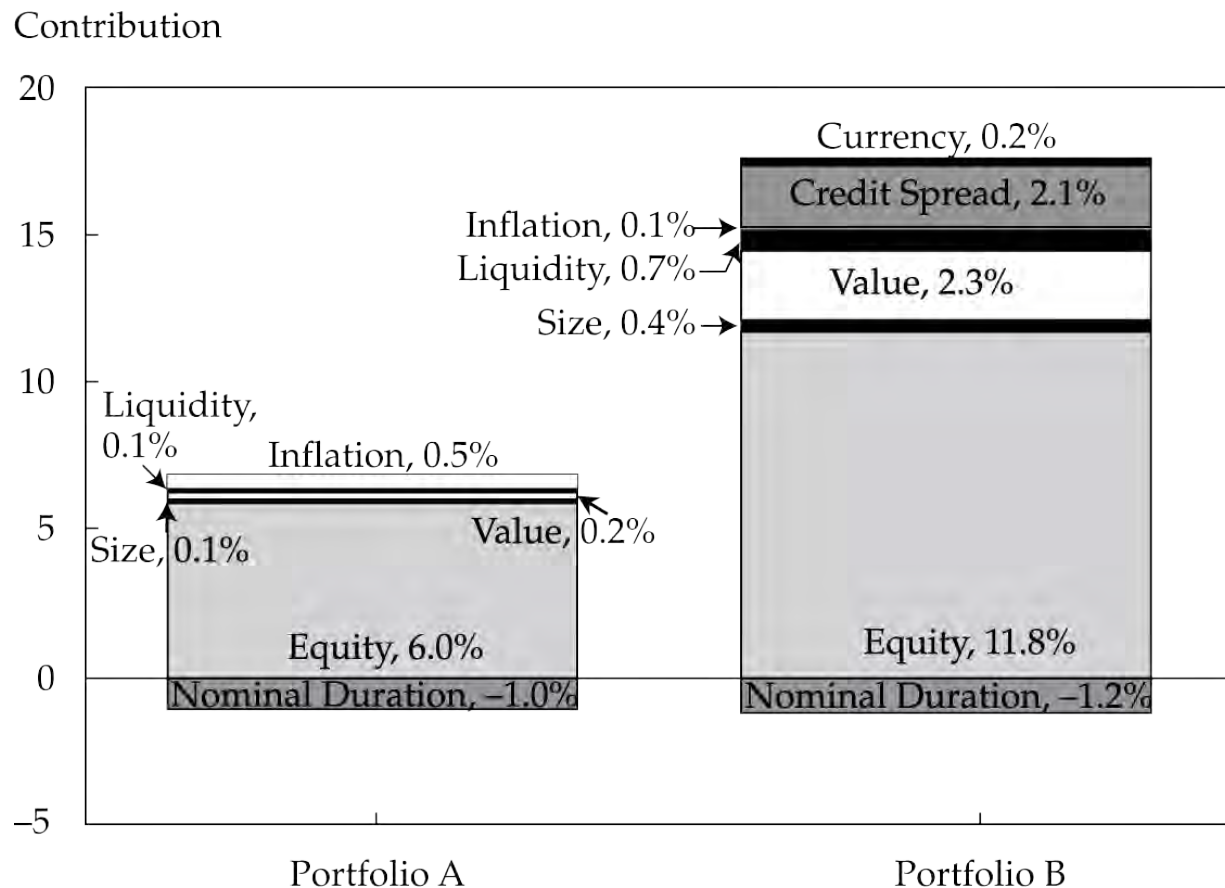
The majority of the risk in Portfolio A comes from public and private equity. Hedge funds contribute approximately 5% to the total risk, and fixed income actually reduces risk because government bonds had negative correlations with public equities in our historical data sample.

## ***Portfolio B.***

Private equity explains about half of the total portfolio risk of Portfolio B. (In this portfolio, the private equity allocation is represented by the higher risk venture capital.) Public equities, hedge funds, and real assets each contribute roughly the same to the total risk of the portfolio. This is consistent with the equity-like characteristics of the underlying assets in the portfolio. The long/short equity hedged strategy has an equity beta of around 0.5, and REITs have an equity beta of 0.9. In Portfolio B, fixed income contributes positively to total risk, consistent with high-yield bonds' positive correlation with equities over the time series.

Although the nominal asset allocations of the two portfolios are the same, the risk profile and the risk allocation among asset classes are significantly different. Let's go one step further and apply the risk factor sensitivities of [Exhibit 14](#) to our hypothetical portfolios. [Exhibit 16](#) shows the absolute contribution to total portfolio risk by risk factor. This approach moves beyond the borders of asset classes and aggregates the equity risk factor embedded in public equities, private equities, venture capital, and REITs into a single-factor contribution. Both portfolios are highly dominated by exposure to equity risk. Portfolio A's total risk is almost fully explained by the exposure to the equity factor, while about 70% of Portfolio B's total risk comes from the equity risk factor alone. Portfolio B also has exposure to the size and value factors, driven by the allocation to venture capital. Finally, we can also see that although Portfolio B is not directly investing in government bonds, some risk mitigation benefit still arises from the low "duration" component of high-yield bonds and REITs.

### **Exhibit 16. Absolute Contribution to Total Risk by Risk Factors**



This is an extreme example (the two portfolios have vastly different expected returns), but it is useful to illustrate how factor sensitivities can be used to explore the underlying risk exposures in seemingly similar asset allocations.

## 4.2. Comparing Risk-Based and Traditional Approaches

Investors often employ multiple approaches in setting their asset allocation for a portfolio that includes alternative investments. When applying these various approaches, investors must consider their strengths and limitations.

### Main strengths of traditional approaches:

- *Easy to communicate.* Listing the roles of various asset classes is intuitive and easy to explain to the decision makers, who often have familiarity with the traditional asset class-based approach. Scenario analyses based on historical or expected behavior of various asset classes under different macroeconomic conditions can help to introduce quantitative aspects of the portfolio's expected performance and risk and substantiate

the asset allocation proposal.

- *Relevance for liquidity management and operational considerations.* Public and private asset class mandates have vastly distinct liquidity profiles. Thus, although private and public equity would have a lot of commonality in their risk factor exposures, they would be positioned very differently from a liquidity management perspective. Similarly, investors must implement the target asset allocation by allocating to investment managers. The traditional categorization of asset classes may be necessary to identify the relevant mandates—what portion of the equity portfolio she would like to allocate to equity-oriented hedge funds rather than to long-only equity managers.

### **Main limitations of traditional approaches:**

- *Over-estimation of portfolio diversification.* Without a proper analytical framework for assessing risk, investors may have a false sense of diversification. An allocation spread across a large number of different asset classes may appear to be very well diversified, when, in fact, the underlying investments may be subject to the same underlying risks.
- *Obscured primary drivers of risk.* Investments with very different risk characteristics may be commingled under the same asset class category. For example, government bonds and high-yield bonds may both be classified as “fixed income,” but each has distinct risk characteristics.

Risk-based approaches are designed to overcome some of these limitations.

### **Key benefits of risk-based approaches:**

- *Common risk factor identification.* Investors are able to identify common risk factors across all investments, whether public or private, passive or active.
- *Integrated risk framework.* Investors are able to build an integrated risk management framework, leading to more reliable portfolio-level risk quantification.

### **Key limitations of risk-based approaches:**

- *Sensitivity to the historical look-back period.* Empirical risk factor exposure estimations may be sensitive to the historical sample. For example, the duration of a bond portfolio or the beta of a diversified equity portfolio could be reasonably stable, but the estimated inflation sensitivity of real assets can change rapidly over time. Thus, the analyst has to be cautious when interpreting some of the risk factor sensitivities, such as the “inflation beta” of commodities.

- *Implementation hurdles.* Establishing a strategic target to different risk factors is a very important high-level decision, but converting these risk factor targets to actual investment mandates requires additional considerations, including liquidity planning, time and effort for manager selection, and rebalancing policy.
- *Determining which risk factors should be used and how to measure them in different asset classes.* One drawback with risk-based approaches is the decision on which risk factors to use is somewhat subjective and how these factors are measured can also be subjective. For example, if using a liquidity factor, should it be measured by the Pastor-Stambaugh metric or by some other metric?

This issue is highlighted by noting that in Level III *Hedge Fund Strategies*, hedge fund returns are analyzed via a conditional factor model using just four risk factors: equities, credit, currencies, and volatility. These risk factors were selected as they are deemed to provide a reasonably broad cross-section of risk exposures for the typical hedge fund, and each of the factor returns can be realized through relatively liquid instruments.

In sum, a limitation of risk-based approaches is the potential subjectivity embedded in their implementation.

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## 5. RISK CONSIDERATIONS, RETURN EXPECTATIONS AND INVESTMENT VEHICLE

- d. discuss investment considerations that are important in allocating to different types of alternative investments;

In addition to the risk, return, and correlation characteristics relevant to the decision to invest in the alternative asset classes, many operational and practical complexities must be considered before finalizing a decision to invest. It is essential that the investor be fully aware of these complexities: Failure to grasp these differences between traditional and alternative investments can derail an investment program. The primary factors to consider include:

- properly defining risk characteristics;
- establishing return expectations;
- selection of the appropriate investment vehicle;

- operational liquidity issues;
- expense and fee considerations;
- tax considerations (applicable for taxable entities); and
- build vs. buy.

## 5.1. Risk Considerations

Mean–variance optimization (MVO), widely used in modeling asset allocation choices, cannot easily accommodate the characteristics of most alternative investments. MVO characterizes an asset’s risk using standard deviation. Standard deviation is a one-dimensional view of risk and an especially poor representation of the risk characteristics of alternative investments—where assets suffer some degree of illiquidity, valuations may be subjective, and returns may be “chunky” and not normally distributed. The non-standard deviation risks are usually accommodated in an MVO framework by assigning a higher standard deviation than might be derived solely by looking at the historical returns of the asset class.

Most approaches to asset allocation assume that the portfolio’s allocation to an asset class is always fully invested. Although this is not an assumption that is limited to alternatives, the problem is exaggerated with the private alternative strategies where it could take several years for capital to be invested and where capital is returned to the investor as investments are sold. Thus, it is rare that the *actual* asset allocation of a program with a significant exposure to alternatives will mirror the *modeled* asset allocation. This suggests that the investor must carefully (and continually) monitor the program’s aggregate exposures to ensure that the risks are in line with the strategic asset allocation. A case in point: Some investors over-allocated to private equity, real-estate, and other call-down funds prior to 2008 in order to more quickly reach their asset allocation targets. Many of these investors then found themselves in a situation where they were receiving capital calls for these commitments during 2008 and 2009, a period where their public assets had lost considerable value and liquidity and cash were scarce. Some investors had to reduce distributions, sell illiquid investments in the secondary market at severely discounted prices, and/or walk away from their fund commitments, thereby forfeiting earlier investments.

Although every strategy (and, by extension, each individual fund) will have its own unique risk profile, we provide two examples of the complications that might be encountered when modelling an allocation to alternative investments.

### **Short-only strategy:**

A short-biased fund can provide strong diversification benefits, lowering a portfolio's aggregate exposure to the equity risk factor; however, a short-only fund has a risk profile quite unlike a long-only equity fund. Most investors understand that a long-only equity fund has theoretically infinite upside potential and a downside loss bounded by zero (assuming no leverage). A short-biased or short-only fund has the opposite distribution. A short-selling strategy is capped on its upside but has unlimited downside risk.

### ***Option payouts:***

Some hedge fund strategies will structure their trades as call options either by owning call options outright or by synthetically replicating a call option (e.g., convertible bond arbitrage in which the manager goes long the convertible bond, short the equity for the same underlying, and hedges the interest rate risk). If executed properly, the fund would have limited downside but unlimited upside. It is difficult, if not impossible, to accurately model such a return profile by looking simply at a fund's historical standard deviation or other risk metrics, especially if the fund's track record does not encompass a full market cycle.

## **5.2. Return Expectations**

Given the limited return history of alternative investments (relative to stocks and bonds) and the idiosyncratic nature of alternative investment returns, no single accepted approach to developing the return expectations required in an asset allocation exercise exists. One approach that can be applied with some consistency across asset classes is a "building blocks" approach: Begin with the risk-free rate, estimate the return associated with the factor exposures relevant to the asset class (e.g., credit spreads, level and shape of the yield curve, equity, leverage, liquidity), apply an assumption for manager alpha, and deduct appropriate fees (management and incentive) and taxes. Where the portfolio already contains an allocation to alternative investments, the underlying money managers can be helpful in estimating exposures and return potential. The portfolio's current positions can be characterized by their known exposures, rather than through a generic set of exposures that may not be truly representative of the program's objectives for the asset class exposure. Say, for example, that the investor's hedge fund program deliberately excludes long/short equity hedge funds because the investor chooses to take equity risk in the long-only portion of the portfolio. The return (and risk) characteristics of this hedge fund allocation would be very different from those of a broad-based allocation to hedge funds, which typically has a significant weight to long/short equity funds.

## **5.3. Investment Vehicle**



Most alternative investments are implemented through a private (limited) partnership that is controlled by a general partner (GP), the organization and individuals that manage the investments. The asset owner becomes a limited partner (LP) in the private partnership. The main rationale for using the limited partnership format is that it limits the investor's liability to the amount of capital that she has contributed; she is not responsible for the actions of or the debts incurred by the GP. The investor may invest directly into a manager's fund or through a fund of funds, a private partnership that invests in multiple underlying partnerships. Larger investors may also consider making co-investments alongside a manager into a portfolio company, or they may make direct private equity investments on their own.

Private limited partnerships are the dominant investment vehicle for most alternative investments in private equity, real estate, private credit, and real assets. In the United States, hedge funds will tend to employ two structures: a limited partnership (typically Delaware-based) or an offshore corporation or feeder fund (possibly based in the Cayman Islands, Bermuda, or the British Virgin Islands) that usually feeds into an underlying limited partnership (i.e., feeder fund). European hedge funds tend to register their vehicles in Ireland or Luxembourg<sup>7</sup> as a public limited company, a partnership limited by shares, or a special limited partnership.

There are growing opportunities to invest in alternatives using mutual funds, undertakings for collective investment in transferable securities (UCITS), and/or separately managed accounts (SMAs), although the strategies implemented through these more-liquid vehicles are unlikely to have the same risk/return profile as their less-liquid counterparts. The requirements and demands of a broader investor base have made mutual funds, UCITS, and SMAs increasingly popular. We describe the structure, benefits, and drawbacks of each of these vehicles.

### ***Direct investment in a limited partnership:***

An investor with the necessary scale and expertise can purchase limited partnership interests directly from the GP. GPs have broad discretion to select and manage the underlying investments and will typically invest a portion of their capital in the fund alongside the limited partners. Because each limited partnership follows its own distinct investment strategy, the investor must often invest in multiple partnerships to diversify idiosyncratic risk. In order to maintain the limited liability shield afforded by the limited partnership structure, the investor must not become too involved in the operation of the fund itself.

### ***Funds of funds (FOFs):***

Many investors lack the necessary scale and investment/operational expertise to access, evaluate, and develop a diversified alternative investment program. An FOF pools the capital of these investors, allowing them to achieve an allocation to an asset class that would

otherwise be unobtainable. An FOF manager will typically specialize in a certain alternative strategy, such as Asian private equity funds, and may invest in either many or just a handful of underlying funds. The FOF manager is responsible for sourcing, conducting due diligence on, and monitoring the underlying managers. Using an FOF simplifies the investor's accounting and reporting: Capital calls from the underlying funds are frequently consolidated into a single capital call by the FOF, and investors receive a single report consolidating the accounting and investment results of all the underlying funds. The FOF manager does charge additional fees for these services. Investors in an FOF also lose a degree of flexibility to customize their exposures.

### ***SMA/funds of one:***

As large institutions and family offices increased capital allocated to the alternative investment space, many of them demanded more-favorable investment terms and conditions than those offered to smaller investors. Some alternative investment managers, interested in accessing these large pools of capital, have agreed to offer investment management services to these clients through a highly customizable SMA. SMAs have very high minimum investments and pose greater operational challenges for both the manager and the investor. In instances where an SMA is impractical, fund managers have created a “fund of one”—a limited partnership with a single client. These funds have many of the same benefits as an SMA but can be easier to implement. (For example, an SMA requires that the *investor* must be approved by each of the counterparties to any derivatives contracts. In a fund of one, GPs must obtain and maintain these approvals, which is something that they do in the ordinary course of running their investment businesses.)

SMAs and funds of one cannot generally avail themselves of the alignment of interests that arises from the investment of GP capital alongside that of the LPs. When other clients are invested in the GP's primary investment vehicles at the GP's standard fees and to which the GP has committed some of its own capital, there is a risk that the GP favors these other funds in allocating capital-constrained investment opportunities.

### ***Mutual funds/UCITS/publicly traded funds:***

A number of open-ended mutual funds and UCITS seek to replicate some alternative investment strategies, particularly hedge funds. Nominally, these allow smaller investors to access asset classes that would otherwise be unavailable to them. It should be noted, however, that these vehicles often operate with regulatory restrictions that limit the fund manager's ability to implement the investment strategy offered via their primary investment vehicle. Accordingly, the investor must be cautious in considering whether the track record achieved in the manager's primary investment vehicle is representative of what might be achieved in a mutual fund, UCIT, or other publicly-traded vehicle. For example, a mutual

fund that offers daily liquidity is unlikely to be a suitable investment vehicle for a distressed or activist investment fund, where the time horizon to realize investment returns may be one to two years. This “liquid-alt” space grew significantly following the Global Financial Crisis.

## 6. LIQUIDITY

- d. discuss investment considerations that are important in allocating to different types of alternative investments;

Traditional assets are generally highly liquid, and the vehicles that are typically used by investors to access the asset class (e.g., separate accounts or daily valued commingled funds, such as mutual funds and UCITS) typically do not impose additional liquidity constraints. That is not the case with many alternative assets, where both the vehicle and the underlying instruments may expose the investor to some degree of liquidity risk. We address liquidity risks at the fund and security level separately.

### 6.1. Liquidity Risks Associated with the Investment Vehicle

The most common vehicle employed by alternative asset managers is the private limited partnership previously described. (Some investors will invest via an offshore corporate structure used for certain tax and regulatory reasons. This offshore corporation is typically a “feeder” fund—a vehicle that channels investors’ assets to the master limited partnership.) The private placement memorandum (PPM) details the subscription and redemption features of the partnership. Liquidity provisions differ across asset classes but are substantially similar within asset classes. [Exhibit 17](#) details the typical liquidity considerations associated with investing in a private limited partnership. SMA liquidity provisions may be negotiated directly with the manager.

**Exhibit 17. Typical Liquidity Provisions for Alternative Investment Vehicles**

	Subscription	Redemption	Lock-Up
Hedge Funds	▪ Typically accept capital on a monthly	▪ Quarterly or annual	▪ Typically one year in

or quarterly basis.

redemptions with 30 to 90 days' notice required.

the US; shorter in Europe.

- May be subject to a gate limiting the amount of fund or investor assets that can be redeemed at any one redemption date.

- Redemptions prior to the lock-up period may be permitted but are subject to a penalty, typically 10%.

- 10% holdback of the redemption amount pending completion of the annual audit.

**Private Equity, Private Credit, Real Estate, and Real Asset Funds**

- Funds typically have multiple "closes." The final close for new investors is usually one year after the first close. Committed capital is called for investment in stages over a 3-year investment period.

- No redemption provisions. Fund interests may be sold on the secondary market, subject to GP approval.

- Typical 10-year life, with GP option to extend fund term 1 to 2 years.

- Distributions paid as investments are realized over the life of the fund. Unrealized assets may be distributed in

kind to the LP  
at fund  
termination.

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## ***Secondary markets:***

Although fund terms may prevent investors from redeeming early, a small but growing secondary market for many alternative funds exists. Some brokers will match sellers and buyers of limited partnership interests, and some secondary funds' main objective is to buy limited partnership interests from the original investor. These transactions typically occur at a significant discount to the net asset value (NAV) of the fund and usually require the GP to approve the transaction.

## ***Understanding a drawdown structure:***

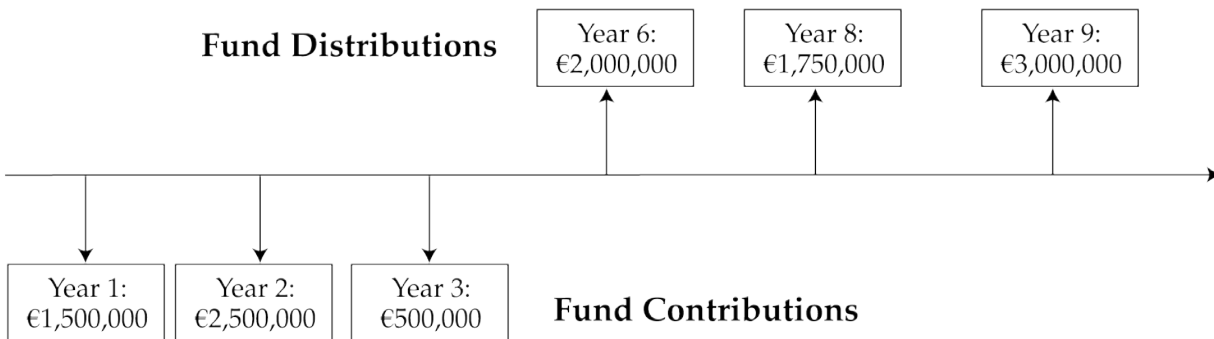
Private equity/credit, private real estate, and real asset funds typically call investors' capital in stages as fund investments are identified. This investment period is specified in the PPM and typically ranges from three to five years from the initial capital call. Thus, although an investor may have committed a specified percentage of the portfolio to an asset class, the allocation may not be fully funded until some point well into the future. We will illustrate the drawdown structure for a single fund using a hypothetical commitment to a real estate fund:

The Chan Family Partnership commits €5,000,000 to Uptown Real Estate LP. The fund has a three-year investment period. When fully invested, Uptown expects to hold 12 to 15 properties. The capital call schedule for Uptown may look something like this:

- Year 1: €1,500,000 of the €5,000,000 committed is called, covering three investments
- Year 2: €2,500,000 is called, covering six investments
- Year 3: €500,000 is called, covering two investments
- Year 6: €2,000,000 is distributed by Uptown Real Estate
- More distributions in subsequent years

Expanding on this example, [Exhibit 18](#) shows how the cash flows for our hypothetical fund might operate throughout the fund's life.

## Exhibit 18. Hypothetical Capital Call—Distribution Schedule



In reality, most funds will have several capital calls in a year. It is also possible that a fund may make a distribution before the final capital call occurs. Because of the highly uncertain liquidity profile of call down (or drawdown) funds (private equity/credit, real estate/real assets), it is incumbent on the investor to plan for multiple contingencies. Funds may end up calling significantly less capital than the investor assumed or may call capital at a faster pace than planned. Capital may be returned to the investor more quickly or more slowly than originally anticipated. Each of these scenarios could result in investors being under or over their target allocations. Critically, investors will want to verify that they have suitable liquidity, such that even under adverse conditions they are able to meet their capital calls. Investors who are unable to meet their capital calls may be required to forfeit their entire investment in the fund (or such other penalties as may be specified in the PPM).

The capital commitment/drawdown structure also presents potential opportunity costs for the investor. Returning to [Exhibit 18](#), having committed €5,000,000 to Uptown Real Estate LP, the Chan Family Partnership is obligated to meet the GP's capital calls but must address the opportunity cost of having the committed capital invested in lower-returning liquid (cash) assets pending the capital call—or face the risk of having insufficient assets available to meet the capital call if the funds were invested in another asset class that has experienced a loss in the interim. Also note that only €4,500,000 of the €5,000,000 commitment was called before distributions began.

## 6.2. Liquidity Risks Associated with the Underlying Investments

The investor must be aware of any potential mismatch between the fund terms and the liquidity profile of the underlying instruments held by the fund. This is particularly important if the investor is negotiating fund terms or if other investors have terms that may be different

from his own. Because the private market funds rarely offer interim liquidity, this problem most often arises in hedge funds. We provide a few examples of the issues an investor may encounter.

### ***Equity-oriented hedge funds:***

The majority of assets in a typical equity-oriented hedge fund are liquid, marketable securities compatible with monthly or quarterly fund-level liquidity terms. Short positions may be notably less liquid than long positions, so funds that make greater use of short selling will have correspondingly lower overall liquidity. This should be taken into consideration when evaluating the potential for a liquidity mismatch between the fund's terms and the underlying holdings. Some otherwise liquid hedge fund strategies may own a portion of their holdings in illiquid or relatively illiquid securities. The GP may designate these securities as being held in a "side pocket." Such "side-pocketed" securities are not subject to the fund's general liquidity terms. The redeeming investor's pro rata share of the side pocket would remain in the fund and be distributed at such time as the fund manager liquidates these assets, which could take quarters or even years to accomplish. If the percentage of assets held in side pockets is large, this could render the fund's liquidity terms irrelevant. The investor must evaluate the illiquidity challenges inherent in the underlying holdings, including side pockets, in order to estimate a liquidity profile for the total portfolio.

### ***Event-driven hedge funds:***

Event-driven strategies, by their nature, tend to have longer investment horizons. The underlying investments in a merger arbitrage strategy, for example, are generally liquid, but the nature of the strategy is such that returns are realized in "chunks." It is in the manager's and the investor's interests to ensure that the liquidity terms provide the necessary flexibility to execute the investment thesis. A hedge fund focused on distressed investing is dealing with both the "workout" horizon (the time frame over which the negotiations between the creditors and the company are being conducted) and the lesser liquidity of the distressed assets. The fund terms for a distressed strategy are likely to be much longer than other hedge fund strategies. (In fact, many distressed funds choose to organize in a private equity fund structure.)

### ***Relative value hedge funds:***

Many relative value hedge funds will invest in various forms of credit, convertibles, derivatives, or equities that have limited or at least uncertain liquidity characteristics. Many funds will include provisions in the fund documents to restrict redemptions under certain scenarios so that they are not forced to sell illiquid securities at inopportune moments.

Without such provisions, the fund manager may be forced to sell what securities they *can* (i.e., the more liquid holdings) rather than the securities that they *want*. This could have the unfortunate consequence of leaving remaining investors in the fund holding a sub-optimally illiquid portfolio. On the other hand, funds that deal in managed futures or similar instruments may have very flexible terms (daily or weekly liquidity, only a few days notification, etc.). This was a scenario many hedge fund managers faced during the Global Financial Crisis as investors made significant redemption requests to meet their own cash needs. The liquid funds were disproportionately affected as investors sought to raise cash wherever they could find it.

### ***Leverage:***

A fund's use of leverage and its agreements with counterparties providing the leverage can also affect the alignment between fund terms and the investment strategy. If a strategy is levered, lenders have a first claim on the assets. The lenders' claims are superior to those of the LPs, and the lenders have preferential liquidity terms; most lenders can make a margin call on stocks, bonds, or derivatives positions with just two days' notice. Given that margin calls are most likely to happen when the markets (and/or the fund) are stressed, the LPs' liquidity can evaporate as the most-liquid positions in the portfolio are sold to meet margin calls. The need to de-lever and sell assets to meet margin calls will typically result in a lower return when the market eventually recovers.

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## **7. FEES AND EXPENSES, TAX CONSIDERATIONS, AND OTHER CONSIDERATIONS**

- d.** discuss investment considerations that are important in allocating to different types of alternative investments;

In addition to management fees of 0.5% to 2.5% of assets and incentive fees of 10% to 20% of returns, investments in alternative assets often entail higher expenses passed through to or paid directly by the investor. These fees can result in a significant variation between the gross and net of fee returns. Consider a hedge fund that was earning a 3% gross quarterly return (12.6% annualized). After deducting a 2% management and a 20% incentive fee, accrued quarterly, the net return at year-end is just 8.2%.



Fees can have a larger impact on the difference between gross and net returns for such call-down-type fund structures as private equity funds, where the management fee is charged on *committed* capital, not invested capital. If the manager is slow to deploy capital, there can be a pronounced J-curve effect (negative IRRs in the early years) that can be difficult to overcome (the adage ‘it takes a 100% return to recover from a 50% loss’).

In addition, most alternative investment funds will pass through normal fund expenses, including legal, custodial, audit, administration, and accounting fees. For smaller funds, these additional costs can add up to another 0.5%. Larger funds can spread these same costs out over the larger asset base, and the pass-through to investors is likely to be in the range of 0.05% to 0.20% of assets. Some of these expenses have a limited life (e.g., the capitalized organizational expenses), so the impact can vary over time. Funds may also pass through to investors costs associated with acquiring an asset, including the due diligence costs and any brokerage commissions paid. A careful evaluation of the fund’s offering documents is essential to understanding the all-in cost of an investment in alternatives.

## 7.1. Tax Considerations

For taxable investors, the tax implications associated with many alternatives can have a significant impact on their relative attractiveness. In many instances, a tax inefficient strategy, one that generates substantial short-term gains or taxable income, can significantly erode the anticipated return benefits. This arises frequently with many hedge fund strategies, especially those funds and fund companies where tax-exempt investors dominate the client base and the fund manager may be insensitive to tax efficiency. Vehicle selection becomes an important tool to mitigate potential tax consequences. For example, certain Asia-based investors may use European or other offshore vehicles that feed into US strategies in order to mitigate US tax withholding. Conversely, some funds benefit from preferential tax treatment that might add to its relative attractiveness.

Here are a few examples of these tax considerations:

- The US tax code has provisions that favor real estate, timber, and energy investments. Timber sales, for example, are taxed at lower capital gains rates rather than as ordinary income and may benefit from a depletion deduction. Commercial and residential building assets can be depreciated according to various schedules, with the depreciation offsetting income received on those assets. Some oil and natural gas royalty owners may benefit from a depletion deduction, offsetting income generated from the sale of the oil or gas.
- Some alternative investment strategies can generate unrelated business income tax (UBIT). UBIT arises when a US tax-exempt organization engages in activities that are not related to the tax-exempt purpose of that organization. Since most tax-exempt

entities seek to mitigate (if not avoid) taxes, they will want to know if the fund might generate UBIT and, if so, whether the fund manager has any strategies that may shield the investor from such income.

- The taxable investor faces additional costs and operational complexities from complex tax filings. Some taxable investors must estimate their taxable income, including income that is derived from investments. This estimate can be a challenge. Unfortunately, if the misestimate is significant, it can result in tax penalties.

Tax considerations, like fees, will affect the return assumptions used in the exercise.

## 7.2. Other Considerations

Although smaller investors seeking to build a diversified alternative investment portfolio are generally constrained to use an intermediary, such as a fund of funds, they also have the opportunity to build a program in-house and must decide whether this is appropriate given their governance structure. Key questions to explore for each option include the following:

- What is the likelihood that the investor can identify and gain access to top-tier managers in the investment strategy?

Truly differentiated strategies and top-tier managers are not easily accessible and are often constrained, which tends to limit the amount of assets they can manage without negatively affecting investment returns. Fund manager compensation and other problems frequently limit the number of investors that they accept, and they often close their doors to new clients or capital. This can make it difficult for investors to find and access top-tier managers. Investors who are not comfortable with disclosure requirements may be rejected by a manager who is not willing to be based on a proprietary informational edge that could be eroded by public disclosures. Many studies on alternative assets have concluded that it is often not worth the costs and resources required to be successful in the alternative asset space if you do not have access to top-tier funds.

- What is the likelihood that the investor will be accorded the effective due diligence on an investment strategy?

It is not enough to know when or if to invest with a fund manager; it is also more important to be able to determine when to terminate the investment or to have no access to the key decision makers within the organization.

















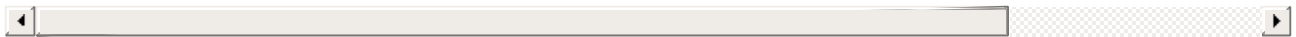










































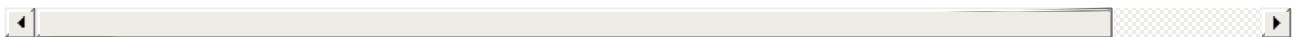








































































































































# Study Session 10

## Private Wealth Management (1)

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This study session addresses the process of private wealth management and the construction of an investment policy statement (IPS) for the individual investor. The IPS is a blueprint for investing client assets. The IPS identifies the needs, goals, and risk tolerance of the investor, as well as constraints under which the investment portfolio must operate. The adviser then formulates an investment strategy to tax-efficiently reconcile these potentially conflicting requirements.

Taxes and regulations are important considerations for individual investors. Because taxes and regulations vary from locality to locality, tax-efficient strategies for portfolio construction and wealth transfer are necessarily specific to the locality in which the investor is taxed. The study session focuses on investment strategies applicable across a wide range of localities. Although illustrations of such strategies may be presented from a country-specific perspective, candidates should focus on the underlying investment principles and be able to apply them to other tax settings.

## READING ASSIGNMENTS

- Reading 21** Overview of Private Wealth Management  
by Christopher J. Sidoni, CFP, CFA, and Vineet Vohra, CFA
- Reading 22** Topics in Private Wealth Management  
by Paul Bouchey, CFA, Helena Eaton, PhD, CFA, and Philip Marcovici

# Reading 21

## Overview of Private Wealth Management

by Christopher J. Sidoni, CFP, CFA, and Vineet Vohra, CFA

*Christopher J. Sidoni, CFP, CFA, is at Gibson Capital, LLC (USA). Vineet Vohra, CFA, is at Cognasia Talent (Singapore and Hong Kong SAR).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a. contrast private client and institutional client investment concerns;
- b. discuss information needed in advising private clients;
- c. identify tax considerations affecting a private client's investments;
- d. identify and formulate client goals based on client information;
- e. evaluate a private client's risk tolerance;
- f. describe technical and soft skills needed in advising private clients;
- g. evaluate capital sufficiency in relation to client goals;
- h. discuss the principles of retirement planning;
- i. discuss the parts of an investment policy statement (IPS) for a private client;
- j. prepare the investment objectives section of an IPS for a private client;
- k. evaluate and recommend improvements to an IPS for a private client;
- l. recommend and justify portfolio allocations and investments for a private client;
- m. describe effective practices in portfolio reporting and review;

- n. evaluate the success of an investment program for a private client;
- o. discuss ethical and compliance considerations in advising private clients;
- p. discuss how levels of service and range of solutions are related to different private clients.

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## 1. INTRODUCTION AND PRIVATE CLIENTS VERSUS INSTITUTIONAL CLIENTS

- a. contrast private client and institutional client investment concerns;

Private wealth management refers to investment management and financial planning for individual investors. The private wealth sector has grown considerably as global wealth has increased and as individuals have taken on more of the responsibility for managing their own financial resources. Private wealth managers can help individual investors seek the benefits as well as navigate the complexities of financial markets.

This reading introduces candidates to the process of designing and executing an investment plan or strategy for the individual investor. We discuss the tools and techniques used by private wealth managers and how the wealth manager interacts with the client to serve the client's needs. Section 1 examines the key differences between private clients and institutional clients. In Section 2, we discuss how the wealth manager gains an understanding of the client and identifies key attributes of the client's financial situation that are relevant to the wealth management process. Sections 6 and 7 cover investment planning, including capital sufficiency and retirement planning. Section 8 discusses the investment policy statement, including its various underlying parts. Sections 10 and 11 analyze portfolio construction, portfolio reporting, and portfolio review. Finally, in Sections 13 and 14, we discuss the practice of private wealth management, including ethical considerations for private wealth managers, compliance considerations, and the various client segments that private wealth managers encounter.

Reflecting the variation in industry terms, we use the terms “private wealth managers,” “wealth managers,” and “advisors” interchangeably.<sup>1</sup> We also refer to “individual investors” as “private clients” or, simply, “clients.” In practice, private wealth managers typically operate either independently or as representatives of organizations, such as wealth management firms, banks, and broker/dealers.

## 1.1. Private Clients versus Institutional Clients

Private clients include individuals and families seeking to invest their personal wealth. These clients are asset owners but typically retain private wealth managers to undertake investment responsibilities on their behalf. Private clients and institutional clients have different concerns, including the following:

- *Investment objectives.*<sup>2</sup> Private clients have diverse investment objectives, some of which may be broadly defined. By contrast, institutional investors tend to have specific, clearly defined investment objectives.
- *Constraints.* Private clients face constraints that differ from those of institutional clients, such as generally shorter time horizons, smaller portfolio sizes (less scale), and more significant tax considerations.
- *Other distinctions.* Institutional investors operate under a formal governance structure and often have a greater level of investment sophistication than many private clients. Behavioral issues may also be more prominent for private clients. In addition, while regulation is common to both private clients and institutional clients, the regulatory bodies and frameworks may differ.

### 1.1.1. Investment Objectives

Private clients have several potential investment objectives. Some common objectives include financial security during the client's retirement years, the ability to provide financial support to family members, and the funding of philanthropic goals. These objectives, however, may not be clearly defined or quantified. For example, a private client's goal may be to fund her retirement lifestyle, but she may not be able to quantify the annual cash flow requirement. She may be able to estimate what is required at the beginning of retirement but uncertain about how the required amount may fluctuate throughout retirement. A different client may wish to fund higher education expenses for his young children. However, he may not know how many of his children will attend a college or university, or what tuition and expenses will be.

Private client investment objectives often compete with one another and may change over time. Consider a business owner who wishes to fund a comfortable retirement for himself and also give generously to certain charities. An unexpected change in his business may shift his priorities considerably. For example, a business downturn may cause him to reduce his charitable goals or eliminate them completely. Conversely, a significant liquidity event, such as the sale of his business, may make a comfortable retirement virtually certain, causing the client to increase his charitable aspirations.

In contrast to private clients, institutional clients tend to have more clearly defined objectives, which are typically related to a specific liability stream. For example, the investment program of a pension plan is designed to meet its benefit obligation, while a university endowment allocates investments to achieve its spending policy. Unlike the objectives of private clients, the primary objectives of these institutional investors are unlikely to change materially over time.

### **1.1.2. Constraints**

Private clients have unique constraints, resulting in investment strategies and approaches that are different from those of institutional clients. Such constraints include time horizon, scale, and taxes.

#### **1.1.2.1. Time horizon**

In general, individual investors have a shorter time horizon than institutional investors, whose horizon is often theoretically infinite. With shorter time horizons, individual investors are typically more constrained than institutions with respect to risk taking and liquidity. Time horizons also depend on an investor's objectives. For example, individual investors may have different time horizons for different objectives, while institutional investors tend to have a single time horizon and a single investment objective.

#### **1.1.2.2. Scale**

In general, individual investor portfolios tend to be smaller in size (or scale) than those of institutional investors. Because of this smaller portfolio size, many individual investors face limitations relating to certain asset classes, such as private equity and private real estate, which require a significant investment and would result in an imbalanced portfolio. As with time horizon, the size of private client portfolios can vary widely.

#### **1.1.2.3. Taxes**

Taxes are a significant and complex consideration for many individual investors, and they vary by jurisdiction. The presence of taxes on investment income or on realized capital gains can impact such investment decisions as asset allocation and manager selection. Investment strategies that result in considerable taxable income may be more favored by a tax-exempt institution than by a taxable private client. Similarly, tax-efficient investments may be more attractive to taxable private clients. An example of a tax-efficient investment is a low-turnover common stock portfolio.

### **1.1.3. *Other Distinctions***

In addition to investment objectives and constraints, there are other key distinctions between private clients and institutional clients. Private clients have a less formal governance structure, are typically less sophisticated at investing, may operate under a different regulatory regime, and are more individually unique and complex. Because of these aspects, the personality profile, time allocation, and resource needs/constraints of a private wealth manager differ significantly from those of an institutional manager.

#### **1.1.3.1. Investment Governance**

The investment governance model and the decision-making process for individual investors differ considerably from those of institutional investors. Institutional investors typically operate under a formal governance structure. This governance structure generally includes a board of directors and an investment committee, sometimes augmented by independent directors with investment expertise. The investment committee may consist of a subset of the board of directors, or the board may delegate this responsibility to an internal committee of staff members. The board and the investment committee play a key role in setting the investment strategy and monitoring investment performance.

By contrast, investment governance for individual investors tends to be less formal. The individual investor works with a private wealth manager to determine an appropriate investment policy. The investment policy is often described in an investment policy statement (which is discussed later in this reading) and typically grants implementation and reporting responsibilities to the wealth manager.

#### **1.1.3.2. Investment Sophistication**

Institutional investors tend to have a higher degree of investment sophistication than the typical private investor as well as access to more investment resources. Unlike institutional clients, private clients do not normally benefit from the “checks and balances” of a formal investment governance framework. As a result, private clients can be more vulnerable to making “emotional” investment decisions.

#### **1.1.3.3. Regulation**

In most countries, the regulatory environment is different for individual and institutional investors. In some cases, separate regulators focus on these two investor segments. For example, in the United States, the Securities and Exchange Commission (SEC) and state regulators oversee independent registered investment advisors (RIAs), while the Financial Industry Regulatory Authority (FINRA) covers those advisors who work for broker/dealer organizations. In other cases, the individual and institutional investor groups share a common

regulator but are subject to different regulations. An example of this structure occurs in Singapore, where the Monetary Authority of Singapore (MAS) is the primary regulator of financial institutions, yet the MAS also regulates individual investors through its Financial Advisors Act (FAA). This shared regulatory structure also exists in several other countries, such as Australia, China, India, Indonesia, and Malaysia.

#### **1.1.3.4. Uniqueness and Complexity**

One final difference between private and institutional clients relates to the uniqueness and complexity of individuals. Private clients with similar sets of financial considerations and objectives may nevertheless pursue different investment strategies. Multiple factors may influence each individual's preferences, needs, and concerns—notably, family background and upbringing, work history, sources of wealth, investment experience, groups of friends, and geographic location. Institutional clients with similar considerations and objectives may also follow different investment strategies, but this outcome is less likely with institutional clients than with private clients.

### **EXAMPLE 1**

## **Private versus Institutional Clients**

Garrett Jones, age 74, is a member of the investment committee for a local non-profit endowment. The endowment portfolio includes sizable allocations to less liquid and more volatile asset classes, such as hedge funds and private equity. Jones's personal portfolio, which is modest in size, contains no exposure to hedge funds or private equity. Jones asks his wealth manager about the lack of exposure to these asset classes.

Discuss why the wealth manager has likely not recommended investments in hedge funds and private equity to Jones.

### **Solution:**

Jones's wealth manager has likely not recommended these investments because of certain private client constraints. First, as an individual investor, Jones likely has a shorter time horizon and/or greater liquidity needs than an institutional investor (such as the endowment for which Jones is a committee member). Second, the relatively small size of Jones's personal portfolio will most likely preclude investing in certain asset classes, such as hedge funds and private equity, which require a significant investment and would result in an imbalanced portfolio. Finally, Jones's personal tax considerations may make these investments relatively unattractive.

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## 2. UNDERSTANDING PRIVATE CLIENTS: INFORMATION NEEDED IN ADVISING PRIVATE CLIENTS

- b. discuss information needed in advising private clients;
- c. identify tax considerations affecting a private client's investments;

Every new private client engagement begins with developing an understanding of the client. In this section, we begin with a discussion of the information needed in advising private clients and how wealth managers obtain this information. In addition, we discuss a process for formulating client goals, the evaluation of a private client's risk tolerance, and both the technical and "soft" skills needed to advise private clients.

### 2.1. Information Needed in Advising Private Clients

Wealth managers gather client information predominantly through conversations with clients and by reviewing various financial documents. In this section, we cover the relevant personal, financial, and other information needed in advising private clients.

#### 2.1.1. *Personal Information*

The process of gathering personal information begins when the wealth manager first communicates with the individual investor. In introductory meetings or telephone calls, individuals typically learn about how wealth managers work with clients, the types of clients that they advise, their areas of expertise, and their fees for service. At the same time, wealth managers ask questions to learn more about prospective clients and what is important to them. While the main purpose of this first interaction is to determine mutual "fit," the introductory conversation often also provides valuable portfolio management information to both sides.

Once an individual becomes a private client, the wealth manager starts by learning about the client's family situation, including marital status, the number of children and grandchildren,



and the ages of family members. In most jurisdictions, obtaining proof of client identification is required. For example, a copy of a passport may need to be obtained. The client's employment and career information is also important, as is a discussion about the client's future career, business, or retirement aspirations. In addition, wealth managers should assess the sources of a client's wealth. This information is not always evident from investment statements or reports. For example, a client who has gradually built her wealth through regular portfolio contributions over many years likely has significant experience with market volatility. She also may be able to articulate her emotional reactions (or lack thereof) to various market events. A different client who has relatively new wealth due to the sale of a business may not have this same experience or ability.

As part of the investment background conversation, the wealth manager should determine whether the client has an explicit return objective. Some clients have clear expectations for minimum absolute or relative return targets. Other clients are more concerned with meeting specific goals and may not have a particular return objective. Information about a client's investment preferences may also be generated through conversation with the wealth manager. For instance, liquidity preferences or a desire to consider environmental, social, and governance (ESG) issues in investments may surface in early conversations.

Finally, a detailed discussion of the client's financial objectives (often also referred to as "goals") and risk tolerance is part of the personal information gathering process. We discuss goals, objectives, and risk tolerance in more detail later in this reading.

### **2.1.2. Financial Information**

It is important for wealth managers to understand the financial information of a private client. In many cases, private clients do not maintain and regularly update personal financial statements, such as a *personal balance sheet* (also known as a net worth statement) or a statement of cash flows. Therefore, one responsibility of the wealth manager is to piece together these financial statements for the client.

On a private client's personal balance sheet, assets typically include the following:

- Cash and deposit accounts
- Brokerage accounts
- Retirement accounts (e.g., employer-sponsored defined contribution plan accounts or the present value of defined benefit pensions)
- Other employee benefits, such as restricted stock or stock options
- Ownership interests (stock) in private businesses

- Cash-value life insurance<sup>3</sup>
- Real property, including residences, rental property, and land
- Other personal assets (e.g., automobiles, art, or jewelry)

Liabilities on a private client's balance sheet typically include the following:

- Consumer debt, such as credit card balances and loans outstanding
- Automobile loans
- Student loans
- Property-related loans, such as mortgages and home equity loans (or lines of credit)
- Margin debt in brokerage accounts

Clients provide information about their assets and liabilities to wealth managers through copies of statements and reports. A key challenge for wealth managers is that the information provided by clients may not be comprehensive. To fully understand a client's financial profile, a wealth manager needs to analyze and synthesize these statements and reports.

[Exhibit 1](#) shows a sample personal balance sheet for a fictitious married couple, Steven and Jenny MacAuley.

### Exhibit 1. Sample Personal Balance Sheet

ASSETS		LIABILITIES	
<b>Cash and Deposit Accounts</b>		<b>Consumer Debt</b>	
Bank deposit account	EUR 40,000	Credit cards	EUR 30,000
<b>Brokerage and Retirement Accounts</b>		<b>Property-Related Loans</b>	
Individual account for Steven	EUR 850,000	Mortgage for personal residence	EUR 320,000
Individual account for Jenny	EUR 1,200,000	Mortgage for rental property 1	EUR 110,000
Retirement account for Steven	EUR 1,400,000	Mortgage for rental property 2	EUR 180,000
<b>Private Investment</b>			

Private stock for Jenny	EUR 2,000,000		
<b>Real Property</b>			
Personal residence	EUR 900,000		
Rental property 1	EUR 250,000		
Rental property 2	EUR 350,000		
Automobiles	EUR 75,000		
Other personal property	EUR 50,000		
<b>Total Assets</b>	<b>EUR 7,115,000</b>	<b>Total Liabilities</b>	<b>EUR 640,000</b>
		<b>Total Net Worth</b>	<b>EUR 6,475,000</b>

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Beyond assets and liabilities, cash flows are also highly relevant to a private client's financial situation. Sources of cash flows may include employment income, business profit distributions, government income benefits, pensions, annuity income, and portfolio income/distributions. A projection of the client's annual expenses is valuable even if clients do not maintain detailed expense information. In addition, the relevance of expense information varies by client. For example, consider a young, modestly affluent couple versus an older couple who possess wealth that is well beyond their needs. For the young couple, expense information is vital for the wealth manager in determining how much the couple can save toward their goals through improved budgeting. By contrast, obtaining detailed expense information is likely less important in the case of the older, wealthier couple, who are not as budget constrained.

### **2.1.3. Private Client Tax Considerations**

A client's specific tax circumstances can be assessed from the client's tax returns. Tax returns, in particular, provide information that may not otherwise surface in conversations between the wealth manager and the client. In this section, we provide a basic overview of common types of taxes, discuss the global applicability of various tax types, and introduce basic tax strategies for private clients.

### 2.1.3.1. Common Tax Categories

Taxes for individuals vary by jurisdiction, although some categories are reasonably consistent globally:

- *Taxes on income.* These include taxes on salaries, interest, dividends, capital gains, and rental income.
- *Wealth-based taxes.* These include taxes on the holding of certain types of property (e.g., real estate) and taxes on the transfer of wealth (e.g., taxes on inheritance).
- *Taxes on consumption/spending.* These include sales taxes (i.e., taxes assessed on the final consumer of goods or services) and value-added taxes (i.e., taxes assessed in the intermediate steps of producing a good or service but ultimately paid by the final consumer).

Capital gains taxes are a good illustration of the variability and complexity of global taxes. For example, in Canada, only half of an individual's "net" capital gains (i.e., total capital gains minus total capital losses) are included in taxable income and are taxed at the client's top marginal rate (that is, the rate to be paid on additional income). In the United States and several other jurisdictions, gains on securities over short-term holding periods are taxed at the client's highest marginal income tax rate, while gains on securities over long-term holding periods are taxed at a "long-term" capital gains rate that is generally lower than the marginal income tax rate. India also distinguishes between long-term and short-term capital gains and has several additional considerations that relate to taxes on securities transactions.

### 2.1.3.2. Basic Tax Strategies

Taxes are normally reflected in a private client's financial plan and asset allocation decisions. While an in-depth discussion of tax strategies is beyond the scope of this reading, the following considerations are common to many clients:

- *Tax avoidance.* Individuals clearly prefer to avoid paying taxes, if possible. Tax avoidance should not be confused with illegal tax evasion. Some countries allow investors to contribute limited amounts to certain accounts that permit tax-free earnings and future withdrawals. Another example of tax avoidance involves various wealth transfer techniques. In a jurisdiction that permits limited amounts of gifts to be transferred without incurring gift taxes, the client can reduce the effects of an estate or inheritance tax both on the amount of the gift and on future capital appreciation.
- *Tax reduction.* Wealth managers typically seek opportunities to reduce the effect of taxes for private clients. For example, a wealth manager may recommend tax-exempt bonds that can produce a higher tax-adjusted return than taxable bonds. Or a wealth manager

may recommend limiting exposure to asset classes with less favorable tax characteristics while increasing exposure to more tax-efficient asset classes.

- *Tax deferral.* By deferring the recognition of certain taxes until a later date, clients can benefit from compounding portfolio returns that are not diminished by periodic tax payments. Some investors in a progressive tax system (i.e., a system in which the tax rate increases as income increases) may also seek to defer taxes because they anticipate lower future tax rates. For example, a client with a high level of compensation (and a high marginal tax rate) during her working years may seek to defer taxes on investment income or gains until after retirement (assuming her marginal income tax rate will then be lower). Another example of a tax deferral strategy is limiting portfolio turnover and thus the realization of capital gains.

## EXAMPLE 2

### Basic Tax Strategies

Roseanna Rodriguez meets with her wealth manager, Raj Gupta, CFA, to discuss her investment strategy and financial plan. Gupta mentions the importance of tax strategies in Rodriguez's financial plan and makes three recommendations:

1. Invest in two different account types: (1) an account that permits both earnings and future withdrawals to be tax-free and (2) an account that permits earnings to accumulate tax-free but requires that taxes be paid when assets are withdrawn from the account.
2. Reduce exposure to an asset class with undesirable tax characteristics in favor of an asset class that is more tax-efficient.
3. Delay the sale of shares of a stock position until the year following retirement.

Identify the basic tax strategy (or strategies)—tax avoidance, tax reduction, or tax deferral—represented in each of the three recommendations.

#### **Solution:**

The first recommendation represents both tax avoidance and tax deferral. With the account that permits tax-free accumulation and distributions, Rodriguez would be avoiding taxes. With the account that permits tax-free accumulation but results in income taxes upon distribution, Rodriguez would be deferring taxes.

The second recommendation is an example of tax reduction because the recommended asset class would incur lower taxes. The third recommendation is an example of tax

deferral and may also be an example of tax reduction if Rodriguez's tax rate declines after retirement.

#### **2.1.4. Other Relevant Information**

Private wealth managers typically gather other information from clients that is related to financial planning. For a client's estate plan (in applicable jurisdictions), the wealth manager obtains copies of relevant legal and governing documents, such as wills and trust documents. Wealth managers also obtain detailed information about the client's life insurance, disability insurance, excess liability coverage, and any other relevant insurance coverage.

We stated previously that private clients tend to have less formal governance models than institutional investors. As part of the information-gathering phase, wealth managers and clients typically establish decision-making parameters as part of investment governance. In fact, wealth managers have an opportunity to help *create* a governance model for clients. Wealth managers and clients normally agree on who can approve and/or change investment policies, who can authorize trading activity, and who can authorize money transfers. When advising couples, it is important to establish whether one individual will be the primary contact with the wealth manager and whether each individual is authorized to make decisions on behalf of the other. Clear guidelines on these issues can minimize the possibility of future misunderstandings or conflicts.

Wealth managers seek information regarding clients' service needs and expectations. For example, it is helpful for the wealth manager to describe her standard practices for portfolio reporting (i.e., frequency, format, information content, and delivery method) and discuss whether the client has reporting needs that differ from the wealth manager's standard practices. When clients expect to have regular cash flow activity, such as periodic withdrawals from their portfolio, the wealth manager should assist in creating an efficient and secure process for executing these transactions. Finally, some clients prefer that their wealth manager interact directly with their other service professionals, such as accountants and legal representatives. The wealth manager and the client should have a clear understanding of what information should and should not be shared with these parties.

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### **3. CLIENT GOALS**

- d. identify and formulate client goals based on client information;

As part of the information-gathering process, wealth managers help private clients formulate and prioritize their goals. These goals may relate to education, property, discretionary spending, gifts to loved ones, health care, or other significant financial considerations. Financial goals are not always apparent, defined, or measurable: they may be expressed by clients as wishes, desires, or aspirations. When goals are uncertain or ambiguous, wealth managers have an opportunity to help clients understand their true objectives, to assess trade-offs and issues with respect to goal prioritization, and to align the client's investment strategy accordingly. This section focuses on the two types of financial goals that are typical of private clients—planned goals and unplanned goals.

## 3.1. Planned Goals

*Planned goals* are those that can be reasonably estimated or quantified within an expected time horizon. The following are some examples of planned goals:

- *Retirement.* Maintaining a comfortable lifestyle beyond their working years is a goal for most clients.
- *Specific purchases.* Client goals may focus on specific purchases, which tend to be a function of the level of wealth and/or stage of life. For instance, younger clients or those with relatively low levels of wealth may wish to save for a primary residence. In contrast, older clients or those with more significant levels of wealth may plan for a second residence, a vacation property, or other luxury items (e.g., art or rare collectibles).
- *Education.* Clients often wish to fund their children's education. The amount of expenditure needed for education varies widely. In some locations, such as the United States, the increase in education costs has significantly exceeded the general rate of inflation. Foreign exchange risk may be a factor for clients whose children study abroad.
- *Family events.* Family events, such as weddings, can be significant expenditures for clients.
- *Wealth transfer.* Clients typically plan for their wealth to outlast their own lifetime. An inheritance for beneficiaries may be transferred when the client dies or, in some cases, during the client's lifetime. When clients have a definite amount that they wish to transfer, this goal may need to be prioritized over other goals.
- *Philanthropy.* Clients often wish to make charitable donations during or after their lifetime. This objective may depend on a client's wealth level and country/region.

## 3.2. Unplanned Goals

*Unplanned goals* are those related to unforeseen financial needs. These goals are typically more challenging than planned goals because of the difficulty of estimating the timing and the amount of funding needed. The following are some examples of unplanned goals:

- *Property repairs.* Although households may be insured against losses or catastrophes, clients may face additional spending needs if insurance does not fully cover such events. The timing of these potential obligations is often uncertain.
- *Medical expenses.* Private client households normally have medical insurance for illness or hospitalization, but health insurance may not cover all medical expenses. The potential for unexpected medical expenses varies significantly by country/region. As with education costs, increases in health care costs in some countries/regions have far exceeded the general rate of inflation. A related issue in some locations is the potential cost of elder care for oneself or one's family members.
- *Other unforeseen spending.* Beyond property repairs and medical expenses, various other unexpected events commonly occur in the lives of private clients that may require significant financial outlays.

## 3.3. The Wealth Manager's Role

Goals are among the more complex aspects of a client's financial profile. Because goals are often not clearly defined, wealth managers play a direct role in helping clients articulate these objectives. The following are some relevant considerations in client goal creation:

- *Goal quantification.* Sometimes clients do not have specific, quantifiable goals that wealth managers can analyze. For example, a young client may be unable to estimate her future retirement lifestyle needs, while another client's well-articulated retirement needs may not be realistic in the private manager's assessment. In both cases, the wealth manager has an opportunity to formulate specific client goals. The wealth manager can help the client quantify each goal and plan accordingly.
- *Goal prioritization.* Private clients tend to have multiple, sometimes competing, goals. For example, ensuring a more secure retirement may mean less funding for the education of a client's grandchildren. When clients have competing priorities, wealth managers have an opportunity to help them decide what matters most. Goal prioritization depends on what is most important to the client, not necessarily which needs occur sooner in the client's investment horizon.



- *Goal changes.* Individual investors' circumstances may change for a variety of reasons. When these changes occur, wealth managers sometimes must help clients re-prioritize their financial goals and reassess their investment strategy. Identifying client goals is not a one-time task but rather a part of an ongoing dialogue between wealth manager and client.

**Example 3** provides an illustration of client goals for a fictitious individual, C.Y. Lee.

## EXAMPLE 3

### Client Goals

Mr. C.Y. Lee is a managing director for the investment firm Acme & Bass, which is located in the Asia-Pacific region. Lee is 43 years old, is married, and has two children, ages 12 and 10. He and his family reside in a home that they own in Singapore. In a conversation with his wealth manager, Lee states that he wishes to fund the undergraduate tuition for his children to study abroad. Lee expects the tuition cost to be approximately £40,000 per year. Lee also wishes to fund his children's weddings at some point in the future. Because the education costs will occur in the next 5–10 years, Mr. Lee states that they are his top priority.

Lee anticipates working until age 65 and does not know how much he and his wife will need to fund their retirement lifestyle. He mentions his desire to purchase a flat in London and let (rent) it as part of their retirement plan. The flat would cost approximately £1.5 million. Lee is also concerned about the future health care expenses of his wife's parents and to what degree he and his wife may need to support them financially.

1. Identify Lee's planned goals.
2. Identify Lee's unplanned goals.
3. Discuss the issue of goal quantification for Lee.
4. Discuss the issue of goal prioritization for Lee.

### Solution to 1:

Lee's planned goals are (a) funding his children's education; (b) funding his children's weddings; (c) funding his and his wife's retirement; and (d) purchasing and subsequently letting (renting) a flat in London.

## Solution to 2:

Lee's unplanned goals relate to the future health care expenses of his wife's parents, as well as possible uninsured property repairs for the Lee's Singapore residence and, if purchased, their London flat.

## Solution to 3:

Lee has quantified the education funding goal and the flat purchase. He and his wealth manager should work to estimate the cost of the weddings for Lee's children and the anticipated retirement lifestyle needs for Lee and his wife.

## Solution to 4:

Lee states that his first priority is education funding for his children. However, the timing of a need should not be the sole determinant of goal priority. If funding their children's education costs will leave Lee and his wife unprepared for retirement, for example, they may wish to reevaluate their priorities.

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## 4. PRIVATE CLIENT RISK TOLERANCE

- e. evaluate a private client's risk tolerance;

Evaluating a private client's risk tolerance is a key step in the information-gathering process. In practice, the term *risk tolerance* sometimes is used to describe a set of risk-related concepts. The following are some key terms used in this context:

- **Risk tolerance** refers to the level of risk an individual is willing and able to bear. Put another way, risk tolerance is the willingness to engage in a risky behavior in which possible outcomes can be negative. Risk tolerance is the inverse of **risk aversion**, which is the degree of an investor's *unwillingness* to take risk.
- **Risk capacity** is the ability to accept financial risk. The key difference between risk capacity and risk tolerance is that risk capacity is more objective in nature, while risk tolerance relates to an attitude. Risk capacity is determined by the client's wealth, income, investment time horizon, liquidity needs, and other relevant factors. Clients

with greater risk capacity can tolerate greater financial losses without compromising current or future consumption goals.

- **Risk perception** is the subjective assessment of the risk involved in the outcome of an investment decision. Unlike risk tolerance, risk perception—how a client perceives the riskiness of an investment decision or the investment climate—depends on the circumstances involved. Consequently, a wealth manager can help shape a client’s risk perception. Generally speaking, risk perception varies considerably among individuals.

## 4.1. Risk Tolerance Questionnaire

In practice, wealth managers often utilize questionnaires to assess clients’ risk tolerance. The result of a risk tolerance questionnaire, typically a numerical score, is often used as an input in the investment planning process. [Exhibit 2](#) provides some common types of questions that may be found on a risk tolerance questionnaire.

### Exhibit 2

## Sample Questions from a Risk Tolerance Questionnaire

1. When you make investment decisions, on which of the following do you tend to focus?
  - a. Always on the potential for gain
  - b. Usually on the potential for gain
  - c. Always on the potential for loss
  - d. Usually on the potential for loss
2. Compared to your friends and family, are you:
  - a. less willing to take risk?
  - b. equally willing to take risk?
  - c. more willing to take risk?

3. What potential percentage decline in your investment portfolio value over a one-year period are you willing to experience?
- a. 5%
  - b. 10%
  - c. 20%
  - d. 30%
  - e. More than 30%
4. Which of the following statements best describes your attitude about the performance of your investment portfolio over the next year?
- a. I can tolerate a substantial loss.
  - b. I can tolerate a loss.
  - c. I can tolerate a small loss.
  - d. I would have a hard time tolerating a loss of any magnitude.
5. Suppose that you have made an investment that, due to a sudden broad market decline, has declined in price by 25%. Which of the following actions would you take?
- a. Sell all of the investment.
  - b. Sell a portion of the investment.
  - c. Hold the investment (take no action).
  - d. Buy more of the investment.
6. Suppose that you have access to two types of investments: one investment with low risk and low expected return and one with high risk and high expected return. Which of the following portfolio mixes would you select?
- a. 100% low risk/low return
  - b. 75% low risk/low return and 25% high risk/high return
  - c. 50% low risk/low return and 50% high risk/high return

- d. 25% low risk/low return and 75% high risk/high return
  - e. 100% high risk/high return
7. Suppose that you are offered employment that involves the choice of a fixed salary, variable compensation that could be higher or lower than the fixed salary, or some mix of the two. Which of the following would you choose?
- a. Entirely fixed salary
  - b. Mostly fixed salary
  - c. Entirely variable compensation
  - d. Mostly variable compensation
  - e. An equal mix of the two
- 

Risk tolerance questionnaires are not perfect and it is unclear whether they are predictive of investor behavior. Recommending an investment or an asset allocation for a client based upon the questionnaire requires significant judgment on the part of a wealth manager. In fact, academic studies indicate a high degree of subjectivity in the client questionnaire approach. This subjectivity increases the potential for the wealth manager's own views on risk to become an influential factor in making investment decisions for a client. Other studies demonstrate how the structuring of questions affects investor responses. For example, presenting a loss in either percentage or dollar terms can lead to different responses from the same individual. Similarly, a question that involves a small dollar loss on a small portfolio may generate a different response than a question involving a large dollar loss on a large portfolio, even if the percentage losses are the same.

## 4.2. Risk Tolerance Conversation

As in the information-gathering process described earlier, conversations with the client can produce valuable insights into that individual's risk tolerance that may not be evident from a risk tolerance questionnaire or an assessment of personality type. These insights may include the following:

- The degree to which the client's financial decisions are influenced by friends or family members.

- The financial experiences that have shaped the client’s perspective: For example, individuals who lived through deep recessions, even in childhood, may bring that perspective to present-day investment decisions.
- The client’s past investment mistakes and successes.
- The client’s accumulation of investment wealth—for example, whether the client achieved wealth through saving, inheritance, a liquidity event, or some combination thereof.
- The client’s evaluation of investment risk—that is, whether the client thinks of investment losses in absolute or percentage terms.

Conversations about risk tolerance enable the wealth manager to educate a client about investment risk. For example, a wealth manager may demonstrate how certain risk factors (e.g., interest rate risk, credit risk, and equity risk) can produce incremental returns as well as incremental losses. As another example, a wealth manager may ask a client to select from a “menu” of portfolio options with a range of expected returns and degrees of volatility. The client’s choice from this menu provides some information about the individual’s risk tolerance.

### **4.3. Risk Tolerance with Multiple Goals**

To this point, we have discussed a client’s overall risk tolerance. Because clients often have multiple goals or objectives, their risk tolerance may vary for different goals. For example, a client may have a low risk tolerance with respect to near-term goals (such as education costs) but a higher risk tolerance when it comes to longer-term goals (such as retirement needs). A challenge for wealth managers in managing client relationships is to satisfactorily address potentially conflicting risk tolerance levels.

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## **5. TECHNICAL AND SOFT SKILLS FOR WEALTH MANAGERS**

- f. describe technical and soft skills needed in advising private clients;

Private wealth management resembles both an art and a science. That is, a wealth manager

needs to have the professional aptitude to understand the client's financial goals, objectives, and constraints, as well as the financial acumen to recommend appropriate investments and portfolio management solutions. In short, wealth managers need both technical skills and non-technical ("soft") skills to succeed in their advisory roles.

## 5.1. Technical Skills

Technical skills represent the specialized knowledge and expertise necessary to provide investment advice to private clients. In some jurisdictions, regulators require minimum qualifications for technical skills among wealth managers. Examples of technical skills include the following:

- *Capital markets proficiency.* Private wealth management requires an understanding of capital market dynamics as part of helping clients achieve their financial goals. In most cases, wealth managers must have a broad understanding of capital markets and asset classes, as opposed to a specialist viewpoint. For example, a wealth manager will likely not have the same sector- or security-level expertise as an equity analyst who focuses on a specific industry.
- *Portfolio construction ability.* In conjunction with capital markets proficiency, private wealth managers need the ability to construct portfolios that are appropriate for each client's financial situation. This ability requires a deep understanding of asset class risks and returns; an awareness of the correlations among asset classes; and knowledge of investment vehicles, managers, products, and strategies for implementing a client's investment program.
- *Financial planning knowledge.* Wealth managers are typically not experts in specialized financial planning fields such as estate law, taxation, and insurance. However, these fields are highly relevant to the practice of wealth management. As a result, wealth managers who have a working knowledge of these related fields can add meaningful value for a client and can more effectively interact with the other professionals who serve that client.
- *Quantitative skills.* Given the need for investment analysis and portfolio construction, quantitative skills are critical for private wealth managers.
- *Technology skills.* Wealth managers use technology to manage client portfolios as well as improve efficiency in delivering advice and services. Examples of technology used by wealth managers include portfolio optimization software, simulation modeling tools, portfolio management software, portfolio accounting and performance reporting packages, and customer relationship management (CRM) software.

- *Language fluency.* In some situations, the ability to communicate in more than one language is a critical technical skill—for example, when a wealth manager has a multinational client base, manages cross-border transactions, or works in markets where more than one language is commonly spoken.

## 5.2. Soft Skills

Soft skills typically involve interpersonal relationships—that is, the ability to effectively interact with others. While soft skills are more qualitative and subjective than technical skills, they are critical nonetheless in the practice of private wealth management. Soft skills include the following:

- *Communication skills.* Because wealth managers interact extensively with clients, strong communication skills are essential. Communication skills begin with active listening when gathering client information. Effective verbal communication requires being able to ask the right questions as well as knowing *how* to ask questions. Meanwhile, effective written communication has become even more relevant with the increased use of email for communicating with clients. Presentation skills are commonly needed by wealth managers for engaging in group meetings and understanding the sophistication of the audience.
- *Social skills.* The ability to understand and relate to others and demonstrate empathy is a critical skill for wealth managers, particularly when “bad news” (e.g., poor investment performance) needs to be delivered to clients. Social skills also include the ability to read and interpret various non-verbal cues, such as body language.
- *Education and coaching skills.* An important role for a wealth manager is to educate and coach clients about investing and the wealth management process. Effective wealth managers are able to tailor this education and coaching to a client’s level of sophistication.
- *Business development and sales skills.* Wealth managers often participate in or lead new business development for their firms or practices. Business development involves initiating contact with prospective clients (often called “prospects”), while the sales aspect involves successfully converting prospects into actual clients. Business development and sales entail several of the technical and soft skills previously mentioned. For example, wealth managers need to demonstrate capital markets and investment expertise while using effective communication and social skills.

### EXAMPLE 4



## Technical and Soft Skills

John Müller, CFA, a private wealth manager, recently received feedback from clients and colleagues as part of his performance review. Clients commented favorably on how Müller coordinates with external tax and legal professionals and on how well he listens to and understands his clients' needs. Colleagues remarked on Müller's broad knowledge of traditional and alternative asset classes and his ability to obtain new client engagements.

Describe which technical and soft skills Müller demonstrated as part of his performance review.

### **Solution:**

In his performance review, Müller demonstrated the technical skills of capital markets proficiency and financial planning knowledge. Müller's capital markets proficiency was shown through his broad knowledge of traditional and alternative asset classes, while his financial planning knowledge was shown by his successful coordination with tax and legal professionals. In addition to technical skills, Müller demonstrated the soft skills of communication and business development and sales. Communication skills were shown by his ability to listen well and understand client needs, while business development and sales skills were shown by his record of obtaining new client engagements.

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## 6. INVESTMENT PLANNING, AND CAPITAL SUFFICIENCY ANALYSIS

- g. evaluate capital sufficiency in relation to client goals;

After developing an understanding of their clients, wealth managers begin the process of helping clients meet their objectives. In this section, we discuss key investment planning concepts, such as capital sufficiency analysis, retirement planning, and the client's investment policy statement.

## 6.1. Capital Sufficiency Analysis

To meet their financial goals and objectives, clients must have sufficient capital or follow a plan that will likely result in sufficient capital. **Capital sufficiency analysis**, also known as **capital needs analysis**, is the process by which a wealth manager determines whether a client has, or is likely to accumulate, sufficient financial resources to meet his or her objectives.

### 6.1.1. *Methods for Evaluating Capital Sufficiency*

Two methods for evaluating capital sufficiency are deterministic forecasting and Monte Carlo simulation. Portfolio growth in a deterministic model occurs in a “straight-line” manner. For example, suppose a client’s investment horizon is 15 years and the wealth manager has determined that the portfolio’s likely compound annual return is 6%. In deterministic forecasting, the client is expected to achieve a 6% return in each of the 15 years in the analysis. While simple to understand, the deterministic method is typically unrealistic with respect to the variability in potential future outcomes.

By contrast, Monte Carlo simulation allows a wealth manager to model the uncertainty of several key variables and, therefore, the uncertainty or variability in the future outcome. Monte Carlo simulation generates random outcomes according to assumed probability distributions for these key variables. Instead of assuming, for instance, linear portfolio growth of 6% per year, Monte Carlo simulation would assume a simple average (arithmetic mean) return and a standard deviation of year-to-year returns for the portfolio. The portfolio’s expected rate of return in a given year is determined randomly from this predefined distribution of possible returns. Monte Carlo simulation generates a large number of independent “trials,” each of which represents one potential outcome for the client’s investment horizon. By aggregating the outcomes of these various trials, the wealth manager is able to draw conclusions about the probability that the client will reach his or her objectives. It should be noted that such conclusions are sensitive to underlying assumptions, which may be subjective in nature.

### 6.1.2. *Inputs to Capital Sufficiency Analysis*

When using deterministic forecasting, the wealth manager must specify the following inputs: a portfolio return assumption, the current value of the portfolio, anticipated future contributions to the portfolio, and cash flows from the portfolio that represent client needs (according to the client’s goals). As mentioned earlier, with Monte Carlo simulation, the wealth manager assumes a simple average return and a standard deviation of returns for the portfolio, rather than determining an annual portfolio growth rate. Wealth managers should

be cautious about using historical rates of return as inputs to either a deterministic forecast or a Monte Carlo simulation. Instead, forward-looking capital market assumptions should be the foundation for the analysis.

In some cases, the inputs to Monte Carlo simulation are more complex. Portfolio return is not the only input that can be made variable. Some Monte Carlo simulation software requires separate asset class assumptions—such as simple average return, standard deviation, and correlation with other portfolio asset classes—rather than assumptions at the overall portfolio level. Some software packages enable variability in the client’s investment horizon, such as their life expectancy. Other common inputs to capital sufficiency analysis for private clients include taxes, inflation, and investment management fees.

**6.1.3. Interpreting Monte Carlo Simulation Results**

When performing a capital sufficiency analysis, one role of a wealth manager is to interpret the results for the client. Suppose a client is approaching retirement and wants to make sure that he does not run out of funds in his lifetime. The wealth manager uses the client’s investment portfolio and assumptions about the client’s expected retirement expenditures to run a Monte Carlo simulation that generates a thousand trials. The output for this fictitious portfolio is shown in [Exhibit 3](#).

The table in [Exhibit 3](#) illustrates portfolio values (adjusted for inflation) at specific time intervals and at certain percentiles of the thousand trials. The table also shows the percentage of trials at a given horizon in which the client successfully achieved her objective. For instance, after 10 years, a portfolio value of \$765,821 at the 75th percentile indicates that in 75% of the trials, the portfolio value after 10 years *exceeded* \$765,821. Similarly, over this same 10-year period, only 5% of trials resulted in a portfolio value that exceeded \$3,519,828. “Successful Trials” at the bottom of the table indicates, for example, that after 20 years, 69% of the trials were successful; that is, the client failed to meet her objective in 31% of trials. The successful trials are those in which the client’s portfolio value meets his objective, which is to have sufficient funds for his retirement (i.e., the client does not want to “run out of funds”). The percentage of successful trials is also known as the “probability of success.” Wealth managers tend to guide clients toward a 75%–90% probability of success, although no industry standard range exists.

**Exhibit 3. Monte Carlo Simulation Results**

Percentile	Year 10 Portfolio Value	Year 15 Portfolio Value	Year 20 Portfolio Value
5th	\$3,519,828	\$3,651,264	\$3,647,328

25th	\$1,981,861	\$1,698,449	\$1,530,372
50th	\$1,239,837	\$843,820	\$569,974
75th	\$765,821	\$305,126	(\$249,205)
95th	\$197,179	(\$264,048)	(\$1,402,608)
Successful Trials	98%	88%	69%

When the probability of success falls below an acceptable range, potential solutions include the following:

- Increasing the amount of contributions toward a goal
- Reducing the goal amount
- Delaying the timing of a goal (e.g., retiring a few years later than originally planned)
- Adopting an investment strategy with higher *expected* returns, albeit within the client's acceptable risk tolerance and risk capacity

In light of these solutions, wealth managers should be careful about allowing capital sufficiency analysis to completely drive portfolio construction. For example, if a client's risk tolerance does not allow for an asset allocation with a higher expected return, adopting a higher-risk strategy may cause the client to abandon the strategy at a market extreme, thus undermining the portfolio's ability to meet the investor's objectives.

## EXAMPLE 5

### Monte Carlo Simulation

Reyansh and Pari Patel are saving to send their sons Rohan (age 4) and Vihaan (age 6) to college in the United States. Thus far, they have saved approximately \$170,000. They will be able to save an additional \$20,000 toward this goal in the next year and to increase the amount each year by 3% to address inflation. Current annual tuition costs are \$40,000, and the Patels expect tuition to increase 6% annually.

The Patels' wealth manager, Sai Chhabra, CFA, uses a Monte Carlo simulation to calculate the probability of meeting the college tuition objective. The Monte Carlo simulation results are shown in [Exhibit 4](#).

#### Exhibit 4. Monte Carlo Simulation Results

Percentile	Year 10 Portfolio Value	Year 15 Portfolio Value	Year 20 Portfolio Value
5th	\$618,860	\$608,445	\$429,512
25th	\$499,552	\$409,753	\$212,123
50th	\$433,375	\$309,823	\$71,849
75th	\$301,502	\$219,852	(\$22,578)
95th	\$213,121	\$121,849	(\$79,845)
Successful Trials	100%	100%	67%

Discuss how the Patels might increase the probability of success in meeting their college tuition goal.

#### Solution:

To increase the probability of success in meeting their tuition goal, the Patels should consider three possible solutions:

1. Increase their annual contributions toward this goal.
2. Reduce the goal amount, perhaps by funding a portion of the tuition costs or by identifying schools with lower tuition costs.
3. Adopt an investment strategy with higher expected returns that is still within the Patels' acceptable risk tolerance and risk capacity.

A fourth possibility—delaying the timing of the goal—is not a practical solution, given the ages of the sons and when they intend to enter college.

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## 7. RETIREMENT PLANNING

- h.** discuss the principles of retirement planning;

For many investors, funding their retirement lifestyle represents the largest and most important financial objective. Retirement planning has grown in significance as life expectancies have increased globally. In 1960, 65-year-old men in developed countries had a life expectancy of approximately 11 to 14 years, while 65-year-old women had a life expectancy of 14 to 16 years.<sup>4</sup> Since that time, the life expectancy of 65-year-old individuals (both men and women) has increased considerably. The increased emphasis on retirement planning has also been driven by a shift in the primary responsibility for funding retirement from employers and governments to individuals.

In this section, we discuss various principles of retirement planning, including the retirement stage of an individual's life, the analysis of retirement goals, and behavioral considerations for retired clients.

### 7.1. Retirement Stage of Life

A wealth manager's role in retirement planning includes assessing how much clients must save toward their retirement goals and helping clients determine at what age they will be financially prepared for retirement. Unlike institutional investors, which often have quantifiable liabilities, private clients may have difficulty estimating their future financial needs. Therefore, wealth managers have an opportunity to help shape clients' expectations about their future retirement lifestyle.

An overview of the following financial stages of life provides some context for our discussion of retirement planning:

- Education
- Early career
- Career development
- Peak accumulation
- Pre-retirement

- Early retirement
- Late retirement

During the education stage, an individual is typically developing human capital rather than financial capital. In this context, **human capital** is an implied asset that represents the net present value of an investor's future expected labor income, while **financial capital** represents the tangible and intangible assets (excluding human capital) owned by an individual or household. Individuals normally begin to accumulate assets for retirement in the early career stage. During this stage, individuals often have competing financial priorities, such as family needs, housing costs, and education. Retirement planning tends to take on greater importance as individuals move into the career development stage and, later, into the peak accumulation and pre-retirement stages. As individuals work and save money for retirement, they convert their human capital into financial capital. They also accumulate other financial benefits, such as pensions and government-provided retirement income, and they reduce non-retirement liabilities, such as mortgage loans and consumer debt.

In the early retirement stage, clients begin to draw from both financial resources and income sources for their retirement spending. Cash flows come from the client's investment portfolio as well as from pension income, government-provided retirement benefits, and if applicable, part-time or full-time employment.

In the late retirement stage, clients generally reduce expenditures on travel and leisure activities. Also during this stage, some individuals experience health issues that, in some countries, result in an increased burden on financial resources.

One of the wealth manager's roles in the early retirement and late retirement stages is determining a sustainable rate of distribution from the client's investment portfolio. This analysis is done on an ongoing basis to ensure that clients' financial resources will cover their remaining lifetime needs. That is, retirement planning does not begin or end with the client's retirement.

### **7.1.2. Analyzing Retirement Goals**

Wealth managers may use several different methods to analyze a client's retirement goals. Three common methods—mortality tables, annuities, and Monte Carlo simulation—are discussed below.

#### **7.1.2.1. Mortality Tables**

A **mortality table** indicates individual life expectancies at specified ages. Wealth managers can use mortality tables to determine the probability that a client will live to a certain age;

they can then estimate the client's anticipated retirement spending over his or her remaining lifespan.

**Example 6** shows a sample mortality table. In the table, the plan year, client age, remaining life expectancy in years, and probability of surviving to a certain year are provided. This client is currently 72 years old and has a life expectancy of 12 years. The probability that he will survive to age 87 (i.e., 15 years from now) is 34%. The probability that he will survive to age 92 (i.e., 20 years from now) is 14%.

In practice, a wealth manager can use a mortality table to estimate the present value of a client's retirement spending needs by assigning associated probabilities to annual expected cash outflows.

## EXAMPLE 6

### Sample Mortality Table

Plan Year	Client Age	Life Expectancy	Survival Probability
0	72	12.0	100%
1	73	11.4	97%
2	74	10.8	93%
3	75	10.2	90%
4	76	9.7	86%
5	77	9.1	82%
6	78	8.6	77%
7	79	8.1	73%
8	80	7.6	68%
9	81	7.2	64%
10	82	6.7	59%
11	83	6.3	54%
12	84	5.8	49%
13	85	5.5	44%
14	86	5.1	39%
15	87	4.7	34%
16	88	4.4	29%
17	89	4.1	25%



18	90	3.8	21%
19	91	3.5	17%
20	92	3.3	14%

Source: Kitces and Hultstrom, “Joint Life Expectancy and Mortality Calculator.” <https://www.kitces.com/joint-life-expectancy-and-mortality-calculator/> (accessed September 14, 2018).

One potential drawback to using mortality tables is that an individual client’s probability of living to a certain age may exceed that of the general population. Factors such as education level and access to quality health care tend to correlate with increased longevity. Therefore, the survival probabilities from an actuarial perspective may understate the true probability of a given client’s living to a given age.

### 7.1.2.2. Annuities

*Annuities* can be used to analyze a client’s retirement goals. A relatively simple way of calculating the present value of a client’s desired retirement spending is by pricing an annuity. Annuities provide a series of fixed payments, either for life or for a specified period, in exchange for a lump sum payment. Many types of annuities exist, some of which are quite complex. Two basic forms are the immediate annuity and the deferred annuity. With an **immediate annuity**, an individual (called the “annuitant”) pays an initial lump sum, typically to an insurance company, in return for a guarantee of specified future monthly payments—beginning immediately—over a specified period of time. With a **deferred annuity**, the specified future monthly payments begin at a later date. Suppose a husband and wife, both age 65, wish to retire with \$100,000 per year in inflation-adjusted income. An immediate fixed annuity with “100% survivor income” might cost the couple approximately \$2,500,000. The percent of survivor determines how much of the original annual income amount will go to the surviving spouse after the death of the first spouse. In this example, in exchange for \$2,500,000 today (i.e., present value), the insurance company promises to pay \$100,000 per year, adjusted for inflation, through the lifetime of the surviving spouse.

Life annuities are those in which the income stream continues as long as the annuitant lives. Using mortality tables, a wealth manager calculates the client’s retirement liability based upon the individual’s life expectancy. If the client lives longer than the actuarial statistics assume, the client’s actual retirement spending needs will exceed the amount that the wealth manager and client planned for. This scenario introduces **longevity risk**, which is the risk of outliving one’s financial resources. Life annuities help to mitigate longevity risk.

### 7.1.2.3. Monte Carlo Simulation Revisited

Earlier, we discussed Monte Carlo simulation in the context of determining a client's capital sufficiency. Monte Carlo simulation can also be used to analyze a client's retirement goals. One advantage of Monte Carlo simulation is its applicability to the client's actual asset allocation. For instance, if a client does not intend to use annuities for retirement needs, then annuity pricing will not be useful in estimating the client's lifestyle needs. Instead, Monte Carlo simulation can be used to analyze the likelihood that the client's actual portfolio will meet anticipated retirement needs.

Another advantage of Monte Carlo simulation for retirement planning is its flexibility in modeling different scenarios and exploring issues that are important to clients. Typically, retirement goals are more complex than a fixed annual cash flow requirement. For instance, if a client wishes to determine the effect of a significant purchase/gift or large unforeseen expense, the wealth manager can model these scenarios with Monte Carlo simulation.

Wealth managers should be careful about the degree of precision that Monte Carlo simulation provides. Simulation modeling is only a method of estimation; it cannot predict the future. Moreover, the output from Monte Carlo simulation can be highly sensitive to small changes in input assumptions. This is especially true for the portfolio rate of return assumption. Finally, a typical Monte Carlo output includes the probability of reaching a goal (or goals) but not necessarily the "shortfall magnitude." Shortfall magnitude matters because if clients are at risk of not meeting their objectives, they can make adjustments. If the shortfall is severe, the necessary adjustment may be significant.

## EXAMPLE 7

### Retirement Planning

Emily Whitfield, CFA, is meeting with two different clients today, Sam and Rebecca, regarding their retirement plans. Sam is retiring soon. He wants to be certain to have €100,000 per year in income throughout retirement. Rebecca is interested in exploring several possible scenarios for her retirement, using assumptions that are specific to her actual portfolio.

Recommend the method of analyzing retirement goals that is most appropriate for each of these two clients.

#### **Solution:**

For Sam, annuities are most appropriate. The price of an annuity that produces €100,000 per year for life will determine how much Sam must have saved for retirement. For Rebecca, Monte Carlo simulation is most appropriate because she is interested in analyzing how different portfolio scenarios will affect her retirement plans.

### 7.1.3. Behavioral Considerations in Retirement Planning

Several behavioral considerations are relevant to retired clients and/or retirement planning. The following are some examples:

- *Heightened loss aversion.* Some studies suggest that retirees are much more loss-averse than younger investors. This observation has implications for clients' asset allocation through retirement and, therefore, for the return assumptions used in retirement planning.
- *Consumption gaps.* Due to loss aversion and uncertainty about future financial needs, many retirees spend less than economists would predict, resulting in a gap between actual and potential consumption.
- *The “annuity puzzle.”* While annuities can help to mitigate longevity risk and, in some cases, may improve the probability of retirees meeting their spending objectives, individuals tend not to prefer to invest in annuities. This phenomenon is known as the “annuity puzzle.” Explanations for the puzzle include investors' reluctance to give up hope of substantial lifestyle improvement, their dislike of losing control over the assets, and, in many cases, the high cost of annuities.
- *Preference for investment income over capital appreciation.* Behavioral economists have noted that individuals distinguish between income and capital when making spending choices. Evidence for this behavior includes the tendency of investors to spend dividend income rather than selling shares of securities and spending the proceeds. One possible explanation is that investors lack self-control with respect to spending. This theory suggests that spending only the income and not the principal is a self-control mechanism.

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## 8. INVESTMENT POLICY STATEMENT

- i. discuss the parts of an investment policy statement (IPS) for a private client;
- j. prepare the investment objectives section of an IPS for a private client;
- k. evaluate and recommend improvements to an IPS for a private client;

The **investment policy statement** (IPS) is a written planning document that describes a client's investment objectives and risk tolerance over a relevant time horizon, along with the constraints that apply to the client's portfolio. A wealth manager typically produces this document prior to constructing and implementing the client's investment portfolio. The IPS creates a link between the client's unique considerations and their strategic asset allocation. The IPS is also an operating manual, listing key ongoing management responsibilities. The client and wealth manager should review the IPS regularly and update it whenever changes occur either in the client's circumstances or in the capital markets environment that impact the client's investment strategy.

A well-constructed IPS has certain advantages for private clients. One advantage is that the IPS encourages investment discipline and reinforces the client's commitment to follow the strategy. This advantage is particularly important during adverse market conditions. A second advantage is that the IPS focuses on long-term goals rather than short-term performance. For the wealth manager, the IPS provides evidence of a professional, client-focused investment management process and the fulfillment of fiduciary responsibilities.

## **8.1. Parts of the Investment Policy Statement**

The IPS includes the client's background and investment objectives, the key parameters of the investment program, the portfolio asset allocation, and some discussion of the duties and responsibilities of relevant parties. Topics addressed in most IPSs for private clients are discussed below.

### **8.1.1. *Background and Investment Objectives***

The client's background and investment objectives are critical parts of the IPS. Background items commonly include the client's name and age, as well as relevant personal and financial information. The wealth manager gains an understanding of the client's investment objectives during the information-gathering process. Common objectives include funding lifestyle needs during retirement, supporting family members, funding philanthropic activities, and meeting bequest goals. These examples typically represent ongoing objectives. By contrast, one-time objectives may include the purchase of a second home or a significant future travel expense. It is common for private clients to have multiple, competing objectives that they seek to achieve with the same portfolio.

Investment objectives should be detailed and quantified whenever possible. For instance, a client who is about to retire may seek to withdraw a specific amount each year that increases with the annual rate of inflation. A client also may have specific amounts in mind for future bequests or for charitable gifts. By comparison, oversimplified investment objectives such as

“growth” or “growth and income” would not be sufficiently detailed.

Sometimes, clients have difficulty assigning specific amounts to future objectives. When this is the case, the wealth manager can create a more general objective, with the understanding that he will continue to work with the client to determine an achievable specific objective.

The wealth manager should also include in this section of the IPS other cash flows that are linked to investment objectives and that will therefore affect the capital sufficiency analysis. For instance, if a client intends to contribute additional amounts to her investment portfolio each year before subsequently beginning periodic withdrawals, the objective should reflect the expected contributions. Likewise, if the client anticipates that a significant liquidity event, such as the sale of a business, will be integral to meeting the investment objective, that information should be included in this section.

In a situation involving multiple objectives, the wealth manager should note which of the objectives is primary. For example, clients may wish to support their lifestyle needs through retirement while preserving an inheritance for their children. In this common example, the primary objective is the client’s retirement security and the secondary objective is the inheritance for the children.

The investment objective, when linked to the client’s asset allocation and the wealth manager’s capital market assumptions, should provide the basic inputs to a capital sufficiency analysis. Whenever the capital sufficiency analysis does not support the investment objective, the wealth manager must work with the client to establish a revised objective that the manager judges to be achievable.

As part of the overall client background, the IPS should include the market value of the portfolio and of the accounts that make up the portfolio. The wealth manager should indicate the tax status of the account—that is, whether it is taxable, as in the case of an individual or joint account, or tax-deferred, as in the case of certain retirement plan accounts. When accounts are tax-deferred, the client pays tax on the distributions from the account rather than on the income generated by the investments. The background and investment objectives section should describe any other investment assets the client may have outside of the portfolio (e.g., accounts managed by another wealth manager) and any cash flows from external sources (e.g., pension income).

## EXAMPLE 8

### Background and Investment Objectives

Huang Zhuo Wei, age 51, is a private investor in Singapore. Wei is an engineer by trade but has also been successful in real estate development. His portfolio consists of CNY 16.5 million in a liquid securities portfolio, including some common stock positions in

which he has large embedded capital gains, and several real estate investments valued at approximately CNY 9 million (combined). He expects to make additional real estate investments in the coming years. He estimates that he can invest approximately CNY 330,000 per year, inflation-adjusted, in real estate until retirement. He has a much higher than average tolerance for volatility, and historically, his liquid portfolio has consisted mostly of large-cap stocks of technology companies. He has stated that his time horizon is 10 years, since he anticipates retiring in approximately 10 years. He estimates that he will need approximately CNY 1 million per year, inflation-adjusted, to support his lifestyle in retirement. He wishes to grow his investment resources and create a significant inheritance for his children.

Discuss how Wei's wealth manager should create the investment objectives section of Wei's IPS.

### **Solution:**

The purpose of this portfolio is to support Wei's lifestyle in retirement and to provide an inheritance for his children. Aside from the investment assets in his portfolio, Wei has private real estate investments valued at approximately CNY 9 million and is likely to add to this segment of his net worth over the next several years. Wei does not anticipate needing distributions from this portfolio for at least 10 years.

Wei estimates an annual, inflation-adjusted lifestyle need of approximately CNY 1 million per year beginning at his retirement in 10 years. His cash needs will be satisfied in part through portfolio distributions and in part from his real estate portfolio. The wealth manager will continue to work with Wei to quantify his bequest objective and ensure that his portfolio distribution rate is sustainable throughout his retirement.

## **8.1.2. Investment Parameters**

The investment parameters section of the IPS outlines important preferences that influence the client's investment program. Wealth managers may need to refine or customize these preferences to suit the particular client. Relevant components of investment parameters are discussed below.

### **8.1.2.1. Risk Tolerance**

In this part of the investment parameters section, the wealth manager indicates that she has considered the client's ability and willingness to withstand portfolio volatility. The process by

which the wealth manager has assessed the client's risk tolerance is included here. For instance, if a risk tolerance questionnaire is used in the data-gathering process, the wealth manager may choose to include conclusions from the questionnaire.

### 8.1.2.2. Investment Time Horizon

A client's investment horizon is indicated in this section, but often as a range rather than a specific number of years. If the wealth manager determines that the client has a long horizon, the IPS may state, for instance, that it "exceeds 15 years." By contrast, a short horizon may be described as "less than 10 years." Clients do not often indicate their own investment time horizons because they may misjudge the appropriate length. For example, married couples might underestimate their joint life expectancy. In general, the wealth manager should determine the investment time horizon in collaboration with the client. Because each goal may have a different time horizon, a client may have multiple time horizons (some of which may exceed the client's lifetime).

#### EXAMPLE 9

### Investment Time Horizon

In [Example 8](#), Huang Zhuo Wei stated that his investment horizon is 10 years because he expects to retire at that point.

Discuss how his wealth manager should reflect Wei's investment horizon in the IPS.

#### **Solution:**

Wei's true investment horizon is *through* retirement, a period that likely will be much longer than 10 years. His wealth manager should describe his time horizon as exceeding 10 years.

### 8.1.2.3. Asset Class Preferences

The IPS should indicate the asset classes that will comprise a client's portfolio. Alternatively, the wealth manager may list the asset classes that the client has not approved. Some wealth managers include a short narrative about the importance of asset allocation and the process that the wealth manager used to educate the client about asset class risk and return characteristics. The narrative captures in written form the risk–return trade-off that the client explored with the wealth manager during the information-gathering process.



#### **8.1.2.4. Other Investment Preferences**

Some clients have additional important investment preferences. One example relates to ESG investing, whereby a client may desire to invest in companies or sectors that are environmentally or socially focused. This section may contain a general comment about or specific criteria about for these ESG preferences.

Other investment preferences described in this section might be a “legacy” holding that the client wishes to retain or a non-recommended investment that the client wishes to make. For example, a client may choose to retain a common stock investment received via inheritance or maintain a position in company stock due to the nature of the client’s employment.

#### **8.1.2.5. Liquidity Preferences**

If the client has liquidity needs that are not established in the background and investment objectives section, those needs should be noted here. Some investors maintain a cash reserve in their portfolio, whereas other investors must initiate a portfolio distribution when they encounter an unanticipated cash need. Clients who require additional liquidity in their portfolios may instruct the wealth manager to maintain a specific cash balance in the portfolio.

If the client’s liquidity preference constrains asset class selection decisions or implementation decisions, that constraint should be listed here. For example, if a client’s liquidity needs dictate that entire portfolio can be sold relatively quickly and easily, illiquid asset classes such as private equity would likely not be part of the client’s portfolio.

#### **8.1.2.6. Constraints**

Some clients have constraints that restrict the wealth manager from implementing certain investments or strategies. For example, a client may be constrained by investment options in certain accounts, such as an employer-sponsored defined contribution retirement plan account. Another significant constraint can involve investments that have large unrealized capital gains and would create significant tax liabilities upon disposition. If a client has ESG-related constraints, such as prohibiting investment in certain sectors or individual securities, those constraints should appear in this section.

### **8.1.3. *Portfolio Asset Allocation***

This section contains the target allocation for each asset class in the client’s portfolio. Wealth managers who use a strategic asset allocation approach typically define a target allocation for each asset class as well as upper and lower bounds. Wealth managers who use a tactical asset



allocation approach may list asset class target “ranges” rather than specific target allocation percentages.

#### **8.1.4. *Portfolio Management***

In this section of the IPS, the wealth manager discusses various issues involved in the ongoing management of the client portfolio. These issues may include the level of discretionary authority, how and when rebalancing activity will take place, and if relevant, tactical asset allocation changes within the client’s portfolio.

##### **8.1.4.1. Discretionary Authority**

The IPS indicates the degree of discretionary authority that the client has granted to the wealth manager. Discretionary authority refers to the ability of the wealth manager to act without having to obtain the client’s approval. Full discretion means that the wealth manager is free to implement rebalancing trades and replace fund managers without prior client approval. If the client has given the wealth manager discretion over certain changes (e.g., rebalancing), this section of the IPS should reflect that arrangement. The wealth manager operating in a non-discretionary capacity makes recommendations to the client but is not able to implement a recommendation without client consent.

##### **8.1.4.2. Rebalancing**

This section explains the wealth manager’s rebalancing methodology. Some wealth managers use a “time-based” rebalancing policy, whereby client portfolios are rebalanced at a certain time interval (e.g., quarterly or annually) regardless of the difference between current asset class weights and target asset class weights. It is more common for wealth managers to use a “threshold-based” rebalancing policy, whereby the manager initiates rebalancing trades when asset class weights deviate from their target weights by a pre-specified percentage. The rebalancing section also sets expectations for how frequently the wealth manager reviews a client’s portfolio for possible rebalancing opportunities.

##### **8.1.4.3. Tactical Changes**

A wealth manager who periodically makes tactical changes (adjustments) to the client’s asset allocation establishes the parameters for implementing such changes in this section of the IPS. If target allocation ranges have been established in the portfolio asset allocation section, this section indicates whether—as well as under what circumstances and to what degree—the wealth manager is permitted to go outside those ranges when executing a tactical change. Note that a wealth manager who uses only a strategic asset allocation approach would likely not include this section in the IPS.

#### **8.1.4.4. Implementation**

This section includes information about the investment vehicles the wealth manager recommends to clients. Among the issues discussed here is whether the wealth manager recommends the exclusive use of third-party money managers, the exclusive use of proprietary investment offerings (those managed within the wealth manager's firm), or some combination of the two approaches. Also, this section indicates whether the wealth manager prefers to invest in mutual funds, exchange-traded funds (ETFs), or individual securities. A general discussion of the incremental cost of using third-party money managers is relevant here.

With respect to third-party managers, this section should include basic information about the wealth manager's due diligence process and how frequently it is performed. A more detailed option involves listing the quantitative screens used in the due diligence process and the qualitative criteria that influence the manager selection and retention decisions.

#### **8.1.5. *Duties and Responsibilities***

This section discusses the wealth manager's overall responsibilities, including expectations about the ongoing review of a client's IPS.

##### **8.1.5.1. Wealth Manager Responsibilities**

A list of responsibilities helps the client understand how the wealth manager operates in helping the client reach his investment objectives. The wealth manager typically addresses the following issues (where applicable):

- Developing an appropriate asset allocation
- Recommending or selecting investment options, such as pooled investment vehicles or individual securities
- Monitoring the asset allocation and rebalancing
- Using derivatives, leverage, short sales, and repurchase agreements (repos)
- Monitoring the costs associated with implementing the investment strategy
- Monitoring the activities of third-party service providers (e.g., asset managers and/or custodians)
- Drafting and maintaining the IPS

- Reporting of performance, including an indication of the base currency
- Reporting of taxes and financial statements
- Voting proxies
- Assisting with the preparation of agreements associated with private fund offerings

The wealth manager might also consider listing the responsibilities of third-party service providers. A custodian, for example, maintains segregated client accounts, values the investment assets, collects income, and settles transactions. Listing the custodian's responsibilities separately creates an opportunity to educate the client about this provider's distinct and important role.

#### **8.1.5.2. IPS Review**

The wealth manager sets expectations for how frequently the client and wealth manager will review the IPS. As part of this review, it is important for the client to affirm that the investment objectives remain accurate. Likewise, it is important for the wealth manager to confirm that the strategy remains likely to meet those objectives.

#### **8.1.6. *IPS Appendix***

The appendix includes additional details that typically change more frequently than the main portion of the IPS. Below are two examples of items that may be included in the appendix.

##### **8.1.6.1. Modeled Portfolio Behavior**

Modeled portfolio behavior describes a range of possible performance outcomes over various holding periods and can provide more value to the client than merely stating the return objective or the "expected compound return." As part of this section, the wealth manager may provide a modeled distribution of returns at various percentile ranges. The median of the modeled return distribution may be termed the "modeled compound return." This approach also enables the wealth manager to present modeled portfolio downside risk (volatility), particularly for short periods, and to confirm that the client can withstand such an outcome.

##### **8.1.6.2. Capital Market Expectations**

Capital market expectations include the wealth manager's modeled portfolio statistics—that is, the expected returns and standard deviations of asset classes, as well as modeled correlations between asset classes. Because clients sometimes confuse expected return (i.e.,

simple average return) with compound annual return, the wealth manager may consider including the modeled compound annual return for each asset class.

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## 9. SAMPLE INVESTMENT POLICY STATEMENT

- i. discuss the parts of an investment policy statement (IPS) for a private client;
- j. prepare the investment objectives section of an IPS for a private client;
- k. evaluate and recommend improvements to an IPS for a private client;

**Exhibit 5** demonstrates a sample IPS for a fictitious private client couple, David and Amelia King. The Kings' wealth manager does not use a tactical asset allocation approach for the couple, so the section on tactical changes is not relevant in this case.

### Exhibit 5. Sample Investment Policy Statement

## Investment Policy Statement Prepared for David and Amelia King

### Background and Investment Objectives

This Investment Policy Statement (IPS) is designed to assist David and Amelia in meeting their financial objectives. It contains a summation of their objectives and expectations, sets forth an investment structure for attaining these objectives, and outlines ongoing responsibilities.

The purpose of this portfolio is to support the continuation of David and Amelia's current lifestyle, provide for their family's needs, and fund their philanthropic objectives. Maintenance of their current lifestyle is their primary objective, followed by support for family members and charitable aspirations, in that order. To meet these objectives, they anticipate needing approximately \$350,000 per year in inflation-adjusted portfolio distributions. In addition, they intend to purchase a second residence within the next two years. They expect the purchase price for the second residence to be approximately \$1.5 million. David and Amelia have not articulated a specific dollar amount that they intend to leave to their children, nor a specific dollar amount that they wish to leave to charity at their death. The wealth

manager will continue to work with them to quantify these c

In establishing their asset allocation, David and Amelia have current assets and expected cash needs. They are seeking to term rate of return and are willing to assume the associated

### ***Portfolio Accounts***

Taxable joint account for David and Amelia

Tax-deferred account for David

Tax-deferred account for Amelia

### ***Current Combined Market Value***

\$12,250,000

## **Investment Parameters**

### ***Risk Tolerance***

The wealth manager has determined that David and Amelia withstand short- and intermediate-term portfolio volatility. They acknowledge the anticipated level of portfolio volatility associated with the asset allocation (as illustrated in the Modeled Portfolio Behavior Appendix).

### ***Investment Time Horizon***

David and Amelia have an investment time horizon that exc

### ***Asset Class Preferences***

The Kings and their wealth manager have selected the follow

- Short-term debt investments
- Intermediate-term bonds
- US stocks
- Non-US stocks











































































































# Reading 22

## Topics in Private Wealth Management

by Paul Bouchey, CFA, Helena Eaton, PhD, CFA, and Philip Marcovici

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Sections 9–11 of this reading draw from *Concentrated Single-Asset Positions* by Thomas J. Boczar, CFA, and Nischal Pai, CFA (©2013 CFA Institute). Sections 12–16 draw on *Estate Planning in a Global Context* by Stephen Horan, CFA, and Thomas Robinson, CFA (©2009 CFA Institute). While both have been extensively rewritten, we wish to acknowledge the previous authors' contributions.

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** compare taxation of income, wealth, and wealth transfers;
- b.** describe global considerations of jurisdiction that are relevant to taxation;
- c.** discuss and analyze the tax efficiency of investments;
- d.** analyze the impact of taxes on capital accumulation and decumulation in taxable, tax-exempt, and tax-deferred accounts;
- e.** explain portfolio tax management strategies and their application;
- f.** discuss risk and tax objectives in managing concentrated single-asset positions;
- g.** describe strategies for managing concentrated positions in public equities;
- h.** describe strategies for managing concentrated positions in privately owned businesses and real estate;

- i. discuss objectives—tax and non-tax—in planning the transfer of wealth;
  - j. discuss strategies for achieving estate, bequest, and lifetime gift objectives in common law and civil law regimes;
  - k. describe considerations related to managing wealth across multiple generations.
- 

## 1. INTRODUCTION

This reading focuses on three important areas of technical competency in the management of private client assets: the impact of taxes on wealth accumulation, the management of concentrated positions in public or private assets, and basic tools and techniques for preserving wealth through generations.

We begin with a discussion of taxes. Taxes are an important determinant of the taxable investor's final returns. While fees and trading costs have received a lot of attention in the press and academic spheres, the erosion of returns due to taxes can be much more significant.

Consider this scenario: After significant development and testing, your firm has just launched a new strategy that tactically shifts between different equity indexes. The backtests show significant alpha over most time horizons and especially strong performance during market downturns—a risk/return profile that should be highly attractive to your clients. You launch the strategy 1 January, and everyone is pleased with the performance in the first year. On 15 February of the following year, the founder of the firm receives a telephone call from the accountant for Charles and Ivy Lee, an important private client relationship. The accountant has been compiling the Lees' tax documents in preparation for filing the annual tax return. It seems that the trading activity inherent in your new strategy has generated a lot of capital gains, and the resulting tax bill is larger than the excess returns generated by your strategy!

This scenario is not uncommon. Because a significant proportion of actively managed assets is managed on behalf of tax-exempt institutions, such as retirement plans and sovereign wealth funds, strategies are often developed either without regard to taxes or with taxes as an afterthought and then applied—unsuccessfully—to taxable investors.

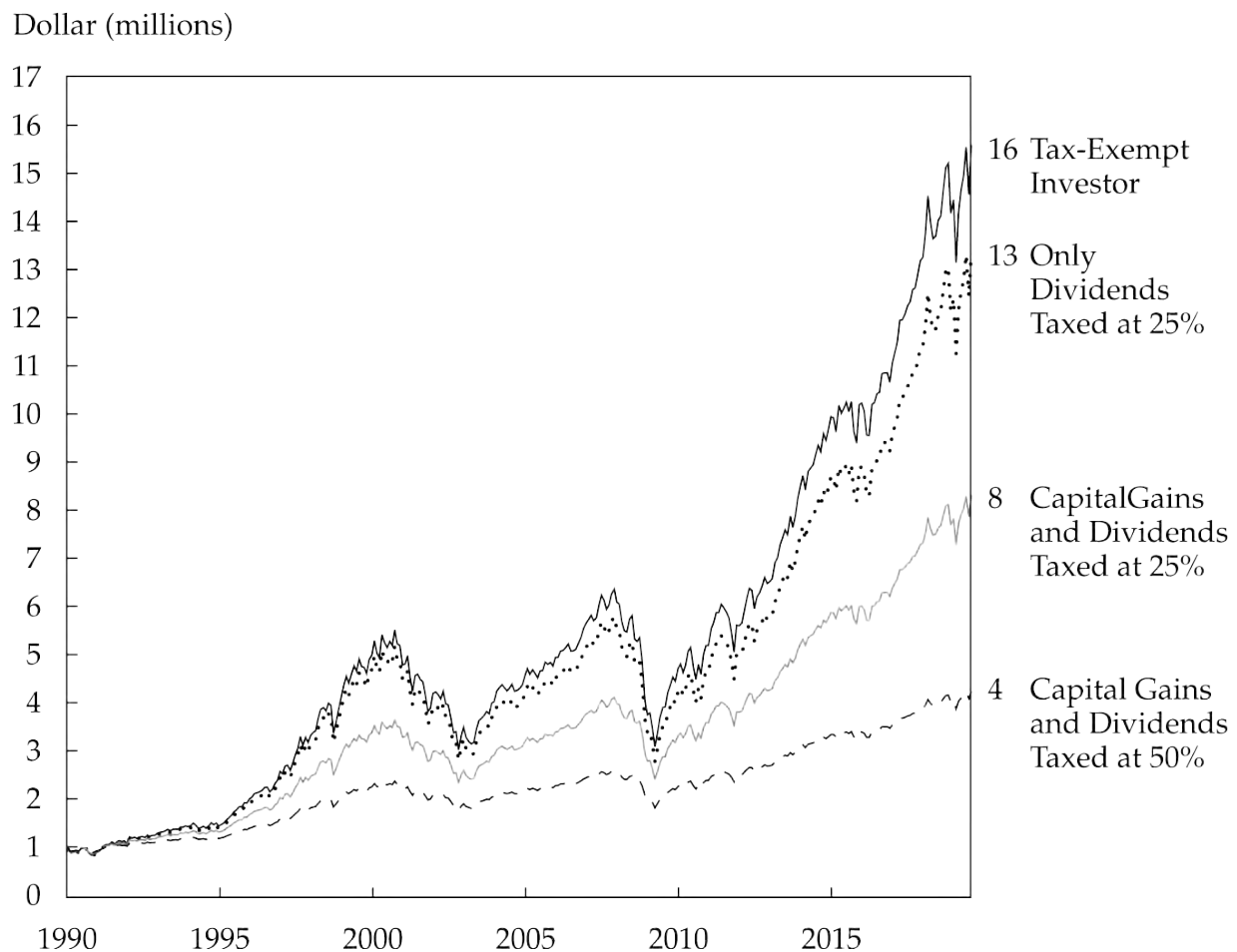
To illustrate the effect of taxes on wealth accumulation, let's examine a longer time horizon. The S&P 500 Index from 1 January 1990 through 30 June 2019 appreciated 7.5% per year, on average. With dividends reinvested and ignoring fees and transaction costs, the compound annual growth rate would have been 9.8%. If the Lees had invested \$1 million on 1 January 1990, we would expect their portfolio to have grown to \$16 million by the end of the nearly

30-year period. However, this is only true if the assets are not subject to taxation during the accumulation phase, as would be the case if they are held in a retirement account or a private family foundation. [Exhibit 1](#) shows the growth of this hypothetical portfolio under several different tax assumptions.

If we assume the worst case, that both dividends and capital gains are taxed fully at a marginal tax rate of 50%, then the 9.8% compound annual growth rate would be cut roughly in half—to 5.0%. In other words, their \$1 million would have only grown to \$4 million after almost 30 years—only one-fourth of what the tax-exempt account realized. Clearly, taxes are an important investment consideration.

Fortunately, as a tax-aware practitioner, you may be able to use various tax-management techniques to reduce the tax drag. If capital gains and dividends are taxed at 25%, the final wealth of the taxable portfolio would have grown to \$8 million. If capital gains taxes can be eliminated or deferred and only dividends are taxed at the 25% rate, then the \$1 million would have grown to \$13 million at the end of our horizon. It is still not as good as the tax-exempt case, but it is significantly better than our worst case.

**Exhibit 1. Growth of \$1 million in the S&P 500 Index**



*Notes:* Growth of \$1 million from January 1990 through June 2019 for the S&P 500 Index with dividends reinvested, ignoring fees and transaction costs. After-tax returns are computed in three ways: 1) Only dividends are taxed at 25%; 2) Dividends and capital gains are taxed at 25%; 3) Dividends and capital gains are taxed at 50%. In each month, we multiply the component of return by 1 minus the tax rate. For example, pre-tax returns of 10% and -10% would become 5% and -5% under a 50% tax rate. This calculation assumes that all capital gains and losses are realized each month and that when capital losses occur, there are sufficient capital gains from other investments so that the investor may deduct the losses in full. Essentially, the tax liability is deducted and the tax benefit added to the account as if it were a cash flow, thus reducing the magnitude and volatility of returns.

*Sources:* Authors' calculations using the S&P 500 Total Return Index and the S&P 500 Price Return Index. The after-tax return methodology follows [Lucas and Sanz \(2016\)](#).

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Broadly speaking, a portfolio manager managing assets for a private client looks to maximize after-tax returns for a given level of risk. This reading lays the ground work for understanding how different types of taxes impact wealth accumulation. We review the general principles of taxation, how to measure tax efficiency, and how to reduce the impact of taxes on a portfolio.

Hopefully we've convinced you why it is important to manage your client's portfolio with taxes in mind. Tax considerations, however, are just one element of managing assets for private wealth clients. Suppose that only 50% of your private client's assets are invested in your tax-aware investment strategy. The other 50% of assets are tied up in a company that was the primary source of wealth creation for your client: Ivy Lee started a business in her early 20s that succeeded far beyond her initial expectations. While she has accumulated liquid assets outside of that business, a substantial portion of her net worth is held in company stock. From your earlier readings in the course of the CFA Program, you realize that this is a very risky position. Taken in the aggregate, her portfolio is undiversified; however, to sell the position outright would create an enormous tax liability or lead to a loss of control over the business she created. How, then, do you help the client achieve her goals? This reading discusses some practical tools that you can employ to manage the risk of this concentrated position.

Finally, Ivy and Charles want to maximize the likelihood that the strong financial foundation they have created will survive to provide support for their children's and grandchildren's future endeavors. Ivy has frequently heard the phrase "shirtsleeves to shirtsleeves in three generations," meaning that family wealth rarely survives beyond three generations. Some variation of that saying exists in many cultures. The Lees want your help to create a structure that will counter that conventional wisdom. While this reading won't make you an estate planning expert, it will prepare you to identify estate planning opportunities that may help the Lees achieve that goal and to work more effectively with the Lees' estate planning professionals toward that end.



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## 2. GENERAL PRINCIPLES OF TAXATION: COMPONENTS OF RETURN AND TAX STATUS OF THE ACCOUNT

- a. compare taxation of income, wealth, and wealth transfers;
- b. describe global considerations of jurisdiction that are relevant to taxation;

In many countries, tax rates can exceed 50%, significantly eroding realized returns (capital gains, interest, and/or dividend income). An understanding of tax structures will improve the portfolio manager's decisions on behalf of the taxable client, decisions such as what asset classes and securities to invest in and when to realize gains and losses. (The readings on asset allocation address issues important to the taxable investor, including conducting an asset allocation study using after-tax returns and such pragmatic issues as the tax implications of rebalancing strategies. This reading does not revisit those issues; instead, it focuses on broader issues frequently faced by the private wealth adviser.) Three foundational elements of investment taxation should be considered when managing private wealth assets: 1) taxation of the components of return, 2) the tax status of the account, and 3) the jurisdiction that applies to the investor (and/or account). We address each of them, in turn.

### 2.1. Taxation of the Components of Return

Although the specifics of tax codes are country- and jurisdiction-specific, the following general categories of taxes are widely recognized:

- *Income Tax.* Income tax is calculated as a percentage of taxable income, often with different rates applied to various levels of income. Wages, rents, dividends, and interest earned are commonly treated as taxable income. Cross-border investments, common in the portfolios of many wealthy families, may also create taxable income in the investor's home country as well as in the country in which the investment is located.
- *Gains Tax.* Capital gains are the profits based on price appreciation that result from the sale of an asset, including financial assets. Gains are often distinguished from income and taxed at different rates.
- *Wealth or Property Tax.* A wealth or property tax most often refers to the taxation of real property (real estate) but may also apply to financial and other assets. Such taxes are generally assessed annually. Comprehensive wealth taxes apply in a limited number of

countries but are increasingly being considered by other countries as a mechanism to raise revenue.

- *Stamp Duties.* A number of countries impose a tax on the purchase price of shares or real estate. Foreign investors may be subject to higher rates than domestic investors.
- *Wealth Transfer Tax.* A wealth transfer tax is assessed as assets are transferred from one owner to another using some mechanism other than an outright sale/purchase transaction. Examples of wealth transfer taxes include “estate” or “inheritance” taxes paid at the investor’s death and “gift” taxes paid on transfers made during the investor’s lifetime. In some cases, these taxes are the responsibility of the person transferring the asset; in other cases, these taxes are imposed on the recipient.

Therefore, investors pay taxes on what they *earn* (income and gains tax), what they *own* (wealth or property tax), what they *buy* (stamp duty tax), and what they *transfer* (gift and estate tax). The income and capital gains taxes are the ones that most directly affect the day-to-day portfolio management of private client assets. These taxes are briefly described next, along with some tax preferences frequently accorded to real estate investments.

### 2.1.1. Interest, Dividends, and Withholding Taxes

Most bonds, debt instruments, and interest-bearing accounts produce income in the form of interest payments. Many countries’ tax codes create preferential treatment for some types of interest income. For example, in Italy interest income on government bonds is taxed at a lower rate. In the United States, income from state and local government bonds (municipal bonds) is often exempt from both federal and state income taxes; unless special provisions exist, interest is taxed at the ordinary income tax rate.

**Double taxation** is a term used to describe situations in which income is taxed twice. For example, corporate earnings are taxed at the company level and then that portion of earnings paid as dividends is taxed again at the investor level. Some countries mitigate the burden of double taxation of dividend income with specific exemptions or provisions in the tax code. Here are some examples:

- In Australia, if your personal tax rate is higher than the corporate tax rate, you will earn “franking” credits such that you only pay the difference between your personal tax rate and the corporate tax rate.
- In the United States, dividends from most domestic companies and qualifying foreign companies are taxed at a lower tax rate if you hold the stock for at least 60 days. (**Qualified dividends** are generally dividends from shares in domestic corporations and certain qualified foreign corporations which have been held for at least a specified minimum period of time—in the United States, 61 days for common stock, 91 days for

preferred stock. The position must be unhedged.)

Portfolio managers investing on behalf of private clients must also consider the tax ramifications of cross-border investments. **Withholding taxes** are often imposed in the country in which the investment is made, most frequently on payments of interest, dividends and royalties. The income will be taxed in the country in which it was earned and may be taxed again in the home country of the investor. The taxing jurisdiction will withhold taxes on the *gross* income earned within the jurisdiction—without regard for offsetting investment expenses or losses that may be available from the taxpayer’s other investment activities.

### 2.1.2. Capital Gains Taxes

To estimate the tax liability associated with a particular trade, we need to know the asset’s **tax basis** and holding period. In many cases, the tax basis is the amount that was paid to acquire an asset, or its ‘cost’ basis. In the case of equities, this would be the share price multiplied by the number of shares plus commissions and other trading costs. Other assets, such as discount or premium bonds or REITs, may be subject to annual accounting adjustments to the tax basis.

The tax basis serves as the foundation for calculating a **capital gain or loss**, which equals the selling price (net of commissions and other trading costs) less the tax basis. Capital gains may be realized or unrealized capital gains. A realized capital gain is the profit “booked” when the asset is sold. An unrealized capital gain is the appreciation on an asset currently held in the portfolio. If an asset is sold at a loss, the loss may often be used to offset a realized capital gain.

There are circumstances where the tax basis may be other than the investor’s actual cost basis. For example, in some countries, such as the United States, there is a basis “step-up” on death, meaning that someone who inherits an asset would have a tax basis equal to the fair market value of the asset on the date of death. No capital gains taxes are due as a result of this step-up in basis. Other countries have laws that lead to a step-up in tax basis upon death or upon a change in citizenship or residency, but the unrealized, embedded gains would be subject to tax.

Capital gains may also be short-term or long-term capital gains. The *holding period* is the length of time between the purchase and sale of an asset. Capital gains are generally taxed as income unless the asset is held longer than some minimum period specified by the tax laws of the relevant jurisdiction. Where such provisions exist, gains realized from assets held for the minimum period are taxed at a lower rate, called the *long-term capital gains* rate. Governments that apply lower tax rates to long-term gains create a tax incentive for long-term investors and a disincentive to speculative short-term trading. In these jurisdictions, stocks are generally more tax-efficient investments than taxable bonds since a significant

portion of equity returns comes from tax-advantaged appreciation.

In some jurisdictions, there is a distinction between investment gains and trading gains. For example, in a jurisdiction where capital gains are tax-free or taxed at lower rates, the tax benefits may be lost if the investor is considered to be in the *business* of stock or real estate trading.

### 2.1.3. Real Estate Taxes

While many countries provide favorable tax treatment for an individual's principal residence—exempting capital gains arising from the sale of the residence—real estate *investments* are subject to a broader range of tax preferences. How the real estate is owned and financed will have a significant bearing on the after-tax returns generated by the investment.

Generally, jurisdictions tax the net income from a real estate investment, allowing such expenses as maintenance, interest, and depreciation to be deducted from gross income prior to calculating the tax liability. Where interest expenses are deductible, it may be attractive to finance a real estate purchase even if the investor has the funds necessary to pay the purchase price in full.

Depreciation expenses may also be deductible. For example, an investor buys a property in a jurisdiction that allows the investor to depreciate the property over 10 years. A portion of the purchase price of the building may be recorded as an expense during each year of ownership, reducing the investor's income tax liability. The depreciation expense is deducted from the investor's cost basis. These deductions are usually recaptured on a sale of the investment if the sales price exceeds the depreciated cost base of the asset involved.

In some countries, one real estate investment can be exchanged for another in a qualifying exchange, enabling the investor to defer capital gains taxes until the second property is sold.

## 2.2. The Tax Status of the Account

The tax status of the account will also factor into investment decisions for private clients. There are three principal types of accounts: taxable, tax-deferred, and tax-exempt. In a **taxable account**, the normal tax rules of the jurisdiction apply. For a **tax-deferred account**, investment and contributions may be made on a pre-tax basis and investment returns accumulate on a tax-deferred basis until funds are withdrawn, at which time they are taxed at ordinary income tax rates. In a **tax-exempt account**, no taxes are assessed during the investment, contribution, or withdrawal phase, nor are they assessed on investment returns. The tax status of an account is an important factor in understanding the tax

implications of investment and wealth management decisions.

Pension funds, endowment funds, and foundations are generally *tax-exempt*. The retirement accounts of individuals are usually *tax-deferred*. In Australia, retirement superannuation plans are taxed but at a discounted rate relative to the individual investor rate. [Exhibit 2](#) shows the tax status for different accounts by investor type.

**Exhibit 2. Tax Status by Type of Investor and Account**

Type of Investment Account	Typical Tax Status
<i>Individual Investor</i>	
Individual Brokerage Account	Taxable
Individual Retirement Account	Tax-deferred
Roth IRA (US)	Tax-exempt
Personal Trust	Taxable
Charitable Trust	Tax-exempt
<i>Institutional Investor</i>	
Foundation	Tax-exempt
Corporation	Taxable
Corporation – Nonprofit	Tax-exempt
Insurance Company	Taxable
Pension Fund	Tax-exempt
Superannuation Fund (Australia)	Taxable at a discounted rate
Endowment	Tax-exempt
Sovereign Wealth Fund	Tax-exempt

**EXAMPLE 1. TAX CONSIDERATIONS FOR THE PRIVATE CLIENT**

You are managing a portfolio for Hugh Jackson, a private wealth client. Just a few weeks remain in the tax year.

				Year-
Unrealized	Realized	Unrealized	Realized	Dat

	Market Value	Short- Term Gain	Short- Term Gain	Long- Term Gain	Long- Term Gain	Inco (Divid /Inter
<b>Domestic Equities</b>	€8,000,000	-€500,000	€250,000	€2,500,000	€500,000	€120,000
<b>Domestic Fixed Income</b>	€5,000,000	0	0	€1,000,000	0	€150,000
<b>Income- Producing Real Estate</b>	€1,000,000	0	0	€500,000	0	€60,000
<b>Total</b>	<b>€14,000,000</b>	<b>-€500,000</b>	<b>€250,000</b>	<b>€4,000,000</b>	<b>€500,000</b>	<b>€330,000</b>

1. Assuming this is a taxable account, what tax considerations are likely to influence your portfolio decisions?
2. If this were a tax-deferred retirement account and the client plans to take a €450,000 pre-tax withdrawal by year-end, how might the portfolio decisions be different?

### Solution to 1:

- The client is subject to tax on the realized capital gains and income received year-to-date. ( $€250,000 + €500,000 + €330,000 = €1,080,000$ .)
- The dividend and interest income may be eligible for preferential tax treatment depending on the composition of the portfolio.
- The taxable component of the real estate income may be reduced through deductions of maintenance, interest, and depreciation.
- The €500,000 in short-term losses should be evaluated for possible sale prior to year-end. The losses could be used to offset the €250,000 in realized short-term gains and half of the realized long-term gains while raising the cash needed to fund the planned withdrawal.
- Any remaining long-term gain is subject to tax, typically at a rate lower than the investor's marginal income tax rate.

## Solution to 2:

The client would be taxed only on the €450,000 withdrawal. The applicable tax rate is the client's marginal income tax rate. The distinctions between realized and unrealized capital gains and losses are irrelevant in a tax-deferred retirement portfolio.

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## 3. THE JURISDICTION THAT APPLIES TO THE INVESTOR

- c. discuss and analyze the tax efficiency of investments;

Tax systems are used by governments to encourage or discourage certain activities (e.g., investing in domestic companies or saving for retirement). These incentives vary globally and can change as the needs and objectives of the government change. Rather than listing the specific rules for each country and jurisdiction, this reading provides a general framework to understand how different tax environments may affect clients. Private wealth advisers must become familiar with the tax provisions of each jurisdiction that affects their clients.

In general, the main types of tax systems we find internationally fall into three broad categories:

- Tax havens
- Territorial tax systems
- Worldwide tax systems, which may be based on either citizenship or residency

A **tax haven** is a country or independent area with no or very low tax rates for foreign investors. The Cayman Islands are a well-known tax haven—with no tax on income or capital gains, no tax on property holdings (other than on the transfer of a property to another individual or entity), and no corporate taxes. Similarly, the British Virgin Islands or The Bahamas do not tax income or capital gains. Russia and Saudi Arabia also have very low tax rates but aren't considered tax havens since the favorable tax treatment is reserved for residents.

Other jurisdictions operate **territorial tax systems**, where only locally-sourced income is



taxed. For example, Hong Kong, a special administrative region of China, has much lower tax rates than the mainland and does not tax capital gains, dividends, or income earned outside of Hong Kong SAR. Examples of other territorial tax systems include the Philippines and Singapore.

Jurisdictions operating under a **worldwide tax system** tax all income regardless of its source. Examples are Switzerland, France, Germany, India, Canada, and Japan, among many other countries. Worldwide tax systems can give rise to double taxation as the country in which investments are made may impose taxes on this same income. This type of double taxation is often addressed through tax credits provided by the home country or through other forms of relief, such as tax treaties (i.e., bilateral agreements between countries).

Because countries operating under a worldwide tax system generally impose those taxes only on individuals considered to be residents of that country, residence rules become very important. Residence rules specify how much time a person can spend in a country without becoming a taxable resident. If an individual spends time in more than one country, tax treaties can play an important role in determining tax residence. Most tax treaties contain *tie-breaker* rules that prevent an individual from being considered a resident of more than one country at the same time.

The United States is one of the few countries that taxes citizens on a worldwide basis *regardless of residence*. As a result, US citizens living in Hong Kong SAR will be subject to US tax on their worldwide income, whereas Canadian citizens also living in Hong Kong SAR will not be taxed by Canada on income earned outside of Canada.

When working with wealthy families, it is essential to develop a full understanding of the tax jurisdictions that will affect investment and estate planning. It is not uncommon to have a client who is a citizen of one country, a resident of another, and who has investments (and heirs) in several others. A good rule of thumb is to start with the tax rules of the investor's home country. The home country rules may influence decisions on how to own assets in another country. The following example illustrates the various issues that must be addressed when considering cross-border investments for clients.

## CONSIDERATIONS IN CROSS-BORDER INVESTING

Josie Boyd is a Hong Kong citizen living in Hong Kong SAR. She wants to invest in income-producing residential real estate in the United States. The ownership structure of an investment will have a material impact on its after-tax return. Consider the following:

- Hong Kong SAR operates under a territorial tax system; thus, it would not tax any income or gains arising from the US-located investment.
- The United States taxes investments in the United States regardless of the



investor's citizenship or residence, taxing both income from the investment and any capital gain on a sale of an investment in which real estate is involved. The investment may also be subject to US estate and gift taxes. Depending on the location of the US investment, state taxation may come into play in addition to any federal tax obligation.

- Hong Kong SAR also has no inheritance or estate tax, so the only tax considerations to be addressed are those arising from the United States.
- If Josie owns the property directly in her name,
  - she may be subject to tax withholding on the gross rental income, with no opportunity to offset that income with investment expenses; and
  - there would be an estate tax payable upon her death, although the value of the estate would be reduced by any outstanding mortgage on the property.
- If Josie owns the property through a US corporation,
  - the US corporation could be owned by a non-US entity, either Josie herself or a non-US corporation, and investment expenses could be used to offset the rental income. Only the net income would be subject to withholding when it is paid to the non-US owner; and
  - at Josie's death,
    - the shares of the company either pass to Josie's heirs, or
    - if the company is liquidated, any gains on the property would be taxed at the corporate capital gains tax rate, which is higher than the capital gains tax rate for individuals. In addition, any retained earnings would be subject to withholding.
- If Josie owns the property through a non-US corporation,
  - the value of the asset would not be subject to US estate taxes at Josie's death: The shares of the company pass to Josie's beneficiaries, not the property itself, on her death. As a non-US company, it is not subject to US taxation. (This is not true in all countries, however.)

Clearly, the jurisdictional tax considerations are an integral part of any cross-border investment decision. While we used a corporation to illustrate some of the issues that might arise, corporations are not the only alternative, and for certain investments, they may be a poor choice. Trusts, private insurance companies, and private foundations are other alternative structures that can be used to maximize the after-tax return for private

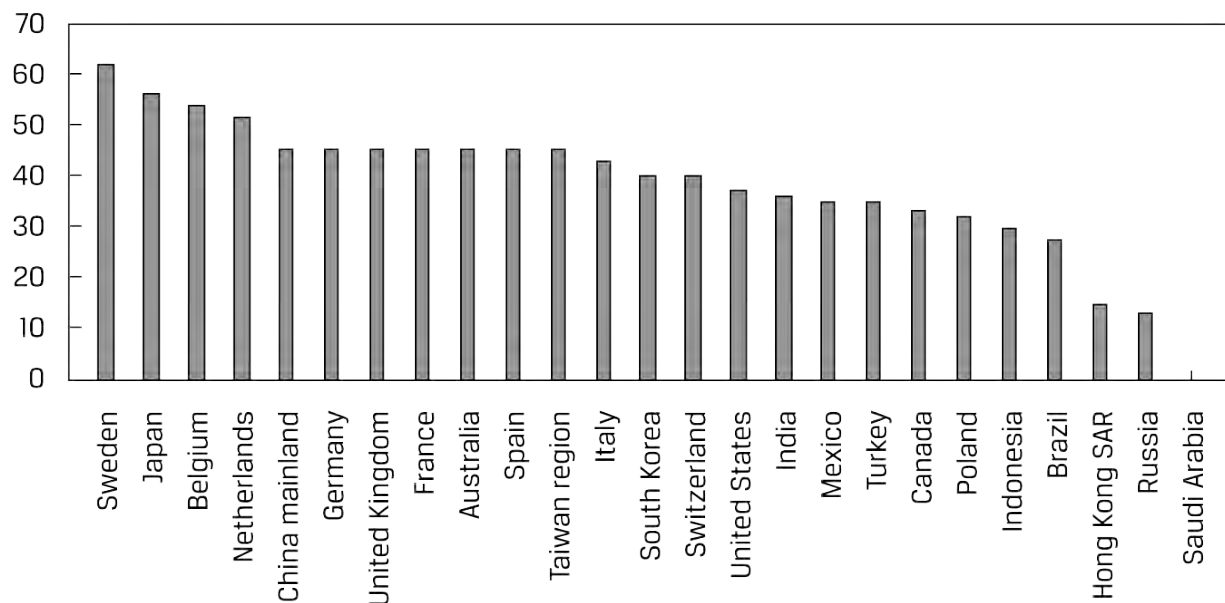
clients. The best solution is one tailored to the client's investment *and* estate planning objectives. An international tax specialist is needed to ensure that all relevant issues are considered in cross-border investment.

**Exhibit 3** summarizes some relevant tax rates for the largest 25 jurisdictions by GDP as of 2018.

### Exhibit 3. Top Marginal Tax Rates for Selected Jurisdictions, Largest 25 Jurisdictions by GDP

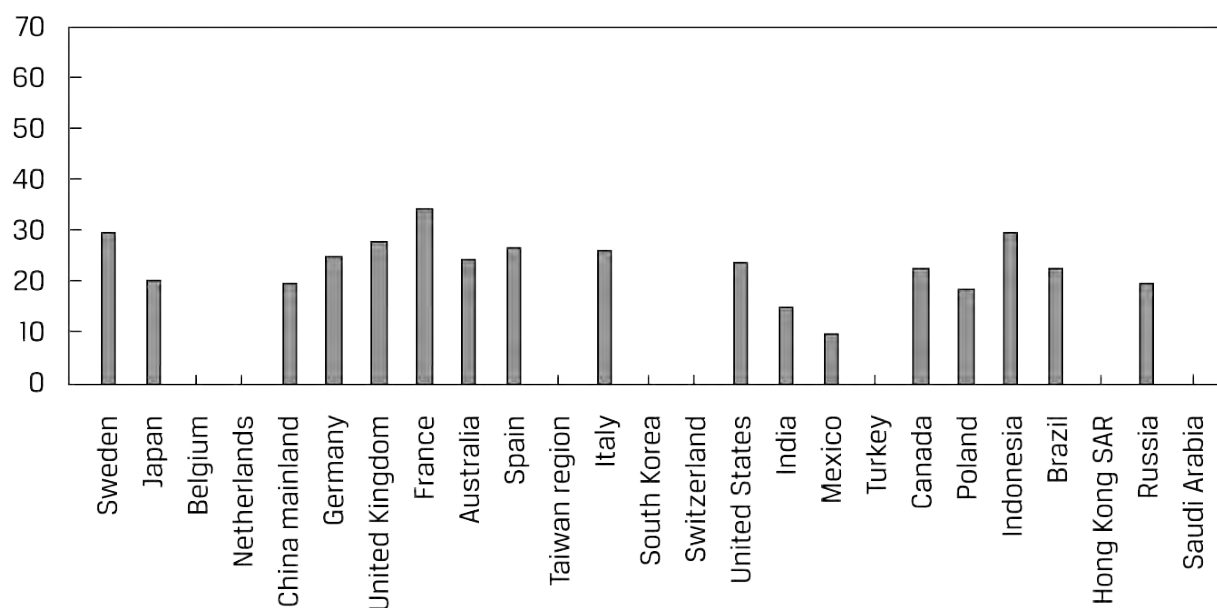
## Income Tax Rate %

Income Tax Rate (%)



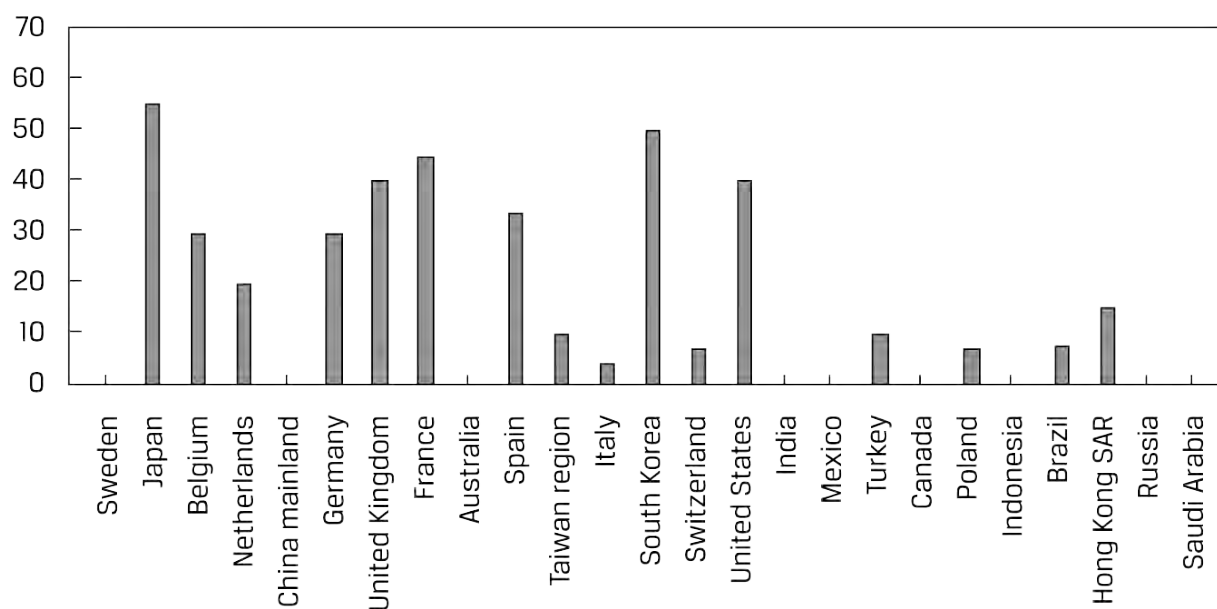
## Capital Gains Tax Rate %

Capital Gain Tax Rate (%)



## Estate Tax Rate %

Estate Tax Rate (%)



*Note:* Tax rates are as of 2018.

*Sources:* [tradingeconomics.com](http://tradingeconomics.com) and [taxfoundation.org](http://taxfoundation.org).

## EXAMPLE 2. JURISDICTIONAL CONSIDERATIONS IN PORTFOLIO MANAGEMENT FOR PRIVATE CLIENTS

Franz Schmid is a portfolio manager for Global Wealth Advisors (GWA), an investment management firm focused on private clients. Franz manages diversified portfolios of stocks and bonds. GWA has recently been retained by two new clients—Valerie Low, based in Singapore, and David Muller, based in Switzerland. Each has a portfolio of CHF10 million held in a taxable account. Valerie and David have similar risk and return objectives, and each has agreed to an asset allocation of 50% domestic stocks and bonds (Singaporean and Swiss, respectively) and 50% US stocks and bonds. Singapore operates under a territorial tax regime. Switzerland operates under a worldwide tax regime. Based on the general principles of territorial and worldwide tax regimes, describe the implications of the two countries' tax regimes for each client's wealth management strategy.

## **Solution:**

Franz must first determine the citizenship of each client to determine which tax rules must be considered in structuring the portfolio. He learns that they both are citizens of the country in which they currently reside.

### ***Home Country Portfolios***

*Valerie Low.* As a citizen and resident of Singapore, Valerie will be taxed only on income earned in Singapore. Because Singapore also exempts most dividends from Singapore companies and most domestic interest income from taxation, Franz's management of the Singaporean stock and bond portfolio will be unconstrained by tax considerations. His chief concern relates to the US taxation of the US stock and bond portfolio.

*David Muller.* As a citizen and resident of Switzerland, David will be subject to Swiss tax on all of his investments and US tax on his US investments. In broad terms, Switzerland taxes dividend and interest income but exempts individual investors' capital gains from taxation. Between local and federal taxes, David's dividend and interest income is likely to be taxed at a rate well over 40%. The portfolio Franz constructs for David will emphasize high-growth equities, where a large portion of the total return is derived from capital gains.

### ***US Portfolios***

*Valerie Low.* No tax treaty exists between Singapore and the United States, so the United States will impose a 30% withholding tax on gross dividends. Most interest income on government and corporate bonds is exempt from withholding, provided the investor supplies the issuer or corporate trustee proof of beneficial ownership. Because they are held by a non-US investor, any capital gains on the stocks and bonds in the US portfolio will not be taxed by the United States. The portfolio Franz develops for Valerie will

emphasize fixed-income securities and high-growth, low-dividend equities.

*David Muller.* There is a tax treaty between Switzerland and the United States that will reduce the withholding rate on David's US dividends from 30% to 15%, a substantial savings. Thus, David's US equity portfolio may have a higher allocation to dividend-paying stocks than would Valerie's portfolio. Any capital gains on the stocks and bonds in the portfolio will not be taxed by the United States, and most interest income will be exempt from US taxation under the same rules applied in Valerie's circumstances.

### ***Wealth and Estate Taxes***

*Valerie Low.* Singapore has no estate tax, and there is no estate tax treaty between Singapore and the United States. The US estate tax applies to US stock holdings but not to holdings of qualifying corporate and government bonds. Therefore, Valerie's estate will be required to pay US estate taxes on her US stock investments. Franz may look to create a non-US company to hold Valerie's US stock investments.

*David Muller.* Switzerland's estate tax is relatively modest compared to the US estate tax rate. While there is an estate tax treaty between Switzerland and the United States, to obtain the estate tax exemption, David would have to disclose his entire net worth to the United States, something he is reluctant to do. Thus, David would like to consider the creation of a non-US company to hold his US investments. This is not a clear-cut solution for David, however. If the country in which this company is created does not have an income tax treaty with the United States, David's dividend income would be subject to the 30% withholding tax rate and capital gains realized within the company would be distributed to David as dividends, which are taxable in Switzerland. Short of pursuing other, more complex, options (e.g., a partnership or trust), David's best option appears to be direct ownership and full disclosure of his net worth.

## **INTERNATIONAL TRANSPARENCY, THE COMMON REPORTING STANDARD, AND FATCA**

In the past, it was not uncommon for people investing on a cross-border basis to assume that their home country would not know about income generated outside that country. While not reporting the foreign income and assets to a home country with a worldwide tax system would have constituted illegal tax evasion, the existence of bank secrecy in such countries as Switzerland facilitated such wrongful activity. Today, substantial information exchange regimes are in operation, including the *automatic* information exchange under what is known as the Common Reporting Standard. Tax authorities have also increased their focus on the activities of those who enable tax evasion, such as

banks and investment managers. Wealthy international families, with a growing awareness of these rules and of the significant penalties associated with tax evasion, are increasingly understanding the need for tax compliance. Thus, they are highly appreciative of investment management strategies that properly analyze tax exposures and make use of legal tax minimization opportunities.

Taxpaying obligations are also accompanied by reporting requirements internationally, and two major regulations are now in place to promote tax transparency and disclosure of beneficial ownership.

The Common Reporting Standard (CRS), also known as the Standard for Automatic Exchange of Financial Account Information, was developed by the OECD with G20 countries and is a reciprocal requirement for the automatic exchange of financial account information. As of April 2019, more than 100 jurisdictions have committed to implementing the Standard, including Switzerland and other financial centers.

FATCA, the Foreign Account Tax Compliance Act, is a US program designed to ensure that US taxpayers pay the appropriate taxes on wealth held outside the country. Financial institutions are required to report this information on US account holders. Failure to do so triggers a 30% withholding on all US income.

### **EXAMPLE 3. MAKING USE OF TAX TREATIES TO ENHANCE THE AFTER-TAX RETURN**

Your client is a resident of Hong Kong SAR and is interested in adding “safe haven” assets to a portfolio. The client asked that you consider adding Swiss equities and bonds to the portfolio. (Switzerland has long been considered a “safe haven” for investors; it is at the center of Europe, has a stable political climate, and is economically integrated with most of the world.) After research, you have identified Swiss equities and bonds that you believe will fit with the client’s investment profile.

You contemplate adding to the portfolio the following equities and bonds, with the following estimated returns:

Swiss equities: CHF200,000, producing annual dividends of CHF5,000 and projected annual appreciation of 5% (CHF10,000)

Swiss bonds: CHF200,000, producing annual interest payments of 3% (CHF6,000)

In your projections, you assume that the appreciation in the equities will be realized through a sale of the shares at year end. So, for your client the total return on the

CHF400,000 portfolio will be:

Dividends: CHF5,000

Capital gains: CHF10,000

Interest income: CHF6,000

Total gross income, pre-tax: CHF21,000

Projected return: 5.25%

1. What questions do you need to ask your client in relation to tax matters, and what information regarding Hong Kong SAR and Swiss taxation do you need in order to determine the after-tax return?
2. How can returns on the portfolio be enhanced by focusing on tax treaties?

### **Solution to 1:**

You need to confirm that the client is not a citizen or permanent resident of a jurisdiction that operates under a worldwide tax regime. (For example, US citizens and permanent residents are taxable in the United States even if not currently residing there.) You also need to confirm the Hong Kong SAR tax treatment of the Swiss portfolio. Here, your client confirms that under Hong Kong SAR tax law there is no Hong Kong SAR taxation on interest, dividends, or capital gains earned in relation to the contemplated Swiss investments.

You also need to understand the Swiss tax position. On review, you confirm with Swiss advisers that Swiss inheritance taxes would not apply to a non-Swiss investor (except on real estate) and that capital gains are tax-free. However, you also learn that Switzerland applies a 35% withholding tax on interest and dividends to foreign investors.

Thus, the after-tax return for your client is estimated as follows:

Total gross income, pre-tax: CHF21,000

35% Swiss withholding tax on CHF11,000 (dividends and interest): CHF3,850

After-tax income: CHF17,150

Projected after-tax return: 4.29% (CHF17,150/CHF400,000).

### **Solution to 2:**

You check on whether a tax treaty exists between Hong Kong SAR, the place of residence of your client, and Switzerland, and you find that there is one. Under the treaty, a qualifying resident of Hong Kong SAR is entitled to a reduction in Swiss withholding taxes on both dividends and interest. In the case of dividends, the withholding rate is reduced from 35% to 10%; in the case of interest, the withholding rate is reduced from 35% to 0%.



Your calculation of the after-tax return is revised as follows:

Total gross income pre-tax: CHF21,000

10% Swiss withholding tax on CHF5,000 (dividends): CHF500

0% Swiss withholding tax on CHF6,000 (interest): CHF0

After-tax income: CHF20,500

Projected after-tax return: 5.13%

In order to recover the Swiss withholding tax, your client, with your help, would apply online to the Hong Kong SAR Inland Revenue Department for a Certificate of Resident Status and then submit it online to the Swiss Federal Tax Administration with details on the withholding tax imposed for the processing of the refund.

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## 4. MEASURING TAX EFFICIENCY WITH AFTER-TAX RETURNS

- d. analyze the impact of taxes on capital accumulation and decumulation in taxable, tax-exempt, and tax-deferred accounts;

We've shown how taxes can materially affect an investor's net returns. Not only do they reduce the investor's return in the year they were paid, they also affect longer-term returns through the lost opportunity to compound gross returns over time. When managing portfolios for taxable investors, it is important to measure the tax efficiency of investments. We do this by quantifying the effects of taxation on returns. Calculating after-tax returns allows us to do a better job of selecting securities, managing trades, and evaluating the performance of portfolios. In this section, we discuss the "tax efficiency" of various asset classes and the calculation of after-tax returns.

### 4.1. Tax Efficiency of Various Asset Classes and Investment Strategies

A **tax-efficient strategy** is one that gives up very little of its return to the friction of taxes. Generally speaking, equity portfolios are often more tax efficient than strategies that rely on derivatives, real assets, or taxable fixed income. 1) Dividends on stocks often receive



preferential tax treatment. 2) Capital gains are taxed less heavily than ordinary income in many jurisdictions. 3) The flexibility to manage the timing of the sell decisions gives asset managers an additional measure of control over the tax burden.

Alternative asset classes are favored by investors for their uncorrelated returns, but the tax considerations associated with these investments can be considerably more complicated than those associated with stocks and bonds. Real estate, timberland, and oil and gas partnerships often have their own tax rules. Market-neutral strategies typically employ leverage, short sales, convertible debt, options, futures contracts, and straddles. The tax rules around these instruments can be difficult to understand even for a tax expert. It is important to model these asset classes' contributions to portfolio risk and return on an after-tax, after-fee basis.

Within an asset class, the portfolio management process and style of investing can affect the tax efficiency of the portfolio. Generally speaking, higher-yield and higher-turnover strategies tend to be less tax efficient. However, the timing of the trading patterns is also an important factor. For example, momentum strategies, which tend to be high turnover strategies, are relatively tax efficient. They hold their winners and sell their losers—letting gains run and accelerating the realization of losses (which create a tax benefit, despite the tendency to have a higher turnover). On the other hand, value and small-cap strategies tend to be less tax efficient as they are likely to sell a security when it reaches a pre-determined target price and thus realize gains more frequently.

Using a “style box” approach to selecting managers can also create tax inefficiencies. A style box approach selects specialist managers to fill targeted large-cap, small-cap, value, growth, and alternative allocations within the equity portfolio. At the manager level, these style constraints force managers to realize gains if a security moves out of their style (or risk losing the account due to “style drift”). At the total fund level, rebalancing to the targeted style allocation can create additional taxable gains.

## 4.2. Calculating After-Tax Returns

To measure tax efficiency, we address the various return measures of interest to the private wealth manager:

- *After-tax holding period return:* Returns are adjusted for the tax liability generated in the period. There is an implicit, simplifying assumption that taxes are withdrawn from (or tax benefits deposited to) the account at the time the asset is sold. This measure allows an investor to judge the tax efficiency of an investment strategy, including how returns are affected by taxes on interest, dividends, and realized capital gains. After-tax holding period returns can be geometrically linked and annualized in the normal way.
- *After-tax post-liquidation return:* Post-liquidation returns assume that the portfolio is

liquidated at the end of a hypothetical investment horizon—usually 1, 3, 5, and 10 years—and the taxes are paid on those gains. The post-liquidation measure allows an investor to consider the impact of the embedded tax liabilities (i.e., the unrealized capital gains) on ending wealth. This is especially useful in the evaluation of commingled funds, such as mutual funds.

- *After-tax excess returns:* Similar to regular returns, after-tax returns can be compared against a benchmark, helping an investor understand whether the tax drag is eroding the return benefits of a strategy.
- *Tax-efficiency ratio:* This ratio is the after-tax annualized total return divided by the pre-tax annualized total return. It helps to quickly sort managers by the efficiency of the product offering. When used in combination with the other measures, it is a useful tool to identify managers who can effectively manage taxable portfolios.

Each of these is discussed next.

#### 4.2.1. After-Tax Holding Period Returns

The pre-tax holding period return,  $R$ , is calculated as the change in value ( $\text{value} - \text{value}_0$ ) plus the income divided by the initial portfolio value:

##### Equation (1)

$$R = \frac{(\text{value} - \text{value}_0) + \text{income}}{\text{value}_0}.$$

The after-tax holding period return,  $R'$ , modifies this formula to account for the tax liability created by the income received and capital gains realized in the period.

##### Equation (2)

$$R' = \frac{(\text{value} - \text{value}_0) + \text{income} - \text{tax}}{\text{value}_0}.$$

This is mathematically equivalent to:

$$R' = R - \frac{\text{tax}}{\text{value}_0}.$$

The tax due in the period can be calculated by multiplying each component of realized return by the appropriate marginal tax rate. If we assume that there are a number of transactions

(realized capital gains or losses, dividends, interest payments, etc.) that each produce a tax consequence and that the tax rate for a particular transaction  $i$  is denoted as  $t_i$ , then we can calculate the total tax for a portfolio in a given period as:

$$\text{tax} = \sum_{i=1}^n \text{transaction}_i \times t_i.$$

If after-tax returns are calculated monthly, the cumulative after-tax return,  $R'_G$ , can be calculated by geometrically linking the monthly returns:

$$R'_G = \left[ (1 + R'_1)(1 + R'_2) \dots (1 + R'_n) \right]^{1/n} - 1.$$

This equation is merely an *estimate* of how taxes can be expected to affect the compounding of the portfolio. It assumes that when capital losses are realized, sufficient capital gains from other investments exist so that the investor may deduct the losses in full. If there are no gains, the deductibility of investment losses can result in an after-tax return that is higher than the pre-tax return. The tax liability is deducted and the tax benefit is added to the account each period as if it were a cash flow, thus reducing the magnitude and volatility of returns. In practice, however, the intricacies of local laws and regulations mean that not all investors will receive full credit for the tax losses realized. Also, taxes are usually paid on an annual or quarterly basis rather than at the time of the taxable event and from an account other than the investment account (i.e., the investor's checking account). Thus, the taxable investment account is unlikely to compound at precisely the after-tax return rate.

## APPROXIMATING MONTHLY AFTER-TAX RETURNS

In many organizations, pre-tax holding period returns are automatically calculated by the firm's accounting systems on a daily basis, while after-tax returns are only calculated monthly. If you want an intra-month after-tax return that accounts for any cash flows during the period, this can be done using the modified Dietz method. We show the calculation of after-tax returns using the modified Dietz method:

$$R' = R - \frac{\text{tax}}{\text{value}_0 + \sum_{j=1}^N C_j (N - j) / N},$$

where:

tax = cumulative tax liability for all transactions during the month

value<sub>0</sub> = initial value at the beginning of the month

$C_j$  = cash flow on day  $j$

$N$  = number of calendar days in a month

$N - j$  = number of days from flow to end of month

If, for example,

- the initial value of the portfolio on 1 January is \$500,000,
- a \$3,500 dividend is received on 10 January,
- the dividend tax rate is 20%, and
- the monthly pre-tax total return for the portfolio is 2.50%,

then the after-tax return can be approximated as

$$2.50\% - \frac{0.20(3,500)}{500,000 + \frac{3,500(31 - 10)}{31}} = 2.36\%.$$

### 4.2.2. After-Tax Post-Liquidation Returns

When evaluating a mutual fund or other commingled vehicle as a potential investment, the taxable investor may need to consider the effect of unrealized capital gains embedded in the fund. One measure that can assist in the analysis is the **post-liquidation return**. The post-liquidation return assumes that all portfolio holdings are sold as of the end date of the analysis and that the resulting capital gains tax that would be due is deducted from the ending portfolio value. The US Securities and Exchange Commission requires that mutual funds report the post-liquidation return as well as an after-tax return calculated under an assumption that all income and capital gain distributions are taxed at the maximum federal rate at the time of distribution and that the after-tax portion of the dividend and interest income return is reinvested in the fund.

To calculate the post-liquidation return,  $R_{PL}$ , we must subtract the embedded tax liability at the end of the final period assuming that all remaining capital gains taxes are paid as they would be if the portfolio were liquidated.

$$R_{PL} = \left[ (1 + R'_1)(1 + R'_2) \dots (1 + R'_n) - \frac{\text{liquidation tax}}{\text{final value}} \right]^{1/n} - 1,$$

where the liquidation tax is given by:

$$\text{liquidation tax} = (\text{final value} - \text{tax basis}) * \text{capital gains tax rate}.$$

These standardized calculations make comparing the tax efficiency of portfolios very straightforward.

#### EXAMPLE 4. CALCULATING THE POST-LIQUIDATION RETURN

A portfolio posts the following pre-tax and after-tax annual returns:

	Pre-Tax Return	After-Tax Return
Year 1	3.0%	2.5%
Year 2	10.0%	9.0%
Year 3	5.0%	4.2%
Year 4	-2.0%	-1.5%
Year 5	5.0%	4.4%
Cumulative Return	22.41%	19.72%
Annualized Return	4.13%	3.66%

Assume the portfolio has embedded gains equal to 10% of the ending value and must pay capital gains taxes at a 20% rate.

What is the annualized post-liquidation return over the 5-year period?

#### Solution:

To calculate the post-liquidation return, we must first calculate the ending portfolio value. Given the five annualized after-tax returns shown, the final after-tax portfolio value is calculated as follows:

$$(1 + 0.025)(1 + 0.09)(1 + 0.042)(1 - 0.015)(1 + 0.044) = 1.197.$$

The after-tax returns compounded in this way account for the tax on distributions and realized capital gains but do not account for any unrealized gains. The assumed tax liability from unrealized capital gains at liquidation is 2% of the final value (10% embedded gain times a 20% tax rate).

Therefore, the portfolio value net of the tax liability is 1.177:

$$1.197 - 0.02 = 1.177,$$

and the annualized post-liquidation return is 3.32%:

$$1.177^{(1/5)} - 1 = 3.32\%.$$

This compares to an annualized return for the non-taxable investor of 4.13%.

### 4.2.3. After-Tax Excess Returns

In an important article on tax management—“Is Your Alpha Big Enough to Cover Its Taxes?”—[Jeffrey and Arnott \(1993\)](#) showed that more than 85% of the active managers in their study underperformed the capitalization-weighted index fund on an after-tax basis. More recently, [Sialm and Zhang \(Forthcoming\)](#) found that, on average, high-tax bracket shareholders invested in equity mutual funds would have lost 108 basis points (bps) per year as a result of taxes due on investment income. This erosion of returns is similar in size to that created by fund expenses, a topic which has received much attention. Both papers confirm the widely-held belief that most mutual fund managers do not generate sufficient alpha to cover fees and taxes.

So, how do we measure the risk and return consequences of the tax management decisions? We use the **after-tax excess return**—the after-tax return of the portfolio,  $R'$ , minus the after-tax return of the benchmark,  $B'$ . If the mandate is passive, the benchmark portfolio is an index. If the mandate is active, we might select an index as the benchmark *or* we could use a strategy benchmark—a model portfolio that represents the manager’s stated investment approach. If we use an index as the benchmark, we are measuring whether the portfolio’s excess return was sufficient to offset its tax burden. If we set the benchmark to be the model portfolio, we are measuring the implementation effects of tax management. In either case, the excess returns are calculated as follows:

$$x = \text{pre-tax excess return} = R - B, \text{ and}$$

$$x' = \text{after-tax excess return} = R' - B'.$$

We use the following notation to measure the performance of a strategy on an after-tax basis:

$R$  = portfolio pre-tax return

$B$  = benchmark pre-tax return

$R'$  and  $B'$  = after-tax returns for the portfolio and benchmark, respectively

$x$  = pre-tax excess return

$x'$  = after-tax excess return

The **tax alpha** isolates the benefit of tax management by subtracting the pre-tax excess return from the after-tax excess return:

$$\alpha_{\text{tax}} = \text{tax alpha} = x' - x.$$

#### 4.2.4. *Tax-Efficiency Ratio*

The **tax-efficiency ratio (TER)** is simply the after-tax return divided by the pre-tax return:

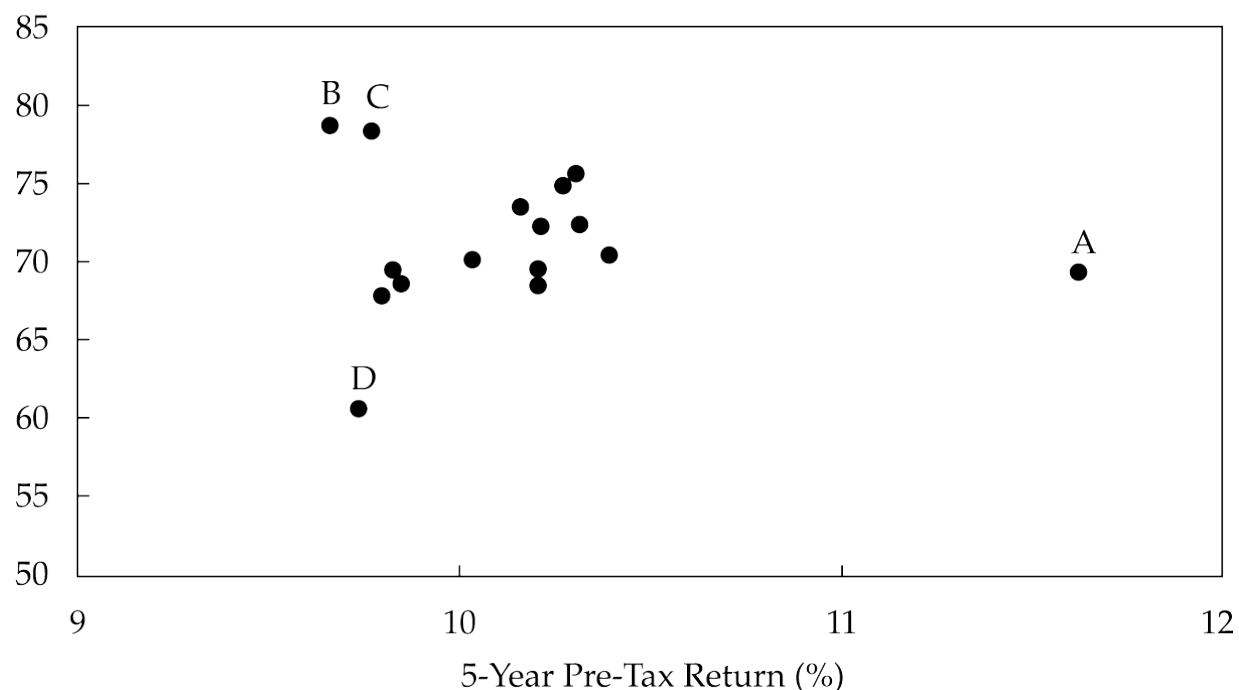
$$\text{TER} = \frac{R'}{R}.$$

For example, if the total annualized return for a portfolio is 10% and the after-tax return is 8%, the tax-efficiency ratio would be 80% ( $= 0.08 / 0.10$ ).

**Exhibit 4** illustrates the extent to which the tax efficiency of even top-performing funds can vary. It plots the five-year pre-tax return of top-decile, no-load, small-cap mutual funds against their tax-efficiency ratios. The funds in this chart are all top-decile funds, having outperformed a majority of their peers over the five-year period. But this top-decile ranking is based on pre-tax returns. An important question for the private wealth investor is how much of that return do I get to keep? Ideally, you would want to focus on funds in the upper right-hand quadrant of the graph—the higher-returning, more-efficient funds. Most of the funds have a TER in the range of 70% to 75%, with annual returns of 10% to 10.5%. There are a few outliers, however. Fund A has a much higher pre-tax return than all of its peers. Its TER, though, is below the median TER of the group. Managers B and C have high TERs but returns that place them at the bottom of the group. Manager D is a negative outlier, with both returns and TER at the bottom of the group.

#### **Exhibit 4. Comparing Managers Using Tax-Efficiency Ratios**

Tax Efficiency Ratio



The tax-efficiency ratio can help an analyst or portfolio manager understand which funds may be more appropriate for the taxable account of a private client. If the client's other investments generate tax losses, perhaps Manager A would be a good fit. While it is difficult to predict what the performance of these managers will be over the next five years, it is likely that their investment process will produce levels of tax efficiency similar to those that each has produced in the past.

Note that the tax-efficiency ratio is not as useful when returns are negative. For example, if a portfolio had a  $-10\%$  pre-tax return and  $-12\%$  after-tax return, the ratio would be  $120\%$  ( $-0.12/-0.10$ ). We know, however, that this cannot be right; taxes are making the returns worse. Rather than relying on the TER, the analyst could choose to simply plot the after-tax returns versus pre-tax returns directly or look at other metrics, such as tax alpha, instead.

### EXAMPLE 5. TAX AND THE CITY

Cary Broadshaw lives in New York City and holds a portfolio of stocks, bonds, and funds in a taxable brokerage account. The following table lists the federal and state tax rates that apply to her various investments. The marginal tax rate is the combined income tax rate—federal, state, and local—that applies to an incremental dollar of investment income that the investor earns. In this case, the highest marginal rate adds up to well over  $50\%$ , which is a difficult environment for an investor attempting to compound wealth over time.



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**Income Tax Rates by Jurisdiction**

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US Federal income tax rate	37.00%
NY State income tax rate	8.82%
NY City income tax rate	3.88%
Federal net investment income (NII) tax rate	<u>3.80%</u>
Total tax rate on ordinary investment income	53.50%

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Some asset classes qualify for preferential income tax rates.

<b>Income Tax Rates by Asset</b>	<b>Tax Rate</b>	<b>Requirement</b>
NY State municipal bond interest income	0.00%	For NY state residents
Out-of-state municipal bond interest income	12.70%	
Capital gains	36.50%	If held longer than 1 year
Qualified dividend income from stocks	36.50%	If held longer than 61 days
US Treasury interest income	40.80%	
Dividend income from REITs	43.50%	
Other fixed-income instruments	53.50%	
Non-qualified dividend income from stocks	53.50%	

---

Cary's adviser, Mr. Bigg, has constructed a diversified portfolio using mutual funds and exchange-traded funds. The following table highlights some characteristics of those funds, obtained from Mr. Bigg's data service provider.

	<b>Annualized 5-Year Pre-Tax Return</b>	<b>5-Year Return after Taxes on Distributions</b>	<b>5-Year Post- Liquidation Return</b>
Passive Equity ETF	10.85%	10.19%	8.71%
Active Equity Mutual Fund	12.05%	10.21%	9.05%
High-Yield Bond ETF	4.28%	1.72%	1.36%

---

*Note:* These returns are net of fund expenses and management fees.

## Questions:

1. Calculate the tax-efficiency ratio for each of the funds in the table. Which of the funds is most tax efficient? Why are the other funds less tax efficient?
2. Mr. Bigg's data provider assumes the highest federal tax rates. How will the after-tax returns on the funds be affected by Cary's actual tax rates?
3. Cary bought 1,000 shares of Microsoft (MSFT) in her brokerage account for \$130 per share at the beginning of the month and sold all 1,000 shares at the end of the month for \$155 per share. She also received a dividend on MSFT of \$0.50 per share during the month. Ignoring any transaction costs, what taxes are due?
4. Discuss the tax efficiency of Cary's MSFT investment. How could the tax efficiency have been improved?
5. Discuss the tax efficiency of this same trade assuming a sale price of \$120 per share.
6. Cary's portfolio also holds several NY State tax-exempt municipal bonds. She plans to hold the bond to maturity. During the month, interest rates declined and the value of the bonds increased by 1%. While Cary didn't buy or sell during the month, she did receive 0.5% of the value of the bonds in interest payments. What are the pre-tax and after-tax returns of her NY state municipal bond portfolio?

## Solution to 1:

- The tax-efficiency ratios for each of the funds are as follows:
  - Passive Equity ETF:  $10.19/10.85 = 94\%$
  - Active Equity Mutual Fund:  $10.21/12.05 = 85\%$
  - High-Yield Bond ETF:  $1.72/4.28 = 40\%$
- The Passive Equity ETF is very tax efficient, as evidenced by its 94% tax-efficiency ratio. The after-tax return is only 0.66% lower than the pre-tax return over five years. The very low turnover in the passive portfolio produces little in the way of capital gains distributions. The tax drag from the ETF is largely due to the tax on dividend income. The post-liquidation returns are quite a bit lower but still tax efficient; in a passively managed portfolio, most shares are likely held long enough that the dividends qualify for preferential tax treatment. The capital gains

are deferred (and the returns compounded) until Cary sells the ETF, and the gains on the sale of the ETF will qualify for the long-term capital gains tax rate.

- The Active Equity Mutual Fund has a higher pre-tax and after-tax return than the Passive Equity ETF but is less tax efficient as evidenced by its 85% tax-efficiency ratio. The after-tax return is 1.84% lower than the pre-tax return over five years. Ongoing capital gains, including the likelihood of some short-term gains, and dividend income on shares held for less than 61 days contribute to the lower tax-efficiency ratio. Still, on a post-liquidation basis, the active fund outperforms the passive fund by 34 basis points (9.05 – 8.71).
- The High-Yield Bond ETF is the least tax efficient. The after-tax return is 2.56% lower than the pre-tax returns. The tax-efficiency ratio is 40%, meaning that more than half of the compounded returns to this fund are paid in taxes. Interest income from high-yield bond investments receives no tax preferences. The after-tax return and post-liquidation returns are very low in this case, making the High-Yield Bond ETF quite unattractive to a taxable investor, especially given that the fund is likely to have significantly higher risks than other investments.

## **Solution to 2:**

- Because Cary lives in NY City, she is subject to state and local taxes as well as federal tax. Therefore, her actual after-tax returns are likely to be lower than the after-tax returns shown in the table.

## **Solution to 3:**

- Cary will realize a \$25,000 capital gain on her sale of MSFT (1,000 shares × \$25 gain per share). She will owe \$13,375 in capital gains tax ( $\$25,000 \times 53.50\%$  tax rate). Cary does not qualify for the long-term capital gains tax rate because she did not hold the stock for longer than a year.
- The \$500 MSFT dividend received (1,000 shares × \$0.50 per share) creates a \$267.50 tax liability ( $\$500 \times 53.50\%$  tax rate). Cary must pay the full tax rate because she did not hold the position for longer than 61 days to qualify for the preferential dividend tax rate.
- Her pre-tax return is 19.62%:  $(25,000 + 500) / 130,000$ .
- Her after-tax return is 9.21%:  $[(25,000 + 500) - (500 \times 0.535) - (25,000 \times 0.535)] / 130,000$ .

## **Solution to 4:**

- This transaction was not very tax efficient, with a tax-efficiency ratio of 46% (9.12/19.62).
- The trading horizon of one month meant that Cary did not qualify for the lower tax rate on dividends and long-term capital gains.
- If Cary had held the stock for a year, then her transaction would have been much more tax efficient. Assuming she was still able to sell the stock for the same \$155 per share after one year (and that she did not receive any further dividends), then her after-tax return would be 12.46%:  $[(25,000 + 500) - (500 \times 0.365) - (25,000 \times 0.365)] / 130,000$ . The tax-efficiency ratio would be improved to 64% (12.46/19.62).

### Solution to 5:

- If MSFT had fallen to \$120 per share, then Cary's pre-tax return would be -7.31%:  $(-10,000 + 500) / 130,000$ . She would realize a short-term capital loss of \$10,000. This loss can be used to offset short-term gains that Cary realized at other times during the same tax year. The potential tax savings is \$5,350 ( $\$10,000 \times 53.50\%$ ). Her after-tax return is -2.99%  $[(-10,000 + 500 - 500 \times 0.535 + 10,000 \times 0.535) / 130,000]$ . Yes, the after-tax return is higher than her pre-tax return. In estimating after-tax returns, we are most concerned with the portfolio impact. In this example, the transaction creates an economic benefit; the loss becomes smaller due to the potential tax savings, increasing the after-tax return.

### Solution to 6:

- The pre-tax return of the municipal bond portfolio is 1.5% (1.0% gain + 0.5% interest).
- The after-tax return of the portfolio is 1.5%, the same as the pre-tax return. The capital gains are unrealized gains, and the interest income on New York municipal bonds is exempt from federal and state taxes.
- This is a very tax-efficient portfolio, with a tax-efficiency ratio of 100%. Cary plans to hold the bonds to maturity, so there are unlikely to be any capital gains realized from a sale prior to maturity. If she does sell the bonds prior to maturity, capital gains will likely qualify for the long-term capital gains tax rate. Also, the interest income is exempt from federal and state taxes.

# 5. TAXABLE, TAX-EXEMPT, AND TAX-DEFERRED ACCOUNTS: CAPITAL ACCUMULATION AND ASSET LOCATION

- e. explain portfolio tax management strategies and their application;

We have shown how tax efficiency can be measured at the security and fund level, but tax considerations will also affect the client’s financial plan, asset allocation strategy, and wealth transfer plan. Often clients will have a mixture of taxable, tax-deferred, and tax-exempt accounts. On the front end of the investment planning process, effective management must consider the interaction of the underlying investment strategy and the accounts in which it might be deployed. At the back end of the investment planning process (as the client approaches retirement and begins to spend down—decumulate—assets), there are additional opportunities to maximize the after-tax value of the client’s assets.

Exhibit 5 shows various phases of developing and executing a financial plan and provides an example of tax-aware and tax-indifferent planning for each. While each investor faces unique circumstances that may affect strategy, the following table gives an idea of how taxes might change the planning process.

**Exhibit 5. Examples of Tax-Aware Approaches to Planning**

Strategic Decisions	Common Tax-Indifferent Approach	Tax-Aware Approach
Financial planning	Use pre-tax growth assumptions	Use after-tax growth assumptions for taxable accounts
Asset allocation	Use pre-tax return and volatility expectations	Use after-tax return and volatility expectations
Asset location	A single allocation across taxable and tax-deferred accounts	Tax-advantaged assets favored in the taxable account
Retirement income planning	Withdraw from retirement accounts first	Optimize withdrawals from taxable and tax-advantaged accounts
Charitable	Gift cash	Gift highly appreciated stock

In this section, we assess the effect of account type on capital accumulation, consider some of the issues related to the allocation of asset classes across a client's various accounts, and discuss tax-efficient decumulation and charitable giving strategies.

## 5.1. Capital Accumulation in Taxable, Tax-Deferred, and Tax-Exempt Accounts

The value of a tax-exempt account compounds in the usual way. For an annual return  $R$  over  $n$  years, the future value multiplier is given by:

$$FV = (1 + R)^n,$$

where  $n$  is the number of years.

The value of a taxable account compounds using the after-tax returns,  $R'$ . Compounding returns on an after-tax basis implicitly assumes that taxes on realized returns are paid (and tax credits received) each period. The tax payment is treated as a cash flow:

$$FV = (1 + R')^n.$$

The value of a tax-deferred account compounds using the pre-tax returns and pays tax only when assets are withdrawn from the account. (Withdrawals are taxed at the applicable income tax rates.) If we assume all the assets are withdrawn in a lump sum at the horizon and have a tax rate  $t$ , then

$$FV = (1 + R)^n(1 - t).$$

### EXAMPLE 6. COMPARING ACCUMULATIONS IN DIFFERENT ACCOUNT TYPES

Chen Li lives in a tax jurisdiction with a flat tax rate of 20%, which applies to all types of income and capital gains. Assume that Li has the following account types:

Account 1: ¥1,000,000 invested in a taxable account earning 10%, taxed annually.

Account 2: ¥1,000,000 invested in a tax-deferred account earning 10%.

Account 3: ¥1,000,000 invested in a tax-exempt account earning 10%.

Compute the after-tax wealth for each account at the end of 20 years assuming the accounts are liquidated at the end of the horizon.

### Solution:

#### Future value of taxable, tax-deferred, and tax-exempt accounts

Account 1	Account 2	Account 3
¥4,660,957	¥5,382,000	¥6,727,500
FV = $\text{¥1,000,000} [1 + 0.10(1 - 0.20)]^{20}$	FV = $\text{¥1,000,000} [(1 + 0.10)^{20}(1 - 0.20)]$	FV = $\text{¥1,000,000} (1 + 0.10)^{20}$

## 5.2. Asset Location

A private wealth client typically has assets spread across taxable, tax-deferred, and tax-exempt portfolios. For these clients, asset allocation must not only consider the appropriate overall asset class mix but must also consider which asset classes are best suited to be held in which accounts. This is called **asset location**—the process for determining whether the assets will be held in a taxable, tax-deferred, or tax-exempt account. A general rule of thumb is to put tax-efficient assets in the taxable account and tax-inefficient assets in the tax-exempt or tax-deferred account. This is only a rule of thumb, however. While it suggests that taxable bonds should be held in a tax-exempt account and that equities (given the preferential tax rate applied to capital gains) should be held in the taxable account, investors with a long investment horizon or that have higher turnover equity strategies may find that putting equities in the tax-exempt account results in better after-tax returns.

Consider the following example. If the expected return for equities is 10% and for fixed income 6%, and if the asset allocation is 50% equity/50% fixed income, then we would expect a pre-tax 8% return. But for a taxable client, there are additional considerations. First, we should consider two additional asset classes: tax-exempt bonds and tax-managed equities. Tax-managed equities are more tax efficient than high-turnover equity strategies that do not

consider taxes. Similarly, tax-exempt bonds are more tax efficient than regular bonds, although they typically have lower pre-tax return expectations. [Exhibit 6](#) shows how the return expectations might change by asset class and account, assuming a 50% marginal tax rate on fixed income, 25% tax rate on equities, and 10% effective tax rate on tax-managed equities.

**Exhibit 6. After-Tax Return Expectations by Asset Location**

	Asset Location	
	Taxable Account	Tax-Exempt Account
Equity	7.5%	10%
Tax-Managed Equity	9%	10%
Fixed Income	3%	6%
Tax-Exempt Fixed Income	4%	4%

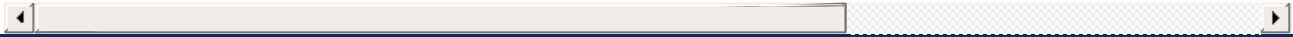
[Exhibit 7](#) shows three potential asset location strategies. We assume the taxable and tax-exempt accounts each represent 50% of the client’s total investment assets.

**Exhibit 7. Maximizing the After-Tax Return of a Given Asset Allocation**

Asset Class	Tax-Indifferent Allocation			Tax-Aware Allocation		
	Taxable Account	Tax-Exempt Account	Return Contrib.	Taxable Account	Tax-Exempt Account	Return Contrib.
Equity	25	25	4.38%	—	25	2.50%
Tax-Managed Equity	—	—	—	25	—	2.25%
Fixed Income	25	25	2.25%	—	25	1.50%
Tax-Exempt Bonds	—	—	—	25	—	1.00%



Total	50	50	6.63%	50	50	7.25%
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- The Tax-Indifferent strategy implements the same 50/50 strategy in each account.
- The Tax-Aware strategy replaces nominal equity and fixed-income assets in the taxable account with tax-managed equities and tax-exempt bonds.
- The Asset Location-sensitive strategy follows the rule “put tax-efficient assets (tax-managed equities) in the taxable account and tax-inefficient assets (fixed income) in the tax-exempt account.”

The expected total after-tax returns for each strategy are 6.63%, 7.25%, and 7.50%, respectively. While the improvement in the annual return is small (87 basis points), that improvement compounds over time and can have a material impact on the client’s wealth as the decumulation phase approaches.

An asset location strategy cannot be rigidly employed. The client may have a different goal and time horizon for each account type and may have multiple goals for the assets held within a single account. For example, a tax-efficient asset location strategy might suggest that the retirement savings account be allocated 100% to bonds while the taxable investment account is allocated 100% to tax-managed equities. If, however, a portion of the taxable account will be used in the next three years for the purchase of a vacation home, exposing these funds to the volatility of a 100% equity allocation may be unwise. Several quantitative tools are available to assist with after-tax portfolio optimization and rebalancing across account types.

## EXAMPLE 7. ASSET LOCATION STRATEGY FOR CHARLES AND IVY LEE

- Charles Lee, 55 years old, has recently inherited \$2,500,000 from his parents.
- Ivy Lee, 54 years old, will soon receive a \$2,500,000 rollover from her company-sponsored retirement plan; this will be deposited in her tax-deferred retirement account.
- The Lees have agreed that they want to establish a \$2,500,000 “angel” fund to make investments in small start-up companies, as they already have sufficient assets to fund their lifestyle needs. This angel investment, although technically equities, will be over-and-above the 60% allocated to equities in their core portfolio.

- The remaining \$2,500,000 will be invested to maintain the 60/40 asset allocation using the same strategies employed for their other liquid assets.
- Their other investment assets are summarized as follows.

	<b>Taxable Brokerage Account (tax basis)</b>	<b>Tax-Deferred Retirement Account</b>	<b>Other (tax basis)</b>	<b>Pre-Tax/ After-Tax Return Expectation*</b>
Passive Global Equity Fund		\$3,000,000		7.0% / 7.0%
Passive Fixed Income (taxable)		2,000,000		3.0% / 3.0%
Active Global Equity Fund	\$3,000,000 (2,500,000)			9.0% / 6.5%
Tax-Exempt Fixed Income	2,000,000 (1,800,000)			1.5% / 1.5%
Residential Real Estate			\$3,000,000 (2,750,000)	n/a
Concentrated Equity Position			15,000,000 (4,000,000)	n/a
<b>Total</b>	<b>\$5,000,000</b>	<b>\$5,000,000</b>	<b>\$18,000,000</b>	

\*Assumed tax rates: 50% marginal income tax rate and 20% capital gains tax rate.

The Lees' adviser has warned them that while the average angel investor realizes 2.5x per dollar invested, more than half of all angel investments lead to a loss.

1. Which account would you recommend that the Lees use to fund their angel investments? Justify your response.
2. Of the four strategies currently employed in the Lees' accounts, which should the adviser recommend for the balance of the new money? Justify your response.

## Solution to 1:

Charles' inheritance, which would be invested via the taxable brokerage account, should be used to make the angel investments. Held in the taxable account, the Lees can use any losses generated to offset gains elsewhere in the account. Over the long term, the Lees expect to realize significant capital gains on these investments. Held in the taxable account, these gains will be taxed at the 20% capital gains rate. If held in the tax-deferred retirement, the gains would be taxed at the 50% income tax rate as they are withdrawn.

## **Solution to 2:**

Because Charles' inheritance is being used to make the angel investments, the \$2,500,000 rollover from Ivy's company-sponsored retirement plan will need to be allocated among the existing investment strategies in a manner to maintain the 60/40 asset allocation. The rollover is in Ivy's tax-deferred retirement account. The most tax-efficient asset location strategy would place the equity investments in the brokerage account and the fixed-income allocation in the retirement account. This would allow the Lees to take full advantage of the more favorable tax rate on capital gains. With the new cash in Ivy's retirement account, the Lees will be able to rebalance their portfolio to achieve a more tax-efficient allocation.

- With \$12,500,000 in financial assets (aside from the angel fund), the 60% equity allocation (\$7,500,000) would be allotted first to the brokerage account. The brokerage account balance is \$5,000,000; it should be invested completely in equities to achieve the desired 60/40 asset allocation. However, the tax-exempt fixed-income position has an embedded gain of \$200,000 that would need to be realized to accomplish the rebalancing. The Lees' adviser will need to assess the merits of incurring the capital gains tax liability in order to reinvest in the higher-returning strategy. If losses can be realized elsewhere in the portfolio, they may be used to offset this gain.
- The choice between equity strategies in the brokerage account is less clear-cut. While the passive equity strategy is likely more tax efficient (capital gains are realized less frequently), the return expectation for the active strategy is 200 basis points higher. Other considerations, such as the desire to maintain a given tracking error relative to the benchmark, are likely to play a role in the selection of the most appropriate equity strategy. Also, the ability of the investment manager to employ tax management trading strategies is an important consideration.
- The remainder of the equity allocation (\$2,500,000) would be achieved through the tax-deferred retirement account. The appropriate strategy is the Active Global Equity strategy, where its higher return (9% vs. the 7% expected return for the passive strategy) will compound tax-free over the Lees' long investment horizon.

- The 40% fixed-income allocation (\$5,000,000) is achieved through the tax-deferred retirement account. The appropriate strategy is the Passive Fixed-Income (taxable) strategy.

The final asset allocation is shown in the following table:

	<b>Taxable Brokerage Account</b>	<b>Tax-Deferred Retirement Account</b>
Passive Global Equity Fund		0
Active Global Equity Fund	\$5,000,000	\$2,500,000
<b>Total Equity</b>		
Tax-Exempt Fixed Income		0
Passive Fixed Income (taxable)	0	5,000,000
<b>Total Fixed Income</b>	<b>\$5,000,000</b>	<b>\$7,500,000</b>

## 6. TAXABLE, TAX-EXEMPT, AND TAX-DEFERRED ACCOUNTS: DECUMULATION STRATEGIES AND CHARITABLE GIVING STRATEGIES

- e. explain portfolio tax management strategies and their application;

Investment advisers should work closely with the client's financial planner, estate planner, and tax attorney to make sure the investment program is aligned with the larger financial plan. Our discussion so far has focused on capital accumulation. In this section, we assume that clients have reached retirement age and will soon be using their retirement assets to support spending needs over their expected remaining lifetime. We examine a **tax-efficient**

## decumulation strategy for a retirement account.

Since retirement accounts are tax-exempt or tax-deferred, they compound at a higher rate than taxable accounts. A common rule of thumb suggests that it is better to make withdrawals from the taxable account first and allow the retirement account to continue to compound. Designing the most effective decumulation strategy may require a significant level of financial planning expertise.

In [Exhibit 8](#), we show a simplified example of a tax-aware decumulation strategy using a taxable and a tax-exempt account. (Practically speaking, the tax-advantaged account is most likely a tax-deferred account, such as a retirement savings account. For this illustration, however, we assume that it is tax exempt). Each account has a beginning balance of \$1,000,000. We assume a pre-tax rate of return of 10% for both accounts and a 25% effective tax rate on earnings in the taxable account, which equates to an after-tax rate of return of 7.5%. At the end of each year, the investor withdraws \$200,000. The withdrawals are taken from the taxable account first, allowing the tax-exempt account to continue to compound at the higher effective rate. Once the taxable account is depleted, withdrawals are taken from the tax-exempt account. At the end of 10 years, the client has \$1.80 million remaining. If the withdrawals are taken from the tax-exempt account first, as shown in [Exhibit 9](#), the client will have only \$1.48 million remaining at the end of 10 years.

### Exhibit 8. Withdraw from Taxable Account First (Tax Aware)

Year	Withdrawal from Taxable Account	Withdrawal from Tax- Exempt Account	Year-End Taxable Account Balance	Year-End Tax- Exempt Account Balance
0			\$1,000,000	\$1,000,000
1	\$200,000		875,000	1,100,000
2	200,000		740,625	1,210,000
3	200,000		596,172	1,331,000
4	200,000		440,885	1,464,100
5	200,000		273,951	1,610,510
6	200,000		94,497	1,771,561
7	101,585	\$98,415		1,850,302
8		200,000		1,835,332
9		200,000		1,818,866
10		200,000		<b>\$1,800,752</b>

## Exhibit 9. Withdraw from Tax-Exempt Account First (Tax-Indifferent)

Year	Withdrawal from Taxable Account	Withdrawal from Tax- Exempt Account	Year-End Taxable Account Balance	Year-End Tax- Exempt Account Balance
0			\$1,000,000	\$1,000,000
1		\$200,000	1,075,000	900,000
2		200,000	1,155,625	790,000
3		200,000	1,242,297	669,000
4		200,000	1,335,469	535,900
5		200,000	1,435,629	389,490
6		200,000	1,543,302	228,439
7		200,000	1,659,049	51,283
8	\$143,589	56,411	1,639,889	
9	200,000		1,562,880	
10	200,000		<b>\$ 1,480,097</b>	

Under progressive tax regimes (jurisdictions where tax rates rise as the level of income rises), a more tax-efficient strategy may be to withdraw from the retirement account until the lowest tax brackets have been fully utilized. Any additional withdrawals would then be taken from the taxable account.

## 6.1. Tax Considerations in Charitable Giving

When the client's overall financial plan includes charitable giving, the source of the assets to be gifted should be approached strategically. In some jurisdictions, appreciated securities can be gifted to a qualified charity without triggering the capital gain. In these jurisdictions, gifting low-cost-basis assets from taxable accounts is preferred. The investor may receive a tax *benefit* (a tax deduction, reducing the overall tax liability) from the gift while simultaneously removing a future tax liability on the unrealized gain from the portfolio. Advisers and portfolio managers can help investors identify highly appreciated securities for

gifting, thereby reducing the tax liability embedded in the portfolio.

### EXAMPLE 8. IDENTIFYING ASSETS FOR CHARITABLE GIVING

Charles and Ivy Lee wish to give \$750,000 to a local art museum. Ivy Lee has a concentrated holding of \$15 million in appreciated company stock (with a tax basis of \$4 million and \$11 million in unrealized capital gains) that they would like to diversify over time. They also have a diversified portfolio of securities and a retirement account, as shown in [Example 7](#). Their tax rate is 50% on income and 20% on realized capital gains. How should the Lees fund this charitable gift?

#### **Solution:**

The Lees should gift shares of the concentrated asset position. The museum, as a tax-exempt entity, can sell the shares without incurring a tax liability, and the Lees will reduce their exposure to the concentrated position. In many jurisdictions, the Lees will receive an income tax deduction, reducing their income tax liability by up to \$375,000. Alternatively, the Lees might consider gifting appreciated assets from their brokerage account. However, the unrealized gains on the assets in this account are comparatively small and a larger financial advantage can be achieved by gifting part of the concentrated stock position.

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## 7. TAX MANAGEMENT STRATEGIES AND BASIC TAX STRATEGIES

- f. discuss risk and tax objectives in managing concentrated single-asset positions;

As the vast majority of professionally managed assets have historically been tax-exempt institutional portfolios, most investment theory and practice presume a pre-tax framework. The goal of this section is to give you an overview of tax management techniques so that when working with a taxable client you have the tools needed to understand and implement investment strategies efficiently.

### TAX AVOIDANCE VS. TAX EVASION—ETHICAL AND LEGAL OBLIGATIONS

As fiduciaries, portfolio managers and advisers are obligated to avoid unnecessary frictions. Taxes are one of the frictions to be aware of. The risk in being too clever when attempting to reduce that particular friction is that a former UK Chancellor of the Exchequer, is often quoted: “The difference between tax avoidance and tax evasion is the thickness of a prison wall.”

In 2010, the CEO of a hedge fund and private wealth manager ended up on the wrong side of that wall, setting up an offshore company for his clients could then use to offset gains. However, the losing stock market meant the offshore company had no employees and no earnings. The CEO and his attorney involved were both sentenced to six years in prison for tax evasion.

Because usage of the terms likely differs from jurisdiction to jurisdiction, we will define them by defining what we mean by “tax avoidance” and “tax evasion.” The difference is that **tax avoidance** is the legal activity of understanding the various tax approaches that avoid or minimize taxation. **Tax evasion** is the illegal activity of non-payment of taxes that are otherwise due. If the primary purpose is to avoid paying tax and the activities are misleading or do not follow the law, then the activity is likely unethical and may be illegal.

The CFA Institute Code of Ethics and Standards of Professional Conduct requires CFA charterholders and candidates act with integrity, competence, and in an ethical manner. Focusing on after-tax returns, minimizing tax burdens, and being thoughtful about how taxation interacts with other elements of being a good steward of a client’s assets. However, they should not be involved in helping a client disguise true ownership of assets or be involved in tax evasion. Charterholders and candidates must not engage in professional conduct involving dishonesty, fraud, or deceit or conduct that reflects adversely on their professional reputation, integrity, or competence.

## 7.1. Basic Portfolio Tax Management Strategies

Basic portfolio tax management strategies fall into two categories:

- Structuring a client’s investments in a legitimate manner to minimize taxes owed. Examples include:
  - holding assets in a tax-exempt account versus a taxable account
  - investing in tax-exempt bonds instead of taxable bonds























































































































































































# Study Session 11

## Private Wealth Management (2)

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The wealth of many individuals and families is often concentrated in a limited number of securities, business holdings, or real estate properties. The sale of concentrated positions to facilitate desired diversification may not be feasible or may create a substantial tax liability.

This study session examines the considerations and risks associated with concentrated single asset positions. Strategies for managing concentrated positions in publicly traded common shares, privately held businesses, and real estate are presented. Coverage on the dynamics of human and financial capital and the challenge of meeting financial goals throughout an investor's lifetime follows. The discussion specifically addresses investment strategies and financial products structured to mitigate the risk of not achieving these goals.

## READING ASSIGNMENTS

**Reading 23** Risk Management for Individuals  
by David M. Blanchett, PhD, CFP, CFA, David M. Cordell, PhD, CFP, CFA,  
Michael S. Finke, PhD, and Thomas M. Idzorek, CFA

# Reading 23

## Risk Management for Individuals

by David M. Blanchett, PhD, CFP, CFA, David M. Cordell, PhD, CFP, CFA, Michael S. Finke, PhD, and Thomas M. Idzorek, CFA

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** compare the characteristics of human capital and financial capital as components of an individual's total wealth;
- b.** discuss the relationships among human capital, financial capital, and economic net worth;
- c.** discuss the financial stages of life for an individual;
- d.** describe an economic (holistic) balance sheet;
- e.** discuss risks (earnings, premature death, longevity, property, liability, and health risks) in relation to human and financial capital;
- f.** describe types of insurance relevant to personal financial planning;
- g.** describe the basic elements of a life insurance policy and how insurers price a life insurance policy;
- h.** discuss the use of annuities in personal financial planning;
- i.** discuss the relative advantages and disadvantages of fixed and variable annuities;

- j. analyze and evaluate an insurance program;
- k. discuss how asset allocation policy may be influenced by the risk characteristics of human capital;
- l. recommend and justify appropriate strategies for asset allocation and risk reduction when given an investor profile of key inputs.

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## 1. INTRODUCTION

Risk management for individuals is a key element of life-cycle finance, which recognizes that as investors age, the fundamental nature of their total wealth evolves, as do the risks that they face. **Life-cycle finance** is concerned with helping investors achieve their goals, including an adequate retirement income, by taking a holistic view of the individual's financial situation as he or she moves through life. Individuals are exposed to a range of risks over their lives: They may become disabled, suffer a prolonged illness, die prematurely, or outlive their resources. In addition, from an investment perspective, the assets of individuals could decline in value or provide an inadequate return in relation to financial needs and aspirations. All of these risks have two things in common: They are typically random, and they can result in financial hardship without an appropriate risk management strategy. Risk management for individuals is distinct from risk management for corporations given the distinctive characteristics of households, which include the finite and unknown lifespan of individuals, the frequent preference for stable spending among individuals, and the desire to pass on wealth to heirs (i.e., through bequests). To protect against unexpected financial hardships, risks must be identified, market and non-market solutions considered, and a plan developed and implemented. A well-constructed plan for risk management will involve the selection of financial products and investment strategies that fit an individual's financial goals and mitigate the risk of shortfalls.

In this reading, we provide an overview of the potential risks to an individual or household, an analysis of products and strategies that can protect against some of these risks, and a discussion regarding the selection of an appropriate product or strategy. Following the introduction, Section 2 provides an overview of human and financial capital. Sections 3–5 address the process of risk management, the financial stages of life for an individual, the economic (or holistic) balance sheet, and individual risks and risk exposures. Sections 6–10 discuss the types of products relevant to financial planning, including insurance and annuities. Sections 11–12 contain an insurance program case study and insights on implementing risk management solutions for individuals.

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## 2. HUMAN CAPITAL, FINANCIAL CAPITAL, AND ECONOMIC NET WORTH

- a. compare the characteristics of human capital and financial capital as components of an individual's total wealth;
- b. discuss the relationships among human capital, financial capital, and economic net worth;

To better understand the financial health of an individual—and how to manage the risks faced by that individual—we can use an **economic balance sheet** (or **holistic balance sheet**). We discuss the economic balance sheet in more detail later in the reading, but it is important to note here that an individual's assets are made up of two primary components, **human capital** and **financial capital**, which present unique risk management challenges.

Ibbotson, Milevsky, Chen, and Zhu (2007) define human capital as the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age. Financial capital includes the tangible and intangible assets (outside of human capital) owned by an individual or household. For example, a home, a car, stocks and bonds, a vested<sup>1</sup> retirement portfolio, and money in the bank are all examples of an individual's financial capital (or financial assets). In this section, both human capital and financial capital are explored in greater detail.

### 2.1. Human Capital

Advances in human capital theory have revolutionized how economists view the household risk management process. Conceptually, future wages or earnings can be thought of as analogous (in a rough sense) to future interest or dividend payments that flow from an individual's work-related skills, knowledge, experience, and other productive attributes that can be converted into wage income—or human capital. Because human capital provides a significant stream of income over decades, its present value is a significant part of most working households' total wealth portfolio. In fact, human capital is often the dominant asset on a household's economic balance sheet. From a risk management perspective, it is critical to understand the approximate total monetary value of an individual's human capital, the investment characteristics of the individual's human capital (i.e., whether the capital is more stock-like or bond-like), and how the approximate value of an individual's human capital relates to the value of the individual's financial capital. Here, we focus on estimating the approximate monetary value of an individual's human capital.

Given that future earnings for many workers are relatively stable over time, earnings can often be compared with the income one might receive from a bond. This analogy is useful because, similar to the way a financial analyst estimates the present value of a bond by discounting future cash flows, we can estimate human capital by discounting the expected future cash flows generated from wages or other income sources. Conceptually, individuals rent out or lease their human capital in the marketplace in exchange for an ongoing income that is a function of the state of the labor market. Some professions will receive a higher rental value (wage rate or salary) than others. Similarly, some professions will see their rental value fluctuate more with changes in the labor market environment.

Estimating the value of human capital is a complex process because the true value cannot be known. One simple approach is to use a discount rate that reflects the risk associated with the future cash flows (i.e., wages). Government employment and teaching are examples of professions that generally lead to relatively stable growth of future cash flows; in these cases, the human capital value would be estimated using a lower discount rate (to reflect the higher degree of certainty). Conversely, investment banking and racecar driving are examples of professions that may experience unstable and less secure future cash flows, so the value of human capital of investment bankers and racecar drivers would be based on a higher discount rate (to reflect the additional risk associated with their professions).

**Equation 1** can be used to estimate the value of an individual's human capital today, at Time 0 ( $HC_0$ ), where  $w_t$  is the income from employment in year  $t$ ,  $r$  is the appropriate discount rate, and  $N$  is the length of working life in years. Working life typically ends at retirement, although it could also be based on the number of years an individual can potentially work (e.g., a 70-year-old may be retired but still have some remaining human capital that could be traded for income in the labor market):

### Equation (1)

$$HC_0 = \sum_{t=1}^N \frac{w_t}{(1+r)^t}$$

This simple model in **Equation 1** can be expanded using **Equation 2**, where we define the wage in time period  $t$  as a product of the wage in period  $t - 1$  and the sum  $(1 + g_t)$ . That is, the wage in a given period is equal to the previous year's wage increased by  $g$  percent (the annual wage growth rate, in nominal terms). We can also modify the discount rate to be the sum of the nominal risk-free rate  $r_f$  and a risk adjustment  $y$  based on occupational income volatility. Similar to our example earlier contrasting the overall stability of labor income for government workers and teachers to that of investment bankers and racecar drivers, this adjustment recognizes the fact that the income from different professions can vary significantly. The risk adjustment should consider the inherent stability of the income stream as well as the possibility that the income stream will be interrupted by job loss, disability, or

death that may be completely unrelated to the type of employment. Additionally, we incorporate mortality, where  $p(s_t)$  is the probability of surviving to a given year (or age). Equation 1 uses a simplifying assumption that  $p(s_t) = 1$  for each year until retirement (i.e., the individual will survive to retirement with certainty). Using these additional factors, Equation 2 can be restated as:

**Equation (2)**

$$HC_0 = \sum_{t=1}^N \frac{p(s_t)w_{t-1}(1 + g_t)}{(1 + r_f + y)^t}$$

## EXAMPLE 1

### Estimating Human Capital

Identify the key assumptions required to estimate an individual's human capital.

**Solution:**

Human capital can be calculated by using the following formula:

$$HC_0 = \sum_{t=1}^N \frac{p(s_t)w_{t-1}(1 + g_t)}{(1 + r_f + y)^t}$$

where

$p(s_t)$  = the probability of surviving to year (or age)  $t$

$w_t$  = the income from employment in period  $t$

$g_t$  = the annual wage growth rate

$r_f$  = the nominal risk-free rate

$y$  = risk premium associated with occupational income volatility

$N$  = the length of working life in years

# Estimating the Present Value of Human Capital

Using [Equation 2](#), we briefly demonstrate how to estimate the present value of an individual's human capital. John Adam is 60 years old and plans on retiring in 5 years. Adam's annual wage is currently \$50,000 and is expected to grow 2% per year. The risk-free rate is 4%. Adam works in a job with a moderate degree of occupational risk; therefore, we assume a risk adjustment based on occupational income volatility of 3%. There is a 99% probability that Adam survives the first year, a 98% probability that he survives the second year, and probabilities of 98%, 97%, and 96% for the following years, respectively. Given this information and using [Equation 2](#), what is the present value of Adam's human capital?

Risk-free rate	= 4%
Income volatility adjustment	= 3%
Total discount rate	= 7%

Year	Wages (2% annual growth)	Present Value of Wages <sup>a</sup>	Probability of Survival	Probability Weighted Wages <sup>b</sup>
1	\$51,000	\$47,664	99%	\$47,187
2	\$52,020	\$45,436	98%	\$44,527
3	\$53,060	\$43,313	98%	\$42,447
4	\$54,122	\$41,289	97%	\$40,050
5	\$55,204	\$39,360	96%	\$37,786
Total value of human capital				<b>\$211,997</b>

<sup>a</sup> This column illustrates "Wages" discounted by 7% as indicated by the discount rate shown. For example: \$47,664 = \$51,000/1.07; \$45,436 = \$52,020/1.07<sup>2</sup>; and so on.

<sup>b</sup> The calculation for this column is as follows: \$47,187 = \$47,664 × 99%. A similar calculation is used for the following years.

How would the estimated value of Adam's human capital change if the wage growth

rate were changed to 0%, the risk-free rate decreased to 2%, and the risk adjustment for occupational income volatility also decreased to 2% (using the same base wage and mortality estimates)?

Risk-free rate	= 2%
Income volatility adjustment	= 2%
Total discount rate	= 4%

Year	Wages (No Growth)	Present Value of Wages	Probability of Survival	Probability Weighted Wages
1	\$50,000	\$48,077	99%	\$47,596
2	\$50,000	\$46,228	98%	\$45,303
3	\$50,000	\$44,450	98%	\$43,561
4	\$50,000	\$42,740	97%	\$41,458
5	\$50,000	\$41,096	96%	\$39,453
Total value of human capital				<b>\$217,371</b>

Reality is typically more complicated than models. Growth rates, nominal risk-free rates, risk adjustments, and mortality are not easily estimated. Additionally, wages do not tend to increase at a constant rate over an individual's lifetime, mortality and disability risk can reduce the value of human capital, and the average growth rate within occupations or even within the overall economy is unknown. In other words, the future payout on human capital, like the future payout on many financial assets, is uncertain. The potential loss of human capital, particularly early in the life cycle, represents an important risk that must be considered. Life and disability insurance, which we discuss later in the reading, are examples of financial instruments that can be used to protect against a random loss in household earnings. As human capital diminishes later in the life cycle, other risks that threaten financial capital and increase spending needs rise in importance. Accordingly, strategies that reduce investment risk and protect against long-term health care expenses and long-life spending needs increase in importance.

Viewing human capital as an asset with its own risk and return characteristics allows us to develop a holistic investment strategy that includes tangible and intangible assets. A total wealth perspective combines human capital with financial capital and incorporates the concept of life-cycle planning (also discussed later) to develop a strategy that maximizes



household welfare.

## 2.2. Financial Capital

Financial capital can be subdivided into various components besides tangible and intangible, such as personal assets and investment assets. Investment assets can be further differentiated into many subtypes with distinctive marketability, tax, and standalone risk characteristics. The relationships between the value of the various components of an individual's financial capital and the value of his or her human capital are important in investment and risk management decision making.

The approach used in financial accounting provides an excellent template for classifying the different financial assets owned by an investor. In financial accounting, the balance sheet includes a summary of all the assets owned by an entity, whether an individual or organization, at a given point in time. Assets are defined broadly as either current or non-current. Current assets are expected to be consumed over the following year; money in a checking account, for example, would be considered a current asset. For an individual, non-current assets—that is, all assets not classified as current assets—include such items as automobiles, real estate, and investments (such as stocks and bonds). Non-current assets differ for a company because they include such items as property, plant, and equipment, as well as intangible assets, such as goodwill.

The financial accounting approach to segmenting assets has important implications when assessing an individual's financial capital because different assets have different roles and each may be exposed to various types of risk. Broadly speaking, an individual's assets can be described as “personal” assets or “investment” assets; personal assets are consumed whereas investment assets are held for their potential to increase in value and fund future consumption. Some assets, such as real estate, can act as both a personal asset (shelter, as an alternative to renting) and an investment asset (to help fund retirement) for an individual.

### EXAMPLE 2

## Comparing Financial and Human Capital

Describe human capital and financial capital.

### Solution:

Human capital is commonly defined as the mortality-weighted net present value of an individual's future expected labor income. Financial capital includes the tangible and

intangible assets (outside of human capital) owned by an individual or household. For example, a home, a car, stocks, bonds, a vested retirement portfolio, and money in the bank are all examples of an individual's financial capital (or financial assets).

### **2.2.1. *Personal Assets***

Personal assets are assets an individual consumes (or uses) in some form in the course of his or her life. Such assets may include automobiles, clothes, furniture, and even a personal residence. In many cases, personal assets are not expected to appreciate in value, and they are often worth more to the individual than their current fair market value.

As mentioned earlier, some assets, like real estate, could be considered a “mixed” asset with both personal and investment characteristics. Another potential example of a mixed asset is collectibles (such as jewelry, wine, stamps, and artwork), which will be discussed separately in a later section. Mixed assets can be especially desirable because they enable individuals to derive satisfaction (i.e., utility) from their current value as well as having the potential to increase in value over time.

## **Classifying Private Accrued Defined Benefits and Government Retirement Benefits**

When separating an individual's total wealth into human capital and financial capital, accrued defined benefits from private pension and government retirement plans—such as the Canada Pension Plan and Old Age Security Pension, the Age Pension in Australia, the mandatory state pension in Germany, and Social Security in the United States—can potentially be classified as either human capital or financial capital. Some practitioners note that accrued defined benefits and government pension benefits are typically a form of deferred labor income, and thus, they prefer to classify these benefits as human capital. Others find it more intuitive to think of accrued defined benefits and social security as a form of human capital that has been converted into a financial asset. In this reading, we classify accrued defined benefits and government pension benefits as components of financial capital.

## **2.2.2. Investment Assets**

Investment assets are the components of an individual's wealth that are often the easiest to identify and typically receive the majority of the attention from financial planners and investment professionals. Investment assets extend beyond relatively tangible investment assets (such as a liquid portfolio) to include less tangible assets (such as an accrued defined benefit pension).

One criterion for subdividing investment assets is marketability, which describes how easy it is to trade an asset. We subdivide marketable assets into publicly traded and non-publicly traded segments, and we define non-marketable assets as those without any ready market (e.g., human capital).

Traditional portfolio construction generally focuses entirely on publicly traded marketable assets, like stocks and bonds, with optimization determining the weights allocated to marketable assets. This approach often ignores the existence of marketable assets that are not publicly traded as well as other non-marketable assets "owned" by the individual (e.g., human capital). In reality, each asset has important risk characteristics that should be considered. In the absence of a generalized framework that can estimate the risk and return of all of the components of an individual's total wealth and their correlations, one must understand the inherent risk and return characteristics of the non-marketable assets and make informed judgments when constructing a holistic portfolio. We will explore this concept more fully later in the reading.

## **2.2.3. Publicly Traded Marketable Assets**

Traditional balance sheets tend to emphasize publicly traded marketable assets because their value and risk characteristics are generally easier to estimate than those of non-publicly traded assets. Publicly traded marketable assets include money market instruments, bonds, and common and preferred equity.

## **2.2.4. Non-Publicly Traded Marketable Assets**

Non-publicly traded marketable assets include real estate, some types of annuities, cash-value life insurance, business assets, and collectibles.

### **2.2.4.1. Real Estate**

Real estate—or direct real estate, as it is sometimes called to distinguish it from real estate investment trusts (REITs)—is typically among the largest assets owned by an individual. In many countries, home ownership is common, although the level of home ownership varies

materially by country. For example, in Germany, approximately half of households own a home, whereas in China, the number is closer to 90%. To purchase a home, many individuals obtain a mortgage loan. It is common for the home buyer to contribute some percentage of the home's value (e.g., 20%) as a down payment to mitigate some of the risk to the lender. The term of the mortgage loan can vary (e.g., 15 years, 30 years), as can the mortgage's interest rate (which can be either fixed or floating). Mortgage payments are often the largest fixed obligation of homeowners, especially during the early years of a mortgage loan. Mortgages present a unique risk for homeowners because they create a leveraged exposure in a home. For example, a 20% down payment (80% mortgage loan) implies that for any given change in the value of the home, the change in the equity (value less the mortgage loan) of the home will be five times greater than the change in the value of the home. Mortgage loans are either recourse or non-recourse, and the status varies by region. With recourse mortgages, if the borrower defaults on the mortgage, the lender has the right to recover from the borrower any amount due on the loan, whereas non-recourse loans prevent the lender from recovering any further amount from the borrower. Non-recourse loans are thus riskier for lenders because the only available collateral for the loan is the home. As a result, non-recourse loans generally have higher interest rates and/or higher borrower credit standards than recourse loans.

#### **2.2.4.2. Annuities**

Annuities are effectively a private defined benefit pension for which an insurance company has guaranteed, or will guarantee, income for life or over some fixed period for the beneficiary (called the annuitant). The estimated balance sheet value of an annuity is comparable to that of a defined benefit pension with a discount for potential insolvency risk, which is difficult to eliminate through diversification or a market hedge. Annuities will be discussed in more detail later in the reading.

#### **2.2.4.3. Cash-Value Life Insurance**

A variety of types of life insurance are available, including cash-value life insurance, for which the policy not only provides protection upon a death but also contains some type of cash reserve. This form of insurance usually combines life insurance protection with some type of cash accumulation vehicle. Some insurance policies allow the purchaser to invest in relatively aggressive investments, such as equities, although more conservative investments, such as bonds, are generally more common. Life insurance products will also be discussed at greater length later in the reading.

#### **2.2.4.4. Business Assets**

Business assets can represent a significant portion of the total wealth of an individual, especially a self-employed individual. A variety of unique considerations are involved in

investing for business owners because their total capital may be very closely tied to the overall performance of the business (i.e., if the business does poorly, it affects not only the value of the business, but also the owner's earnings as well). The value of business assets may best be estimated through recent sales of comparable private businesses within the same industry—often as a multiple of net income or net income with various adjustments (e.g., EBITDA). The value of business assets may vary based on market conditions and will often correlate with other financial assets within a household portfolio. This potential correlation is an important consideration in the risk management process for individuals, particularly small business owners.

#### **2.2.4.5. Collectibles**

Collectibles include such items as stamps, paintings, wine, and precious metals (e.g., coins). The value of these assets is often set by auction markets or specialized dealers and involves substantial transaction costs. Collectibles may also provide a flow of utility for the owner. For example, in addition to benefiting from the potential price increase of a painting, the owner is able to display the painting in his or her home and view it daily.

### **2.2.5. *Non-Marketable Assets***

The most significant non-marketable financial assets are pensions, whether from a private employer or from a governmental organization. In this section, we consider both types of pensions.

#### **2.2.5.1. Employer Pension Plans (Vested)**

There are a variety of retirement plan types across the globe. These accounts can generally be described as either employee-directed savings plans, in which contribution amounts and investments are controlled by the individual (and not guaranteed), or traditional pension plans, which guarantee some level of retirement benefits, typically based on past wages. We include only vested pension benefits as financial assets, because unvested pension benefits are typically contingent on future work and are thus considered to be part of human capital.

The value of a vested traditional defined benefit pension from an employer can be estimated by determining the mortality-weighted net present value of future benefits. The mortality-weighted net present value at Time 0 (now),  $mNPV_0$ , can be estimated using [Equation 3](#), which is reasonably equivalent to [Equation 1](#). [Equation 3](#) is based on the future expected vested benefit ( $b_t$ ), the probability of surviving until year  $t$  [ $p(s_t)$ ], and a discount rate ( $r$ ). The discount rate should vary based on the relative riskiness of the future expected benefit payment—that is, the rate will be higher for riskier future benefit payments—and should reflect whether the benefit is in nominal or real terms:

### Equation (3)

$$mNPV_0 = \sum_{t=1}^N \frac{p(s_t)b_t}{(1+r)^t}$$

Estimating an appropriate discount rate to use in valuing a pension can be quite complex, although it is generally less complex than estimating the discount rate to use in valuing an individual's human capital. There are a number of factors to consider in determining the pension discount rate. As a starting point, one should consider the health of the plan (e.g., its funding status, where the value of the plan's liability is estimated using an appropriate market-based discount rate), the credit quality of the sponsoring company, and any additional credit support. If the company in question has long-term bonds, the yield on the bonds can provide a proxy for an appropriate discount rate. As one example of credit support, the Pension Protection Fund (PPF) was established in the United Kingdom as part of the Pensions Act 2004 to guarantee continued payment of most UK defined benefit pension plans should the employer become insolvent. The existence of PPF insurance helps to decrease the payout risk (and accompanying discount rate) for eligible UK pension plans.

#### 2.2.5.2. Government Pensions

Government pensions are similar to employer pension plans but are generally more secure (in those countries with a high degree of creditworthiness). As with employer pension plans, the vested or accrued benefit amount can be estimated by calculating the mortality-weighted net present value. Given the guaranteed nature of these benefits, government pensions can be considered relatively bond-like. For example, in the United States, retiree government pension benefits (called Social Security retirement benefits) can be thought of as a government bond with benefits indexed to inflation (because Social Security retirement benefits usually increase annually based on inflation). This inflation adjustment is consistent with securities called Treasury Inflation-Protected Securities (TIPS).

Regardless of the domicile, one should consider the financial health of the government entity sponsoring the defined benefit plan as well as the legal framework and any accompanying political risk at the country level.

#### 2.2.6. Account Type

Financial capital is often held in account types that have different tax attributes. Although these account types (and the potential tax benefits surrounding them) vary materially by country, the accounts can generally be described as taxable, tax-deferred, or non-taxable. A taxable account is one for which taxes are due annually on the realized gains, dividends, and/or interest income. A tax-deferred account is one for which taxes on any gains are

deferred until some future date, such as when a withdrawal is made from the account. A non-taxable account is one for which taxes are never due, no matter how much the account grows.

## 2.3. Economic Net Worth

An individual's *net worth* consists of the difference between traditional assets and liabilities that are reasonably simple to measure, such as investment assets, real estate, and mortgages. **Economic net worth**, however, extends net worth to include claims to future assets that can be used for consumption, such as human capital and the present value of pension benefits. When we refer to economic net worth in this reading, we refer to the more holistic accounting of resources that can be used to fund future consumption for the purpose of financial planning over the life cycle.

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# 3. A FRAMEWORK FOR INDIVIDUAL RISK MANAGEMENT

- c. discuss the financial stages of life for an individual;

This section contains an overview of the important considerations when developing an effective risk management plan for an individual. First, a risk management strategy for individuals is introduced. Next, the primary financial stages of the life of an individual are discussed. We then incorporate the human capital and financial capital concepts developed in Section 2 into an individual's economic (or holistic) balance sheet, explaining how key components of that balance sheet develop over time. Finally, we identify some of the primary risks to an individual and how they evolve during an individual's lifetime.

## 3.1. The Risk Management Strategy for Individuals

In general, *risk management* for individuals is the process of identifying threats to the value of household assets and developing an appropriate strategy for dealing with these risks. The risk management strategy provides a framework that allows a household to decide when to avoid, reduce, transfer, or self-insure those risks. There are typically four key steps in the risk management process:

1. Specify the objective.
2. Identify risks.
3. Evaluate risks and select appropriate methods to manage the risks.
4. Monitor outcomes and risk exposures and make appropriate adjustments in methods.

### **3.1.1. *Specify the Objective***

The overarching objective of individual risk management is to maximize household welfare through an appropriate balance of risk and safety. Risk represents a possible decrease in future spending caused by unexpected events, such as a market crash, a physical disability, the premature death of a primary earner, or health care expenses. As with investments, this objective is achieved by deciding how much risk a household is willing to bear in order to achieve its long-run spending goals.

### **3.1.2. *Identify Risks***

Households face a significant number of risks, including earnings, premature death, longevity, property, liability, and health risks. These risks will be discussed at length in subsequent sections. Each of these risks is associated with a potential loss of financial and/or human capital, and individuals should address each of them to determine how best to address the possibility of loss.

### **3.1.3. *Evaluate Risks and Select Appropriate Methods to Manage the Risks***

The existence of a risk exposure does not necessarily require the purchase of an insurance product. The appropriate risk management strategy considers the magnitude of the risk and the range of options available to address that risk. Section 11 will explain the choice among the four techniques of risk avoidance, risk reduction, risk transfer, and risk retention. *Risk avoidance* involves avoiding a risk altogether. For example, one way to avoid the risk to human and financial capital from riding a motorcycle is to simply not own or ride one. *Risk reduction* involves mitigating a risk by reducing its impact on an individual's welfare, either by lowering the likelihood that it will occur or by decreasing the magnitude of loss (for example, by wearing a helmet when riding a motorcycle). *Risk transfer* involves transferring the risk: The use of insurance and annuities to transfer risk to insurers will be discussed later in the reading. *Risk retention* involves retaining a risk and thus maintaining the ability to finance the cost of losses; when funds are set aside to meet potential losses, the individual is



said to *self-insure*.

### **3.1.4. Monitor Outcomes and Risk Exposures and Make Appropriate Adjustments in Methods**

Once the appropriate risk management method has been selected, risks must be monitored and updated as the household moves through its life cycle. It is advisable to annually review an insurance/risk management program, including all the ongoing risk exposures and risk management methods. As an individual's goals and personal and financial situation change, these changes will affect risk exposures and optimal risk management strategies. In addition to an annual review, every life change—such as a birth, marriage, inheritance, job change, relocation, divorce, or death—should trigger a review of the risk management plan.

## **3.2. Financial Stages of Life**

Individuals tend to follow a predictable pattern during their lifetimes: They invest in education early in life, embark on a career, start families, accumulate assets, fund growing household expenses, transition into retirement, and ultimately pass on wealth through bequests. In each of these life-cycle stages, the household faces unique goals and risks that require appropriate investment and risk management strategies.

Defining financial stages of life in clear and concise terms does pose a challenge because all individuals are different; however, financial stages are a useful construct when thinking about risk management and the optimal forms of insurance and other products to consider at different ages. Therefore, we divide the financial stages of life for adults into the following seven periods:

- Education phase
- Early career
- Career development
- Peak accumulation
- Pre-retirement
- Early retirement
- Late retirement

### **3.2.1. Education Phase**

The education phase occurs while an individual is investing in knowledge (or human capital) through either formal education or skill development. In theory, the education phase could begin as early as when an individual starts primary school, but this phase typically involves the period when the individual starts developing more specific human capital by attending college or trade school or undertaking an apprenticeship. In some cases, an individual in the education phase may be largely financially dependent on his or her parents or guardians and have little, if any, accumulated financial capital. There is generally little focus on savings or risk management at this point; however, some individuals in this phase may already have families and could benefit from products, such as life insurance, that hedge against the risk of losing human capital.

### **3.2.2. Early Career**

The early career phase normally begins when an individual has completed his or her education and enters the workforce. This stage may begin as early as age 18 (16 in some countries) or as late as the late 20s (or even early 30s), depending on the level of education attained, and generally lasts into the mid-30s. During this period, the individual often marries, perhaps has young children, may purchase a home, and usually begins to save for their children's college expenses. Sometimes, a career-related relocation occurs that could have negative short-term financial implications. Significant family and housing expenses may not allow for much retirement savings. Insurance may be especially valuable during this phase because human capital represents such a large proportion of total wealth and family members are highly dependent on the human capital of one or two individuals to fund expected future consumption.

### **3.2.3. Career Development**

The career development phase normally occurs during the 35–50 age range and is often a time of specific skill development within a given field, upward career mobility, and income growth. This phase often includes accumulation for the children's college educations as well as expenditures for college. Concern intensifies about retirement income planning and financial independence. Higher earners will begin building wealth beyond education and retirement objectives and may make large purchases, such as a vacation home, or travel extensively. Retirement saving tends to increase at a more rapid pace during this phase compared with the early career phase.

### **3.2.4. Peak Accumulation**

In the peak accumulation phase, generally during the ages of 51–60, most people either have reached or are moving toward maximum earnings and have the greatest opportunity for wealth accumulation. This phase may include accumulating funds for other goals and objectives, but it is usually a continuation of retirement income planning, coordination of employee benefits with investment and retirement strategies, and travel. Investors following a life-cycle portfolio strategy will begin to reduce investment risk to emphasize income production for retirement (particularly near the end of this period) and become increasingly concerned about minimizing taxes, given higher levels of wealth and income. There is also potentially more career risk in this phase because if an individual were to lose his or her job, it might be relatively difficult for that individual to find another job with similar pay.

### **3.2.5. *Pre-retirement***

The pre-retirement phase consists of the few years preceding the planned retirement age, and it typically represents an individual's maximum career income. Many people in this phase continue to restructure their portfolios to reduce risk and may consider investments that are less volatile. There is further emphasis on tax planning, including the ramifications of retirement plan distribution options.

### **3.2.6. *Early Retirement***

The early retirement phase in the cycle is generally defined as the first 10 years of retirement and, for successful investors, often represents a period of comfortable income and sufficient assets to meet expenses. For individuals who are forced to retire because of injury or unemployment, this time may be one of shifting expectations and may involve changing to a lifestyle more commensurate with the individual's savings. This is generally the most active period of retirement and is when an individual is less likely to suffer from cognitive or mobility limitations. The primary objective of the retiree is to use resources to produce activities that provide enjoyment. Some retirees seek a new career, and many will look for a job (part time or full time) that has less stress. It is important to note that upon entering retirement, the need for asset growth does not disappear. For many households, the length of retirement could exceed two decades; given this potential horizon, it is important to continue taking an appropriate level of investment risk in retirees' portfolios.

### **3.2.7. *Late Retirement***

The late retirement phase is especially unpredictable because the exact length of retirement is unknown. This uncertainty about longevity for a specific individual is known as longevity risk, which is the risk that an individual outlives his or her financial resources in retirement. Physical activity typically declines during this phase, as does mobility. Although many

individuals live comfortably and are in good health until their final days, others experience a long series of physical problems that can deplete financial asset reserves. Cognitive decline can present a risk of financial mistakes, which may be hedged through the participation of a trusted financial adviser or through the use of annuities. Annuities will be discussed in more detail later in the reading.

Two additional concerns may be appropriate to any financial stage. First, depending on the family situation, the need to provide for long-term health care may become apparent. Second, some people may need to devote resources to care for parents or a disabled child for an extended period of time.

### EXAMPLE 3

## Financial Stages of Life

From a personal financial planning standpoint, what are typical characteristics of someone in the “peak accumulation” phase?

### **Solution:**

An individual in the peak accumulation phase of the life cycle would typically have the following characteristics:

- Approximate age of 51–60
- Maximum earnings and opportunity for wealth accumulation
- Increased interest in retirement income planning
- Greater emphasis on stability and less emphasis on growth in the investment portfolio
- Greater concern about tax strategies
- Increased concern about losing employment because it may be more difficult to find new employment

# 4. THE INDIVIDUAL BALANCE SHEET

d. describe an economic (holistic) balance sheet;

A traditional balance sheet includes assets and liabilities that are usually easy to quantify. Our purpose in developing an individual balance sheet is to more comprehensively represent the assets available to fund life-cycle consumption and for wealth preservation and transfer bequests. The primary value of a balance sheet in this context is to illustrate the magnitude of risk exposures for an individual. This perspective is particularly important for individuals who are in life-cycle stages during which human capital is a significant share of overall wealth and for individuals who hold claims on pension assets that grow in value later in the life cycle.

In this section, we attempt to provide a more complete picture of an investor’s wealth through the use of an economic balance sheet (or holistic balance sheet), which we initially mentioned in Section 2. Such a balance sheet provides a useful overview of the individual’s total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth and expanding liabilities to include consumption and bequest goals. These additional liabilities are important because they often represent leverage created in order to gain access to assets, such as the cost of education to create human capital. They also represent regular payment obligations that may influence the optimal amount of portfolio liquidity and investment risk. Human capital and pension wealth are important because they represent expected income flows that can be drawn on to fund future consumption.

## 4.1. Traditional Balance Sheet

The simplest balance sheet for an individual investor includes recognizable marketable assets and liabilities. Assets include any type of investment portfolio, retirement portfolio (or plan), real estate, and other tangible and intangible items of value. Liabilities include mortgage debt, credit card debt, auto loans, business debt, and student loans. An example of a simple balance sheet (or statement of net worth) is shown in [Exhibit 1](#), where the assets are netted against the liabilities to determine the net worth of the individual.

**Exhibit 1. Traditional Balance Sheet as of 31 December 2014**

Assets	Liabilities
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<b>Liquid Assets</b>		<b>Short-Term Liabilities</b>	
Checking account	€35,000	Credit card debt	€25,000
Certificates of deposit	€100,000	Total short-term liabilities	€25,000
Total liquid assets	€135,000		
<b>Investment Assets</b>		<b>Long-Term Liabilities</b>	
Taxable account	€750,000	Car loan*	€25,000
Retirement plan	€600,000	Home mortgage	€500,000
Cash value of life insurance	€25,000	Home equity loan	€90,000
Total investment assets	€1,375,000	Total long-term liabilities	€615,000
<b>Personal Property</b>			
House	€2,200,000		
Cars	€160,000		
House contents	€150,000		
Total personal property	€2,510,000		
Total Assets	€4,020,000	Total Liabilities	€640,000
		Net Worth	€3,380,000

\* *Note:* A portion of the car loan would likely be short term, but to simplify, we included the entire loan as a long-term liability.

The net value of an asset, or its equity, is calculated by subtracting liabilities associated with that asset from the gross value. For example, an individual may own a home worth £1 million, but if that individual has a £900,000 mortgage, the equity in the home would be only £100,000 (ignoring any additional intangible benefits associated with home ownership).

It should be noted that this traditional balance sheet includes those assets that can be valued

easily but ignores other individual assets that are material, such as human capital and pension benefits. For individuals in the earlier life-cycle stages, human capital is larger than other assets on the balance sheet. For those who are eligible to receive a guaranteed retirement income stream, the present value of these assets is significant and can be of great value to older individuals. Although non-marketable and difficult to value precisely, human capital and retirement benefits are extremely important when planning the optimal use of assets and the repayment of liabilities over a life cycle.

## 4.2. Economic (Holistic) Balance Sheet

The primary goal of an economic (holistic) balance sheet is to arrive at an accurate depiction of an individual’s overall financial health by accounting for the present value of all available marketable and non-marketable assets as well as all liabilities. This view allows an individual to map out the optimal level of future consumption and non-consumption goals (such as bequests or other transfers) given the resources that exist today and those that are expected in the future. Although a traditional balance sheet provides information about marketable assets that exist today, it offers limited insight into how these assets should be used to maximize the expected lifetime satisfaction of the individual (a concept economists call “utility”). An economic balance sheet allows an individual to anticipate how available resources can be used to fund consumption over the remaining lifetime.

[Exhibit 2](#) provides a simplified example of an economic balance sheet, which is an expanded version of the traditional balance sheet in [Exhibit 1](#). The traditional assets and liabilities are condensed from the traditional balance sheet in [Exhibit 1](#), with the present value of human capital and pensions added as assets and the present value of lifetime consumption and bequests added as liabilities. For further simplification purposes, we assume that all the assets and liabilities in [Exhibit 1](#) are already calculated at their present value.

**Exhibit 2. Economic (Holistic) Balance Sheet as of 31 December 2014**

Assets		Liabilities	
Financial capital	€4,020,000	Debts	€640,000
Liquid assets		Credit card debt	
Investment assets		Car loan	
Personal property		Home mortgage	

## Home equity loan

Human capital	€1,400,000	Lifetime consumption needs (present value)	€4,200,000
Pension value	€500,000		
		Bequests	€400,000
Total Assets	<u>€5,920,000</u>	Total Liabilities	<u>€5,240,000</u>
		Economic Net Worth	€680,000

An economic balance sheet that includes the present value of non-marketable assets (e.g., human capital and pensions) and liabilities (e.g., consumption needs and bequests) provides a much more accurate baseline from which to maximize the expected utility of future consumption. Assessing pension and human capital value can also be useful when setting consumption or bequest goals because these assessments provide a more accurate estimation of the future trade-offs an individual will make. Younger households with greater human capital, in addition to spending more to protect the value of this human capital early in the life cycle, will be able to plan for more generous retirement savings goals than households with comparatively lower human capital.

The total economic wealth of an individual changes throughout his or her lifetime, as do the underlying assets that make up that wealth. The total economic wealth of younger individuals is typically dominated by the value of their human capital because younger individuals have not had as much time to save and accumulate financial wealth. As individuals grow older, they are likely to save some of their earnings and will accumulate financial capital. The total value of human capital and the total value of financial capital tend to be inversely related over time as individuals attempt to smooth consumption through borrowing, saving, and eventual spending. When human capital is depleted, an absence of financial capital would result in no wealth to fund an individual's consumption needs. Although some people may live with family or friends at older ages out of necessity, most would prefer to have financial independence in retirement—something that typically requires individuals to save throughout their prime working years.

Although the economic net worth in the hypothetical economic balance sheet was equal to €680,000, it is possible for an individual to have either a surplus or a shortfall. For example, if the individual is not saving enough to adequately fund the lifestyle he or she will want at



retirement, that individual may have a shortfall. Alternatively, if the individual is saving more than enough to fund lifestyle needs and has no bequest goals, he or she may have a surplus. In either case, an economic balance sheet provides some perspective about the overall financial situation of an individual based on his or her holistic wealth.

#### EXAMPLE 4

### Traditional vs. Economic Balance Sheet

Contrast a traditional balance sheet with an economic balance sheet.

#### **Solution:**

A traditional balance sheet includes assets and liabilities that are generally relatively easy to quantify. An economic balance sheet provides a useful overview of one's total wealth portfolio by supplementing traditional balance sheet assets with human capital and pension wealth and including additional liabilities, such as consumption and bequest goals.

## 4.3. Changes in Economic Net Worth

To provide some context for how the relative value of various household assets changes over a lifetime, we will use the hypothetical example of a British individual at age 25. This 25-year-old is assumed to make £40,000 a year in after-tax income. Over his or her lifetime, real wages are expected to grow at a constant rate of 1% per year, the annual savings rate is 10%, the nominal discount rate is 8%, and the rate of expected inflation is 3%. The value of human capital is estimated using [Equation 2](#). Financial capital at age 25 is assumed to be £10,000, and it is expected to grow at an annual real rate of return of 3% per year. The assumed need from the portfolio is £20,000 for the first year of retirement (age 65) and is increased annually by inflation throughout retirement.

We further assume that at age 30 the individual purchases a home that costs £100,000 in today's currency. The home is purchased with a 10% down payment (which comes from financial capital), with the remainder financed by a 30-year mortgage at a fixed nominal interest rate of 5%. The real growth rate of the value of the home is assumed to be 1%. Total pension benefits of £20,000 per year (in today's currency, at age 25) are assumed to commence at age 65, and the real discount rate for pension retirement benefits is 5%. We assume the benefits are accrued throughout the employment of the individual.

**Exhibit 3** shows the values of the assets in the individual's economic balance sheet and how they are expected to change over time. To simplify the concept, we demonstrate graphically how the sample inputs reflect the allocation in the exhibit.

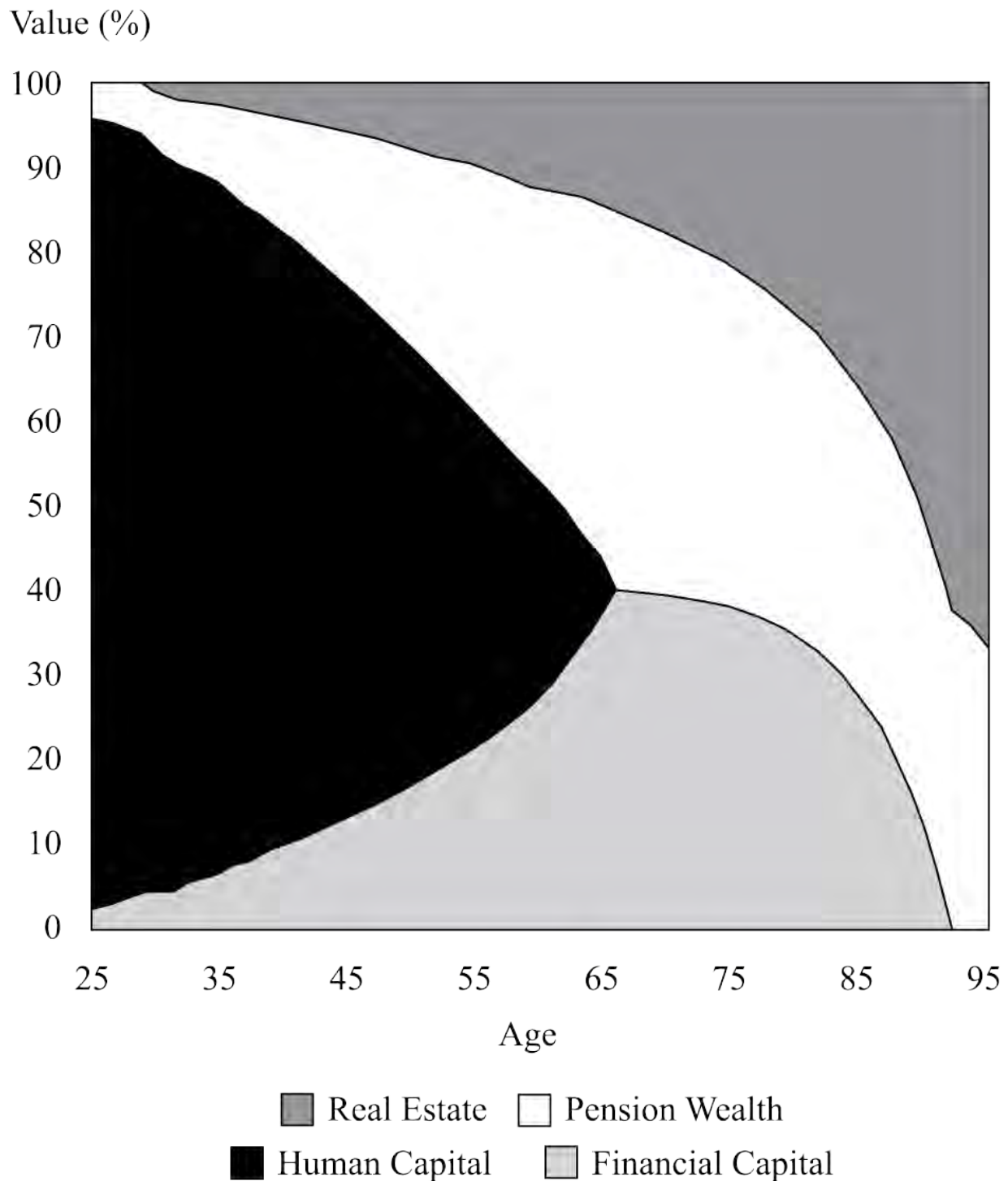
### Exhibit 3. Life-Cycle Economic Balance Sheet Allocation



Traditional balance sheet assets, such as investments in marketable securities, real estate, and businesses, vary in importance from one life-cycle stage to the next. In general, tangible

assets, such as real estate and personal goods, which provide great value to a young family, dominate a household's portfolio early in the life cycle. As households age, they accumulate financial assets that must be managed efficiently to provide the greatest expected later-life consumption for the amount of risk the household is willing to take. Non-traditional balance sheet assets, such as employer pensions, increase in importance later in the life cycle, providing an important source of stable consumption and affecting the optimal allocation of securities within an investment portfolio. To illustrate, [Exhibit 4](#) provides the relative weights for the various assets included in [Exhibit 3](#).

#### **Exhibit 4. Relative Weights of Economic Balance Sheet Allocation**



In [Exhibit 4](#), we see that for the typical individual, an investment portfolio represents a significant portion of wealth at age 65 but is still less than 50% of the total economic wealth when home equity, pension wealth, and human capital are also considered. As that individual proceeds through his or her retirement years and funds consumption, the relative share of the investment portfolio declines. In the early retirement stage, total economic wealth is dominated by pension wealth (i.e., the remaining mortality-weighted net present value of benefits) and the value of real estate (i.e., the individual's personal residence). For wealthier

individuals, the value of defined benefit pension wealth will likely represent a low percentage of the total wealth portfolio in retirement. To the extent that defined benefit pension wealth has very low credit risk (for example, because of the low default probability of National Insurance in the United Kingdom), a retiree's optimal investment portfolio allocation will be affected. As discussed earlier, one must consider the financial health of both the plan and the sponsor providing the defined benefit pension.

In a related manner, a 65-year-old with £2 million in pension wealth will have a higher level of expected remaining lifetime consumption than a retiree with £1 million in pension wealth and the same traditional balance sheet net worth. Both individuals will need to consider means to safeguard the value of the pension wealth as part of the financial planning process. For example, a pension from a private employer may be subject to company-specific risk. The risk of employer insolvency might be hedged in financial markets by positions in securities and derivatives (if available) that have a negative correlation with the value of the company. As mentioned previously, guarantees of benefit payments may exist, such as the Pension Protection Fund in the United Kingdom that protects many private defined benefit schemes.

The allocation of the different asset types will affect the optimal financial asset allocation decision. A 45-year-old individual in Germany with €1 million in human capital and €500,000 in investment assets should invest differently than a 45-year-old with €3 million in human capital and an identical €500,000 in investment assets. The volatility in the investment portfolio of the individual with lower human capital will have a much greater impact on variation in expected consumption if both individuals have a 40-year planning horizon. Assume that the first 45-year-old with €1.5 million in combined human and financial capital expects to spend approximately €38,000 each year until age 85. The other 45-year-old with €3.5 million in economic net worth expects to spend €88,000 each year. All else being equal, a 40% loss in the first individual's portfolio ( $0.4 \times €500,000 = €200,000$ ) will lead to a 13.2% loss in expected spending per year  $[(€200,000/40 \text{ years})/€38,000]$  whereas a 40% investment loss to the second individual's portfolio will lead only to a 5.7% decrease in expected consumption  $[(€200,000/40 \text{ years})/€88,000]$ . For this reason, portfolio recommendations will be less conservative for the investor with high human capital than for the investor with low human capital if both have the same level of risk tolerance.

## EXAMPLE 5

### Changes in Human and Financial Capital

Describe how the relative values of human capital and financial capital change over an individual's lifetime.

**Solution:**

The total value of human capital and the total value of financial capital tend to be inversely related over time as individuals attempt to smooth consumption through borrowing, saving, and eventual spending. When human capital becomes depleted, without financial capital, an individual will have no wealth to fund his or her lifestyle. Human capital is generally largest for a younger individual, whereas financial capital is generally largest when an individual first retires.

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## 5. INDIVIDUAL RISK EXPOSURES

- e. discuss risks (earnings, premature death, longevity, property, liability, and health risks) in relation to human and financial capital;

Managing risks to financial and human capital is an essential part of the household financial planning process. In this section, we provide an overview of the risks faced by individuals and discuss how they relate to human and financial capital. In future sections, we introduce financial products that could be used to manage many of these risks.

### 5.1. Earnings Risk

**Earnings risk**, within the context of personal risk management, refers to the risks associated with the earning potential of an individual—that is, events that could negatively affect the individual’s human and financial capital. As noted previously, health issues can affect earnings, and some health risks are a function of the occupation itself. For example, a construction worker is likely to face higher health-related earnings risk than the average worker. Aside from health issues, unemployment and underemployment represent major factors in earnings risk. Sometimes, an employee’s job performance or a poor “fit” may lead to job loss, but many people find themselves without a job through no fault of their own.

The risk associated with unemployment for reasons other than disability is rather difficult to characterize. In some cases, such as government employees and union members with seniority, the likelihood of unemployment may be very low. Smaller, younger companies may be riskier employers because of dynamic business conditions or cash flow issues. But even large, well-established companies have been known to go out of business or to close unprofitable divisions or locations. In such cases, even an offer to transfer to another location may be undesirable for someone late in his or her working life, for someone with a working

spouse and/or children in school, or for someone who strongly prefers to remain in the same location for a variety of other reasons. Some industries are cyclical and are prone to layoffs, whereas other industries are subject to competitive pressures that may lead to permanent terminations. Self-employed individuals and even some professionals are prone to variability in their earnings. Of course, the cost is the loss or reduction of earnings and may also include the loss of employer contributions to one's retirement fund as well as other benefit programs. A lengthy period of unemployment may itself create more risk because employers are sometimes hesitant to hire people who have been out of work for an extended period of time. If the individual finally finds a job, it may be at a dramatically lower compensation level.

Obviously, the loss of income represents a reduction in both human and financial capital, and this reduction is exacerbated if job opportunities are few, especially in a poor economy or in a region or industry that is particularly affected. For individuals who lose a job as they approach retirement age, it could be very difficult to find another job, even if there are regulations against age discrimination. Aside from the stress on the family budget, unemployment can be psychologically devastating to the individual and his or her family. With earnings risk, as well as health risk (which is discussed in further detail later), an implication in estimating the total value of human capital is that individuals who work in dangerous occupations or in jobs that have a high likelihood of variability or disruption in earnings have either lower future expected earnings or a higher discount rate or both. Financial capital may also be affected by earnings risk because assets will be needed to make up for any loss of income. Furthermore, there may be a need to seek additional training or education to acquire requisite skills, and this retooling can be very expensive.

## 5.2. Premature Death Risk

The term **premature death risk**, which is sometimes referred to as mortality risk, relates to the death of an individual earlier than anticipated whose future earnings, or human capital, were expected to help pay for financial needs and aspirations of the individual's family. These needs include funding day-to-day living expenses, such as food, housing, and transportation, as well as paying off debts, saving for a child's education, and providing for a comfortable retirement for the surviving spouse. An individual's death may also lead to a reduction in the income of the surviving spouse because some family responsibilities of the deceased individual must now be performed by the surviving spouse (assuming the spouse does not remarry). For a young family, the effect can be especially tragic because the increase in household lifestyle that might have accompanied the career of the deceased may never occur (again, if there is no remarriage).

A risk to consumption needs also occurs if a non-earning member of the family dies. The loss can be estimated as the discounted value of the services provided by the deceased family member plus any out-of-pocket death expenses. If a household's primary caregiver dies, the



rest of the family can help with that member's responsibilities, but often additional, paid help is required to replace the primary caregiver's duties. This scenario will mean a dramatic change in lifestyle, compounding the incalculable emotional effect of the death. It could even have a negative impact on the career of the surviving spouse, who may feel drained by the added responsibilities.

Besides the obvious reduction in human capital that the death of an income earner represents, there are also effects on financial capital. Death expenses (including funeral and burial), transition expenses, estate settlement expenses, and the possible need for training or education for the surviving spouse are among the financial costs that may be incurred.

## 5.3. Longevity Risk

**Longevity risk** within the context of financial planning relates to the uncertainty surrounding how long retirement will last and specifically the risks associated with living to an advanced age in retirement (e.g., age 100). An extended retirement period may deplete the retiree's resources to the point at which income and financial assets are insufficient to meet post-retirement consumption needs. A common question posed to financial planners is, "How much money do I need to have when I retire?" The answer is dependent on the lifespan of the individual, and longevity is a key variable that can only, at best, be estimated. Other important variables include the nominal rate of return on the portfolio, the rate of inflation, additional sources of income (and whether those sources are adjusted for inflation), and the level of spending. Determining how large a fund an individual will actually have at retirement depends on the amount and timing of contributions, the nominal rate of return, and the amount of time until retirement.

When calculating the sum needed at retirement, financial planners often run a Monte Carlo simulation that is based on an assumed asset allocation to calculate the probability that the funds will last for a specified number of years. Another approach for the time variable is to use a mortality table, adjust for health factors, and add years to be conservative. For example, Friedrich is retiring at age 65, and the mortality tables in his country indicate that a 65-year-old man has an expected lifespan of 20 years. But Friedrich is healthy, exercises regularly, eats well, and has had annual physical examinations, and his parents lived until their late 80s, which was past life expectancy at that time. Friedrich might assume that his retirement will last only 20 years (his life expectancy), but the mortality tables indicate a 50% chance that he will live beyond the forecasted period, which is why it is common to add years to be conservative (e.g., plan for retirement to last 30 years, or until age 95). The decision regarding the additional number of years is obviously subjective. The only way to minimize the likelihood of living beyond the forecasted retirement period would be to use extremely advanced ages (e.g., age 110).



Longevity risk can have a significant impact on the lifestyle of an individual. Even in countries that provide significant pension benefits, income may be inadequate to support the hoped-for lifestyle, and insufficient assets may exacerbate the situation. Making matters worse, many pension programs do not consider inflation. Furthermore, some pension programs, even those sponsored by governmental entities, are unlikely to have sufficient assets to pay future expected liabilities without significant changes to the pension structure. Relying on a pension thus entails its own set of risks.

Longevity risk affects human capital in the sense that an individual who is concerned about “living too long” may choose to work longer than someone else might. Indeed, all else being equal, the person who is concerned about outliving his or her money and who intends to work longer has more human capital, but at the possible expense of a less desirable (i.e., longer) retirement stage.

## 5.4. Property Risk

**Property risk** relates to the possibility that a person’s property may be damaged, destroyed, stolen, or lost. There are, of course, many different possible events relating to property risk. A house may catch fire, an automobile may be involved in a collision or be damaged in a hailstorm, or a valuable necklace may be lost. In the context of property risk, *direct loss* refers to the monetary value of the loss associated with the property itself. For example, a house fire may cause €50,000 of damage. If the repair process requires that the family live elsewhere while the damage is repaired, the expenses incurred are considered an *indirect loss*. If the family is renting a room to a boarder, the income lost during construction would also be considered an indirect loss. Similarly, if a driver damages his or her automobile by running into a curb, the damage to the automobile is a direct loss and the cost of renting a replacement automobile is an indirect loss.

Because property represents a financial asset, property risk is normally considered to be associated with a potential loss of financial capital. But property used in a business to create income is rightfully considered in a discussion of human capital. That is, this type of business property can be considered a tool that helps drive future earnings, and to the extent that such property is at risk, human capital is also at risk. Business owners should be especially conscious of the fact that in the absence of insurance or other risk management techniques, both financial and human capital is at risk.

## 5.5. Liability Risk

**Liability risk** refers to the possibility that an individual or household may be held legally

liable for the financial costs associated with property damage or physical injury. In general, one may be *liable* if because of one's action—or inaction when one is legally responsible for taking action—bodily injury, property damage, or other loss is incurred by another person or entity.

For individuals, the most common cause of legal liability involves driving an automobile. An automobile accident may cause bodily injury leading to medical costs, lost income, and even the necessity for long-term care. For the vast majority of people, the potential liability of a major automobile accident exceeds not only their financial capital but also their human capital as well. For example, in some jurisdictions, a liability judgment may result in the confiscation (often termed garnishing) of the wages or other income of the person found liable. Note, though, that the person who is found liable—for example, in an automobile accident—may also have suffered an injury that may affect the individual's financial and/or human capital.

As an example of liability risk, assume that a driver causes an automobile accident in which a passenger in the other car is injured and the other driver's automobile is heavily damaged. In many jurisdictions, the individual who caused the accident is deemed responsible for the repair or replacement of the damaged automobile and the medical expenses and lost income of the victim. As another example, in many countries, a homeowner or even an apartment renter may be deemed legally liable for an accident that causes injury or property damage to a visitor. For example, a guest may accidentally slip on some steps, be seriously injured by the fall, and become incapable of gainful employment. Even if the visitor was careless, laws may specify that the owner or renter of the property is liable.

## 5.6. Health Risk

**Health risk** refers to the risks and implications associated with illness or injury. Direct costs associated with illness or injury may include coinsurance, copayments, and deductibles associated with diagnostics, treatments, and procedures. In the context of health insurance, the term *coinsurance* means that the insured must share some of the costs of the specific health care provided. For example, an insurance company may be obligated to pay 80% of the cost of a medical procedure and require that the insured pay the other 20%. *Copayments* refer to the requirement that the insured pay a specified amount of money for a medical service, typically treatment by a physician. For example, a copayment, or “copay,” of US\$30 may be required for a visit to a primary care physician and US\$45 may be required for a visit to a specialist. The remainder of the actual expense is paid by the insurance company. A *deductible* is an amount that the insured is required to spend on health care approved by the insurance company during the plan year before the insurance company pays for anything. For example, there may be a US\$500 deductible per person and a US\$1,500 total deductible for a family. Insurance companies contend that coinsurance, copayments, and deductibles

discourage frivolous use of the health care system, thereby keeping insurance premiums lower.

In some countries, health care costs for individuals can be significant. Obviously, the risk associated with these costs varies considerably both across and within countries and must be considered as a risk to financial capital. Health factors typically have a significant impact on the premiums individuals pay for life, disability, and long-term care insurance.

Health risks manifest themselves in different ways over the life cycle and can have significant implications for human capital as well as for financial capital. For example, if a worker becomes disabled as a result of an accident or health incident, he or she may be unable to work while health expenses are incurred, resulting in a loss to both current assets and future earnings. The impact of a negative health event on human capital can be approximated by using the discounted cash flow framework and estimating the decline in projected cash flows along with an increase in the discount rate arising from increased earnings uncertainty. Illness and injury can also obviously have an adverse impact on life expectancy, potentially resulting in death before planned retirement. Furthermore, health issues involving non-earning members of the family can also be costly. There may be a need for special medical services, housing improvements, specialized vehicles, and other health-related expenses. In the case of the special needs of a child, the financial obligation could continue well beyond the parents' working lives, or even their actual lives.

Although long-term care is a part of the national health care system in some countries, such as Germany and Japan, in others, such as the United States, the cost of long-term care can represent a significant burden on financial capital. In countries where long-term care expenses are incurred by the individual, policies that provide insurance to protect against the cost of long-term care should be considered. Long-term care insurance is designed to cover a portion of the cost of necessities, such as home care, assisted living facilities, and nursing homes.

The risk and cost of long-term care may be considered both a health issue and an issue of insufficient assets at an advanced age—the latter being a component of the aforementioned longevity risk. The risks may also go beyond the immediate family unit. For example, one may have a parent who is not financially capable of paying for long-term care. An added risk is that inflation in long-term care costs (i.e., medical costs) has historically been higher than base inflation.

## **EXAMPLE 6**

### **Individual Risk Exposures (1)**

Describe premature death risk with respect to financial and human capital.

## **Solution:**

Within a personal financial planning context, premature death means that an individual dies before fully providing for his or her financial needs (and, if applicable, those of the family). By definition, at that point human capital is eliminated because the deceased individual can no longer generate income. To a lesser degree, there may also be an impact on financial capital. In addition to expenses associated with a funeral and burial, there may be a need for significant transitional funds or even a requirement to settle certain debts or business obligations upon the individual's death. Funds may also be required for education and/or training of the surviving spouse to generate income.

## **EXAMPLE 7**

### **Individual Risk Exposures (2)**

Describe longevity risk within the context of personal financial planning, and explain how it relates to human and financial capital.

## **Solution:**

Longevity risk refers to the possibility that an individual may live long enough to deplete his or her resources—to outlive one's money. Longevity risk relates primarily to financial capital—that is, spending one's retirement portfolio. But there is also an aspect of human capital in that one may address longevity risk, in part, by retiring later, thus expanding one's retirement portfolio and reducing the number of years to draw it down while increasing one's human capital.

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## **6. LIFE INSURANCE: USES, TYPES AND ELEMENTS**

- f. describe types of insurance relevant to personal financial planning;

- g. describe the basic elements of a life insurance policy and how insurers price a life insurance policy;

An individual's balance sheet provides a comprehensive overview of the asset categories held to fund current and future spending. Each of these categories involves some risk of a random loss. Managing these risks involves assessing possible loss exposures and considering market and non-market solutions to both address the possibility of and reduce the magnitude of a loss. We review the range of products that can be used to reduce these risks and present a strategy for analyzing the value of possible treatment options.

What are the consequences of risk? Effective risk management for individuals addresses the trade-offs between expected total wealth and security. Individual life-cycle planning involves assessing expected available resources and planning an optimal earning and spending path over a lifetime. But life does not always unfold as expected. A negative event can threaten the value of assets, and a loss in this value will cause total wealth (and expected future consumption) to fall. For each risk exposure, a solution exists to manage that risk exposure, whether through an altered portfolio allocation, a change in behavior, or the purchase of financial and/or insurance products. Each of these solutions involves a cost that generally results in a lower expected level of consumption over time. Shifting assets from risky to risk-free securities results in the loss of a risk premium. In the case of financial products, purchasing insurance trades a reduction in expected lifetime consumption for an increase in the stability of expected spending after a loss. In this section, we discuss the various types of insurance that individuals may use in financial planning. We then turn our attention to annuities, another financial product available to individuals.

## 6.1. Life Insurance

**Life insurance** protects against the loss of human capital for those who depend on an individual's future earnings. In this section, we provide an overview of the key uses of life insurance, the primary types of life insurance, the basic elements of a life insurance policy, how a life insurance policy is priced, and how to determine the appropriate amount of life insurance to purchase, if any.

### 6.1.1. Uses of Life Insurance

Life insurance provides a hedge against the risk of the premature death of an earner. A family's need for life insurance is related to the risk of the loss of the future earning power of an individual less the expected future spending of that individual. In each case, the risk associated with premature death can be mitigated by transferring the risk to a third party (i.e., by purchasing life insurance). The optimal amount of insurance to purchase is a function of

both the expenses of the insurance hedge and the magnitude of the difference in expected lifetime utility with and without that family member.

Life insurance can also be an important estate-planning tool. A life insurance policy can provide immediate liquidity to a beneficiary without the delay involved in the legal process of settling an estate (i.e., distributing assets to beneficiaries) following the death of an individual. This liquidity can be particularly valuable if the estate contains illiquid assets or assets that are difficult to separate and distribute equitably among heirs.

Another possible use of life insurance is as a tax-sheltered savings instrument, notably in the United States. As mentioned previously in this reading, cash-value policies invest a portion of the premium in a tax-advantaged account that represents the difference between the current cost of providing insurance coverage and the premium. The mortality charge is the cost of providing life insurance, which increases with age (as does mortality risk). As mortality risk increases, the accumulated excess premium can be used to pay the increasingly higher costs of providing insurance protection. These excess premiums can be invested in a variety of instruments that can grow over time sheltered from taxation and can eventually be cashed out without paying for older-age life insurance protection.

### 6.1.2. Types of Life Insurance

There are two main types of life insurance: temporary and permanent. For the purposes of this reading, both types of life insurance are assumed to be non-cancelable: The policy lapses only at the end of the term (for temporary life insurance) or upon death (for permanent life insurance).

**Temporary life insurance** provides insurance for a certain period of time specified at purchase. This type of coverage is commonly referred to as “term” life insurance. If the individual survives until the end of the period (e.g., 20 years), the policy will terminate unless it can be automatically renewed. Generally, premiums for term life insurance either remain level over the insured period (e.g., 20 years) or increase over the period as mortality risk increases. The cost of term insurance is less than that of permanent insurance, and the cost per year is less for shorter insured periods (e.g., 10 years versus 20 years), again because of increasing mortality risk.

**Permanent life insurance** provides lifetime coverage, assuming the premiums are paid over the entire period. Policy premiums for permanent life insurance are usually fixed, and there is generally some underlying cash value associated with a permanent insurance policy. There are several types of permanent life insurance that vary by region. Here, we will discuss the two most common types of permanent life insurance: *whole life insurance* and *universal life insurance*.



Whole life insurance remains in force for an insured's entire life (hence the name). Whole life insurance generally requires regular, ongoing fixed premiums, which are typically paid annually, although monthly, quarterly, and semiannual payment options also exist. Failure to pay premiums can result in the lapse of the insurance policy. There is generally a cash value associated with a whole life insurance policy that may be accessed if the insured chooses to do so. The non-cancelability of whole life insurance can make this type of policy appealing to purchase at younger ages, when an individual is typically healthier. Whole life insurance policies can be participating or non-participating. Participating life insurance policies allow potential growth at a higher rate than the guaranteed value, based on the profits of the insurance company. A non-participating policy is one with fixed values: The benefits will not change based on the profits and experience of the insurance company. Universal life insurance is constructed to provide more flexibility than whole life insurance. The policy owner, generally the insured, has the ability to pay higher or lower premium payments and often has more options for investing the cash value. The insurance will stay in force as long as the premiums paid or the cash value is enough to cover the policy expenses of the provider.

Many permanent life insurance policies have a “non-forfeiture clause,” whereby the policy owner has the option to receive some portion of the benefits if premium payments are missed (i.e., before the policy lapses). The scenarios permitted by a non-forfeiture clause generally include a cash surrender option (whereby the existing cash value is paid out), a reduced paid-up option (whereby the cash value is used to purchase a single-premium whole life insurance policy), and an extended term option (whereby the cash value is used to purchase a term insurance policy, generally with the same face value as the previous policy).

In addition, a number of potential “riders” can be added to both temporary and permanent life insurance policies. Riders are modifications that add some risk mitigation beyond the basic policy. One example of a common rider is an “accidental death” rider (also referred to as accidental death and dismemberment, or AD&D), which increases the payout if the insured dies or becomes dismembered from an accident. Other common riders include an accelerated death benefit (which may allow insured parties who have been diagnosed as terminally ill to collect all or part of the death benefit while they are still alive), guaranteed insurability (which allows the owner to purchase more insurance in the future at certain predefined intervals), and a waiver of premium (whereby future premiums are waived if the insured becomes disabled). The value of the rider will depend on the level of protection against an unexpected decline in consumption not otherwise provided by a basic policy. An additional way for life insurance policyholders to access the value of the policy is the option to sell the policy to a third party, which is often called a viatical settlement. After purchasing the policy, the third party becomes responsible for paying the premiums and will receive the death benefit when the insured dies.

### ***6.1.3. Basic Elements of a Life Insurance Policy***

The basic elements of a life insurance policy include

- the term and type of the policy (e.g., a 20-year temporary insurance policy),
- the amount of benefits (e.g., £100,000),
- limitations under which the death benefit could be withheld (e.g., if death is by suicide within two years of issuance),
- the contestability period (the period during which the insurance company can investigate and deny claims),
- the identity (name, age, gender) of the insured
- the policy owner,
- the beneficiary or beneficiaries,
- the premium schedule (the amount and frequency of premiums due), and
- modifications to coverage in any riders to the policy.

In addition, for a life insurance policy to be valid, the policy owner generally needs to have an insurable interest in the life of the insured. Thus, the presence of an insurable interest is a basic element of an insurance policy as well.

The insured, the policy owner, the beneficiary (or beneficiaries), and the insurer are the four primary parties involved in any life insurance policy. The insured is the individual whose death triggers the insurance payment. The policy owner is the person who owns the life insurance policy and is responsible for paying premiums. The beneficiary is the individual (or entity) who will receive the proceeds from the life insurance policy when the insured passes away. The actual beneficiary of a jointly owned life insurance policy may be determined by the order of death of the prospective beneficiaries (e.g., a husband and a wife). Lastly, the insurer is the insurance company that writes the policy and is responsible for paying the death benefit. The amount payable to the beneficiary is typically referred to as the “face value” of the life insurance policy.

For most life insurance policies, the policy owner and the insured are the same person. In certain instances, however, a policy owner may choose to obtain insurance to protect against a loss in economic value from the death of another individual. For example, as part of a divorce, one ex-spouse may purchase life insurance on the other ex-spouse. Similarly, a business may purchase life insurance on a key executive under the assumption that the business would be negatively affected by that executive’s death.

When the insured is not the policy owner, the policy owner must have an “insurable interest”



in the life of the insured. Insurable interest prevents individuals from gambling on the lives of strangers and removes any incentive to hasten the insured person's demise. An insurable interest means that the policy owner must derive some type of benefit from the continued survival of the individual that would be negatively affected should that individual pass away. For example, a spouse has an insurable interest because he or she relies on the income or household services of the other spouse. A business has an insurable interest in key executives who are essential to the ongoing operations of the business.

Life insurance benefits are payable to the beneficiary upon the death of the insured. Usually, some form of documentation or proof of death is required by the life insurance company, such as a death certificate, before benefits are paid to the beneficiary. Death benefits from a life insurance policy can be paid in various forms, such as a lump sum or an annuity, although lump sums are generally more common.

There may be certain situations in which a life insurance company would not be required to pay a benefit. For example, if the insured commits suicide within some predetermined period after purchasing the policy (e.g., two years), or if the insured made material misrepresentations relating to his or her health and/or financial condition during the application process, benefits may not be payable. There is often a maximum contestability period during which the insurer has a legal right to contest the death benefit, after which the insurer cannot deny the claim even if it involves suicide and/or material misstatement.

## EXAMPLE 8

### Elements of a Life Insurance Policy

Describe the concept of insurable interest for life insurance.

#### **Solution:**

An insurable interest means that the policy owner must derive some type of benefit from the continued survival of the insured that would be negatively affected should the insured pass away. For example, an individual may rely on a spouse for his or her financial well-being. If the spouse dies, income is no longer generated, leading to financial problems. Another example is a business that may have an insurable interest in a key employee who generates large sales volumes. The purpose of an insurable interest is to prevent individuals from gambling on the lives of others or from having a financial reason to arrange the death of the insured.

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## 7. LIFE INSURANCE - PRICING, POLICY COST COMPARISON AND DETERMINING AMOUNT NEEDED

- g. describe the basic elements of a life insurance policy and how insurers price a life insurance policy;

There are a number of factors that determine how an insurer prices life insurance, and there are many different types of life insurance policies. Although the details of the actuarial calculations are beyond the scope of this reading, it is useful to understand the basic concepts of life insurance pricing.

In general, there are three key considerations in the pricing of life insurance: mortality expectations, a discount rate, and loading.

### 7.1. Mortality Expectations

One of the most important factors in determining the price for life insurance is the expected mortality of the insured individual (i.e., how long the person is expected to live). Actuaries at insurance companies estimate mortality based on both historical data and future mortality expectations. Generally speaking, life expectancies in most regions of the world have been increasing. Certain attributes, such as age and gender, are obvious factors in evaluating life expectancy. Whether the applicant is a smoker (or has other health risks) is another important factor because smoking is associated with deadly diseases. [Exhibit 5](#) shows an example of the probability of men and women (both smokers and non-smokers) dying at various ages, although these numbers will vary considerably in different countries.

Rather than use a generalized mortality table, life insurance company actuaries typically make adjustments to consider additional factors. The underwriting process serves to categorize applicants according to their perceived riskiness, consistent with the actuaries' specifications. The resulting customized tables consider applicants' health history, particularly conditions that are associated with shorter-than-average life expectancy, such as cancer and heart disease. If an applicant's parents or siblings died at a relatively early age from certain diseases, that applicant may be considered a bigger risk. Excess weight is another health issue leading to shorter life expectancies. Certain activities, such as scuba diving and flying personal aircraft, are deemed to increase mortality risk also. All of these underwriting factors can be collected on a typical life insurance application, and the

salesperson who gathers this information can be considered the first level of the underwriting process.

For larger policies, insurance companies may require a physical examination, performed by an insurer-paid nurse or physician, and the examination could include blood pressure, cholesterol and other blood analysis, an electrocardiogram, and other tests. All of these factors can be used to categorize applicants in tables that discriminate among standard risks, preferred (lower) risks, and high risks, and the cost to the insured can vary considerably. Of course, some people have a sufficient number of factors, or serious-enough factors, to make them uninsurable. This underwriting process reduces the likelihood of *adverse selection*. Adverse selection refers to the fact that individuals who know that they have higher-than-average risk are more likely to apply for life insurance. Unless the insurance company performs its underwriting well, mortality experience can be worse than projected.

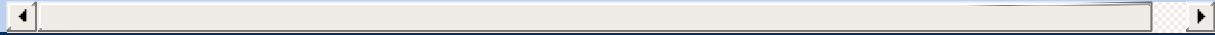
## The Probability of Dying at Certain Ages

Exhibit 5 provides information about the mortality (i.e., the probability of dying) for males and females at different ages.<sup>2</sup> The cost of life insurance is based on the probability that the insured will die during the duration of the policy. The table helps demonstrate why younger (versus older) individuals, females (versus males), and non-smokers (versus smokers) tend to pay less for life insurance—the expected probability of dying in a given year is lower.

**Exhibit 5. Mortality of Males and Females at Certain Ages**

Age	Male			Female		
	Composite	Non-Smoker	Smoker	Composite	Non-Smoker	Smoker
35	0.14%	0.09%	0.14%	0.08%	0.07%	0.10%
40	0.21%	0.15%	0.24%	0.12%	0.10%	0.17%
45	0.26%	0.19%	0.35%	0.14%	0.11%	0.23%
50	0.30%	0.23%	0.48%	0.21%	0.15%	0.37%
55	0.42%	0.35%	0.74%	0.32%	0.25%	0.60%
60	0.67%	0.50%	1.21%	0.52%	0.37%	1.00%
65	1.12%	0.84%	2.08%	0.88%	0.59%	1.66%

70	1.81%	1.40%	3.35%	1.48%	0.95%	2.61%
75	3.18%	2.58%	5.34%	2.45%	1.71%	3.93%
80	5.38%	4.65%	7.56%	4.23%	3.33%	6.27%
85	9.71%	8.80%	11.75%	7.77%	6.54%	10.74%
90	17.41%	16.55%	19.04%	13.79%	12.27%	17.34%
95	25.49%	25.16%	26.09%	21.96%	20.82%	24.65%



## EXAMPLE 9

### Mortality Expectations

If a given male and female are the same age and have equivalent health profiles, evaluate which one should expect to pay more for life insurance.

#### Solution:

A key pricing component of life insurance is expected mortality. From [Exhibit 5](#), one can see that the chance of death for females across the age spectrum is less than it is for males of the same age. Therefore, all else being equal, females should expect to pay less than males for the equivalent life insurance.

## 7.2. Calculation of the Net Premium and Gross Premium

The *net premium* of a life insurance policy represents the discounted value of the future death benefit. To illustrate a simplified calculation of the net premium, we will consider the example of a one-year, non-renewable term life insurance policy with a death benefit of US\$100,000 for Ramon, a 40-year-old non-smoking male. The insurance company insures thousands of people with characteristics like Ramon's. Thus, the life insurance company will experience a predictable distribution of death benefit payments in a given year, although it does not know who among its customers will die during that year.

Premiums are collected at the beginning of the year, and for simple death benefit payments occur at the end of the year. As shown in the absence of other underwriting information, Ramon has a probability of 0.0015 within the year. Although the life insurance company will pay a death benefit of US\$100,000 or US\$0, we can calculate an expected outflow at the end of the year of US\$150, which equals  $(0.0015 \times \text{US\$}100,000) + (0.9985 \times \text{US\$}0)$ . A discount factor, representing an assumption of the insurance company's discount rate, is applied to the expected outflow. Assuming a 5.5% rate, the present value of one year to a present value of US\$142.18 ( $\text{US\$}150/1.055$ ), which

As mentioned previously, life insurance companies typically offer policies in which the insured can pay equal annual premiums for a specified period, for example, a five-year level term policy. The calculation still requires discounting future death benefit payments back to the present, but we must allow for the fact that individuals who die within the five-year period will not be paying premiums for the remaining outstanding term.

To determine what the insurance company would actually charge for a policy, the insurer must consider other factors to calculate the gross premium. The gross premium adds a *load* to the net premium, allowing for expenses and profit for the insurance company.

Expenses are incurred by the insurer for both writing a life insurance policy and on an ongoing basis. Expenses associated with writing a life insurance policy include the costs of the underwriting process, which potentially include a salary for the agent who sold the policy and the cost of a physical exam. Ongoing expenses include administrative expenses associated with monitoring the policy, expenses paid on a timely basis, and verifying a potential death claim. Firms typically provide a low percentage “renewal commission” for the first year of a policy, which encourages the agent to provide needed advice to the policy owner and discourages the policy owner from terminating the policy.

Life insurers can be divided into two groups—stock companies and mutual companies. Stock companies are similar to other corporations in that they are owned by shareholders, have a profit motive, and are expected to provide a return to those shareholders. Due to the constraints of supply and demand for their product, stock life insurers typically charge a gross premium that is somewhat higher than the net premium plus expenses. In mutual companies, which are owned by the policy owners themselves and there is no profit motive, the company typically charge a gross premium that is somewhat higher than the net premium plus expenses. Even though mutual companies do not have profits per se, the gross premium exceeds the net premium plus expenses, and the excess is paid to policy owners as a policy dividend, which is considered a return

























































































































































# GLOSSARY

## A

### **Absolute return benchmark**

A minimum target return that an investment manager is expected to beat.

### **Accounting defeasance**

Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

### **Accumulation phase**

Phase where the government predominantly contributes to a sovereign wealth pension reserve fund.

### **Active management**

A portfolio management approach that allows risk factor mismatches relative to a benchmark index causing potentially significant return differences between the active portfolio and the underlying benchmark.

### **Active return**

Portfolio return minus benchmark return.

### **Active risk**

The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

### **Active risk budgeting**

Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

## **Active share**

A measure of how similar a portfolio is to its benchmark. A manager who precisely replicates the benchmark will have an Active Share of zero; a manager with no holdings in common with the benchmark will have an Active Share of one.

## **Activist short selling**

A hedge fund strategy in which the manager takes a short position in a given security and then publicly presents his/her research backing the short thesis.

## **After-tax excess return**

Calculated as the after-tax return of the portfolio minus the after-tax return of the associated benchmark portfolio.

## **Agency trade**

A trade in which the broker is engaged to find the other side of the trade, acting as an agent. In doing so, the broker does not assume any risk for the trade.

## **Alpha decay**

In a trading context, alpha decay is the erosion or deterioration in short term alpha after the investment decision has been made.

## **Alternative trading systems**

(ATS) Non-exchange trading venues that bring together buyers and sellers to find transaction counterparties. Also called *multilateral trading facilities (MTF)*.

## **Anchoring and adjustment**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anchoring and adjustment bias**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anomalies**

Apparent deviations from market efficiency.

## **Arithmetic attribution**

An attribution approach which explains the arithmetic difference between the portfolio return and its benchmark return. The single-period attribution effects sum to the excess return, however, when combining multiple periods, the sub-period attribution effects will not sum to the excess return.

## **Arrival price**

In a trading context, the arrival price is the security price at the time the order was released to the market for execution.

## **Asset location**

The type of account an asset is held within, e.g., taxable or tax deferred.

## **Asset-only**

With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

## **Asset swap spread (ASW)**

The spread over MRR on an interest rate swap for the remaining life of the bond that is equivalent to the bond's fixed coupon.

## **Asset swaps**

Convert a bond's fixed coupon to MRR plus (or minus) a spread.

## **Authorized participants**

Institutional investors who create and redeem ETF shares using an OTC primary market with an ETF sponsor.

## **Availability bias**

An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

# **B**

## **Back-fill bias**

The distortion in index or peer group data which results when returns are reported to a database only after they are known to be good returns.

## **Barbell**

A fixed-income investment strategy combining short- and long-term bond positions.

## **Base**

With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in “one unit of a currency.”

## **Base-rate neglect**

A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

## **Basis risk**

The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

## **Bear flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in short-term bond yields-to-maturity.

## **Bear spread**

An option strategy that becomes more valuable when the price of the underlying asset declines, so requires buying one option and writing another with a *lower* exercise price. A put bear spread involves buying a put with a higher exercise price and selling a put with a lower exercise price. A bear spread can also be executed with calls.

## **Bear steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in long-term bond yields-to-maturity.

## **Behavioral finance macro**

A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

## **Behavioral finance micro**

A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

## **Bequest**

The transferring, or bequeathing, of assets in some other way upon a person's death. Also referred to as a testamentary bequest or testamentary gratuitous transfer.

## **Best-in-class**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *positive screening*.

## **Bid price**

In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

## **Breadth**

The number of truly independent decisions made each year.

## **Buffering**

Establishing ranges around breakpoints that define whether a stock belongs in one index or another.

## **Bull flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in long-term bond yields-to-maturity.

## **Bull spread**

An option strategy that becomes more valuable when the price of the underlying asset rises, so requires buying one option and writing another with a *higher* exercise price. A call bull spread involves buying a call with a lower exercise price and selling a call with a higher exercise price. A bull spread can also be executed with puts.

## **Bull steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in short-term bond yields-to-maturity.

## **Bullet**

A fixed-income investment strategy that focuses on the intermediate term (or “belly”) of the yield curve.

## **Business cycle**

Fluctuations in GDP in relation to long-term trend growth, usually lasting 9-11 years.

## **Butterfly spread**

A measure of yield curve shape or curvature equal to double the intermediate yield-to-maturity less the sum of short- and long-term yields-to-maturity.

## **Butterfly strategy**

A common yield curve shape strategy that combines a long or short bullet position with a barbell portfolio in the opposite direction to capitalize on expected yield curve shape changes.

# **C**

## **Calendar rebalancing**

Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

## **Calendar spread**

A strategy in which one sells an option and buys the same type of option but with different expiration dates, on the same underlying asset and with the same strike. When the investor buys the more distant (near-term) call and sells the near-term (more distant) call, it is a long (short) calendar spread.

## **Canada model**

Characterized by a high allocation to alternatives. Unlike the endowment model, however, the Canada model relies more on internally managed assets. The innovative features of the Canada model are the: a) reference portfolio, b) total portfolio approach, and c) active management.

## **Capital gain or loss**

For tax purposes equals the selling price (net of commissions and other trading costs) of the asset less its tax basis.

## **Capital market expectations**

(CME) Expectations concerning the risk and return prospects of asset classes.

## **Capital needs analysis**

See *capital sufficiency analysis*.

## **Capital sufficiency analysis**

The process by which a wealth manager determines whether a client has, or is likely to accumulate, sufficient financial resources to meet his or her objectives; also known as *capital needs analysis*.

## **Capture ratio**

A measure of the manager's gain or loss relative to the gain or loss of the benchmark.

## **Carhart model**

A four factor model used in performance attribution. The four factors are: market (RMRF), size (SMB), value (HML), and momentum (WML).

## **Carry trade**

A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

## **Carry trade across currencies**

A strategy seeking to benefit from a positive interest rate differential across currencies by combining a short position (or borrowing) in a low-yielding currency and a long position (or lending) in a high-yielding currency.

## **Cash drag**

Tracking error caused by temporarily uninvested cash.

## **Cash flow matching**

Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives.

## Cash-secured put

An option strategy involving the writing of a put option and simultaneously depositing an amount of money equal to the exercise price into a designated account (this strategy is also called a fiduciary put).

## CDS curve

Plot of CDS spreads across maturities for a single reference entity or group of reference entities in an index.

## Cell approach

See *stratified sampling*.

## Charitable gratuitous transfers

Asset transfers to not-for-profit or charitable organizations. In most jurisdictions charitable donations are not subject to a gift tax and most jurisdictions permit income tax deductions for charitable donations.

## Charitable remainder trust

A trust setup to provide income for the life of named-beneficiaries. When the last named-beneficiary dies any remaining assets in this trust are distributed to the charity named in the trust, hence the term *charitable remainder* trust.

## Closet indexer

A fund that advertises itself as being actively managed but is substantially similar to an index fund in its exposures.

## Cognitive cost

The effort involved in processing new information and updating beliefs.

## Cognitive dissonance

The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

## Cognitive errors

Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.



## **Collar**

An option position in which the investor is long shares of stock and then buys a put with an exercise price below the current stock price and writes a call with an exercise price above the current stock price. Collars allow a shareholder to acquire downside protection through a protective put but reduce the cash outlay by writing a covered call.

## **Completion overlay**

A type of overlay that addresses an indexed portfolio that has diverged from its proper exposure.

## **Completion portfolio**

Is an index-based portfolio that when added to a given concentrated asset position creates an overall portfolio with exposures similar to the investor's benchmark.

## **Conditional value at risk**

(CVaR) Also known as expected loss The average portfolio loss over a specific time period conditional on that loss exceeding the value at risk (VaR) threshold.

## **Confirmation bias**

A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

## **Conjunction fallacy**

An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

## **Conservatism bias**

A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

## **Contingent immunization**

Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

## **Controlled foreign corporation (CFC)**

A company located outside a taxpayer's home country in which the taxpayer has a controlling interest as defined under the home country law.

## **Covered call**

An option strategy in which a long position in an asset is combined with a short position in a call on that asset.

## **Covered interest rate parity**

The relationship among the spot exchange rate, the forward exchange rate, and the interest rate in two currencies that ensures that the return on a hedged (i.e., covered) foreign risk-free investment is the same as the return on a domestic risk-free investment. Also called *interest rate parity*.

## **Credit cycle**

The expansion and contraction of credit over the business cycle, which translates into asset price changes based on default and recovery expectations across maturities and rating categories.

## **Credit default swap (CDS) basis**

Yield spread on a bond, as compared to CDS spread of same tenor.

## **Credit loss rate**

The realized percentage of par value lost to default for a group of bonds equal to the bonds' default rate multiplied by the loss severity.

## **Credit migration**

The change in a bond's credit rating over a certain period.

## **Credit valuation adjustment (CVA)**

The present value of credit risk for a loan, bond, or derivative obligation.

## **Cross-currency basis swap**

An interest rate swap involving the periodic exchange of floating payments in one currency for another based upon respective market reference rates with an initial and final exchange of notional principal.

## **Cross hedge**

A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

## **Cross-sectional consistency**

A feature of expectations setting which means that estimates for all classes reflect the same underlying assumptions and are generated with methodologies that reflect or preserve important relationships among the asset classes, such as strong correlations. It is the internal consistency across asset classes.

## **Cross-sectional momentum**

A managed futures trend following strategy implemented with a cross-section of assets (within an asset class) by going long those that are rising in price the most and by shorting those that are falling the most. This approach generally results in holding a net zero (market-neutral) position and works well when a market's out- or underperformance is a reliable predictor of its future performance.

## **Currency overlay**

A type of overlay that helps hedge the returns of securities held in foreign currency back to the home country's currency.

## **Currency overlay programs**

A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

## **Custom security-based benchmark**

Benchmark that is custom built to accurately reflect the investment discipline of a particular investment manager. Also called a *strategy benchmark* because it reflects a manager's particular strategy.

## **D**

## **Decision price**

In a trading context, the decision price is the security price at the time the investment decision was made.

### **Decision-reversal risk**

The risk of reversing a chosen course of action at the point of maximum loss.

### **Decumulation phase**

Phase where the government predominantly withdraws from a sovereign wealth pension reserve fund.

### **Dedicated short-selling**

A hedge fund strategy in which the manager takes short-only positions in equities deemed to be expensively priced versus their deteriorating fundamental situations. Short exposures may vary only in terms of portfolio sizing by, at times, holding higher levels of cash.

### **Default intensity**

POD over a specified time period in a reduced form credit model.

### **Default risk**

Likelihood that a borrower will default or fail to meet its obligation to make full and timely payments of principal and interest according to the terms of a debt obligation.

### **Deferred annuity**

An annuity that enables an individual to purchase an income stream that will begin at a later date.

### **Defined benefit**

A retirement plan in which a plan sponsor commits to paying a specified retirement benefit.

### **Defined contribution**

A retirement plan in which contributions are defined but the ultimate retirement benefit is not specified or guaranteed by the plan sponsor.

### **Delay cost**

The (trading related) cost associated with not submitting the order to the market in a timely manner.

## **Delta**

The change in an option's price in response to a change in price of the underlying, all else equal.

## **Delta hedging**

Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

## **Demand deposits**

Accounts that can be drawn upon regularly and without notice. This category includes checking accounts and certain savings accounts that are often accessible through online banks or automated teller machines (ATMs).

## **Diffusion index**

An index that measures how many indicators are pointing up and how many are pointing down.

## **Direct market access**

(DMA) Access in which market participants can transact orders directly with the order book of an exchange using a broker's exchange connectivity.

## **Disability income insurance**

A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

## **Discount margin**

The discount (or required) margin is the yield spread versus the MRR such that the FRN is priced at par on a rate reset date.

## **Discretionary portfolio management**

An arrangement in which a wealth manager has a client's pre-approval to execute investment decisions.

## **Discretionary trust**

A trust that enables the trustee to determine whether and how much to distribute based on a beneficiary's general welfare.

## **Disposition effect**

As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

## **Dividend capture**

A trading strategy whereby an equity portfolio manager purchases stocks just before their ex-dividend dates, holds these stocks through the ex-dividend date to earn the right to receive the dividend, and subsequently sells the shares.

## **Domestic asset**

An asset that trades in the investor's domestic currency (or home currency).

## **Domestic currency**

The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

## **Domestic-currency return**

A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

## **Double taxation**

A term used to describe situations in which income is taxed twice. For example, when corporate earnings are taxed at the company level and then that portion of earnings paid as dividends is taxed again at the investor level.

## **Drawdown**

A decline in value (represented by a series of negative returns only) following a peak fund valuation.

## **Drawdown duration**

The total time from the start of the drawdown until the cumulative drawdown recovers to zero.

## **Due diligence**

Investigation and analysis in support of an investment action, decision, or recommendation.

## **Duration matching**

Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

## **Duration times spread**

Weighting of spread duration by credit spread in order to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage, rather than absolute, basis.

## **Duration Times Spread (DTS)**

Weighting of spread duration by credit spread to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage rather than absolute basis.

## **Dynamic asset allocation**

A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

## **Dynamic hedge**

A hedge requiring adjustment as the price of the hedged asset changes.

# **E**

## **Earnings risk**

The risk associated with the earning potential of an individual.

## **Econometrics**

The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

## **Economic balance sheet**

A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet*.

## **Economic indicators**

Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

## **Economic net worth**

The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

## **Effective federal funds (FFE) rate**

The fed funds rate actually transacted between depository institutions, not the Fed's target federal funds rate.

## **Emotional biases**

Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

## **Empirical duration**

Estimation of the price-yield relationship using historical bond market data in statistical models.

## **Endowment bias**

An emotional bias in which people value an asset more when they hold rights to it than when they do not.

## **Endowment model**

Characterized by a high allocation to alternative investments (private investments and hedge funds), significant active management, and externally managed assets.

## **Enhanced indexing approach**



Maintains a close link to the benchmark but attempts to generate a modest amount of outperformance relative to the benchmark.

## **Enhanced indexing strategy**

Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

## **Equity monetization**

A group of strategies that allow investors to receive cash for their concentrated stock positions without an outright sale. These transactions are structured to avoid triggering the capital gains tax.

## **Estate**

Consists of all of the property a person owns or controls, which may consist of financial assets (e.g., bank accounts, stocks, bonds, business interests), tangible personal assets (e.g., artwork, collectibles, vehicles), immovable property (e.g., residential real estate, timber rights), and intellectual property (e.g., royalties).

## **Estate planning**

The process of preparing for the disposition of one's estate upon death and during one's lifetime.

## **Estate tax**

Levied on the total value of a deceased person's assets and paid out of the estate before any distributions to beneficiaries.

## **Evaluated pricing**

*See matrix pricing.*

## **Excess return**

Used in various senses appropriate to context: 1) The difference between the portfolio return and the benchmark return; 2) The return in excess of the risk-free rate.

## **Excess spread**

Credit spread return measure that incorporates both changes in spread and expected credit losses for a given period.

## **Exchange fund**

A partnership in which each of the partners have each contributed low cost-basis stock to the fund. Used in the United States as a mechanism to achieve a tax-free exchange of a concentrated asset position.

## **Execution cost**

The difference between the (trading related) cost of the real portfolio and the paper portfolio, based on shares and prices transacted.

## **Exhaustive**

An index construction strategy that selects every constituent of a universe.

## **Expected shortfall**

The average loss conditional on exceeding the VaR cutoff; sometimes referred to as *conditional VaR* or *expected tail loss*.

## **Expected tail loss**

See *expected shortfall*.

## **Extended portfolio assets and liabilities**

Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

# **F**

## **Factor-model-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

## **Family constitution**

Typically a non-binding document that sets forth an agreed-upon set of rights, values, and responsibilities of the family members and other stakeholders. Used by many wealth- and business-owning families as the starting point of conflict resolution

procedures.

## **Family governance**

The process for a family's collective communication and decision making designed to serve current and future generations based on the common values of the family.

## **Financial capital**

The tangible and intangible assets (excluding human capital) owned by an individual or household.

## **Fixed trust**

Distributions to beneficiaries of a fixed trust are specified in the trust document to occur at certain times or in certain amounts.

## **Forced heirship**

Is the requirement that a certain proportion of assets must pass to specified family members, such as a spouse and children.

## **Foreign assets**

Assets denominated in currencies other than the investor's home currency.

## **Foreign currency**

Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

## **Foreign-currency return**

The return of the foreign asset measured in foreign-currency terms.

## **Forward rate bias**

An empirically observed divergence from interest rate parity conditions that active investors seek to benefit from by borrowing in a lower-yield currency and investing in a higher-yield currency.

## **Foundation**

A legal entity available in certain jurisdictions. Foundations are typically set up to hold assets for a specific charitable purpose, such as to promote education or for

philanthropy. When set up and funded by an individual or family and managed by its own directors, it is called a *private foundation*. The term *family foundation* usually refers to a private foundation where donors or members of the donors' family are actively involved.

## **Framing**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Framing bias**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Fulcrum securities**

Partially-in-the-money claims (not expected to be repaid in full) whose holders end up owning the reorganized company in a corporate reorganization situation.

## **Full replication approach**

When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

## **Fund-of-funds**

A fund of hedge funds in which the fund-of-funds manager allocates capital to separate, underlying hedge funds (e.g., single manager and/or multi-manager funds) that themselves run a range of different strategies.

## **Funding currencies**

The low-yield currencies in which borrowing occurs in a carry trade.

# **G**

## **G-spread**

Yield spread for a fixed-rate bond over a government benchmark.

## **Gamblers' fallacy**

A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

## **Gamma**

The change in an option's delta for a change in price of the underlying, all else equal.

## **General account**

Account holding assets to fund future liabilities from traditional life insurance and fixed annuities, the products in which the insurer bears all the risks—particularly mortality risk and longevity risk.

## **Generation-skipping tax**

Taxes levied in some jurisdictions on asset transfers (gifts) that skip one generation such as when a grandparent transfers assets to their grandchildren. (see related Gift Tax).

## **Gift tax**

Depending on the tax laws of the country, assets gifted by one person to another during the giftor's lifetime may be subject to a gift tax.

## **Goals-based**

With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

## **Goals-based investing**

An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

## **Green bonds**

Fixed-income instruments issued by private or public sector borrowers that directly fund ESG initiatives.

## **Grinold–Kroner model**

An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

# H

## **Halo effect**

An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

## **Hard-catalyst event-driven approach**

An event-driven approach in which investments are made in reaction to an already announced corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) in which security prices related to the event have yet to fully converge.

## **Hazard rate**

The conditional POD, or the likelihood that default will occur given that it has not already occurred in a prior period.

## **Health insurance**

A type of insurance used to cover health care and medical costs.

## **Health risk**

The risk associated with illness or injury.

## **Hedge ratio**

The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

## **Herding**

When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

## **High-water mark**

A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

## **Hindsight bias**

A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

### **Holdings-based attribution**

A “buy and hold” attribution approach which calculates the return of portfolio and benchmark components based upon the price and foreign exchange rate changes applied to daily snapshots of portfolio holdings.

### **Holdings-based style analysis**

A bottom-up style analysis that estimates the risk exposures from the actual securities held in the portfolio at a point in time.

### **Holistic balance sheet**

*See economic balance sheet.*

### **Home bias**

A preference for securities listed on the exchanges of one’s home country.

### **Home-country bias**

The favoring of domestic over non-domestic investments relative to global market value weights.

### **Home currency**

*See domestic currency.*

### **Human capital**

An implied asset; the net present value of an investor’s future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital*.

## **I**

### **I-spread (interpolated spread)**

Yield spread measure using swaps or constant maturity Treasury YTM as a benchmark.

## **Illusion of control**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Illusion of control bias**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Immediate annuity**

An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

## **Immunization**

An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

## **Impact investing**

Investment approach that seeks to achieve targeted social or environmental objectives along with measurable financial returns through engagement with a company or by direct investment in projects or companies.

## **Implementation shortfall**

(IS) The difference between the return for a notional or paper portfolio, where all transactions are assumed to take place at the manager's decision price, and the portfolio's actual return, which reflects realized transactions, including all fees and costs.

## **Implied volatility**

The outlook for the future volatility of the underlying asset's price. It is the value (i.e., standard deviation of underlying's returns) that equates the model (e.g., Black–Scholes–Merton model) price of an option to its market price.

## **Implied volatility surface**

A three-dimensional plot, for put and call options on the same underlying asset, of days to expiration ( $x$ -axis), option strike prices ( $y$ -axis), and implied volatilities ( $z$ -axis). It



simultaneously shows the volatility skew (or smile) and the term structure of implied volatility.

### **Incremental VaR (or partial VaR)**

The change in the minimum portfolio loss expected to occur over a given time period at a specific confidence level resulting from increasing or decreasing a portfolio position.

### **Information coefficient**

Formally defined as the correlation between forecast return and actual return. In essence, it measures the effectiveness of investment insight.

### **Inheritance tax**

Paid by each individual beneficiary of a deceased person's estate on the value of the benefit the individual received from the estate.

### **Input uncertainty**

Uncertainty concerning whether the inputs are correct.

### **Interaction effect**

The attribution effect resulting from the interaction of the allocation and selection decisions.

### **Intertemporal consistency**

A feature of expectations setting which means that estimates for an asset class over different horizons reflect the same assumptions with respect to the potential paths of returns over time. It is the internal consistency over various time horizons.

### **Intestate**

A person who dies without a valid will or with a will that does not dispose of their property are considered to have died intestate.

### **Intrinsic value**

The difference between the spot exchange rate and the strike price of a currency option.

### **Investment currencies**

The high-yielding currencies in a carry trade.

## **Investment policy statement**

A written planning document that describes a client's investment objectives and risk tolerance over a relevant time horizon, along with the constraints that apply to the client's portfolio.

## **Investment style**

A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

## **Irrevocable trust**

The person whose assets are used to create the trust gives up the right to rescind the trust relationship and regain title to the trust assets.

# **K**

## **Key person risk**

The risk that results from over-reliance on an individual or individuals whose departure would negatively affect an investment manager.

## **Key rate duration**

A method of measuring interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

## **Knock-in/knock-out**

Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

# **L**

## **Leading economic indicators**

A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

## **Liability-based mandates**

Mandates managed to match or cover expected liability payments (future cash outflows) with future projected cash inflows.

## **Liability-driven investing**

An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

## **Liability driven investing (LDI) model**

In the LDI model, the primary investment objective is to generate returns sufficient to cover liabilities, with a focus on maximizing expected surplus return (excess return of assets over liabilities) and managing surplus volatility.

## **Liability glide path**

A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

## **Liability insurance**

A type of insurance used to manage liability risk.

## **Liability-relative**

With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

## **Liability risk**

The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

## **Life-cycle finance**

A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

## **Life insurance**

A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

## **Life settlement**

The sale of a life insurance contract to a third party. The valuation of a life settlement typically requires detailed biometric analysis of the individual policyholder and an understanding of actuarial analysis.

## **Limited-life foundations**

A type of foundation where founders seek to maintain control of spending while they (or their immediate heirs) are still alive.

## **Liquidity budget**

The portfolio allocations (or weightings) considered acceptable for the liquidity categories in the liquidity classification schedule (or time-to-cash table).

## **Liquidity classification schedule**

A liquidity management classification (or table) that defines portfolio liquidity “buckets” or categories based on the estimated time it would take to convert assets in that particular category into cash.

## **Longevity risk**

The risk of outliving one’s financial resources.

## **Loss-aversion bias**

A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

## **Loss severity**

Also known as loss given default (LGD). The amount of loss if a default occurs, usually expressed as a percentage in annual terms.

# **M**

## **Macro attribution**

Attribution at the sponsor level.

## **Manager peer group**

See *manager universe*.

## **Manager universe**

A broad group of managers with similar investment disciplines. Also called *manager peer group*.

## **Matrix pricing**

An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

## **Matrix pricing (or evaluated pricing)**

Methodology for pricing infrequently traded bonds using bonds from similar issuers and actively traded government benchmarks to establish a bond's fair value.

## **Mental accounting bias**

An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

## **Micro attribution**

Attribution at the portfolio manager level.

## **Minimum-variance hedge ratio**

A mathematical approach to determining the optimal cross hedging ratio.

## **Mission-related investing**

Aims to direct a significant portion of assets in excess of annual grants into projects promoting a foundation's mission.

## **Model uncertainty**

Uncertainty as to whether a selected model is correct.

## **Mortality table**

A table that indicates individual life expectancies at specified ages.

## **Multi-class trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and involves buying and selling different classes of shares of the same company, such as voting and non-voting shares.

### **Multi-manager fund**

Can be of two types—one is a multi-strategy fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund; the second type is a fund of hedge funds (or fund-of-funds) in which the manager allocates capital to separate, underlying hedge funds that themselves run a range of different strategies.

### **Multi-strategy fund**

A fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund.

### **Multilateral trading facilities**

(MTF) See *Alternative trading systems (ATS)*.

## **N**

### **Negative butterfly**

An increase in the butterfly spread due to lower short- and long-term yields-to-maturity and a higher intermediate yield-to-maturity.

### **Negative screening**

An ESG implementation approach that excludes certain sectors or companies that deviate from an investor's accepted standards.

### **Non-deliverable forwards**

Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

### **Nonstationarity**

A characteristic of series of data whose properties, such as mean and variance, are not constant through time. When analyzing historical data it means that different parts of a

data series reflect different underlying statistical properties.

## **Norway model**

Characterized by an almost exclusive reliance on public equities and fixed income (the traditional 60/40 equity/bond model falls under the Norway model), with largely passively managed assets and with very little to no allocation to alternative investments.

## **O**

### **OAS duration**

The change in bond price for a given change in OAS.

### **Offer price**

The price at which a counterparty is willing to sell one unit of the base currency.

### **Opportunity cost**

The (trading related) cost associated with not being able to transact the entire order at the decision price.

### **Option-adjusted spread (OAS)**

A generalization of the Z-spread yield spread calculation that incorporates bond option pricing based on assumed interest rate volatility.

### **Optional stock dividends**

A type of dividend in which shareholders may elect to receive either cash or new shares.

### **Options on bond futures contracts**

Instruments that involve the right, but not the obligation, to enter into a bond futures contract at a pre-determined strike (bond price) on a future date in exchange for an up-front premium.

### **Overbought**

When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

## **Overconfidence bias**

A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

## **Overlay**

A derivative position (or positions) used to adjust a pre-existing portfolio closer to its objectives.

## **Oversold**

The opposite of overbought; see *overbought*.

# **P**

## **Packeting**

Splitting stock positions into multiple parts.

## **Pairs trading**

An equity market-neutral strategy that capitalizes on the misalignment in prices of pairs of similar under- and overvalued equities. The expectation is the differential valuations or trading relationships will revert to their long-term mean values or their fundamentally-correct trading relationships, with the long position rising and the short position declining in value.

## **Parameter uncertainty**

Uncertainty arising because a quantitative model's parameters are estimated with error.

## **Participant/cohort option**

Pools the DC plan member with a cohort that has a similar target retirement date.

## **Participant-switching life-cycle options**

Automatically switch DC plan members into a more conservative asset mix as their age increases. There may be several automatic de-risking switches at different age targets.

## **Passive investment**



In the fixed-income context, it is investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

## **Passive management**

A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

## **Percent-range rebalancing**

An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

## **Performance attribution**

Attribution, including return attribution and risk attribution; often used as a synonym for return attribution.

## **Permanent life insurance**

A type of life insurance that provides lifetime coverage.

## **Portfolio overlay**

An array of derivative positions managed separately from the securities portfolio to achieve overall intended portfolio characteristics.

## **Position delta**

The overall or portfolio delta. For example, the position delta of a covered call, consisting of long 100 shares and short one at-the-money call, is +50 (= +100 for the shares and -50 for the short ATM call).

## **Positive butterfly**

A decrease in the butterfly spread due to higher short- and long-term yields-to-maturity and a lower intermediate yield-to-maturity.

## **Positive screening**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *best-in-class*.

## **Post-liquidation return**

Calculates the return assuming that all portfolio holdings are sold as of the end date of the analysis and that the resulting capital gains tax that would be due is deducted from the ending portfolio value.

## **Potential capital gain exposure (PCGE)**

Is an estimate of the percentage of a fund's assets that represents gains and measures how much the fund's assets have appreciated. It can be an indicator of possible future capital gain distributions.

## **Premature death risk**

The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

## **Present value of distribution of cash flows methodology**

Method used to address a portfolio's sensitivity to rate changes along the yield curve. This approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

## **Principal trade**

A trade in which the market maker or dealer becomes a disclosed counterparty and assumes risk for the trade by transacting the security for their own account. Also called *broker risk trades*.

## **Probability of default**

The likelihood that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest.

## **Probate**

The legal process to confirm the validity of the will so that executors, heirs, and other interested parties can rely on its authenticity.

## **Program trading**

A strategy of buying or selling many stocks simultaneously.

## **Progressive tax rate schedule**

A tax regime in which the tax rate increases as the amount of income or wealth being taxed increases.

## **Property insurance**

A type of insurance used by individuals to manage property risk.

## **Property risk**

The possibility that a person's property may be damaged, destroyed, stolen, or lost.

## **Protective put**

An option strategy in which a long position in an asset is combined with a long position in a put on that asset.

## **Pure indexing**

Attempts to replicate a bond index as closely as possible, targeting zero active return and zero active risk.

## **Put spread**

A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

# **Q**

## **Qualified dividends**

Generally dividends from shares in domestic corporations and certain qualified foreign corporations which have been held for at least a specified minimum period of time.

## **Quantitative market-neutral**

An approach to building market-neutral portfolios in which large numbers of securities are traded and positions are adjusted on a daily or even an hourly basis using algorithm-based models.

## **Quoted margin**

The yield spread over the MRR established upon issuance of an FRN to compensate investors for assuming an issuer's credit risk.

# R

## Re-base

With reference to index construction, to change the time period used as the base of the index.

## Realized volatility

Historical volatility, the square root of the realized variance of returns, which is a measure of the range of past price outcomes for the underlying asset.

## Rebalancing

In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

## Rebalancing overlay

A type of overlay that addresses a portfolio's need to sell certain constituent securities and buy others.

## Rebalancing range

A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

## Rebate rate

The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

## Reduced form credit models

Credit models that solve for default probability over a specific time period using observable company-specific variables such as financial ratios and macroeconomic variables.

## Reduced-form models

Models that use economic theory and other factors such as prior research output to describe hypothesized relationships. Can be described as more compact representations of underlying structural models. Evaluate endogenous variables in terms of observable

exogenous variables.

## **Regime**

The governing set of relationships (between variables) that stem from technological, political, legal, and regulatory environments. Changes in such environments or policy stances can be described as changes in regime.

## **Regret**

The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

## **Regret-aversion bias**

An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

## **Relative value**

A concept that describes the selection of the most attractive individual securities to populate the portfolio with, using ranking and comparing.

## **Relative value volatility arbitrage**

A volatility trading strategy that aims to source and buy cheap volatility and sell more expensive volatility while netting out the time decay aspects normally associated with options portfolios.

## **Relative VaR**

The minimum portfolio loss expected to occur over a given time period at a specific confidence level based on a portfolio containing active positions minus benchmark holdings.

## **Repo rate**

The interest rate on a repurchase agreement.

## **Representativeness bias**

A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

## **Repurchase agreements**

In repurchase agreements, or *repos*, a security owner agrees to sell a security for a specific cash amount while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

## **Request for quote**

(RFQ) A non-binding quote provided by a market maker or dealer to a potential buyer or seller upon request. Commonly used in fixed income markets these quotes are only valid at the time they are provided.

## **Reserve portfolio**

The component of an insurer's general account that is subject to specific regulatory requirements and is intended to ensure the company's ability to meet its policy liabilities. The assets in the reserve portfolio are managed conservatively and must be highly liquid and low risk.

## **Resistance levels**

Price points on dealers' order boards where one would expect to see a clustering of offers.

## **Return attribution**

A set of techniques used to identify the sources of the excess return of a portfolio against its benchmark.

## **Returns-based attribution**

An attribution approach that uses only the total portfolio returns over a period to identify the components of the investment process that have generated the returns. The Brinson–Hood–Beebower approach is a returns-based attribution approach.

## **Returns-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

## **Returns-based style analysis**

A top-down style analysis that involves estimating the sensitivities of a portfolio to security market indexes.

## **Reverse repos**

Repurchase agreements from the standpoint of the lender.

## **Revocable trust**

The person whose assets are used to create the trust retains the right to rescind the trust relationship and regain title to the trust assets.

## **Risk attribution**

The analysis of the sources of risk.

## **Risk aversion**

The degree of an investor's unwillingness to take risk; the inverse of risk tolerance.

## **Risk budgeting**

The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

## **Risk capacity**

The ability to accept financial risk.

## **Risk perception**

The subjective assessment of the risk involved in the outcome of an investment decision.

## **Risk premium**

An extra return expected by investors for bearing some specified risk.

## **Risk reversal**

A strategy used to profit from the existence of an implied volatility skew and from changes in its shape over time. A combination of long (short) calls and short (long) puts on the same underlying with the same expiration is a long (short) risk reversal.

## **Risk tolerance**

The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

# S

## **Sample-size neglect**

A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or “real” data).

## **Scenario analysis**

What-if analysis that involves changing multiple assumptions at the same time in order to evaluate the change in an investment’s value.

## **Seagull spread**

An extension of the risk reversal foreign exchange option strategy that limits downside risk.

## **Securities lending**

A form of collateralized lending that may be used to generate income for portfolios.

## **Selective**

An index construction methodology that targets only those securities with certain characteristics.

## **Self-attribution bias**

A bias in which people take personal credit for successes and attribute failures to external factors outside the individual’s control.

## **Self-control bias**

A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

## **Separate accounts**

Accounts holding assets to fund future liabilities from variable life insurance and variable annuities, the products in which customers make investment decisions from a menu of options and themselves bear investment risk.

## **Sharpe ratio**



The average return in excess of the risk-free rate divided by the standard deviation of return; a measure of the average excess return earned per unit of standard deviation of return. Also known as the *reward-to-variability ratio*.

## **Short-biased**

A hedge fund strategy in which the manager uses a less extreme version of dedicated short-selling. It involves searching for opportunities to sell expensively priced equities, but short exposure may be balanced with some modest value-oriented, or index-oriented, long exposure.

## **Shortfall probability**

The probability of failing to meet a specific liability or goal.

## **Shrinkage estimation**

Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

## **Single-manager fund**

A fund in which one portfolio manager or team of portfolio managers invests in one strategy or style.

## **Smart beta**

Involves the use of transparent, rules-based strategies as a basis for investment decisions.

## **Smart order routers**

(SOR) Smart systems used to electronically route small orders to the best markets for execution based on order type and prevailing market conditions.

## **Social proof**

A bias in which individuals tend to follow the beliefs of a group.

## **Soft-catalyst event-driven approach**

An event-driven approach in which investments are made proactively in anticipation of a corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) that has yet to occur.

## Special dividends

A dividend paid by a company that does not pay dividends on a regular schedule, or a dividend that supplements regular cash dividends with an extra payment.

## Spread duration

The change in bond price for a given change in yield spread. Also referred to as *OAS duration* when the option-adjusted spread (OAS) is the yield measure used.

## Staged diversification strategy

The simplest approach to managing the risk of a concentrated position involves selling the concentrated position over some period of time, paying associated tax, and reinvesting the proceeds in a diversified portfolio.

## Static hedge

A hedge that is not sensitive to changes in the price of the asset hedged.

## Status quo bias

An emotional bias in which people do nothing (i.e., maintain the “status quo”) instead of making a change.

## Stock lending

Securities lending involving the transfer of equities.

## Stop-losses

A trading order that sets a selling price below the current market price with a goal of protecting profits or preventing further losses.

## Stops

Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

## Straddle

An option combination in which one buys *both* puts and calls, with the same exercise price and same expiration date, on the same underlying asset. In contrast to this long straddle, if someone *writes* both options, it is a short straddle.

## **Strangle**

A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

## **Stratified sampling**

A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

## **Structural credit models**

Credit models that apply market-based variables to estimate the value of an issuer's assets and the volatility of asset value.

## **Structural models**

Models that specify functional relationships among variables based on economic theory. The functional form and parameters of these models are derived from the underlying theory. They may include unobservable parameters.

## **Structural risk**

Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

## **Stub trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and entails buying and selling stock of a parent company and its subsidiaries, typically weighted by the percentage ownership of the parent company in the subsidiaries.

## **Support levels**

Price points on dealers' order boards where one would expect to see a clustering of bids.

## **Surplus**

The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

## **Surplus portfolio**

The component of an insurer's general account that is intended to earn higher expected returns than the reserve portfolio and so can assume more risk. Surplus portfolio assets are often managed aggressively with high-risk assets.

## **Survivorship bias**

Bias that arises in a data series when managers with poor track records are dropped from the database whereas managers with good track records remain. A data series of a given date reflects only entities that have survived to that date.

## **Swaption**

This instrument grants a party the right, but not the obligation, to enter into a rate swap at a pre-determined strike (fixed swap rate) on a future date, for a fixed up-front premium.

## **Synthetic long forward position**

The combination of a long call and a short put with identical strike prices, all traded at the same time on the same underlying.

## **Synthetic short forward position**

The combination of a short call and a long put at the same strike price, all traded at the same time on the same underlying.

# **T**

## **Tactical asset allocation**

Asset allocation that involves making short-term adjustments to the portfolio based on short-term predictions of relative performance among asset classes.

## **Tax alpha**

Calculated by subtracting the pre-tax excess return from the total return. Tax alpha isolates the benefit of tax management of the portfolio.

## **Tax avoidance**

The legal activity of understanding the tax laws and finding ways to minimize tax liability.

















# INSTITUTIONAL INVESTORS, OTHER TOPICS IN PORTFOLIO MANAGEMENT, AND CASES

CFA® Program Curriculum  
2022 • LEVEL III • VOLUME 5

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7.1. Asset-Based Benchmarks

8. Benchmark Properties, Evaluating Benchmark Quality, and

## Choosing the Correct Benchmark

8.1. Evaluating Benchmark Quality: Analysis Based on a Decomposition of Portfolio Holdings and Returns

8.2. Importance of Choosing the Correct Benchmark

## 9. Benchmarking Alternative Investments

9.1. Benchmarking Hedge Fund Investments

9.2. Benchmarking Real Estate Investments

9.3. Benchmarking Private Equity

9.4. Benchmarking Commodity Investments

9.5. Benchmarking Managed Derivatives

9.6. Benchmarking Distressed Securities

## 10. Performance Appraisal: Risk-Based Measures

10.1. Distinguishing Investment Skill from Luck

10.2. Appraisal Measures

10.2.1. The Sharpe Ratio

10.2.2. The Treynor Ratio

10.2.3. The Information Ratio

10.2.4. The Appraisal Ratio

10.2.5. The Sortino Ratio

## 11. Performance Appraisal: Capture Ratios and Drawdowns

11.1. Capture Ratios

11.2. Drawdown

## 12. Evaluation of Investment Manager Skill

12.1. Performance Attribution Analysis

12.2. Appraisal Measures

12.3. Sample Evaluation of Skill

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## Reading 27. Investment Manager Selection

Learning Outcomes

1. Introduction

2. A Framework for Investment Manager Search and Selection

2.1. Defining the Manager Universe

3. Type I and Type II Errors in Manager Selection

3.1. Qualitative considerations in Type I and Type II errors

3.2. Performance implications of Type I and Type II errors

4. Quantitative Elements of Manager Search and Selection

4.1. Style Analysis

5. Capture Ratios and Drawdowns in Manager Evaluation

- 6. The Manager's Investment Philosophy
  - 6.1. Investment Philosophy
  - 6.2. Investment Personnel
- 7. The Manager's Investment Decision-making Process
  - 7.1. Signal Creation (Idea Generation)
  - 7.2. Signal Capture (Idea Implementation)
  - 7.3. Portfolio Construction
  - 7.4. Monitoring the Portfolio
- 8. Operational Due Diligence
  - 8.1. Firm
  - 8.2. Investment Vehicle
  - 8.3. Evaluation of the Investment's Terms
    - 8.3.1. Liquidity
- 9. Management Fees
  - 9.1. Assets under Management Fees
  - 9.2. Performance-Based Fees

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## Study Session 14. Cases in Portfolio Management and Risk Management

### Reading Assignments

#### Reading 28. Case Study in Portfolio Management: Institutional

### Learning Outcomes

- 1. Introduction
- 2. Background: Liquidity Management
  - 2.1. Liquidity Profiling and Time-to-Cash
  - 2.2. Rebalancing, Commitments
  - 2.3. Stress Testing
  - 2.4. Derivatives
  - 2.5. Earning an Illiquidity Premium
- 3. QUINCO Case: Background
  - 3.1. Quadrivium University Investment Company (QUINCO)
  - 3.2. Investment Strategy: Background and Evolution
    - 3.2.1. Current Scenario
- 4. QUINCO Case: Strategic Asset Allocation
- 5. QUINCO Case: Liquidity Management
- 6. QUINCO Case: Asset Manager Selection
- 7. QUINCO Case: Tactical Asset Allocation
- 8. QUINCO Case: Asset Allocation Rebalancing
- 9. QUINCO Case: ESG Integration

Student Activity  
QUINCO ESG Approach  
QUINCO  
Investment Response

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## Reading 29. Case Study in Risk Management: Private Wealth

Learning Outcomes

### 1. Introduction and Case Background

#### 1.1. Background of Eurolandia

1.1.1. Government Pension Plan

1.1.2. Health System

1.1.3. Unemployment Insurance

1.1.4. Disability Insurance

1.1.5. Education

1.1.6. Social Security Contributions and Tax Rates

#### 1.2. The Schmitt Family in Their Early Career Stage

##### 1.2.1. Initial Case Facts

### 2. Identification and Analysis of Risk Exposures: Early Career Stage

2.1. Specify the Schmitts' financial objectives

2.2. Identification of risk exposures

2.3. Analysis of identified risk

2.3.1. Earnings risk

2.3.2. Premature death risk

2.3.3. Car accident and repair costs

2.3.4. Liability risk

2.3.5. House purchase

### 3. Risk Management Recommendations: Early Career Stage

3.1. Recommendations for managing risks

3.1.1. Earnings risk

3.1.2. Premature death risk

3.1.3. Car accident and repair costs

3.1.4. Risks to lifestyle arising from the proposed house purchase

3.1.5. Other risks

3.2. Monitoring outcomes and risk exposures

### 4. Risk Management Considerations associated with Home Purchase

4.1. Review of risk Management Arrangements Following the House Purchase

5. Identification and Analysis of Risk Exposures: Career Development Stage
  - 5.1. Case Facts: The Schmitts Are 45
  - 5.2. Financial Objectives in the Career Development Stage
  - 5.3. Identification and Evaluation of Risks in the Career Development Stage
    - 5.3.1. Assessment of earnings risk
    - 5.3.2. Analysis of the investment portfolio risks
    - 5.3.3. Analysis of the retirement savings plans
    - 5.3.4. Other risks
6. Risk Management Recommendations: Career Development Stage
  - 6.1. Disability insurance
  - 6.2. Life insurance
  - 6.3. Investment risk recommendations
  - 6.4. Retirement planning recommendation
  - 6.5. Additional suggestions
7. Identification and Analysis of Risk Exposures: Peak Accumulation Stage
  - 7.1. Review of Objectives, Risks, and Methods of Addressing Them
    - 7.1.1. Financial objectives
    - 7.1.2. Review of Risks and Related Risk Management Methods
8. Assessment of and Recommendations concerning Risk to Retirement Lifestyle and Bequest Goals: Peak Accumulation Stage
  - 8.1. Analysis of Investment Portfolio
    - 8.1.1. The goal of supporting Peter
    - 8.1.2. Leaving inheritance to Roxane
  - 8.2. Analysis of Asset Allocation
    - 8.2.1. Peter's care
    - 8.2.2. Leaving an inheritance for Roxane
  - 8.3. Recommendations for Risk Management at Peak Accumulation Stage
    - 8.3.1. Risk to earnings
    - 8.3.2. Recommendations for retirement savings
    - 8.3.3. Recommendations for the investment portfolio
9. Identification and Analysis of Retirement Objectives, Assets and Drawdown Plan: Retirement Stage
  - 9.1. Key Issues and Objectives
  - 9.2. Analysis of Retirement Assets and Drawdown Plan
10. Income and Investment Portfolio Recommendations: Retirement

## Stage

10.1. Investment Portfolio Analysis and Recommendations

10.2. The Advisor's Recommendations for Investment Portfolio in Retirement

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## Practice Problems

## Solutions

## Reading 30. Integrated Cases in Risk Management: Institutional Learning Outcomes

### 1. Introduction

### 2. Financial Risks Faced by Institutional Investors

#### 2.1. Long-Term Perspective

#### 2.2. Dimensions of Financial Risk Management

2.2.1. Top-down vs. bottom-up risk analysis

2.2.2. Portfolio-level risk vs. asset-class-specific risk

2.2.3. Return-based vs. holdings-based risk approaches

2.2.4. Absolute vs. relative risk

2.2.5. Long-term vs. short-term risk metrics

2.2.6. Quantitative vs. qualitative risks

2.2.7. Pre- and post-investment risk assessment

#### 2.3. Risk Considerations for Long-Term Investors

#### 2.4. Risks Associated with Illiquid Asset Classes

2.4.1. Cash flow modeling

2.4.2. Addressing return smoothing behavior of illiquid asset classes

2.4.3. Direct vs. fund investments in illiquid asset classes

#### 2.5. Managing Liquidity Risk

#### 2.6. Enterprise Risk Management for Institutional Investors

### 3. Environmental and Social Risks Faced by Institutional Investors

#### 3.1. Universal Ownership, Externalities, and Responsible Investing

#### 3.2. Material Environmental Issues for an Institutional Investor

3.2.1. Physical climate risks

3.2.2. Impact on real assets

3.2.3. Climate transition risks

3.2.4. Climate opportunities

Climate mitigation

Climate adaptation

#### 3.3. Material Social Issues for an Institutional Investor

3.3.1. Managing community relations and the social license to operate

3.3.2. Labor issues in the supply chain

### 3.3.3. The “just” transition

#### Case Study

1. Case Study: Introduction
2. Case Study: Background
3. R-SWF’S Investments: 1.0

Initial Case Facts (1.0)

Investment Committee Meeting 1.0

Participants

Chief Investment Officer:

Infrastructure Investment Discussion

Head of Infrastructure:

Chief Investment Officer:

Head of Infrastructure:

Chief Investment Officer:

Private Equity Investment Discussion

Head of PE:

Chief Investment Officer:

Head of PE:

Chief Investment Officer:

Head of Risk:

Head of PE:

Chief Investment Officer:

Head of Risk:

Head of PE:

Chief Investment Officer:

Head of Equities:

Head of PE:

Chief Investment Officer:

Head of Risk:

Chief Investment Officer:

Head of Equities:

Head of PE:

Chief Investment Officer:

Head of PE:

Head of Equities:

Chief Investment Officer:

Head of Risk:

Head of PE:

Head of Equities:

Chief Investment Officer:

Head of PE:



## General Discussion on Risk

Chief Investment Officer:

Head of Risk:

Head of PE:

Head of Infrastructure:

Head of Risk:

Head of Infrastructure:

Head of Risk:

Head of Infrastructure:

Head of Risk:

Head of Equities:

Head of Infrastructure

Head of Risk:

Head of Infrastructure:

Chief Investment Officer:

Head of Infrastructure:

Head of PE:

Head of Risk:

Head of PE:

Head of Infrastructure:

Chief Investment Officer:

Head of Risk:

Head of Infrastructure:

Head of PE:

Head of Equities:

Head of Infrastructure:

Head of PE:

Chief Investment Officer

Head of Risk:

Head of Equities:

Head of Risk:

Head of Infrastructure:

## Voting on Infrastructure Investment

Chief Investment Officer:

Head of Infrastructure:

Chief Investment Officer:

Head of Risk:

Chief Investment Officer:

Head of PE:

Chief Investment Officer:

Head of Equities:

Chief Investment Officer:  
Voting on Private Equity Investment  
Chief Investment Officer:  
Head of PE:  
Chief Investment Officer:  
Head of Equities:  
Chief Investment Officer:  
Head of Infrastructure:  
Chief Investment Officer:  
Head of Risk:  
Chief Investment Officer:  
Head of PE:  
Head of Risk:  
Head of PE:  
Chief Investment Officer:

—The End—

#### 4. R-SWF'S Investments: 2.0

Extension of Case Facts (2.0)

#### Investment Committee Meeting 2.0

##### Participants

Chief Investment Officer:  
Head of Infrastructure:  
Chief Investment Officer:  
Head of PE:  
Chief Investment Officer:  
Head of PE:  
Head of Risk:  
Head of PE:  
Head of Risk:  
Head of PE:  
Chief Investment Officer:  
Head of PE:  
Head of Risk:  
Chief Investment Officer:  
Head of PE:  
Chief Investment Officer:  
Head of Risk:  
Head of Infrastructure:  
Head of Equities:  
Head of Infrastructure:  
Chief Investment Officer:

Head of PE:  
Head of Infrastructure:  
Chief Investment Officer:  
Head of Risk:  
Chief Investment Officer:  
Head of Risk:  
Head of Infrastructure:  
Head of Risk:  
Head of PE:  
Head of Equities:  
Head of PE:  
Chief Investment Officer:  
Head of Equities:  
Chief Investment Officer:  
Head of Infrastructure:  
Chief Investment Officer:  
Head of Risk:  
Chief Investment Officer:  
Head of Equities:  
Chief Investment Officer:

—The End—

## 5. R-SWF'S Investments: 3.0

Second Extension of Case Facts (3.0)

Update on Infrastructure Investment

Update on PE Investment

## References

## Glossary

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# How to Use the CFA Program Curriculum

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Congratulations on your decision to enter the Chartered Financial Analyst (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities (competencies) it develops. Your commitment should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. CFA Program enrollment represents the first step toward a career-long commitment to professional education.

The CFA exam measures your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major CFA Program topic areas ([www.cfainstitute.org/programs/cfa/curriculum/cbok](http://www.cfainstitute.org/programs/cfa/curriculum/cbok));
- Topic area weights that indicate the relative exam weightings of the top-level topic areas ([www.cfainstitute.org/programs/cfa/curriculum](http://www.cfainstitute.org/programs/cfa/curriculum));
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- CFA Program curriculum that candidates receive upon exam registration.

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, features of the curriculum, and tips for designing an effective personal study program.

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# BACKGROUND ON THE CBOK

CFA Program is grounded in the practice of the investment profession. CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the competencies that are relevant to the profession, beginning with the Global Body of Investment Knowledge (GBIK®). Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback about the GBIK. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

The CFA Institute staff—in conjunction with the Education Advisory Committee and Curriculum Level Advisors, who consist of practicing CFA charterholders—designs the CFA Program curriculum in order to deliver the CBOK to candidates. The exams, also written by CFA charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into six topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected. It is then divided into one or more study sessions. These study sessions should form the basic structure of your reading and preparation. Each study session includes a statement of its structure and objective and is further divided into assigned readings. An outline illustrating the organization of these study sessions can be found at the front of each volume of the curriculum.

The readings are commissioned by CFA Institute and written by content experts, including investment professionals and university professors. Each reading includes LOS and the core material to be studied, often a combination of text, exhibits, and in-text examples and questions. End of Reading Questions (EORQs) followed by solutions help you understand and master the material. The LOS indicate what you should be able to accomplish after

studying the material. The LOS, the core material, and the EORQs are dependent on each other, with the core material and EORQs providing context for understanding the scope of the LOS and enabling you to apply a principle or concept in a variety of scenarios.

*The entire readings, including the EORQs, are the basis for all exam questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK.*

You should use the LOS to guide and focus your study because each exam question is based on one or more LOS and the core material and practice problems associated with the LOS. As a candidate, you are responsible for the entirety of the required material in a study session.

We encourage you to review the information about the LOS on our website ([www.cfainstitute.org/programs/cfa/curriculum/study-sessions](http://www.cfainstitute.org/programs/cfa/curriculum/study-sessions)), including the descriptions of LOS “command words” on the candidate resources page at [www.cfainstitute.org](http://www.cfainstitute.org).

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## FEATURES OF THE CURRICULUM

### End of Reading Questions/Solutions

*All End of Reading Questions (EORQs) as well as their solutions are part of the curriculum and are required material for the exam.* In addition to the in-text examples and questions, these EORQs help demonstrate practical applications and reinforce your understanding of the concepts presented. Some of these EORQs are adapted from past CFA exams and/or may serve as a basis for exam questions.

### Glossary

For your convenience, each volume includes a comprehensive Glossary. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the Glossary.

Note that the digital curriculum that is included in your exam registration fee is searchable for key words, including Glossary terms.

### LOS Self-Check

We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

## Source Material

The CFA Institute curriculum cites textbooks, journal articles, and other publications that provide additional context or information about topics covered in the readings. As a candidate, you are not responsible for familiarity with the original source materials cited in the curriculum.

Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written or updated but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*<sup>®</sup>, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and several Nobel laureates have contributed articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this, and other, CFA Institute practice-oriented publications through the Research & Analysis webpage ([www.cfainstitute.org/en/research](http://www.cfainstitute.org/en/research)).

## Errata

The curriculum development process is rigorous and includes multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, there are times when we must make corrections. Curriculum errata are periodically updated and posted



by exam level and test date online ([www.cfainstitute.org/en/programs/submit-errata](http://www.cfainstitute.org/en/programs/submit-errata)). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

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## DESIGNING YOUR PERSONAL STUDY PROGRAM

### Create a Schedule

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all assigned readings and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skills, and abilities described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will probably spend more time on some study sessions than on others.

You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

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## CFA INSTITUTE LEARNING ECOSYSTEM (LES)

As you prepare for your exam, we will email you important exam updates, testing policies, and study tips. Be sure to read these carefully.

Your exam registration fee includes access to the CFA Program Learning Ecosystem (LES). This digital learning platform provides access, even offline, to all of the readings and End of Reading Questions found in the print curriculum organized as a series of shorter online

lessons with associated EORQs. This tool is your one-stop location for all study materials, including practice questions and mock exams.

The LES provides the following supplemental study tools:

## **Structured and Adaptive Study Plans**

The LES offers two ways to plan your study through the curriculum. The first is a structured plan that allows you to move through the material in the way that you feel best suits your learning. The second is an adaptive study plan based on the results of an assessment test that uses actual practice questions.

Regardless of your chosen study path, the LES tracks your level of proficiency in each topic area and presents you with a dashboard of where you stand in terms of proficiency so that you can allocate your study time efficiently.

## **Flashcards and Game Center**

The LES offers all the Glossary terms as Flashcards and tracks correct and incorrect answers. Flashcards can be filtered both by curriculum topic area and by action taken—for example, answered correctly, unanswered, and so on. These Flashcards provide a flexible way to study Glossary item definitions.

The Game Center provides several engaging ways to interact with the Flashcards in a game context. Each game tests your knowledge of the Glossary terms a in different way. Your results are scored and presented, along with a summary of candidates with high scores on the game, on your Dashboard.

## **Discussion Board**

The Discussion Board within the LES provides a way for you to interact with other candidates as you pursue your study plan. Discussions can happen at the level of individual lessons to raise questions about material in those lessons that you or other candidates can clarify or comment on. Discussions can also be posted at the level of topics or in the initial Welcome section to connect with other candidates in your area.

## **Practice Question Bank**

The LES offers access to a question bank of hundreds of practice questions that are in addition to the End of Reading Questions. These practice questions, only available on the LES, are intended to help you assess your mastery of individual topic areas as you progress through your studies. After each practice question, you will receive immediate feedback

noting the correct response and indicating the relevant assigned reading so you can identify areas of weakness for further study.

## Mock Exams

The LES also includes access to three-hour Mock Exams that simulate the morning and afternoon sessions of the actual CFA exam. These Mock Exams are intended to be taken after you complete your study of the full curriculum and take practice questions so you can test your understanding of the curriculum and your readiness for the exam. If you take these Mock Exams within the LES, you will receive feedback afterward that notes the correct responses and indicates the relevant assigned readings so you can assess areas of weakness for further study. We recommend that you take Mock Exams during the final stages of your preparation for the actual CFA exam. For more information on the Mock Exams, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## PREP PROVIDERS

You may choose to seek study support outside CFA Institute in the form of exam prep providers. After your CFA Program enrollment, you may receive numerous solicitations for exam prep courses and review materials. When considering a prep course, make sure the provider is committed to following the CFA Institute guidelines and high standards in its offerings.

Remember, however, that there are no shortcuts to success on the CFA exams; reading and studying the CFA Program curriculum *is* the key to success on the exam. The CFA Program exams reference only the CFA Institute assigned curriculum; no prep course or review course materials are consulted or referenced.

### SUMMARY

Every question on the CFA exam is based on the content contained in the required readings and on one or more LOS. Frequently, an exam question is based on a specific example highlighted within a reading or on a specific practice problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the exam.

2. All questions, problems, and their solutions are part of the curriculum and are required study material for the exam. These questions are found at the end of the readings in the print versions of the curriculum. In the LES, these questions appear directly after the lesson with which they are associated. The LES provides immediate feedback on your answers and tracks your performance on these questions throughout your study.
3. We strongly encourage you to use the CFA Program Learning Ecosystem. In addition to providing access to all the curriculum material, including EORQs, in the form of shorter, focused lessons, the LES offers structured and adaptive study planning, a Discussion Board to communicate with other candidates, Flashcards, a Game Center for study activities, a test bank of practice questions, and online Mock Exams. Other supplemental study tools, such as eBook and PDF versions of the print curriculum, and additional candidate resources are available at [www.cfainstitute.org](http://www.cfainstitute.org).
4. Using the study planner, create a schedule and commit sufficient study time to cover the study sessions. You should also plan to review the materials, answer practice questions, and take Mock Exams.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

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## FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and investment professional comments and feedback as we work to improve the curriculum, supplemental study tools, and candidate resources.

Please send any comments or feedback to [info@cfainstitute.org](mailto:info@cfainstitute.org). You can be assured that we will review your suggestions carefully. Ongoing improvements in the curriculum will help you prepare for success on the upcoming exams and for a lifetime of learning as a serious investment professional.



# Portfolio Management

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## STUDY SESSIONS

<b>Study Session 1</b>	Behavioral Finance
<b>Study Session 2</b>	Capital Market Expectations
<b>Study Session 3</b>	Asset Allocation and Related Decisions in Portfolio Management
<b>Study Session 4</b>	Derivatives and Currency Management
<b>Study Session 5</b>	Fixed-Income Portfolio Management (1)
<b>Study Session 6</b>	Fixed-Income Portfolio Management (2)
<b>Study Session 7</b>	Equity Portfolio Management (1)
<b>Study Session 8</b>	Equity Portfolio Management (2)
<b>Study Session 9</b>	Alternative Investments Portfolio Management
<b>Study Session 10</b>	Private Wealth Management (1)
<b>Study Session 11</b>	Private Wealth Management (2)
<b>Study Session 12</b>	Portfolio Management for Institutional Investors
<b>Study Session 13</b>	Trading, Performance Evaluation, and Manager Selection
<b>Study Session 14</b>	Cases in Portfolio Management and Risk Management

This volume includes Study Sessions 12–14.

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## TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; and evaluate portfolio performance.

# Study Session 12

## Portfolio Management for Institutional Investors

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Broadly defined, institutional investors include retirement plans such as defined-benefit or defined-contribution plans, grant making organizations, endowments, insurance companies, banks, sovereign wealth funds, and investment intermediaries. These institutions typically have a well-defined purpose or business model in which their investment portfolio plays a pivotal role. Each group faces a unique set of investment objectives and constraints.

This study session provides a conceptual, yet practical, framework for understanding institutional portfolio management. Concepts and practices important in determining the investment policy statement (IPS) are presented for different types of institutional investors.

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## READING ASSIGNMENT

**Reading 24** Portfolio Management for Institutional Investors  
by Arjan Berkelaar, PhD, CFA, Kate Misic, CFA, and Peter Stimes, CFA



# Reading 24

## Portfolio Management for Institutional Investors

by Arjan Berkelaar, PhD, CFA, Kate Misic, CFA, and Peter C. Stimes, CFA

*Arjan Berkelaar, PhD, CFA, is at KAUST Investment Management Company (USA). Kate Misic, CFA, is at Telstra Super Pty Ltd (Australia). Peter C. Stimes, CFA, is a private investor in Fallbrook, California (USA).*

CFA Institute would like to thank Karl Mergenthaler, CFA, for his contributions to earlier drafts of this reading.

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss common characteristics of institutional investors as a group;
- b.** discuss investment policy of institutional investors;
- c.** discuss the stakeholders in the portfolio, the liabilities, the investment time horizons, and the liquidity needs of different types of institutional investors;
- d.** describe the focus of legal, regulatory, and tax constraints affecting different types of institutional investors;
- e.** evaluate risk considerations of private defined benefit (DB) pension plans in relation to 1) plan funded status, 2) sponsor financial strength, 3) interactions between the sponsor's business and the fund's investments, 4) plan design, and 5) workforce characteristics;
- f.** prepare the investment objectives section of an institutional investor's investment policy statement;
- g.** evaluate the investment policy statement of an institutional investor;
- h.** evaluate the investment portfolio of a private DB plan, sovereign wealth fund, university endowment, and private foundation;

- i. describe considerations affecting the balance sheet management of banks and insurers.

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# 1. INSTITUTIONAL INVESTORS: TYPES AND COMMON CHARACTERISTICS

## a. discuss common characteristics of institutional investors as a group

Institutional investors are corporations, trusts, or other legal entities that invest in financial markets on behalf of groups or individuals, including both current and future generations. On a global basis, institutional investors represent more than US\$70 trillion in investable assets, and, as such, wield significant influence over capital markets.

The universe of institutional investors includes, but is not limited to, defined benefit and defined contribution pension plans, sovereign wealth funds, endowments, foundations, banks, and insurance companies. Pension plans, which account for approximately US\$35 trillion in investable assets or roughly half of global institutional assets under management, include both defined benefit plans, in which the sponsor (employer) assumes investment risk, and defined contribution plans, in which the individual makes investment decisions and assumes the investment risk. Sovereign wealth funds, which account for about US\$7 trillion in assets as of the end of 2016, are government-owned investment funds that invest in financial and/or real assets. Endowments and foundations, which account for approximately US\$1.6 trillion in assets, manage assets on behalf of educational institutions, hospitals, churches, museums, and other charitable organizations. Banks and insurance companies, comprising net financial assets on the order of US\$9 trillion, are financial intermediaries that balance portfolios of securities, loans, and derivatives for the purposes of (i) meeting the claims of depositors, counterparties, policyholders, and creditors and (ii) providing adequate returns to their contractual capital holders. The universe of institutional investors is comprised of large, complex, and sophisticated investors that must contend with a multitude of investment challenges and constraints.

There has been an important shift in the asset allocation of institutional investors over the last half century. In the 1970s, most pensions and endowments invested almost exclusively in domestic, fixed-income instruments. In the 1980s, many institutional investors began to invest in equity markets and often pursued a long-term strategic allocation of 60% equities/40% fixed income. In the 1990s, investors recognized the benefits of diversification and many made their first forays into international equity markets. At the turn of the 21st century, many of the world's largest pension funds and endowments further diversified their portfolios and increased investments in alternative asset classes, including private equity,

hedge funds, real estate, and other alternative or illiquid assets.

Meanwhile, institutional investors have seen broad shifts in their strategic investment behavior. The trend toward Liability Driven Investing (LDI), long a mainstay of banks and insurance companies, has taken hold among many defined benefit pension plans, particularly US corporate and public pension funds. Sovereign wealth funds have amassed significant assets over the past several decades, and many have implemented innovative investment approaches characterized by active management. Many endowments have adopted the “Endowment Model” of investing that involves significant exposure to alternative investments. Meanwhile, banks and insurers must navigate a complex and ever-changing economic and regulatory environment.

In this reading, we endeavor to put the numerous factors that affect investment by institutional investors into context. Section 1 discusses common characteristics of institutional investors as a group. Section 2 provides an overview of investment policies for institutional investors. Detailed coverage by institutional investor type begins with Sections 3–7, pension funds, where we discuss various factors that influence investments, including: stakeholders, liability streams, investment horizons, and liquidity needs; major legal, regulatory, accounting, and tax constraints; investment objectives and key components of Investment Policy Statements; and, finally, asset allocation and investment portfolios that emanate from the foregoing factors and constraints. Sections 8–10 follow the same approach for sovereign wealth funds, and Sections 11–15 do the same for university endowments and private foundations. Sections 16–19 covers banks and insurers and includes balance sheet management considerations. A summary of key points concludes the reading.

## 1.1. Institutional Investors: Common Characteristics

For the purposes of this reading, institutional investors include pension plans, sovereign wealth funds, endowments, foundations, banks, and insurance companies. As we will see in upcoming sections where we cover each of these six institutional types in detail, their objectives and constraints can vary widely. First, in this section we discuss important defining characteristics of institutional investors as a group, characteristics that set them apart from individual (retail and high-net-worth) investors. The common defining characteristics of institutional investors include the following:

1. **Scale (i.e., asset size):** The issue of scale is relevant for institutional investors because it may impact investment capabilities, access to investment strategies, liquidity, trading costs, and other key aspects of the investment process.
2. **Long-term investment horizon:** Institutional investors generally have a long-term investment horizon that is often determined by a specific liability stream, such as the benefit obligation of a pension plan, the spending policy of an endowment, or other

obligations.

3. **Regulatory frameworks:** Institutional investors must contend with multiple regulatory frameworks that frequently vary by jurisdiction and complexity and are often evolving.
4. **Governance framework:** Institutional investors typically implement their investment programs through an investment office that often has a clearly defined governance model.
5. **Principal–Agent issues:** As institutional investors manage assets on behalf of others, principal–agent issues must be recognized and managed appropriately.

We discuss these five common characteristics in more detail next.

### 1.1.1. *Scale*

Institutional investors' assets under management can range from relatively small (e.g., less than US\$25 million) to relatively large (e.g., more than US\$10 billion). Smaller institutions may face challenges in building a diversified portfolio spanning public and private asset classes because they may be unable to access certain investments that have a high minimum investment size. For example, smaller institutions are less likely to be able to invest in private equity or real estate assets (i.e., property). Small institutional investors may also face challenges in hiring skilled investment professionals. As a result, they are more likely to outsource investments to external asset managers and rely on investment consultants. Larger institutional investors experience scale benefits that allow them access to a wider investment universe, and they can readily hire investment professionals. They may potentially manage part of their portfolios in-house if benefits outweigh costs. The largest institutional investors, however, may experience dis-economies of scale. For example, they might be unable to invest in certain niche investments like venture capital ("VC"). Given the huge asset size of investments under management, a small allocation to VC may not generate sufficient returns to justify the position (including due diligence costs). The largest institutional investors may also be unable to deploy as much capital as desired with some external managers as certain investment strategies are capacity constrained. External managers who want to avoid jeopardizing their ability to generate superior returns will close the strategy to new investors. To overcome these constraints, some of the largest institutions buy private companies, property, and infrastructure assets directly and manage their traditional asset-class portfolios in-house. Large institutional investors also face the costs of market impact given their sizable trading orders.

Rapidly growing institutional investors may experience high cash inflow relative to the size of their portfolios, which requires them to continuously invest inflows and to maintain the appropriate asset mix (strategic asset allocation). Ensuring access to investments capable of absorbing their growth in assets under management may be challenging when investing in

capacity-constrained strategies, such as small-cap equity or venture capital.

### **1.1.2. Long-Term Investment Horizon**

Pension funds, sovereign wealth funds, endowments, and foundations all typically have long investment horizons and relatively low liquidity needs. Cash outlays are relatively modest as a percent of assets under management, with net payouts typically around 5% or less. However, there are exceptions: For example, frozen defined benefit plans might be in a de-risking mode that increases their liquidity needs. Relatively low liquidity needs allow these institutions to invest in a broad range of alternative asset classes, including private equity, private real estate, natural resources, infrastructure, and hedge funds. Banks and insurance companies, however, tend to be much more asset/liability focused while operating within tight regulations designed to ensure adequacy of capital.

### **1.1.3. Regulatory Frameworks**

Institutional Investors are typically subject to different legal, regulatory, tax, and accounting frameworks than individual investors. These frameworks define the set of rules an institutional investor must follow to qualify for reduced tax rates or tax-exempt status. Importantly, these frameworks and rules typically differ by national jurisdiction in which the institutional investor operates. Some examples of important relevant legal, regulatory, taxation, and accounting frameworks and organizations include the following:

- United States:
  - Employee Retirement Income Security Act (ERISA)
  - Pension Protection Act (PPA)
  - Uniform Prudent Management of Institutional Funds Act (UPMIFA)
  - Uniform Prudent Investor Act (UPIA)
  - Freedom of Information Act (FOIA)
  - Governmental Accounting Standards Board (GASB)
  - Generally Accepted Accounting Principles (GAAP) set by the Financial Accounting Standards Board (FASB)
  - Statutory Accounting Principles (SAP) set by the National Association of Insurance Commissioners (NAIC)

- United Kingdom:
  - Pensions Act
  - Finance Acts (various)
- European Union:
  - Institutions for Occupational Retirement Provision (IORP) II
- South Korea:
  - Employee Retirement Benefit Security Act
- Australia:
  - Superannuation Industry (Supervision) Act (SIS Act)
- International:
  - International Financial Reporting Standards (IFRS) set by the International Accounting Standards Board (IASB)
  - International Organization of Securities Commissions (IOSCO)

Many relevant regulatory bodies govern and supervise institutional investors and their portfolios globally. The International Organization of Securities Commissions (IOSCO) is the international body that brings together the world's securities regulators, and it has 217 members. Ordinary members (127) include the national securities commissions or similar governmental bodies. Associate members (24) are supranational governmental regulators, subnational governmental regulators, intergovernmental international organizations, and other international standard-setting bodies. Affiliate members (66) include self-regulatory organizations, securities exchanges, and other financial market infrastructure and international regulatory bodies.

The key drivers of the legal and regulatory frameworks faced by institutional investors are investor protection, safety and soundness of financial institutions, and integrity of financial markets. Changes to these frameworks following the 2007–2009 global financial crisis focused on leverage limits, enhanced collateral requirements, increased liquidity requirements, central clearing, proprietary trading limits, private equity limits, trading tax implementation, brokerage fee limits, compensation limits, and requirements for more transparent reporting. Examples of regulations focusing on such reforms include the following:

- United States:

- Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank)
- Section 619 (12 U.S.C. Section 1851) of the Dodd-Frank Act (Volcker Rule)
- Foreign Account Tax Compliance Act (FATCA), which has international implications
- United Kingdom:
  - Retail Distribution Review (RDR)
- European Union (with most adopted by the United Kingdom):
  - Undertakings for the Collective Investment of Transferable Securities V (UCITS V)
  - Alternative Investment Fund Managers Directive (AIFMD)
  - Solvency II Directive (Solvency II)
  - Markets in Financial Instruments Directive II (MIFID II)
  - European Market Infrastructure Regulation (EMIR)
  - Financial Transaction Tax (FTT)
  - Packaged Retail Investment and Insurance Products (PRIIPs)
- International:
  - Third Basel Accord / Capital Requirements Directive (Basel III / CRD IV)
  - Santiago Principles (Generally Accepted Principles and Practices for Sovereign Wealth Funds)
  - Principles of the Linaburg-Maduell Transparency Index (Sovereign Wealth Funds)

#### **1.1.4. Governance Framework**

Institutional investors typically operate under a formal governance structure. The governance structure generally includes a board of directors and an investment committee. The board may comprise company representative directors, employee representative directors, and independent directors. Independent directors are usually selected to increase the board's overall investment expertise. Investment committees can be sub-committees of the board

with delegated authority to oversee investment policy. Alternatively, investment committees can be internal and consist of investment staff tasked with implementing the investment policy set by the board. The board and/or investment committee provide a key role in establishing the organization's investment policy, defining the risk appetite, setting the investment strategy, and monitoring the investment performance.

The board often sets the long-term strategic asset allocation and can delegate the setting of medium-term tactical asset allocation to its investment staff. It may also delegate manager selection to investment staff. Notably though, many institutional investor boards will seek to retain control through overseeing hiring and firing of managers. Best practice suggests, however, that it is better to delegate the hiring and firing of external managers to investment staff to ensure that the board focuses on such broader issues as governance, investment policy, and strategic asset allocation.

Institutional investors typically implement their investment strategy through an investment office. The investment office can be structured in different ways, but the most common model involves a Chief Investment Officer, who is supported by a team of asset-class specialists or a team of generalists working across asset classes. Institutional investors may manage investments in-house (e.g., some large Canadian pension plans and Australian superannuation funds) or outsource investment management partially or entirely to external assets managers. The factors affecting the decision to manage assets internally include the size of assets under management, capability of internal resources, or a desire to pursue custom strategies not readily offered by external managers. It can be costly to build the capability to manage assets internally, so in most cases asset owners need to achieve a certain threshold of assets under management before the benefits outweigh the costs of internalization.

For pension funds, sovereign wealth funds, endowments, and foundations, outsourcing elements of the investment function to external asset managers—or even outsourcing the entire investment operation to an outsourced chief investment officer (CIO) firm—is much more common than managing investments in-house. Such asset owners typically rely on specialized consultants to assist with asset allocation decisions and investment manager selection. These consultants often provide macro-economic forecasts and capital market assumptions for asset classes that are integral to determining the investor's optimal asset allocation. In addition, the consultant assists in monitoring the large universe of external asset managers. Finally, the consultant may provide independent performance attribution and reporting and may monitor any internally managed investments and benchmark them against the external asset manager universe.

In contrast, banks and insurance companies undertake most of their investing, risk budgeting, compliance, and balance sheet management activities internally.



### 1.1.5. *Principal–Agent Issues*

Institutional investors frequently experience conflicts of interest that stem from principal–agent issues. The principal–agent issue arises if one person, the agent, makes decisions on behalf of another person or institution, the principal, and their interests are not aligned. A dilemma exists for the agent when he/she may be motivated to act in his/her own best interests and not in the best interests of the principal. Because of operational and investment complexity, institutional investors generally rely on various parties (i.e., agents) to act on their behalf. Agents may be internal or external. Internal agents include investment committee members and investment staff. External agents include third-party asset managers, broker/dealers, consultants, and board members. A typical example of the principal–agent problem is where performance fee structures are designed by external fund managers to provide attractive compensation to them via a high base fee, which is due regardless of fund performance. This fee structure gives little incentive for the fund manager to produce superior performance. Such fee arrangements are common among hedge funds and have led to greater demand for fee transparency and alignment of interest between hedge fund managers and their clients. To manage principal–agent issues, institutional investors will typically have highly developed governance models and high levels of accountability with a board and/or investment committee typically overseeing the investment office. Such models should be designed to explicitly acknowledge and manage conflicts of interest and align the interests of all agents with those of the principals.

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## 2. OVERVIEW OF INVESTMENT POLICY

### **b. discuss investment policy of institutional investors**

Institutional investors codify their mission, investment objectives, and guidelines in an Investment Policy Statement (IPS). The IPS establishes policies and procedures for the effective administration and management of the institutional assets. A well-crafted IPS can help minimize principal–agent challenges by providing clear guidance on day-to-day management of the assets. Besides mission and investment objectives (i.e., return and risk tolerance), the IPS should cover any constraints that affect the asset allocation, asset allocation policy with ranges and asset class benchmarks, rebalancing policy, guidelines affecting the implementation of the asset allocation policy, and reporting requirements. The IPS should be reviewed annually; however, revisions should be infrequent, such as when material changes occur in investor circumstances and/or the market environment, as the IPS serves as the foundation for the investment program. The asset allocation policy and investment guidelines are typically included in an appendix that can be modified more easily.

Investment objectives flow from the organization's overall mission. For banks and insurance companies, the investment objective is to maximize net present value by balancing (i) the expected returns on assets, (ii) the expected cost of liabilities, (iii) the overall risks of assets and liabilities, and (iv) the economic relationships between and among assets and liabilities.

The investment objectives are more straightforward for the other types of institutions covered in this reading. For example, the overall objective of a DB pension fund might be to maintain a funded ratio in excess of 100%; for an endowment, it may be to maintain long-term purchasing power while providing needed financial support to its university. Investment objectives are typically expressed as a desired return target over the medium-to-long term (which should be clearly specified) with an acceptable level of risk. This return target should be evaluated in the context of the organization's overall mission and should be tied to the evaluation of liabilities (e.g., discount rate used to value DB pension plan liabilities or spending rate for an endowment). When expressing the return target in real terms, the relevant inflation metric must be defined. For example, GIC—Singapore's sovereign wealth fund—uses global inflation defined as G3 (the US, Japan, and Eurozone) inflation, while some US endowments use the Higher Education Price Index (HEPI) published by Commonfund (an independent asset management firm serving non-profit organizations and promoting best practices among institutional investors).

Investment objectives and return targets must be consistent with an organization's risk tolerance and other constraints. Risk tolerance can be expressed in different ways, such as for:

- DB pension funds: surplus volatility (standard deviation of asset returns in excess of liability returns);
- Sovereign wealth funds (SWFs): probability of investment losses (or probability of not maintaining purchasing power) over a certain time period;
- Endowments and foundations: volatility of total returns (standard deviation of total returns); and
- Banks and insurance companies: value at risk (VaR) or conditional VaR (CVaR) and comprehensive, scenario-based stress tests.

Finally, constraints (legal, regulatory, tax, and accounting) have a bearing on investment objectives and should be incorporated into the design of an investment policy. For example, constraints might limit the scope of acceptable risk and available asset classes.

Once the investment objectives—the desired risk and return characteristics—have been established, a strategic asset allocation or policy portfolio is designed. The investment portfolio of an institutional investor is designed to meet its objectives and should reflect the appropriate risk and liquidity considerations addressed in the IPS. For example, a large

allocation to private equity is probably not appropriate for institutions with a relatively short investment horizon and high liquidity requirements. Similarly, a large fixed-income allocation might not be appropriate for an institution with a long investment horizon and low liquidity requirements. While institutional investors each have unique liability characteristics, several investment approaches have emerged over the past couple of years. Broadly speaking, these can be grouped into four different approaches:

1. **Norway Model** popularized by Norway's global pension fund, Government Pension Fund Global (GPFG). The Norway model is characterized by an almost exclusive reliance on public equities and fixed income (the traditional 60/40 equity/bond model falls under the Norway model), with largely passively managed assets and with very little to no allocation to alternative investments. Investments are usually managed with tight tracking error limits. The advantages of this approach are that investment costs/fees are low, investments are transparent, the risk of poor manager selection is low, and there is little complexity for a governing board. The disadvantage is that there is limited potential for value-added (i.e., alpha from security selection skills) above market returns. However, Norway's GPFG has begun to seek additional value over market-capitalization benchmarks by attempting to capture systematic risk factors.
2. **Endowment Model** popularized by the Yale Endowment. The endowment model is characterized by a high allocation to alternative investments (private investments and hedge funds), significant active management, and externally managed assets. This investment approach stands in almost direct contrast to the Norway model. Although labeled 'endowment model,' this investment approach is not only followed by many university endowments and foundations but also by several sovereign wealth funds and defined benefit pension funds. The endowment model is appropriate for institutional investors that have a long-term investment horizon, high risk tolerance, relatively small liquidity needs, and skill in sourcing alternative investments (the nature of alternative investments is such that there is large variation between the worst and best performing asset managers, and selecting the right manager is therefore critically important). The endowment model is difficult to implement for small institutional investors as they might not be able to access high quality managers. It might also be difficult to implement for very large institutional investors because of their very large footprint. The endowment model is more expensive in terms of costs/fees compared to the Norway model.
3. **Canada Model** popularized by the Canada Pension Plan Investment Board (CPPIB). The Canada model, just like the endowment model, is characterized by a high allocation to alternatives. Unlike the endowment model, however, the Canada model relies more on internally managed assets. The innovative features of the Canada model are the: a) reference portfolio, b) total portfolio approach, and c) active management. The reference portfolio is a passive mix of public equities, fixed income, and cash that represents a cheap and easily implementable portfolio that is expected to achieve the long-term

expected return consistent with the institution's investment objectives and risk appetite. The reference portfolio effectively defines a transparent, risk-equivalent benchmark for the investment portfolio, and serves as a low-cost alternative to the fund's actual portfolio. The reference portfolio might be different from the institution's strategic asset allocation or policy portfolio. Importantly, the reference portfolio is typically made up of only publicly traded securities (in the form of common public market indices in equities and fixed income) that can be more easily understood by the governing board, while the strategic asset allocation may include target allocations to private markets and hedge funds. The total portfolio approach is the method of constructing the portfolio to ensure that planned risk exposures at the total portfolio level are maintained as individual investments enter, leave or change in value. It is an approach that is aimed at minimizing the unintended exposures and uncompensated risks that may arise as added value is sought by extending investments beyond the reference portfolio. For example, if private equity is added, management considers that it is leveraged equity and as a result the exposure to public equities needs to be reduced by more than the proposed allocation to private equity and the allocation to fixed-income needs to be increased to offset the leverage. Although the Canada model starts with a passive reference portfolio, it is important to note that the Canada model employs active management from tilting asset allocation through to stock selection. A good example of a sovereign wealth fund that has embraced the concept of the reference portfolio is the New Zealand Superannuation Fund.

4. **Liability Driven Investing (LDI) Model** has gained significant importance, particularly among corporate defined benefit pension plans in the United States, although some of the European pension funds—particularly in Denmark and in the Netherlands—adopted the LDI concept even prior to the 2007–2009 global financial crisis. In the LDI model, the primary investment objective is to generate returns sufficient to cover liabilities. As such, the investor's focus shifts away from operating in an asset-only context, to a focus on maximizing expected surplus return (excess return of assets over liabilities) and managing surplus volatility. Although the implementation and resultant asset allocation may vary significantly, LDI portfolios—other than for banks and insurance institutions—typically have a significant exposure to long duration fixed-income securities. In some LDI implementations, institutional investors separate their portfolios into a hedging portfolio (this portfolio usually hedges the main risk factor in the liabilities, which is interest rate risk) and a return-generating portfolio (this portfolio needs to generate sufficient returns to offset the growth rate of liabilities, other than changes in the discount rate). The hedging portfolio for defined benefit pension funds, sovereign wealth funds, and endowments/foundations usually consists of long duration fixed-income securities and may entail the use of derivatives, such as interest rate swaps, to extend the duration of the portfolio. The return-generating portfolio usually includes public equities and alternative investments.

**Exhibit 1** summarizes these four investment approaches.

## Exhibit 1. Common Investment Approaches Used by Institutional Investors

Investment Approach	Description
<b>Norway Model</b>	<p>Traditional style characterized by 60%/40% equity/fixed-income allocation, few alternatives, largely passive investments, tight tracking error limits, and benchmark as a starting position.</p> <p><i>Pros:</i> Low cost, transparent, suitable for large scale, easy for board to understand.</p> <p><i>Cons:</i> Limited value-added potential.</p>
<b>Endowment Model</b>	<p>Characterized by high alternatives exposure, active management and outsourcing.</p> <p><i>Pros:</i> High value-added potential.</p> <p><i>Cons:</i> Expensive and difficult to implement for most sovereign wealth funds because of their large asset sizes.</p>
<b>Canada Model</b>	<p>Characterized by high alternatives exposure, active management, and insourcing.</p> <p><i>Pros:</i> High value-added potential and development of internal capabilities.</p> <p><i>Cons:</i> Potentially expensive and difficult to manage.</p>
<b>LDI Model</b>	<p>Characterized by focus on hedging liabilities and interest rate risk including via duration-matched, fixed-income exposure. A growth component in the return-generating portfolio is also typical (exceptions being bank and insurance company portfolios).</p> <p><i>Pros:</i> Explicit recognition of liabilities as part of the investment process.</p> <p><i>Cons:</i> Certain risks (e.g., longevity risk, inflation risk) may not be hedged.</p>

## 3. PENSION FUNDS: TYPES AND STAKEHOLDERS

- c. discuss the stakeholders in the portfolio, the liabilities, the investment time

## horizons, and the liquidity needs of different types of institutional investors

Pension funds are long-term saving and investment plans designed to accumulate sufficient assets to provide for the financial needs of retirees. There are two main types of pension plans: **defined benefit**, in which a plan sponsor commits to paying a specified retirement benefit, and **defined contribution**, in which contributions are defined but the ultimate retirement benefit is not specified or guaranteed by the plan sponsor. Globally, there are many variations and nuances of these two broad categories of pension plans. [Exhibit 2](#) compares the key features of defined benefit and defined contribution pension plans.

### Exhibit 2. Comparison of Defined Benefit and Defined Contribution Pension Plan Features

Characteristics/Features	Defined Benefit Pension Plan	Defined Contribution Pension Plan
Benefit payments	Benefit payouts are defined by a contract between the employee and the pension plan (payouts are often calculated as a percentage of salary).	Benefit payouts are determined by the performance of investments selected by the participant.
Contributions	The employer is the primary contributor, though the employee may contribute as well. The size of contributions is driven by several key factors, including performance of investments selected by the pension fund.	The employee is typically the primary contributor—although the employer may contribute as well or may have a legal obligation to contribute a percentage of the employee's salary.
Investment decision making	The pension fund determines how much to save and what to invest in to meet the plan objectives.	The employee determines how much to save and what to invest in

		to meet his/her objectives (from the available menu of investment vehicles selected by the plan sponsor).
Investment risk	The employer bears the risk that the liabilities are not met and may be required to make additional contributions to meet any shortfall.	The employee bears the risk of not meeting his/her objectives for this account in terms of funding retirement.
Mortality/Longevity risk	Mortality risk is pooled. If a beneficiary passes away early, he/she typically leaves a portion of unpaid benefits in the pool offsetting additional benefit payments required by beneficiaries that live longer than expected. As a result, the individual does not bear any of the risk of outliving his/her retirement benefits.	The employee bears the risk of not meeting his/her objectives for this account in terms of funding retirement. The employee bears longevity risk.

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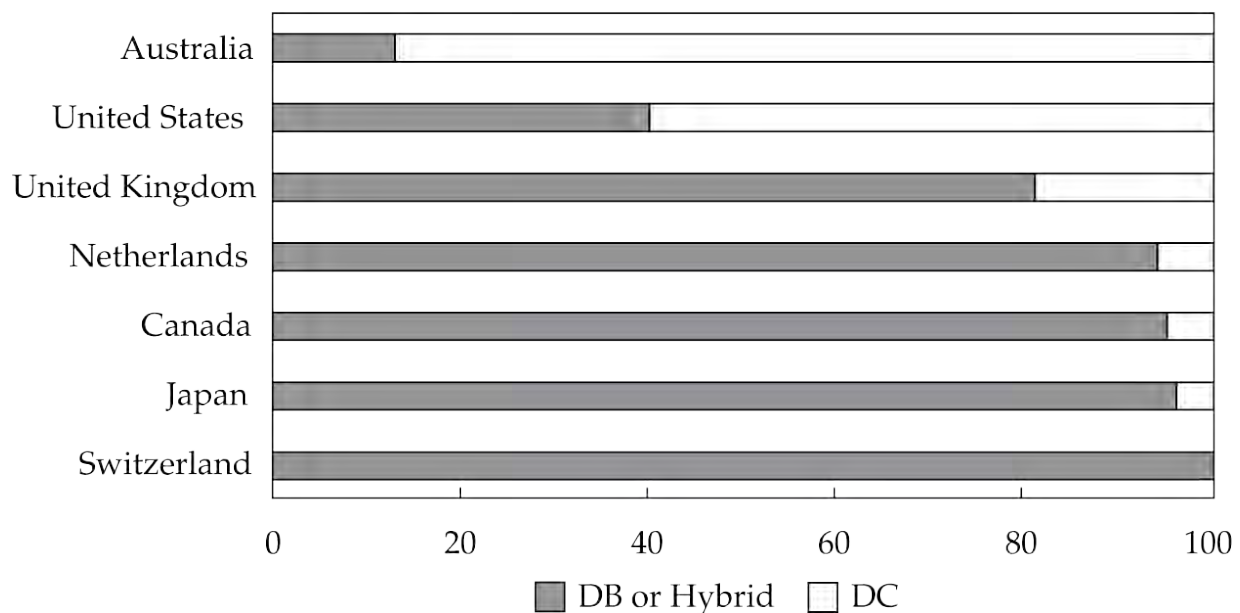
*Source:* World Economic Forum, “Alternative Investments 2020: The Future of Alternative Investments” (2015).

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Pension funds are significant players in the global investment landscape. Over the past 20 years, there has been a move away from defined benefit (DB) plans (especially non-government DB plans) to defined contribution (DC) plans. Among drivers of this shift are DC plans’ lower financial risk for plan sponsors, absence of risk of becoming underfunded, and ease of portability (simplifies job mobility). Willis Towers Watson reports in its “Global Pension Assets Study 2018” covering the seven largest pension markets, the “P7” (Australia, Canada, Japan, the Netherlands, Switzerland, the United Kingdom, and the United States) that during the past 20 years DC pension plans have risen from 33% to 49% of total plan assets.

The split between DB and DC plans can vary significantly from country to country. One of the challenges of classifying countries by this split is that many countries offer hybrid pension plans, such as that in Switzerland where defined contribution connotes a cash balance plan in which all assets are pooled and the plan sponsor shares the investment risk. There are basically no pure DC plans in Switzerland. [Exhibit 3](#) presents the split between DB and DC plans for the P7 countries. Together these countries comprise more than 80% of worldwide pension assets. In these data, DB plans and hybrid plans are combined (as for Switzerland). Note that a substantial difference exists between countries. Some countries rely almost exclusively on DC plans (like Australia), while others predominantly use DB plans (like Canada).

**Exhibit 3. Split Between DB or Hybrid Plans and DC Plans in Select Countries (2017)**



Source: Willis Towers Watson Thinking Ahead Institute (2018).

### 3.1. Stakeholders

Many entities are involved with institutional retirement plans. These include the employer, employees, retirees, unions, management, the investment committee and/or board, and shareholders. Governments have generally encouraged pension plans as a tool to assist individuals to build sufficient financial resources to fund their retirement needs. Government support typically comes in the form of favorable tax treatment for both companies and individuals who contribute to or manage pension plans, provided they operate according to



local pension plan regulations. The government and taxpayers will bear some of the shortfall risks (in terms of added welfare or social security payments) in instances of employers failing to pay agreed on defined benefit payments and where individuals fail to accumulate sufficient wealth for retirement.

### **3.1.1. *Defined Benefit Pension Plans***

The stakeholders of a defined benefit pension plan are the employer [typically referred to as the plan sponsor and usually represented by management and the Chief Financial Officer (CFO)]; plan beneficiaries (employees and retirees); the Chief Investment Officer (CIO) and investment staff; the investment committee and/or board; and the government, unions, and shareholders in the case of corporate DB plans. Defined benefits promised to beneficiaries create liabilities for the plan sponsor. In operating the pension plan, the sponsor and investment staff must make investment decisions in the interest of the ultimate beneficiaries (employees and retirees). Defined benefit pension liabilities are typically funded from two sources: 1) employer and employee contributions and 2) investment returns on funded assets. Employee contributions can be fixed or variable, but employer contributions usually vary depending on the plan's funded status. Although each of the stakeholders has a strong interest in plan assets being invested appropriately, opinions might differ over the acceptable level of investment risk and the magnitude of employer contributions to the plan.

The plan sponsor may have an interest in 1) minimizing employer contributions due to budget constraints and/or 2) managing the volatility of employer contributions (by aiming for less volatility in investment returns). This allows management to plan future contributions with less uncertainty. Management and the CFO may also want to manage the impact of pension assets and liabilities on the sponsor's balance sheet. Employees and retirees, however, want to maximize the probability that plan liabilities are met and thus want the sponsor to make timely and sufficient plan contributions. Finally, the CIO and investment staff should be interested in meeting the investment objectives and constraints of the investment policy statement.

In a defined benefit pension plan, the sponsor bears the ultimate risk of the portfolio falling short of meeting liabilities. This risk manifests itself in the form of higher contributions from the plan sponsor when the plan becomes underfunded. In the extreme case of default, however—when the plan sponsor can no longer meet its legal obligations and cannot contribute further to the plan—the employee bears the ultimate risk and may need to find alternative means to meet financial needs in retirement. Some of this risk may be shared by taxpayers via additional social security or welfare payments, making the government a stakeholder in a defined benefit pension plan.<sup>1</sup>

The investment office of the DB pension plan is tasked with investing assets appropriately and may have variable compensation (bonuses) tied to investment performance. The

investment committee or board will consider recommendations from investment staff, such as setting strategy and investment manager selection. In setting and executing strategy, all stakeholders' positions must be considered, including the sponsor's ability to make plan contributions. Ultimately, however, the board has a fiduciary duty to employees and retirees.

Finally, for corporate DB plans the company's shareholders are stakeholders. They are interested in the sustainability of the pension plan because if it is underfunded, any shortfall becomes a liability on the balance sheet, reducing the value of the company. Contributions to an underfunded plan also reduce net income. Underfunded status also increases financial risk, which may cause higher volatility in the stock price.

### **3.1.2. *Defined Contribution Pension Plans***

The main stakeholders of a defined contribution pension plan are the plan beneficiaries, the employer, the board, and the government.

A key stakeholder in a DC plan is the participant. Each participant has an individual account into which contributions are made on a regular basis—either by the employee, the employer, or both. Plan participants must ensure that 1) adequate contributions are made and 2) appropriate investment options are selected to generate sufficient investment returns. For a DC pension plan, the individual participant bears the investment risk of the portfolio failing to meet future liabilities (i.e., retirement needs). If plan participants outlive their savings, they will need to find other ways to meet their financial needs in retirement. In that case, the government (via taxpayers) may need to provide additional social welfare benefits, making the government another stakeholder in a DC plan.

Although DC plan participants control the investment decisions for their individual accounts, perhaps acting upon the advice of their financial adviser, the plan sponsor still has important fiduciary responsibilities, including overseeing the appropriate investment of plan assets (either by internal staff or by third-party asset managers or a combination thereof), offering suitable investment options, and selecting administrative providers. The plan sponsor, therefore, is an important stakeholder in a DC plan. The plan sponsor typically has an obligation to contribute to the DC plan on behalf of the employee as specified by the employment contract or through a government-mandated system. In some countries, a plan sponsor may also have an obligation to provide employees with a choice of different investment options within the employer-sponsored DC plan or even the choice of different DC plans. The sponsor typically must ensure that the investment options provide appropriate levels of diversification. It may also need to provide investment education and communications so that employees can make well informed investment choices. Running DC plans can be more expensive than DB plans given their increased complexity of administration and meeting regulatory compliance, all of which may result in higher fees for DC plan participants.

The board of a DC plan sponsor must consider the differing levels of sophistication among participants and provide adequate disclosure in communications to ensure participants are well informed. The board may be required to select a default investment option when participants do not explicitly make an investment choice. In such cases, the board has a higher obligation because by entering the default option, the participant is indicating that he/she either does not have sufficient understanding to make an informed choice or that he/she trusts the board of the pension plan to make the best choice.

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## 4. PENSION FUNDS: LIABILITIES, INVESTMENT HORIZON, AND LIQUIDITY NEEDS

- c. **discuss the stakeholders in the portfolio, the liabilities, the investment time horizons, and the liquidity needs of different types of institutional investors**

### 4.1. Liabilities and Investment Horizon

#### 4.1.1. *Defined Benefit Pension Plans*

The liabilities of a DB pension plan are the present value of the future payments it will make to beneficiaries upon retirement, disability, or death. Calculating DB liabilities is complex and typically undertaken by actuaries employed by the plan sponsor or by external actuaries. Here we will highlight some key elements and focus on the discount rate used in calculating the present value of future benefit payments.

The first step in determining DB liabilities is to calculate the expected future cash flows (i.e., retirement benefits). These depend on the design and specifics of the pension plan. Some of the key elements common among DB plans in the calculation of expected cash flows are:

1. **Service/tenure:** The number of years the employee has been with the company or organization (or service years) determines the defined benefit the employee is expected to receive upon retirement. The higher the service years, the higher the retirement benefit. Sometimes a minimum number of service years is required before retirement benefits become vested (i.e., the employee becomes eligible to receive a pension).
2. **Salary/earnings:** The salary or earnings level of the employee affects the calculation of

the defined benefit the employee is expected to receive upon retirement. The defined benefit may be a function of the average earnings over the entire career or the average earnings over the last several years prior to retirement (e.g., last three years).

- 3. Mortality/longevity:** The length of time that retirement benefits are expected to be paid to plan participants is important in calculating expected cash flows. This requires assumptions about employees' and retirees' life expectancies. Importantly, ever-increasing life expectancies is a key factor in making DB pension plans less affordable from the sponsor's perspective. Longevity risk is the risk to the plan sponsor that participants will live longer than assumed in the pension liabilities calculations.

In estimating future benefits, the plan sponsor must make several key assumptions, such as the growth rate of salaries, expected vesting, and mortality and disability assumptions.

**Vesting** means that employees only become eligible to receive a pension after meeting certain criteria, typically a minimum number of years of service. In measuring defined benefit obligations, the plan sponsor must consider the likelihood that some employees may not satisfy the vesting requirements. Under both International Financial Reporting Standards (IFRS) and US generally accepted accounting principles (GAAP), pension obligations are determined as the present value of future benefits earned by employees for service provided to date. Assumptions about future salary increases, expected vesting, and life expectancy change over time and will change the estimated pension obligation. Given the importance of these factors, pension plans require periodic actuarial reviews to determine the value of the liabilities and the sponsor's annual required contribution rate.

Once expected future benefits are calculated, they must be discounted to determine their present value. Practices of marking-to-market liabilities using market discount rates can vary considerably based on country, or even within a country, between private and public pension plans. Typical discount rates include government bond yields or swap rates, corporate bond yields, and constant actuarial discount rates (long-term expected rate of return). Plan sponsors might be inclined to use a higher discount rate that will, all else equal, result in lower pension liabilities, a better funded status, and potentially lower contributions. Beneficiaries prefer to see a lower discount rate being used that will, all else equal, result in higher pension liabilities, a worse funded status, and potentially higher contributions. There is a delicate balance, however, because if contributions become unsustainable, the plan sponsor might decide to shut down its DB plan and substitute it with a less risky DC plan.

Over the past 15 years, a shift has occurred in many countries toward tying the discount rate to market rates. As a result, many pension plans have adopted a more liability-driven investment approach to partially or fully hedge the interest rate risk in their liabilities. Given the low interest rate environment since the 2007–2009 financial crisis, this has posed tremendous challenges for pension funds globally.



# Discount Rates for Defined Benefit Plans in the US

In the United States, private and corporate DB pension plans may discount liabilities at rates based on high-grade bond yields averaged over 25 years. This was allowed under the 2012 update to the Pension Protection Act (PPA), part of broader legislation known as MAP-21. The change effectively raised the applicable discount rates (and reduced DB pension liabilities), providing some relief to defined benefit plans given what were perceived to be ‘artificially’ low interest rates. Prior to the PPA, corporate DB plans had to discount liabilities using current investment-grade corporate bond yields, not a historical average.

US public DB pension plans use actuarial discount rates which, as required by the US Governmental Accounting Standards Board (GASB), are based on the expected return of the pension plan asset portfolio. These are typically far higher than bond rates. The higher discount rates lower their liabilities and raise their funded status. However, this may cause such pension plans to potentially make inadequate plan contributions and take on excessive risk by investing heavily in equities and alternatives in hope of generating an expected rate of return that supports the high discount rate.

**Exhibit 4** summarizes the key elements in the calculation of defined benefit pension plan liabilities.

## Exhibit 4. Factors Affecting Calculation of Defined Benefit Liabilities

Factor	Impact on Liabilities
Service/tenure	Depending on plan design, often the longer the period of service or tenure, the larger the benefit payments.
Salary/earnings	The faster salaries or earnings grow, the larger the benefit payments.
Additional or matching contributions	Additional or matching contributions are often rewarded by a step change increase in benefit payments.
Mortality/Longevity assumptions	If life expectancy increases, the obligations or liabilities will increase.
Expected Vesting	If employee turnover decreases, expected vesting will increase.

Expected Investment Returns	In some cases, increases in expected returns will result in a higher discount rate being used—hence, lower obligations or liabilities.
Discount Rate	A higher (lower) discount rate results in lower (higher) liabilities.

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The main objective of a DB plan is to have sufficient assets to cover future benefit payments. A common pension industry metric used to gauge asset sufficiency is the funded ratio, also known as the vested benefit index (VBI) in some countries. The funded ratio is defined as:

$$\text{Funded ratio} = \text{Fair value of plan assets} / \text{PV of Defined benefit obligations}$$

In some countries, if the funded ratio is less than 100%, the sponsor must increase contributions until it exceeds 100%. Improving the plan's funded ratio can transform the pension obligation from a liability to an asset on the plan sponsor's balance sheet. It is important to note that in some cases, underfunded pension plans may take more investment risk in the hope of achieving higher returns and growing assets sufficiently to return to fully funded status. In other cases, underfunded pension plans reduce investment risk and rely on other actions to improve their funded status, such as increasing contributions or reducing benefits.

Additional considerations in DB pension design are:

1. the size of the pension plan relative to the size of the sponsor's balance sheet; and
2. the cyclicity of the plan sponsor's core business.

If plan assets and liabilities are small relative to the sponsor's balance sheet, then there may be more flexibility in taking investment risk and more tolerance for volatility in employer contributions. If, on the other hand, plan asset and liabilities are large in relation to the sponsor's balance sheet, then there may be less appetite for volatility of employer contributions and hence a reduced desire for taking investment risk.

Another important factor is the core business of the plan sponsor. If the plan sponsor's revenues are highly cyclical, it will not want plan funded status to deteriorate when the core business suffers from a cyclical downturn. In such cases, the DB plan's asset allocation would be modified to ensure adequate diversification so as not to have significant exposure to assets highly correlated with the sponsor's core business or industry. In sum, it is desirable for plan assets to have low (high) correlations with the sponsor's operating assets (liabilities).

The plans sponsor's ability to tolerate volatility of contribution rates may impact the



investment horizon, and hence the pension plan's appetite for such illiquid investments as private equity and venture capital. Another important factor determining the investment horizon is the mix of active plan participants (i.e., current employees) versus retirees. The higher the proportion of retirees (so the higher the liability associated with retirees only) relative to the proportion of active participants (or the liability associated with active participants), the more mature the plan—hence, the lower its risk tolerance. Some mature DB pension plans have been frozen (closed to new participants) as they typically experience negative cash flow where benefit payments exceed contributions. Generally, the more mature a pension fund, the shorter its investment horizon, which directly affects risk tolerance and the allocation between fixed-income assets and riskier assets.

#### **4.1.2. Defined Contribution Pension Plans**

In a DC plan, participants' pension benefits are based on amounts credited to their individual accounts in the form of contributions (from the employee and possibly the employer) and investment returns. Consequently, the liabilities of a DC pension plan sponsor are equal only to its required contributions. DC plan assets are typically pooled, and the sponsor invests according to the investment choices selected by plan participants. Often the DC plan may invest in a broadly diversified portfolio that may include investments not generally offered to retail investors, such as private equity and hedge funds. This is possible since pooling of assets gives rise to scale and the long-term horizon of the aggregate beneficiaries. In such case, the plan sponsor takes on the residual investment risk of its asset allocation. Once invested in such alternative asset types, the DC plan sponsor bears liquidity risk if any event occurs that causes a significant proportion of its participants to exit the plan. The asset allocation may be impacted to such an extent that the plan sponsor is unable to provide the asset allocation promised to its participants. Such a circumstance will have regulatory and reputational consequences for the DC plan sponsor.

Individuals in a DC plan are at different stages of their careers, so each has a different investment time horizon (the time period from his/her current age until expected death or expected death of a spouse, whichever is longer) as well as different risk tolerances. Therefore, key considerations for most DC plans are participants' ages and invested balances. If the plan has a larger proportion of older (younger) participants with large (small) invested balances, the investment options might reflect a shorter (longer) investment horizon. Many DC plans offer investment options that allow participants to select the investment horizon that best aligns with their own investment horizon. Examples are life-cycle options or target date options, which feature a glide path that manages the asset mix based on a desired retirement date. In the United States, most DC plans offer target-date options as default options; in Hong Kong SAR it is mandated that every default option plan have a life-cycle option.

There are two main types of life-cycle options. **Participant-switching life-cycle options**

automatically switch members into a more conservative asset mix as their age increases. There may be several automatic de-risking switches at different age targets. A **participant/cohort option** pools the participant with a cohort that has a similar target retirement date. For example, if a participant is 40 years old in 2020 and plans to retire at the age of 65, he/she could invest in an option with a target date of 2045 and the fund would manage the appropriate asset mix over the next 25 years. In 2020, the assets might be 90% invested in equities and 10% in bonds. As time passes, however, the fund would gradually change the asset mix (less equities and more bonds) to reflect an appropriate allocation given the time to retirement.

## 4.2. Liquidity Needs

Although pension plans typically have long investment time horizons, they still must maintain sufficient liquidity relative to their projected liabilities. Liquidity needs are driven by:

- Proportion of active employees relative to retirees—The former contribute to the plan, while the latter receive benefit payments. More mature pension funds have higher liquidity needs. Frozen DB pension plans, often facing negative cash flow, must hold even more cash and other liquid investments compared to open mature plans.
- Age of workforce—Liquidity needs rise as the age of the workforce increases, since the closer participants are, on average, to retirement, the sooner they will switch from the contribution phase to benefit payment stage. This is true for both DB and DC plans.
- DB plan funded status—If the plan is well funded, the plan sponsor may reduce contributions, generating a need to hold higher balances of liquid assets to pay benefits.
- Ability of participants to switch/withdraw from plan—If pension plan participants can switch to another plan or withdraw on short notice, then higher balances of liquid assets must be held to facilitate these actions. This applies to DB and some DC plans.

A pension plan with lower liquidity needs can hold larger balances in private investments—such as real estate, infrastructure, private equity, and hedge funds—and can invest a higher proportion in equities and credit. A pension plan with higher liquidity needs, however, must invest a higher proportion of its assets in cash, government bonds, and highly liquid, investment-grade corporate bonds.

It is important for pension plans to regularly perform liquidity stress tests, which may include stressing the value of their assets and modelling reduced liquidity of certain asset classes in a market downturn. Such stress-testing may also help DC plans anticipate whether participants might switch out of more volatile investment options during market downturns.



## EXAMPLE 1

# Comparing Defined Benefit (DB) and Defined Contribution (DC) Pension Plans

Geoff Albright is 35 years old and has been working at Henley Consulting in Melbourne, Australia, for 10 years. Henley Consulting offers a defined benefit (DB) pension plan for its employees. The defined benefit plan is fully funded. Geoff Albright's benefit formula for monthly payments upon retirement is: final monthly salary  $\times$  benefit percentage ( $=1.5\%$ )  $\times$  number of years of service, where final monthly salary equals his average monthly earnings for the last three financial years immediately prior to retirement date. Having been at Henley Consulting for 10 years, his benefits have vested and can be transferred to another pension plan.

Geoff has been offered a job at rival Australian firm, Horizon Ventures Consulting, which is offering a similar salary; however, Horizon Ventures Consulting offers a defined contribution (DC) pension plan for its employees. Horizon Ventures Consulting will pay 15% of annual salary into the plan each year. Employees can choose to invest in one of three diversified portfolios offered by the plan sponsor—Horizon Growth, Horizon Balanced, and Horizon Conservative—based upon their risk appetite, and employees can elect to make additional contributions to the plan. The monthly pension payments will depend on what has accumulated in Geoff's account when he retires.

Discuss the features that Geoff should consider in evaluating the two plans. Please address benefit payments, contributions, shortfall risk, and mortality/longevity risks.

### Solution:

- Geoff notes his benefits at Henley Consulting have vested and can be transferred to Horizon Ventures Consulting's DC plan.
- Henley Consulting's plan provides a defined benefit payment linked to years of service and final salary, whereas Horizon Ventures Consulting's plan provides an uncertain benefit payment linked to the company's and Geoff's contribution rates and investment performance of plan assets. The benefits he can achieve in Henley Consulting's DB plan increase both by time employed as well as by growth in his wages. Geoff considers his capacity to achieve wage growth and compares this to the return objectives of his chosen option in Horizon Ventures Consulting's DC plan. Geoff notes his risk appetite and time horizon are suited to the Horizon Growth option.

- Although Henley Consulting's contribution rate is not known, Geoff is aware that the plan is currently fully funded and that it is Henley Consulting's obligation to maintain a fully funded status. Horizon Ventures Consulting's contribution rate is known (15% of annual salary), and Geoff can also make additional contributions himself.
- Geoff notes that the shortfall risk of plan assets being insufficient to meet his retirement benefit payments falls to his employer in the case of Henley Consulting's DB plan. But, for Horizon Ventures Consulting's DC plan, the shortfall risk falls to Geoff and depends on the contribution rate (15% from the company plus any additional contributions he chooses to make) and the performance of his chosen investments.
- Henley's DB plan pools mortality risk such that those in the pool who die prematurely leave assets that help fund benefit payments for those who live longer than expected. Horizon Venture Consulting's DC plan pays out the amount accumulated in Geoff's account, and he bears the risk of outliving his savings.

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## 5. PENSION FUNDS: EXTERNAL CONSTRAINTS

### **d. describe the focus of legal, regulatory, and tax constraints affecting different types of institutional investors**

In this section, we take a high-level view of some of the legal and regulatory constraints faced by pension funds. In the next section, we consider tax and accounting constraints that may affect investing by pension funds.

### **5.1. Legal and Regulatory Constraints**

Regulatory bodies supervising pension funds typically cover financial services licensing and regulation, prudential supervision, capital adequacy, market integrity, and consumer protection. Breaching key regulations may result in loss of operating licenses and/or loss of tax benefits, where applicable, which provides a strong incentive to comply. Regulations do

vary from country to country; for example, some countries specify minimum and maximum percentage allocations to certain asset classes, while other countries require a minimum contribution rate by employers, particularly if the plan's funded ratio falls below 100%. However, despite national differences, there are similar themes in regulation globally.

Reporting and transparency are heavily influenced by regulatory requirements, as some regulators now require extensive reporting, not only on direct investment fees and costs incurred by pension plans but also on indirect fees and costs of external commingled vehicles. Drivers of more detailed reporting and transparency are avoidance of corruption by government officials involved with public pension plans and increased consumer protection for private pension plans so participants and stakeholders make appropriate investment choices. Many countries have increased personal liability for pension trustees to ensure they act in the best interests of ultimate beneficiaries. For example, DC plan participants must choose their contribution rates and the investment risk they are willing to bear. However, regulators are aware that many DC plan participants have little understanding of how to invest for retirement. Although regulators may require the plan sponsor to provide investor education to their employees, DC plan trustees, as fiduciaries, are still required to operate with prudence and as if they were the asset owners.

In Australia, for example, most employees are covered by the DC Superannuation Guarantee, under which employers must contribute 9.5% of an employee's salary. Since many participants do not actively make investment decisions, the government applies strict licensing and other obligations for trustees when offering the default option (MySuper), including: providing a single diversified investment strategy as a default option suitable for the majority of participants; avoiding unnecessary or excessive fees; and delivering value for money (measured by long-term net returns). A similar default DC plan account exists in the United States (known as the Qualified Default Investment Alternative), which must also be diversified.

In Europe the updated Institutions for Occupational Retirement Provision (IORP II) will lead to regulatory changes for pension plans. Although each country will interpret the provisions slightly differently, the changes relate to governance, risk management, and disclosure. A number of key functions are defined, such as an internal audit, and standards are applied to those executing these key functions, including a requirement that such a person does not carry out a similar function for the plan sponsor. Many pension plans will need to document their risk management policies and procedures. For example, each fund must document its "own risk assessment" covering items such as the risk of not meeting benefit obligations and operational risk, including administrative error or fraud. For disclosure, there will also be greater harmonization of pension benefit statements with certain items required to be included.

US corporate pension plans are subject to significant regulatory oversight. The Employee Retirement Income Security Act of 1974 (ERISA) regulates vesting, funding requirements, and payouts. ERISA includes a fiduciary code of conduct and required disclosures. ERISA

established the Pension Benefit Guaranty Corporation, a US government agency that collects premiums from pension plan sponsors and pays benefits to participants (approximately 630,000) in terminated plans. Although ERISA protects benefits that workers have earned, an employer may still terminate a plan, essentially freezing a worker's ability to earn additional benefits. Moreover, the US Pension Protection Act of 2006 established minimum funding standards for DB plans, while later revisions raised the rates corporations could use to discount their liabilities (high-grade bond yields averaged over 25 years). Importantly, a potential consequence of using higher discount rates is these DB plans must generate higher returns for their funding status to remain sustainable, which typically requires taking on greater investment risk.

## 5.2. Tax and Accounting Constraints

Governments around the world encourage citizens to save for retirement by typically providing favorable tax treatment to retirement savings. Favorable tax treatment may come in different forms: reduced taxes on retirement plan contributions, favorable tax rates on investment income and/or capital gains, and lower tax rates on benefit payments drawn throughout retirement (versus higher taxes on lump sum payments). Foregone tax revenues from such favorable tax treatment are costly, so to ensure pension plans actually reduce tax burdens for retirement savers, governments typically place restrictions on plan design, governance, and investment activities in order for plans to qualify for the favorable tax treatment.

In the United States, 401(k) plans are tax deferred as participants make pre-tax contributions and do not pay tax on investment earnings; benefit payments, however, are taxed as ordinary income. To encourage savings retention within the pension plan, early withdrawals before age 59½ are taxed an additional 10%. In the United Kingdom, private pension plans are also tax deferred, with no tax on contributions or on investment earnings. The first 25% of benefit payments are tax free, and the remaining 75% is taxed as ordinary income after a tax-free personal allowance. In China, companies providing occupational pensions (known as Enterprise Annuities) are given tax relief amounting to 4% of wages; however, there are taxation differences between regions.

Pension plans taxed on investment earnings must be aware of tax implications of their investment activities. For example, there may be favorable capital gains tax treatment for investments held over 1 year, which should incentivize investing in lower turnover strategies. Also, pension plans must consider tax implications when returns from investing via futures and other derivatives are treated as income and taxed at higher rates than returns from investing in the underlying securities, which are typically taxed at lower capital gains and dividend rates. When investing internationally, double taxation may occur when the same income or capital gain is taxed both by the jurisdiction in which it is earned *and* in the

jurisdiction where the pension fund resides. To achieve tax efficiency, pension plans should invest via legal structures that provide access to double taxation treaties, whereby taxes paid in the country of residence are exempt in the country where they arise (alternatively, the plan receives a foreign tax credit in its country of residence to reflect taxes withheld in the country where the income/gain arose).

Accounting treatment is another important external factor that drives investment decision making by pension funds. These treatments may differ across countries, so it is important to be fully aware of them. Here we focus on the United States to illustrate how accounting treatment may influence investment choices. Corporate DB pension plans must follow generally accepted accounting principles—notably, Accounting Standards Codification (ASC) 715, Compensation—Retirement Benefits, which requires that an overfunded (underfunded) plan must appear as an asset (liability) on the balance sheet of the corporate sponsor. Such plan sponsor must also report gains, losses, and service costs as part of net income. This accounting treatment significantly increased the transparency of US plans' funded status, and it prompted many corporate plans to implement liability-driven investing techniques to reduce the effect of funded ratio volatility on their financial statements.

Public pension plans in the US must follow Governmental Accounting Standards Board (GASB) rules. Under GASB rules, public plan sponsors must report fair market values of plan assets and can use a blended approach to valuing plan liabilities. The latter involves discounting the funded portion of pension liabilities using the (higher) expected return on plan assets as well as discounting the unfunded portion of liabilities based on the (lower) yield on tax-exempt municipal bonds. Using a higher discount rate for the funded portion of liabilities skews the risk tolerance of public pension plans and incentivizes them to allocate relatively large proportions of assets to equities and alternative investments.

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## 6. PENSION FUNDS: RISK CONSIDERATIONS

- e. evaluate risk considerations of private defined benefit (DB) pension plans in relation to 1) plan funded status, 2) sponsor financial strength, 3) interactions between the sponsor's business and the fund's investments, 4) plan design, and 5) workforce characteristics**

Despite the long-term trend in the shift away from DB plans toward DC plans, as previously demonstrated, DB plans (and their hybrids) are still a key part of the pension landscape in several P7 countries, such as Canada, Japan, the Netherlands, and Switzerland. As such, it is important to review risk management considerations of private defined benefit pension plans—a topic that has intensified following the global financial crisis of 2007-2009. Key risk

considerations of such plans must be measured and managed.

## 1. Plan funded status

When a defined benefit pension plan is fully funded, the value of assets is greater than or equal to the present value of the liabilities. If the value of the assets falls below the present value of the liabilities, the pension plan is considered to be underfunded and the plan sponsor is left with a financial liability. The plan sponsor can take several approaches in order to minimize the risk of generating a financial liability:

- a. Seek to match assets to liabilities in terms of quantity, timing, and risk using a Liability Driven Investing (LDI) approach. Duration gap management or cash flow–matching suits plans that are close to fully funded and seek to maintain that status.
- b. Seek to grow assets at a higher rate of return than the expected growth in liabilities—which typically involves taking on more investment risk. This form of investment suits plans that are underfunded and wishing to return to a fully funded status. It may also suit fully funded plans that are seeking to lower their contribution rate over time and are willing to endure the increased volatility in funded status that this approach entails.
- c. Seek to invest in more defensive assets expected to deliver less volatile returns. This may suit defined benefit pension plans where the plan sponsor is willing to make higher contributions over time in exchange for less variability in the plan funded status.

In cases where a plan is adequately funded, the sponsoring corporation may seek to remove pension-driven balance sheet volatility by engaging pension risk transfer through such mechanisms as:

- offering lump sum payments to beneficiaries in exchange for voluntarily leaving the plan; or
- negotiating a transfer of the risk to an insurance provider.

## 2. Sponsor financial strength

When a defined benefit pension plan sponsor is not financially strong, there is a considerable risk that it may fail to make the necessary contributions to the plan. The plan sponsor may not be able to meet its defined benefit pension plan liabilities if there is a funding shortfall. If the plan sponsor files for bankruptcy protection, an underfunded pension plan is in the same difficult position as other creditors, having to join the queue claiming the firm's remaining assets.

The relative size of the plan also influences the sponsor's ability to assume risk. If the pension plan is small (large) relative to the size of the sponsor, then volatility in pension assets, liabilities, and/or contributions will have a smaller (larger) effect on the sponsoring company's balance sheet.

### 3. Interactions between the sponsor's business and the fund's investments

In the past, many private defined benefit pension plans have held significant stakes in the equity of the sponsor company. However, due to the risk involved, many regulators have restricted how much a plan may invest in the stock of the sponsor company. This risk materializes in circumstances in which the company performs poorly and its share price falls, thereby increasing the risk that pension plan assets fall below liabilities. This may coincide with a point in time when the sponsor's financial strength is poor, constraining its ability to make additional contributions necessary to address the developing funding shortfall. For this reason, it is advisable for the plan to diversify out of the sponsor company's stock. It is also prudent to diversify away from companies operating in the same industry, because their risk and return are expected to be highly correlated with those of the sponsor company's stock.

### 4. Plan design

Poor plan design can contribute many risks for the private defined benefit pension plan sponsor. When setting out the formula for calculation of defined benefit payments, the plan sponsor must balance adequacy (will the benefit payment be sufficient to meet income needs in retirement) and sustainability (what contribution rate is sustainable, and what investment return can realistically be achieved) within the context of its risk tolerance. There is a significant risk that a company will be overly optimistic in predicting its ability to make contributions to its pension plan decades into the future.

The plan design is informed by its purpose as an employee retention tool to mitigate the risk of losing employees to a competitor. The company/sponsor may also wish to increase future defined benefit payments to address worker unrest, which may otherwise lead to strike action or lengthy negotiations with unions. If a company does not have immediate excess cash flow, it may prefer to increase future defined benefit payments instead of granting immediate pay raises.

### 5. Workforce characteristics

The nature of the workforce is an important risk consideration for companies because it impacts what the duration of the assets should be. The younger the workforce, the longer the duration of assets and the greater risk tolerance the plan will have. If a company's workforce has high turnover, it may have few employees whose entitlements to defined benefit payments will vest. On the other hand, if the average tenure of the workforce increases, then more liabilities will vest, thereby reducing the plan's funded

status. If the workforce is older and nearer to retirement age, an important risk consideration is keeping sufficient liquidity so the plan can meet liabilities when they become due. Conversely, in a plan where the workforce is younger, on average, the sponsor may take on more liquidity risk. A workforce with a high level of vested benefits may constrain the company in terms of flexibility in managing its workforce. For example, a company may prefer to downsize its workforce, but doing so might require it to pay out excessive vested benefits.

Retired workers also influence the longevity risk of DB plans. Longevity risk is the risk that an individual will live longer than expected and draw more in benefit payments than the amount determined in the calculation of plan liabilities. In private DB pension plans, longevity risk is pooled such that if a participant dies earlier than expected, he/she leaves more assets in the pool that can then cover additional payments for those who live longer than expected. However, this pooling of longevity risk does not mitigate the effect of rising life expectancies, which implies, all else equal, an increase in total DB plan liabilities.

In setting a risk objective, plan sponsors must consider plan status, sponsor financial status and profitability, sponsor and pension fund common risk exposures, plan features, and workforce characteristics, as shown in [Exhibit 5](#).

#### **Exhibit 5. Factors Affecting Risk Tolerance and Risk Objectives of Defined Benefit Plans**

<b>Category</b>	<b>Variable</b>	<b>Explanation</b>
Plan status	<ul style="list-style-type: none"> <li>Plan funded status (surplus or deficit)</li> </ul>	<ul style="list-style-type: none"> <li>Higher pension surplus or higher funded status implies potentially greater risk tolerance.</li> </ul>
Sponsor financial status and profitability	<ul style="list-style-type: none"> <li>Debt to total assets</li> <li>Current and expected profitability</li> <li>Size of plan compared to market capitalization</li> </ul>	<ul style="list-style-type: none"> <li>Lower debt ratios and higher current and expected profitability imply greater risk tolerance.</li> <li>Large sponsor company size relative to pension plan size implies greater risk tolerance.</li> </ul>



of sponsor  
company

Sponsor and  
pension fund  
common risk  
exposures

- Correlation of sponsor operating results with pension asset returns

- The lower the correlation, the greater the risk tolerance, all else equal.

Plan features

- Provision for early retirement
- Provision for lump-sum distributions

- Such options tend to reduce the duration of plan liabilities, implying lower risk tolerance, all else equal.

Workforce  
characteristics

- Age of workforce
- Active lives relative to retired lives

- The younger the workforce and the greater the proportion of active lives, the greater the duration of plan liabilities and the greater the risk tolerance.
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## EXAMPLE 2

### Andes Sports Equipment Corporation— Defined Benefit Plan

1. Frank Smit, CFA, is chief financial officer of Andes Sports Equipment Company (ADSE), a leading Dutch producer of winter and water sports gear. ADSE is a small company based in Amsterdam, and all of its revenues come from Europe. Product demand has been strong in the past few years, although it is highly cyclical. The company has rising earnings and a strong (low debt) balance sheet. ADSE is a relatively young company, and as such, its defined benefit pension plan has no retired employees. This essentially active-lives plan has €100 million in assets and an €8 million surplus in relation to the projected benefit obligation

(PBO). Several facts concerning the plan follow:

- The duration of the plan's liabilities (which are all Europe-based) is 20 years.
- The discount rate applied to these liabilities is 6 percent.
- The average age of ADSE's workforce is 39 years.

Based on the information provided, discuss ADSE's risk tolerance.

2. Smit must set risk objectives for the ADSE pension plan. Because of excellent recent investment results, ADSE has not needed to make a contribution to the pension fund in the two most recent years. Smit considers it very important to maintain a plan surplus in relation to PBO. Because an €8 million surplus will be an increasingly small buffer as plan liabilities increase, Smit decides that maintaining plan funded status, stated as a ratio of plan assets to PBO at 100 percent or greater, is his top priority.

Based on the information provided, state an appropriate risk objective for ADSE.

## **Solution to 1:**

ADSE appears to have above average risk tolerance for the following reasons:

- a. The plan has a small surplus (8 percent of plan assets); that is, the plan is overfunded by €8 million.
- b. The company's balance sheet is strong (low use of debt).
- c. The company is profitable despite operating in a cyclical industry.
- d. The average age of its workforce is low.

## **Solution to 2:**

Given Smit considered it very important to maintain a plan surplus in relation to PBO, an appropriate risk objective for ADSE relates to shortfall risk with respect to the plan's funded status falling below 100 percent. For example, ADSE may want to minimize the probability that funded status falls below 100 percent, or it may want the probability that funded status falls below 100 percent to be less than or equal to 10 percent. If a plan surplus is maintained, ADSE may experience more years in which it does not need to make a contribution. Indeed, a major motivation for maintaining a plan surplus is to reduce the contributions ADSE needs to make in the future. As such, another relevant type of risk objective would be to minimize the present value of expected cash

contributions.

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## 7. PENSION FUNDS: INVESTMENT OBJECTIVES AND ASSET ALLOCATION

- f. prepare the investment objectives section of an institutional investor's investment policy statement**
- g. evaluate the investment policy statement of an institutional investor**
- h. evaluate the investment portfolio of a private DB plan, sovereign wealth fund, university endowment, and private foundation**

### 7.1. Investment Objectives

#### 7.1.1. *Defined Benefit Pension Plans*

Defined benefit pension plans ultimately need to meet pension liabilities through a combination of investment returns and contributions. In practice, the investment objective of a DB pension plan is often to achieve a long-term rate of return on plan assets that exceeds the assumed rate of return used by the pension plan actuaries, typically the discount rate used in valuing pension liabilities. Importantly, targeting a long-term return based on the discount rate may be inappropriate in some cases. For example, when the discount rate is set using yields on government bonds, the target return is likely too low. In such a case, it may be preferable to fully hedge interest rate risk by adopting a liability-driven investing approach.

In determining an appropriate target return, it is worth noting that, ideally, the asset base should grow—through investment returns and contributions—in line with the growth of liabilities. If a plan is underfunded, the asset base must grow faster than liabilities. Because the growth of liabilities is met through investment returns and contributions (from the plan sponsor and/or employees), the DB plan's board and investment committee must consider the appropriate level of portfolio risk relative to the plan sponsor's willingness and ability to raise contribution rates should investment returns fall short of expectations.

In summary, the primary objective for DB pension plans is to achieve a long-term target return (usually defined in nominal terms) over a specified investment horizon (3–5 years or even as long as 10 or 25 years) with an appropriate level of risk that allows the plan to meet its contractual liabilities. The secondary objective could be to minimize the present value of expected cash contributions.

In setting overall investment strategy, many DB pension plans engage in detailed Asset Liability Management studies every 3–5 years. These studies include Monte Carlo simulations of thousands of scenarios for asset returns and factors driving pension liabilities (importantly, the discount rate) aimed at producing probability distributions for funded ratios and contribution rates at different horizons. These distributions are useful for determining key metrics, such as the expected funded ratio in 10 or 15 years, surplus volatility, surplus-at-risk, and volatility of contribution rates. Additionally, many pension funds engage in detailed liquidity modeling and stress testing that involve modeling contributions, benefit payments, capital calls for funding private equity investments, stressed asset values, and reduced liquidity of certain asset classes in market downturns. Besides providing an assessment of the appropriateness of the pension fund's liquidity profile, such stress testing provides insights into meeting liquidity needs during a financial crisis.

### ***7.1.2. Defined Contribution Pension Plans***

The main objective of defined contribution pension plans is to prudently grow assets that will support spending needs in retirement. Defined contribution plans usually offer a variety of investment options with differing investment objectives to suit participants of different ages, asset balances, and risk appetites. The investment options offered by the DC plan sponsor can be managed either in-house or externally as well as passively or actively. Most DC pension plans also provide a default option for disengaged participants. Plan trustees/boards must set an appropriate investment objective of the default option after reviewing the characteristics of existing default participants. Unsurprisingly, many DC plans end up with a balanced asset allocation mix as the default option—frequently in the form of a life-cycle fund. In cases where a DC plan provides participants a balanced asset allocation option with active management, a secondary objective may be to outperform the long-term policy benchmark consisting of the weighted average of individual asset class benchmarks and the policy weights defined by the strategic asset allocation. Finally, for some DC plans it is important their investment options outperform those of other DC pension plans, which is particularly relevant in countries where participants can voluntarily switch between DC plan providers.

## **Sample Investment Objectives of Different**

# Pension Plans

## Public DB Pension Plan:

1. The assets of Public Plan will be invested with the objective of achieving a long-term rate of return that meets or exceeds the Public Plan actuarial expected rate of return.
2. Public Plan will seek to maximize returns for the level of risk taken.
3. Public Plan will also seek to achieve a return that exceeds the Policy Index.
4. Public Plan will seek to achieve its objectives on an after fees basis.

## Corporate DB Pension Plan:

The Trustee wishes to ensure that the Corporate Plan can meet its obligations to the beneficiaries while recognizing the cost implications to the Company of pursuing excessively conservative investment strategies. The objectives of the Plan are defined as: wishing to maximize the long-term return on investments subject to, in its opinion, an acceptably low likelihood of failing to achieve an ongoing 105% funding level.

## Corporate DC Pension Plan:

The Fund currently offers a range of investment options to its participants and has adopted an age-based default strategy for participants who do not choose an investment option.

The investment strategy of the Fund is to put in place portfolios to achieve the objectives of its stakeholders over a reasonable period of time with a reasonable probability of success.

In establishing each option's investment objectives, the Trustee takes into account the average participant's age, account balance, and risk appetite. The participant's choice of investment option indicates his/her risk appetite.

For example, a participants selecting the growth option indicates a higher risk tolerance over a longer investment time horizon. The investment objective for the growth option is to build an investment portfolio to outperform inflation + 4% per annum over 7-year periods while accepting a high level of risk that is expected to generate 4–6 negative annual returns over any 20-year period.

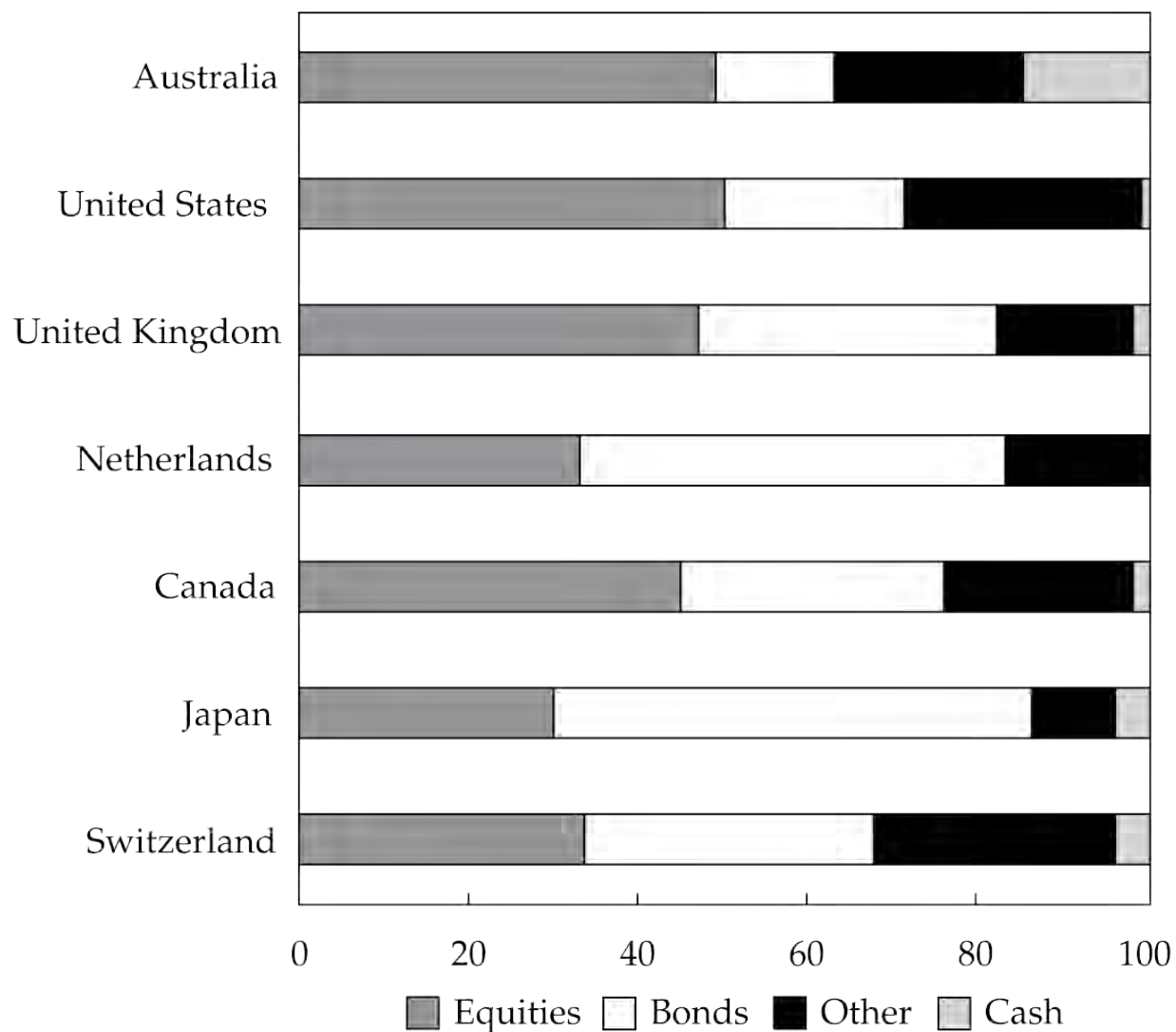
## 7.2. Asset Allocation by Pension Plans

An examination of pension fund asset allocations shows very large differences in average asset allocations by country. Moreover, examining pension fund asset allocations within a country also typically shows large differences despite these plans seeking to achieve similar goals. Such inter- and intra-national differences are driven by many factors discussed earlier in this reading, including the differences in legal, regulatory, accounting, and tax constraints; the investment objectives, risk appetites, and investment beliefs of the stakeholders; the liabilities to and demographics of the ultimate beneficiaries; the availability of investment opportunities; and the expected cost of living in retirement.

**Exhibit 6** presents the average asset allocation of pension funds in the world's largest pension fund markets. The data are an aggregation of both DB and DC plans as presented (the split between DB and DC plans for each of the P7 countries is shown in **Exhibit 3**).

Note the category 'Other' includes hedge funds, private equity funds, loans, structured products, other mutual funds (i.e., not invested in equities, bonds, or cash), land, buildings, and other miscellaneous investments.

### **Exhibit 6. Pension Asset Allocation for P7 Countries (2017)**



Source: Willis Towers Watson Thinking Ahead Institute (2018).

The key observations regarding the data presented in [Exhibit 6](#) are as follows:

- Equities:** Equities provide a long-term risk premium over bonds and cash and are typically viewed as the asset class of choice for long-term investors, like pension plans because of the higher expected returns they offer. Traditionally, equities are also viewed as an inflation hedge, as opposed to bonds that do not perform well in an inflationary environment. However, over the past decade, there has been a decrease in the equity allocation in several countries, particularly in Japan, the United Kingdom, and the United States. In aggregate, the resulting reallocation has been to the category ‘Other,’ which includes such alternatives as private equity and debt, real assets, and hedge funds, as well as to bonds (and fixed income, generally) as DB pension funds have reduced their risk appetite to lower the volatility of their funded ratios. Australia and the US have the largest proportions of DC pension assets and also the largest allocations to equities. Although not shown in [Exhibit 6](#), it is worth noting that the United States,

Australia, and the Netherlands have the highest proportions of their equities allocations invested in their local markets. Given the size of the domestic equities markets in Australia and the Netherlands, this implies significant home bias.

- *Fixed Income*: Fixed income plays a defensive role in pension fund portfolios, because during times of financial market stress, equity markets and interest rates tend to fall. Fixed-income investments also help DB pension plans hedge the interest rate risk relative to their pension liabilities. Many regulators, in fact, require DB pension plans to hold a minimum allocation in fixed-income investments. Over the last decade, US corporate pension plans have increased their allocations to fixed-income investments, despite low expected returns, driven by the desire to reduce their funded ratio volatility. Conversely, US public pension plans have reduced their fixed-income allocations overall while increasing their allocations in the fixed-income space to high yield (riskier) bonds. The reallocation and repositioning are driven by the large gap that has opened between their expected rate of return and the yield available on long-term government securities.
- *Alternatives (Other)*: This category includes private equity and debt markets, real estate, hedge funds, and real assets. As a group, these alternative assets tend to have low, or negative, correlations with traditional investments as well as lower drawdowns. In the case of hedge funds, this may be explained by the lower volatility of these strategies versus equity markets. Private asset classes have historically also exhibited lower drawdowns compared to equities. This may be partially explained by a lack of fully marking-to-market because of limited market transactions as well as appraisal-based valuations that lag changes in market pricing. Overall, the perception of institutional investors is that alternatives can produce equity-like returns over the long run with relatively low drawdowns, which has been the motivation for the shift from equities to alternatives over the past decade and a half. However, given the complexity and skill required to manage alternative investments, these investments come with high fees; thus, fee-sensitive institutions with significant liquidity needs may be unable to make sizable allocations to alternatives. Furthermore, attractive investment opportunities in private markets and in hedge fund strategies may be scarce. Increased competition and the huge amounts of capital deployed on a global scale by institutional investors may put downward pressure on future returns. Although still a smaller part of most institutional portfolios, allocations to real assets have increased significantly because they are considered an attractive way to hedge inflation. Japan has been slowest among the select countries to increase allocations to alternatives; however, the transition is underway with the country's largest pension plan, Government Pension Investment Fund (GPIF), which is reducing its allocation to domestic bonds in favor of alternatives.

### EXAMPLE 3



# Asset Allocation by a Public Defined Benefit Plan

Susan Liew, CFA, is the chief investment officer of the Lorenza State Pension Plan (LSPP), a public DB plan. The plan maintains an asset allocation of 30% US equities, 30% international equities, 30% US fixed income, and 10% international fixed income. Liew's investment team developed the following long-term expected real returns for the asset classes in which the LSPP has traditionally invested. The outlook for US and international equities is slightly below long-term averages, while the outlook for US and international fixed income is well below long-term averages.

Asset Class	Expected Long-Term (10-Year) Annual Return
US equities	4.0%
International equities	5.0%
US fixed income	1.0%
International fixed income	-0.5%

Given the poor prospects for fixed income and the mediocre expectations for equities, Liew is exploring making allocations to various alternatives and has asked LSPP's asset consultant to provide comments on considerations for each alternative asset class, as shown here:

Asset Class	Comments
Alternative debt	Represents a diverse range of high yielding and floating-rate debt expected to return 300 bps annually over traditional fixed income (default-adjusted basis). The additional returns are compensation for increased liquidity risk in private debt, added credit risk in high yield and EM debt, and non-performing loans.
Infrastructure funds	Strong income-like characteristics given contracted cash flows for most underlying infrastructure projects. This asset class entails increased liquidity risk but offers some inflation protection (many contracted cash flows are linked to inflation).
Hedge funds	Provide access to various diversifying strategies, including those with potential to generate gains in both rising and falling markets. Expected to return 250 bps annually over traditional long-only equities. Careful manager selection and underlying strategy selection

(especially exposure to equity market beta) are important factors.

Liew recommends to LSPP's Board of Trustees the following change in asset allocation:

Asset Class	Current Asset Allocation	Recommended Asset Allocation
US equities	30%	25%
International equities	30%	25%
US fixed income	30%	15%
International fixed income	10%	5%
Alternative debt	—	10%
Infrastructure funds	—	10%
Hedge funds	—	10%

How would the recommended change in asset allocation be expected to affect LSPP's funded status?

### Solution:

The recommended changes in asset allocation would likely affect LSPP's funded status as follows:

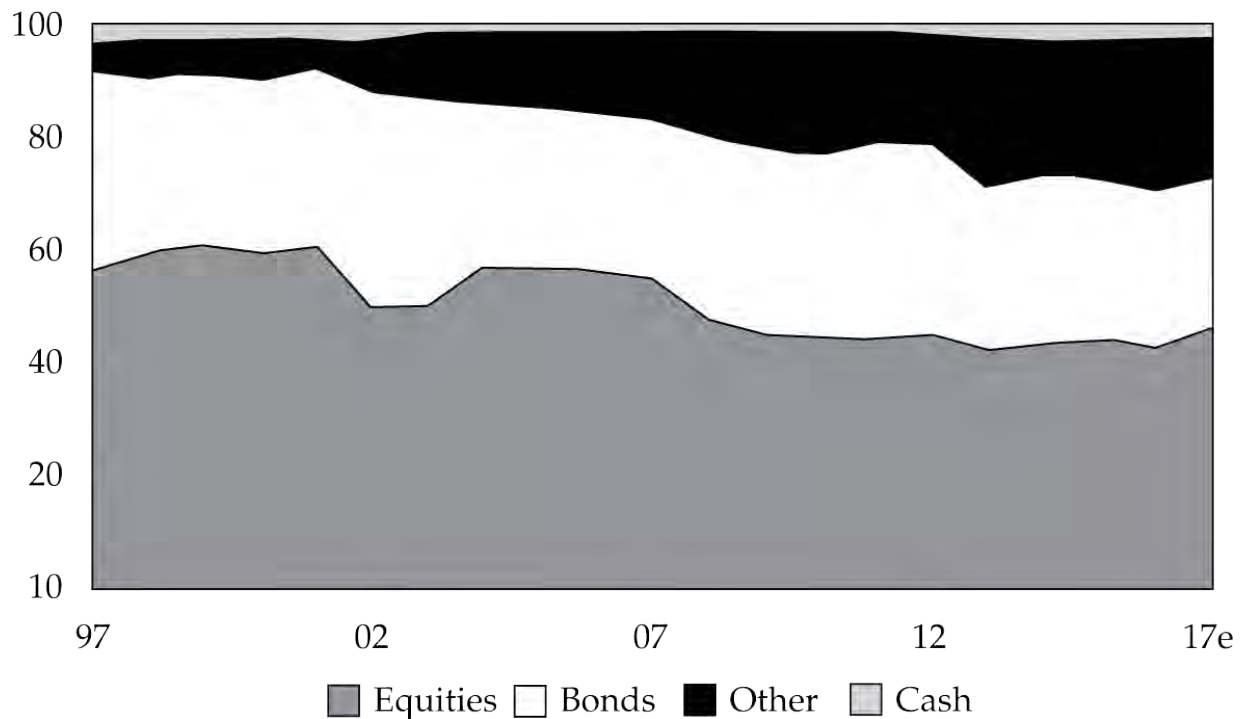
- The changes would increase expected returns, implying higher expected asset values for LSPP over time.
- Given that both alternative debt and hedge funds have higher projected long-term returns than traditional debt and equities, respectively, the discount rate applied to LSPP's liabilities can be increased, thereby reducing their present value.
- On balance, LSPP's funded status would be expected to improve because of the recommended changes in asset allocation. In addition to generating higher asset values and lower present value of liabilities, the volatility of assets (and therefore the risk to funded status) should be reduced because of the lower correlation among asset returns.

Note that although these alternative investments entail reduced liquidity, this does not impact funded status; in fact, funded status improves because of the factors mentioned

previously. However, the reduced liquidity must be considered to ensure sufficient coverage of prospective liabilities. Alternative investments entail greater manager selection risk and larger dispersion of returns around the policy benchmark relative to a passive allocation to public markets. Careful manager selection would likely require resources that would increase internal costs, and also require paying higher fees to access skilled alternative asset managers.

**Exhibit 7** shows the evolution of pension fund asset allocation trends from 1997–2017 for the P7 countries. It is apparent that the allocation to equities has decreased from about 57% in 1997 to about 46% in 2017, while allocations to the ‘Other’ category of alternatives has increased from about 4% to 25% over the same time period. This is consistent with the general trend among institutional investors of diversifying out of equities and into alternative investments, including private equity, natural resources, real estate, and hedge funds.

**Exhibit 7. Evolution of Pension Asset Allocation from 1997 to 2017**



Source: Willis Towers Watson Thinking Ahead Institute (2018).

# 8. SOVEREIGN WEALTH FUNDS: STAKEHOLDERS

- c. discuss the stakeholders in the portfolio, the liabilities, the investment horizons, and the liquidity needs of different types of sovereign wealth funds

Sovereign wealth funds (SWFs) are state-owned investment funds that hold financial or real assets. Sovereign wealth funds have increased significantly in size over the past two decades. Governments have established SWFs to meet different objectives. The International Monetary Fund (IMF) identifies five types of sovereign wealth funds, and each pursues different investment strategies. This exhibit summarizes these five types with their main objective and some examples.

Exhibit 8. Major Types of Sovereign Wealth Funds

Type	Objective	Example
Budget stabilization funds	Set up to insulate the budget and economy from commodity price volatility and external shocks.	Economic Stabilization Fund, Timor-Leste; Russia's National Welfare Fund
Development funds	Established to allocate resources to priority socio-economic projects, usually infrastructure.	Mubadala Development Fund, National Development Fund of Ireland
Savings funds	Intended to share wealth across generations by transforming non-renewable assets into diversified financial assets.	Abu Dhabi Investment Authority, Norwegian Government Pension Fund Global, Saudi PIF
Reserve funds	Intended to reduce the negative carry costs of holding reserves or to earn higher return on ample reserves.	China Investment Corporation, Monetary Fund for the Republic of Korea, Private Reserve Fund of the Netherlands
Pension reserve funds	Set up to meet identified future outflows with respect to	National Pension Reserve Fund (China);













































































































































































































































# Study Session 13

## Trading, Performance Evaluation, and Manager Selection

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The investment process is not complete until securities are bought or sold, and so the quality of trade execution is an important determinant of investment results. The first reading examines how portfolio managers need to work closely with traders to determine the most appropriate trading strategy given their motivation for trading, risk aversion, trade urgency, and other factors such as order characteristics and market conditions. Portfolio manager motivations to trade, inputs to trade strategy selection, and the range of trade implementation choices, trading algorithms, and a comparison of various markets are discussed. Guidance is provided on evaluating a firm's trading procedures for good governance practices, measuring trade costs, and evaluating success in trade execution.

Performance evaluation is one of the most critical areas of investment analysis. Performance results can be used to assess the quality of the investment approach and suggest changes that might improve it. They are also used to communicate the results of the investment process to other stakeholders and may even be used to compensate the investment managers.

The second reading on performance evaluation includes three primary components, each corresponding to a specific question needed to answer to evaluate a portfolio's performance:

- performance measurement—what was the portfolio's performance?;
- performance attribution—how was the performance achieved?; and
- performance appraisal—was the performance achieved through manager skill or luck?

The last reading of this study session addresses the complex and detailed process involved in evaluating an investment manager. The focus is on understanding how the investment results were achieved and on assessing the likelihood that the investment process that generated these returns will produce superior or at least satisfactory investment results going forward. It also entails an evaluation of a firm's integrity, operations, and personnel. This reading provides a framework that introduces and describes the important elements of the

manager selection process.

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## READING ASSIGNMENTS

- Reading 25** Trade Strategy and Execution  
by Bernd Hanke, PhD, CFA, Robert Kissell, PhD, Connie Li, and Roberto Malamut
- Reading 26** Portfolio Performance Evaluation  
edited by Marc A. Wright, CFA
- Reading 27** Investment Manager Selection  
by Jeffrey C. Heisler, PhD, CFA, and Donald W. Lindsey, CFA

# Reading 25

## Trade Strategy and Execution

by Bernd Hanke, PhD, CFA, Robert Kissell, PhD, Connie Li, and Roberto Malamut

*Bernd Hanke, PhD, CFA, is at Global Systematic Investors LLP (United Kingdom). Robert Kissell, PhD, is at Molloy College and Kissell Research Group (USA). Connie Li (USA). Roberto Malamut (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss motivations to trade and how they relate to trading strategy;
- b.** discuss inputs to the selection of a trading strategy;
- c.** compare benchmarks for trade execution;
- d.** recommend and justify a trading strategy (given relevant facts);
- e.** describe factors that typically determine the selection of a trading algorithm class;
- f.** contrast key characteristics of the following markets in relation to trade implementation: equity, fixed income, options and futures, OTC derivatives, and spot currency;
- g.** explain how trade costs are measured and determine the cost of a trade;
- h.** evaluate the execution of a trade;
- i.** evaluate a firm's trading procedures, including processes, disclosures, and record keeping with respect to good governance.



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# 1. INTRODUCTION

This reading discusses trading and execution from a portfolio manager's perspective. The reading covers a broad range of topics related to trade strategy selection and implementation and trade cost measurement and evaluation. Growth in electronic trading has led to increased automation in trading, including the use of algorithmic trading and machine learning to optimize trade strategy and execution. Various markets, including equities, fixed income, derivatives, and foreign exchange, are examined. Adequate trading processes and procedures are also discussed from a regulatory and governance perspective.

Portfolio managers need to work closely with traders to determine the most appropriate trading strategy given their motivation for trading, risk aversion, trade urgency, and other factors, such as order characteristics and market conditions. Trade execution should be well integrated with the portfolio management process, and although trading strategies will vary on the basis of market and security type, all trade activity should be evaluated for execution quality and to assess broker and trade venue performance consistent with the fund's objectives. Additionally, firms should have proper documentation of trade procedures in place to meet regulatory and governance standards.

This reading is organized as follows: Section 2 discusses portfolio manager motivations to trade. Sections 3–5 discuss inputs to trade strategy selection and the trade strategy selection process. Sections 6 and 7 cover the range of trade implementation choices and trading algorithms and provide a comparison of various markets. Sections 8 and 9 explain how trade costs are measured and how to evaluate trade execution. Section 10 provides guidance on evaluating a firm's trading procedures for good governance practices. The final section concludes and summarizes the reading.

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## 2. MOTIVATIONS TO TRADE

### **a. discuss motivations to trade and how they relate to trading strategy**

Portfolio managers need to trade their portfolio holdings to ensure alignment with the fund's underlying investment strategy and objectives. The reasons for trading, or motivations to trade, and the extent of trading vary by investment strategy and circumstance. Even a passive buy-and-hold index portfolio requires some trading because of corporate actions, fund flows, or changes in the benchmark index. Portfolio managers for actively managed funds have

additional reasons for trading based on their changing views for individual assets and market conditions. A portfolio manager's motivation to trade in addition to the fund's investment objectives play an important role in determining an overall trading approach.

Broadly speaking, a portfolio manager's motivation to trade falls into one of the following categories:

- Profit seeking
- Risk management/hedging needs
- Cash flow needs
- Corporate actions/index reconstitutions/margin calls

## 2.1. Profit Seeking

The primary added value that most active managers seek to provide is risk-adjusted outperformance relative to their benchmark. Superior returns originate from a manager having a unique insight that can be capitalized on ahead of the market. Trading in these cases is based on information portfolio managers have uncovered that they believe is not fully recognized by the market and, therefore, offers the potential to earn an excess return from the trade. Active managers will seek to transact in securities believed to be mispriced (under- or overvalued) at more favorable prices before the rest of the market recognizes the mispricing.

To prevent information leakage, or the disclosure of information about their trades, which might alert the market to the mispricing, active managers take steps to hide their trades from other market participants by executing in multiple or less transparent trade venues. *“Lit” markets* (a term referring to illumination), such as exchanges and other displayed venues, provide pre- and post-trade transparency regarding prices, volumes, market spreads, and depth. In contrast, alternative trading systems, such as dark pool trading venues, are available only to select clients and provide far less transparency, reporting only post-trade transactions and quantities. Because of these characteristics, orders in dark pool venues have a higher likelihood of going unfilled since clients receive executions only if an offsetting order arrives while their order is pending. For example, to prevent information about their trading activity from leaking to the market, a manager executing a large, directional trade may choose to execute the order in a less transparent venue.

As their investment views change with changing market and macroeconomic environments, portfolio managers will trade their holdings to align the portfolio with their views. Portfolio managers seeking longer-term profits may have relatively stable views from one period to the next whereas, in contrast, managers seeking shorter-term profits may have more rapidly

changing views based on short-term movements in the market or individual securities that require higher turnover and trading.

To capitalize on investment views ahead of the market, trading the order faster, at an accelerated pace, may be needed. Portfolio managers may execute their orders at prices nearer to the market if they believe the information they have uncovered is likely to be realized by the rest of the market in the near term. **Trade urgency** refers to how quickly (aggressively) or slowly (patiently) the order is executed over the trading time horizon. Greater trade urgency is associated with executing over shorter execution horizons, whereas lower trade urgency is associated with executing over longer execution horizons.

A portfolio manager with a short-term event-driven strategy will trade with greater urgency if the expected alpha, or return payoff associated with the investment view over the trading horizon, is likely to be rapidly acted on by other market participants. In this case, the rate or level of expected alpha decay is high. In a trading context, **alpha decay** refers to the erosion or deterioration in short-term alpha once an investment decision is made. Portfolio managers following a longer-term strategy based on company fundamentals will trade more patiently, with less urgency, if the rate or level of expected alpha decay is lower.

Following are examples of short-term and long-term profit-motivated trading with differing levels of trade urgency.

### ***2.1.1. Michigan Index of Consumer Sentiment (short-term profit seeking)***

The University of Michigan Index of Consumer Sentiment (ICS) is one of the primary indicators of US consumer confidence. It is based on a nationwide survey of households. The ICS is closely watched by market participants, and changes in the index can prompt significant moves in the US equity market. Since 2007, Thomson Reuters, a financial data vendor, has held the exclusive right to disseminate the ICS. Until mid-2013, the firm had a two-tiered process for disseminating the ICS. A small number of trading clients received the ICS at 9:54:58, or two seconds earlier than the broader market release at 9:55:00. The two-tiered process was abolished in July 2013 after receiving negative public attention. Hu, Pan, and Wang (2017) examined how quickly the information contained in the ICS was incorporated into S&P 500 Index prices during the period of the two-tiered process.<sup>1</sup> They found that most of the price adjustment happened within the first 200 milliseconds. This is an example of profit-driven trading with high associated trade urgency and an extremely short-term execution horizon.

### ***2.1.2. Value manager (long-term profit seeking)***

An investment manager following a value strategy might attempt to identify undervalued companies on the basis of such metrics as earnings yields and price-to-book ratios. The manager might favor companies that score well according to these metrics. To capitalize on their views, individual positions may be held for months or years by value managers. Minimal trading is required, and any necessary trading can often be carried out in a more patient manner. Trading in this case has no trade urgency, given the managers' much longer trade execution horizons.

As more news and market information become available on a close-to-real-time basis, combined with the increase in electronic trading, markets have become more competitive. Information is being incorporated into security prices at even faster rates. Surprises in companies' earnings announcements, interest rate changes by central banks, and other macroeconomic announcements are being incorporated into security prices on a nearly instantaneous basis. Portfolio managers trying to act on this information must trade quickly and ahead of others to capitalize on the perceived opportunity. If more immediate execution cannot be achieved at a reasonable trading cost and risk, the trade may not be worthwhile given high rates of alpha decay. Therefore, these trades may be possible only in more liquid markets, such as equities, exchange-traded derivatives, foreign exchange, and fixed-income Treasury. In less liquid markets, such as non-Treasury fixed income or over-the-counter (OTC) markets where more immediate executions cannot be achieved, trades may not be worthwhile. For active managers seeking to maximize net returns to the portfolio, the expected rate of alpha decay of the security being traded is an important trading consideration.

## **2.2. Risk Management/Hedging Needs**

As the market and the risk environment change, portfolios need to be traded or rebalanced to remain at targeted risk levels or risk exposures. Risk horizons and risk forecasts used by portfolio managers vary by investment strategy type and by investment time horizon. Fixed-income portfolio managers, for example, may have investment objectives to adhere to target portfolio durations. For these managers, portfolio rebalancing is usually required to match a benchmark duration target over time. Trading may be required because of a changing interest rate environment, a change in the benchmark index, or the passage of time. Equity portfolio managers may wish to manage their portfolio's beta or remain market neutral by hedging market risk and targeting a beta of zero relative to the equity market. To do this, the manager could trade to adjust holdings in the underlying portfolio or trade futures or exchange-traded funds (ETFs) to adjust the fund's equity beta to zero. Similarly, hedge fund managers may wish to maintain exposure to higher market volatility without having a view on directional price movement.

In general, the risks being managed, or hedged, in addition to such factors as security

liquidity considerations and the fund's investment mandate, determine whether derivatives can be used or whether trades in the underlying portfolio (cash) securities are necessary. For example, an equity portfolio's beta to a broad equity market may be managed to the portfolio's target beta by trading equity index futures (e.g., S&P 500 futures, FTSE 100 Index futures, or Nikkei 225 futures). Using futures for hedging is often a simpler, more cost-effective approach because many futures contracts are liquid and can be traded at minimal cost. In addition, the standardization of futures contracts makes them attractive to investors. They can also be traded on margin, requiring relatively small amounts of capital. Similarly, for fixed-income strategies in the United States, interest rate risk can often be (at least partially) hedged using futures on Treasury securities, such as T-bond futures. Using liquid derivatives for risk management can provide an inexpensive and straightforward means of hedging versus trading in the underlying cash securities. In addition, the ability to trade derivatives or underlying securities may depend on the fund's investment mandate. In some cases, the fund's investment mandate may not allow the use of derivatives, and the portfolio manager must instead trade ETFs or the underlying to achieve the desired exposures.

For quantitative funds, targeted volatility is usually explicitly stated in the fund's offering documents whereas for fundamental funds, it may be an implicit assumption within the investment process. Regardless of fund type, portfolio managers should understand target risk levels and when changes in the market environment might require trading to adjust portfolio risk back to targeted volatility.

Portfolio managers may also trade to hedge risks when they do not have a view on the specific risk in question. For example, a global fixed-income long/short manager without strong currency views may choose to minimize currency exposure through a currency hedging trade. A fixed-income manager who wants to trade expected changes in the shape of the yield curve may not have a view on the level of the yield curve. In this case, the manager's yield curve trade would incorporate a hedge for duration risk. A manager of a high-yield bond portfolio may need to manage portfolio sector risk as well as geographical risk. Although credit default swaps (CDSs) might be used to manage this type of risk, finding a counterparty for a more specialized CDS can be difficult and costly. Because few derivatives to manage these risks exist, the underlying cash securities are generally traded. Using more illiquid securities for these risk trades generally increases the difficulty and cost of implementation.

A portfolio manager using option strategies may want to hedge the portfolio against certain risk factors: for example, the buyer of a long straddle position (a long position in a call and a put option on the same underlying security, both with the same strike price) who is implementing a view on higher expected volatility, irrespective of whether higher volatility will lead to higher or lower security prices. This is inherently an investment view on volatility that requires hedging directional price movement in the security.

The amount and nature of trading required for risk management generally depend on the risk profile of the portfolio as well as the amount of leverage used in the fund. Although various

types of funds permit the use of leverage, leverage is typically used more by hedge funds that hold both long and short positions. For highly levered funds, risk must be monitored closely because the portfolios can quickly accumulate large losses with sudden increases in market risk. This strong risk sensitivity makes trading for risk management crucial.

## 2.3. Cash Flow Needs

A considerable amount of trading for portfolios is neither return seeking nor for risk management purposes but instead is driven by cash flow needs. Cash flow needs may involve high or low trade urgency depending on their nature. For example, collateral/margin calls could require close-to-immediate liquidation, whereas a fund redemption due to longer-term client asset allocation changes might not require immediate liquidation.

This type of trading is often client driven, arising from fund inflows (orders, mandates) and outflows (redemptions, liquidations). Fund inflows and outflows require capital to be invested or positions to be liquidated. To minimize cash drag on a portfolio, or fund underperformance from holding uninvested cash in a rising market, fund inflows may be equitized using futures or ETFs until the next portfolio rebalance or positions in the underlying can be traded. Equitization in this case refers to a strategy of temporarily investing cash using futures or ETFs to gain the desired equity exposure before investing in the underlying securities longer term. Equitization may be required if large inflows into a portfolio are hindered by lack of liquidity in the underlying securities. For example, a large inflow into a small-capitalization equity portfolio often cannot be invested immediately in the underlying stocks owing to limited market liquidity. Instead, the manager may equitize the cash using equity futures or ETFs and then gradually trade into the underlying positions and trade out of the futures/ETF position. For client redemptions, fund holdings may need to be liquidated if redemptions are larger than expected and cannot be funded by portfolio cash or offsetting fund inflows. Currency trades in which one currency needs to be exchanged (traded) into another may be required if fund inflows or outflows are not in the desired currency for receipt or payment. Many funds offer daily liquidity, which means investors can invest or redeem on a daily basis, often without limitation. Cash positions for these funds must be carefully managed in order to satisfy all fund flows and, at the same time, minimize the fund's cash drag. Trading is often required to manage the fund's cash position appropriately.

Hedge funds often have lockup periods in which fund redemptions are made according to a regular schedule, such as calendar quarter-ends. The stated objective is to protect remaining investors from incurring transaction charges resulting from other investors' redemption activity. These types of fund liquidations generally must be requested in advance to allow fund managers time to trade out of potentially illiquid positions and thereby minimize trading costs.

In most cases, client redemptions are based on the fund's net asset value (NAV), where NAV is calculated using the closing price of the listing market for listed securities. Clients receive proceeds based on the fund's NAV calculation. In these cases, trading at the closing price eliminates the risk (to the fund and the trader) associated with executing at prices different from those used to calculate the fund's NAV and resulting redemption proceeds.

Trading to raise or invest cash proceeds may not require specific securities to be traded to meet cash flow needs. Instead, these trades may involve strategically choosing from those securities considered optimal to trade from a risk–return or cost perspective. Trade size and security liquidity considerations play a determining role, and understanding trade-offs between costs, liquidity, and other factors is key. For example, selling a liquid security that generates a substantial tax liability is preferred over selling an illiquid security that has a smaller associated tax liability with substantially higher trading costs that overwhelm any savings in tax liability. Similar considerations apply to risk–return and liquidity trade-offs.

## **2.4. Corporate Actions/Index Reconstitutions/Margin Calls**

Trading may also be necessitated by such activity as corporate actions and operational needs (e.g., dividend/coupon reinvestment, distributions, margin calls, and expiration of derivative contracts). The companies held in a manager's portfolio might be undergoing corporate actions, such as mergers, acquisitions, or spinoffs, that require trading. Cash equity dividends or bond coupons may need to be reinvested. For funds that make regular distributions, the timing of distributions may not align with the timing of dividends or coupons received on the individual securities. Therefore, raising proceeds for fund distributions may require individual holdings to be sold to meet distribution needs.

Cash needs can also arise from margin calls on leveraged positions as portfolio managers are asked to increase cash collateral on trades that have moved against them. Margin or collateral calls may drive high levels of trade urgency, given a need for the immediate sale of portfolio holdings. For example, the use of derivatives within a portfolio often requires collateral posting, which can necessitate a move to more liquid government bonds or cash in order to meet or fund collateral requirements.

Long-only managers may manage funds using a market-weighted index as a benchmark (e.g., the S&P 500, the MSCI World Index). If the benchmark constituents change, it could affect the manager's desired portfolio composition. If the manager runs an active portfolio, in the case of a change in index constituents, the manager might choose to sell holdings in a security that has been removed from the benchmark index.

For index tracking portfolios, such index changes as additions, deletions, and constituent



weight changes are generally traded in the manager's portfolio to reflect benchmark exposure. Since the fund's NAV is calculated using the official market close for each security, trading index changes at the closing price ensures that the same price is used for fund and benchmark valuation (which also uses the closing price in its calculation) and thus minimizes the fund's tracking error to the benchmark index.

## IN-TEXT QUESTION

The trading desk of a large firm receives three orders from the senior portfolio manager. Based on his research, the portfolio manager has identified two investment opportunities: a short-term stock buy and a longer-term stock sell. The third order is to raise proceeds to accommodate an end-of-day client withdrawal from the fund.

Discuss the motivation to trade and the associated trade urgency for each order:

- a. Short-term buy
- b. Longer-term sell
- c. Client withdrawal

## Solution:

- a. This is a profit-seeking trade because the portfolio manager has identified the short-term buy as an investment opportunity. Short-term profit-seeking trades typically involve higher levels of trade urgency as managers attempt to realize short-term alpha before it dissipates (decays). These managers seek to transact before the rest of the market recognizes the mispricing and as a result are less price sensitive and more aggressive (seek to transact at accelerated rates) in their trading.
- b. This is a profit-seeking trade because the portfolio manager has identified the longer-term sell as an investment opportunity. Managers seeking long-term profits are typically more patient in trading and willing to wait for favorable prices by spreading executions over a longer time horizon, which may be days or weeks. Managers trading for long-term profits generally have much lower trade urgency for these orders.
- c. This is a cash flow–driven trade arising from the need to raise proceeds for the client withdrawal. For funds that offer daily liquidity, clients can invest and redeem at the end of each trading day. In this case, managers raising proceeds for client withdrawals will generally target end-of-day closing prices to match trade prices to those used to calculate the fund's valuation and redemption proceeds to the client. Hedge funds that hold less liquid positions may allow redemptions only at quarter-



end and with a relatively long notice period (e.g., one month), allowing them more time to sell illiquid positions. Client-driven redemptions usually involve much lower levels of trade urgency.

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## 3. TRADING STRATEGIES AND STRATEGY SELECTION

### **b. discuss inputs to the selection of a trading strategy**

Once a portfolio manager has made an investment decision, the portfolio manager and the trader must work together to identify the most appropriate trading strategy to meet the portfolio manager's trade objective given cost, risk, and other considerations. Selecting the appropriate trading strategy involves a number of important trade input considerations to ensure the strategy is transacted in the most efficient manner possible.

### 3.1. Trade Strategy Inputs

In addition to a portfolio manager's motivation to trade, other factors play a role in the selection of a trading strategy by affecting trade urgency, expected costs, and risks for the desired trade. Portfolio managers can manage the trading costs and execution risks they incur through their selection of an appropriate trading strategy.

Key inputs for trade strategy selection include

- order characteristics,
- security characteristics,
- market conditions, and
- individual risk aversion.

#### 3.1.1. *Order Characteristics*

Order-related considerations include the following:

- **Side:** the side or trade direction of the order—for example, buy, sell, cover, or short
- **Size:** the total amount or quantity of the security being transacted
- **Relative size (% of ADV):** order size as a percentage of the security's average daily volume (ADV)

The side of the order, such as buy or sell, may be important when there is expected price momentum associated with trading the security or when trading a basket of securities where managing the risk of the entire trade list is required. If prices are rising, executing a buy order may take longer than executing a sell order, given the presence of more buyers (liquidity demanders) than sellers (liquidity suppliers) in the market. Trading a list that consists of only buys or only sells will have greater market risk exposure than a list of buys and sells in which the securities have offsetting market risk exposures.

Order size is the amount or quantity of the security being traded. Larger order sizes create greater market impact in trading. Market impact is the adverse price movement in a security caused by trading an order and is one of the most significant costs in trading. Larger orders usually take longer to trade than smaller orders do, and portfolio managers will often trade larger orders in a more patient manner (lower trade urgency) to reduce market impact. All else equal, trading larger order sizes more quickly will increase market impact cost whereas trading smaller order sizes more slowly will decrease market impact cost.

To have a consistent order size measure across securities, portfolio managers often divide the order size by the security's ADV. For example, a 1 million share order in Stock ABC may be much different than a 1 million share order in Stock XYZ. If Stock ABC has an average daily volume of 50 million shares, the 1 million share order represents 2% (1 million/50 million) of ADV. If Stock XYZ has an average daily volume of 4 million shares, its order represents 25% (1 million/4 million) of ADV. The larger the size of the trade expressed as a percentage of ADV, the larger the expected market impact cost.

### **3.1.2. Security Characteristics**

Security-related considerations include the following:

- **Security type:** the type of security being traded (underlying, ETF, American depositary receipt, global depositary receipt)
- **Short-term alpha:** the expected price movement in the security over the trading horizon

- **Price volatility:** the annualized price volatility of the security
- **Security liquidity:** the liquidity profile of the security (e.g., ADV, bid–ask spread, average trade size)

The security type distinguishes the instrument being traded and can include underlying securities, ETFs, American depositary receipts (ADRs), global depositary receipts (GDRs), derivative contracts, and foreign exchange currencies. Identifying the best means of exposure—for example, whether to trade a foreign security in its local market or trade its associated ADR (if US listed) or GDR (if non-US listed)—requires an evaluation of the trade-offs. Trading costs and liquidity will vary by local exchange. Gaining emerging market exposure, in particular, may be less expensive and operationally easier when trading available ADRs and GDRs than when trading the security in the local market. In addition, compliance, regulatory, and custody costs can be lower with ADRs and GDRs.

Short-term alpha in a trading context is the expected movement in security price over the trading horizon (independent of the trade's impact). Short-term alpha (also called *trading alpha* or *trade alpha*) may arise from an appreciation, a depreciation, or a reversion (i.e., reversal) in security price.

*Alpha decay* is the erosion in short-term alpha that takes place after the investment decision has been made. Alpha decay results from price movement in the direction of the investment forecast and occurs regardless of whether the trade takes place. Alpha decay is a function of the time required for a relevant piece of information (used by a portfolio manager to form her investment view) to be incorporated into a security's price. If this information is rapidly incorporated into the security's price, then its alpha is considered to decay quickly. High rates of alpha decay, or alpha loss, require faster, or more accelerated, trading to realize alpha before it is traded on by other market participants.

Depending on the expected rate of alpha decay, portfolio managers may be better off trading the order faster (higher trade urgency) or slower (lower trade urgency). In an adversely trending market—for example, buying in a rising market or selling in a falling market—portfolio managers may trade at an accelerated rate if less favorable prices are expected later in the trading horizon. In a favorably trending market—for example, buying in a falling market or selling in a rising market—portfolio managers are better off trading more slowly to execute at more favorable prices expected later in the trading horizon. Adverse price movements increase trading costs, whereas favorable price movements decrease trading costs.

The price volatility of a security primarily affects the execution risk of the trade. *Execution risk* is the risk of an adverse price movement occurring over the trading horizon owing to a change in the fundamental value of the security or because of trading-induced volatility. Execution risk is often proxied by price volatility. Securities with higher levels of price volatility have greater exposure to execution risk than securities with lower price volatility.

A security's liquidity profile affects how quickly the trade can be executed, in addition to expected trading cost, and is a significant consideration in determining trade strategy. All else being equal, greater liquidity reduces execution risk and trading costs, such as market impact. Bid-ask spreads indicate round-trip trading costs for trades of a given maximum size (as they are associated with a maximum quantity). As a result, bid-ask spreads indicate both trading costs and the amount of a security that can be traded at a given point in time (market depth), which affects how larger trades might need to be broken down into smaller orders for trading. Average trade sizes observed in past data provide additional information on quantities that can be traded at reasonable trading costs for a given security.

### 3.1.3. Market Conditions

Inputs relating to market conditions include the following:

- **Liquidity crises:** deviations from expected liquidity patterns due to periods of crisis

Market liquidity refers to the liquidity conditions in the market at the time the order is traded. At the time of trading, current or realized market conditions, such as traded volumes, price volatility, and bid-ask spreads, are additional factors that affect trade strategy selection, given that real-time market conditions are likely to be different from those anticipated and the conditions at the time the investment decision was made.

During market events or crises, the volatility and liquidity of the market and the security will be critical to consider as conditions result in sudden and significant deviations from normal trade patterns. Such seasonal considerations as local market holidays and quarter-end or year-end dates may have more predictability in their liquidity variations and are also important to consider.

Security liquidity will also change over time, often because of changes in market-wide liquidity. For example, in August 2007, stocks with high exposure to widely used quantitative factors became very hard to liquidate as many quantitative asset managers tried to reduce their exposures to certain factors around the same time. In the fall of 2008, during the credit crisis, short selling in certain stocks, mostly financials, was banned. During this time, many structured credit securities became "toxic assets" and became extremely difficult to liquidate.

Even during "normal" market environments, liquidity will vary. For example, over time certain companies reach market values that may result in them being added to or removed from widely used equity indexes. When this happens, their stocks' liquidity often improves or deteriorates as their shares become more widely or more narrowly held. Government bonds are generally liquid as long as they are the most recently issued (so-called on the run) among a particular bond type. However, once they become off-the-run bonds, their liquidity generally decreases.

Moreover, market volatility and liquidity are dynamic. They are also generally negatively related, which becomes apparent especially during periods of crisis, when volatility increases and liquidity decreases. For example, during the 1987 stock market crash, the Long-Term Capital Management crisis in 1998, and the global financial crisis in 2008, market volatility increased sharply and market liquidity collapsed. Portfolio managers can be hurt in such environments: Lower liquidity might suggest a longer trading horizon for order completion, but higher volatility might lead people to speed up their trades and incur higher costs. However, as trading horizon lengthens, market risk increases, particularly during periods of high volatility.

#### ***3.1.4. User-Based Considerations: Trading Cost Risk Aversion***

In addition to order, security, and market considerations, the risk aversion of the individual(s) trading affects trade strategy selection.

Risk aversion is specific to each individual, and in a trading context, it refers to how much risk the portfolio manager or trader is willing to accept during trading. A portfolio manager or trader with a high level of risk aversion is likely to be more concerned about market risk and will tend to trade with greater trade urgency to avoid the greater market exposure associated with trading more patiently. A portfolio manager with a low level of risk aversion might be less concerned about market risk and may tend to trade more patiently (more passively), with lower levels of trade urgency.

#### ***3.1.5. Market Impact and Execution Risk***

The temporary market impact cost of trading an order is the often short-lived impact on security price from trading to meet the need to buy or sell. For example, in situations where a portfolio manager is looking to buy shares but there are not enough sellers in the market to complete the order, the portfolio manager will need to increase his buying price to attract sellers to complete the order. In situations where a portfolio manager is looking to sell shares but there are not enough buyers in the market to complete the order, the portfolio manager will need to decrease his selling price to attract buyers to complete the order. In these situations, there is usually price reversion after the trade has been completed since the price change was driven by short-term buying or selling pressure rather than a fundamental change in security value. Therefore, post-trade prices should revert, with prices decreasing after buy order completion and increasing after sell order completion.

The permanent component of price change associated with trading an order is the market price impact caused by the information content of the trade. Trading in the market often conveys information to other market participants that the asset may be under- or overvalued. If market participants discover there are more buyers demanding liquidity than sellers

supplying liquidity, the market interprets this situation as the pricing being relatively too low and prices will move in the direction of the trade imbalance on average. In this case, market participants will increase their selling price.

If market participants find out that there are more sellers than buyers, the market interprets this situation as the pricing being relatively too high and market participants will decrease their buying price. In other words, market participants may believe there is some information component of the trade that is causing the counterparty to buy or sell shares in the market that they have not yet discovered or incorporated into their own asset valuations. Therefore, market participants will adjust the price at which they are willing to buy or sell to reflect this potential new information.

To minimize information leakage, which may result in market participants adjusting the prices at which they are willing to buy or sell, portfolio managers may attempt to hide their trading activity by executing orders across different venues and using a mix of order types, such as market and limit orders. Market (marketable) orders instruct execution at the best available price at the time of trading, whereas limit orders instruct execution at the best available price as long as the price is equal to or better than the specified limit price—that is, a price equal to or lower than the limit price in the case of buys and equal to or higher in the case of sells. To hide their activity, portfolio managers will also trade less on displayed venues (e.g., exchanges with greater trade transparency regarding the intentions of market participants) and make greater use of dark pool venues.

Execution risk—the risk of adverse price movement during the trading horizon due to a change in the fundamental value of the security—arises as time passes and occurs even if the order is not traded. Trading faster (greater trade urgency) results in lower execution risk because the order is executed over a shorter period of time, which decreases the time the trade is exposed to price volatility and changing market conditions. Trading slower (lower trade urgency) results in higher execution risk because the order is executed over a longer period of time, which increases the time the trade is exposed to price volatility and changing market conditions.

### **Trader's dilemma.**

To alleviate the market impact effect of entering a large order into the market, traders will “slice” the order into smaller pieces to trade over time. This results in a lower market price impact on the value of the asset, but in trading in smaller pieces over time, the fund is exposed to market risk, which could result in an even higher trading cost than if the order was entered into the market in its entirety. This phenomenon is known as the trader's dilemma and is stated as follows:

Trading too fast results in too much market impact, but trading too slow results in too much market risk.

The goal in selecting a trading strategy is to choose the best price–time trade-off given current market conditions and the unique characteristics of the order.

## IN-TEXT QUESTION

Discuss how order size and security liquidity considerations affect market impact and execution risk for an order.

### Solution:

Trading a large order creates greater market impact than trading a smaller order, all else being equal. To minimize market impact, large orders are often traded over longer trade time horizons, which increases the corresponding execution risk of the order. Smaller orders have less market impact and can be traded more quickly over shorter time horizons, with lower associated execution risk. The liquidity profile of a security has important implications for trading strategy. More liquid securities (higher traded volumes, tighter bid–ask spreads, etc.) have lower levels of market impact and execution risk given that they can be transacted over shorter time horizons with greater certainty of execution. Finally, higher rates of alpha decay would speed up order execution time horizons and increase market impact costs given greater trade order urgency, whereas lower rates of alpha decay would increase trade time horizons and associated execution risk.

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## 4. REFERENCE PRICES

### c. compare benchmarks for trade execution

*Reference prices*, also referred to as *price benchmarks*, are specified prices, price-based calculations, or price targets used to select and execute a trade strategy. Reference prices are used in determining trade prices for execution strategy and in calculating actual trade costs for post-trade evaluation purposes. Following is a discussion of reference prices used in the selection and execution of a trade strategy.

Reference prices are categorized as follows:

- pre-trade benchmarks, where the reference price for the benchmark is known before

trading begins;

- intraday benchmarks, where the reference price for the benchmark is computed on the basis of market prices that occur during the trading period;
- post-trade benchmarks, where the reference price for the benchmark is established after trading is completed; and
- price target benchmarks, where the reference price for the benchmark is specified as a price to meet or beat (transact more favorably).

## 4.1. Pre-Trade Benchmarks

A pre-trade benchmark is a reference price that is known before the start of trading. For example, pre-trade benchmarks include decision price, previous close, opening price, and arrival price. A pre-trade benchmark is often specified by portfolio managers who are buying or selling securities on the basis of decision prices (the price at the time the investment decision was made) or seeking short-term alpha by buying undervalued or selling overvalued securities in the market. Portfolio managers making trading decisions based on quantitative models or portfolio optimizers that use historical trading prices, such as the previous close, as model inputs may also specify a pre-trade benchmark.

### 4.1.1. *Decision price*

The **decision price** benchmark represents the security price at the time the portfolio manager made the decision to buy or sell the security. In many situations, portfolio managers have exact records of the price when they decided to buy or sell the security. Quantitative portfolio managers will often have records of their decision price because these prices may be inputs into their quantitative models.

There are times, however, when portfolio managers do not have a record of their decision price. In these situations, portfolio managers may decide to buy or sell securities on the basis of long-term growth prospects or higher-than-expected return potential and will specify the previous close or opening price as their reference price benchmark.

### 4.1.2. *Previous close*

The previous close benchmark refers to the security's closing price on the previous trading day. A previous close benchmark is often specified by quantitative portfolio managers who



incorporate the previous close in a quantitative model, portfolio optimizer, or screening model. The previous close is often used as a proxy for the decision price by quantitative portfolio managers.

### **4.1.3. Opening price**

An opening price benchmark references the security's opening price for the day. This benchmark price is most often specified by portfolio managers who begin trading at the market open and wish to minimize trading costs. The opening price is often used as a proxy for the decision price by fundamental portfolio managers who are investing in a security for long-term alpha or growth potential. Portfolio managers may choose an opening price instead of the decision price or previous close because, unlike a reference price from the prior day or earlier, the opening price does not have associated overnight risk, or the risk that prices will adjust at market open to incorporate information released after the close of the previous business day.

If the trade is to be executed in the opening auction, then using the opening price as a reference benchmark is not appropriate because the trade itself can influence the reference benchmark. An auction in this case is a market where buyers compete for order execution and orders are aggregated for execution at a single price and point in time. An auction taking place at market open is referred to as an opening auction, and one taking place at market close is a closing auction. The impact of trading any amount of the order in the opening (or closing) auction would be incorporated in the opening (or closing) price auction calculation, thus inappropriately influencing the reference benchmark level.

### **4.1.4. Arrival price**

The **arrival price** is the price of the security at the time the order is entered into the market for execution. Portfolio managers who are buying or selling on the basis of alpha expectations or a current market mispricing will often specify an arrival price benchmark. In these cases, the portfolio manager's goal is to transact at or close to current market prices in order to complete trade execution and realize as much potential alpha as possible. Portfolio managers looking to minimize trading cost will also in many cases specify the arrival price as their benchmark.

## **4.2. Intraday Benchmarks**

An intraday price benchmark is based on a price that occurs during the trading period. The most common intraday benchmarks used in trading are volume-weighted average price

(VWAP) and time-weighted average price (TWAP).

Portfolio managers often specify an intraday benchmark for funds that are trading passively over the day, seeking liquidity, and for funds that may be rebalancing, executing a buy/sell trade list, and minimizing risk. Portfolio managers who do not expect the security to exhibit any short-term price momentum commonly select an intraday benchmark.

#### **4.2.1. VWAP**

The VWAP benchmark price is the volume-weighted average price of all trades executed over the day or the trading horizon. Portfolio managers may specify the VWAP benchmark when they wish to participate with volume patterns over the day.

Portfolio managers who are rebalancing their portfolios over the day and have both buy and sell orders may select the VWAP as a price benchmark. In these situations, the preference is to participate with market volume. Exposure to market risk is reduced in this case by having a two-sided trade list of buys and sells, as opposed to a trade list containing all buys or all sells. Portfolio managers who are rebalancing and using cash from sell orders to purchase buy orders will also often select an intraday benchmark, such as VWAP. Doing so allows the portfolio managers to structure their executions over time to ensure cash received from sell orders is sufficient to fund remaining buy orders. If trades are not executed properly, portfolio managers could be short cash for buy orders and need to raise additional money for order completion.

#### **4.2.2. TWAP**

The TWAP benchmark price is defined as an equal-weighted average price of all trades executed over the day or trading horizon. Unlike VWAP, TWAP price does not consider volume traded and is simply the average price of trades executed over the specified time horizon. Portfolio managers may choose TWAP when they wish to exclude potential trade outliers. Trade outliers may be caused by trading a large buy order at the day's low or a large sell order at the day's high. If market participants are not able to fully participate in these trades, then TWAP may be a more appropriate choice. The TWAP benchmark is used by portfolio managers and traders to evaluate fair and reasonable trading prices in market environments with high volume uncertainty and for securities that are subject to spikes in trading volume throughout the day.

### **4.3. Post-Trade Benchmarks**

A post-trade benchmark is a reference price that is determined at the end of trading or sometime after trading has completed. The most common post-trade benchmark is closing price. Portfolio managers for funds valued at the closing price on the day or who wish to minimize tracking error to an underlying benchmark price, such as index funds, often select a post-trade reference price, such as the official closing price. In this case, the objective is to target consistency between the trade execution price and the price used in fund valuation and benchmark calculation.

#### **4.3.1. Closing price**

The closing price is typically used by index managers and mutual funds that wish to execute transactions at the closing price for the day. For managers with index mandates, where the fund's securities are typically valued using the official market close for each security, it is important to know how close their executions are to the benchmark price, which also uses the official market close in its calculation. A portfolio manager who is managing tracking error to a benchmark will generally select a closing price benchmark since the closing price is the price used to compute the fund's valuation and resulting tracking error to the benchmark.

An advantage of the closing price benchmark is that it provides portfolio managers with the price used for fund valuation and thus minimizes potential tracking error. A disadvantage is that the benchmark price is not known until after trading is completed. Thus, portfolio managers have no way of knowing whether they are performing more or less favorably relative to the benchmark until after trading is completed.

### **4.4. Price Target Benchmarks**

Portfolio managers seeking short-term alpha may select an alternative benchmark known as a price target benchmark. In this case, a portfolio manager would like to transact in a security—believed to be undervalued or overvalued—at a more favorable price. For example, if a stock currently trading in the market at \$20.00 is believed to be undervalued by \$0.50, the portfolio manager will seek to purchase shares by specifying a price target of \$20.50 or better (better being lower than \$20.50 in the case of a buy). In this example, the benchmark price is specified as the perceived fair value price of \$20.50. In this setting, the portfolio manager wishes to purchase as many order shares as possible at a price equal to or better (lower) than the specified price target.

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## **5. TRADING STRATEGIES**

#### **d. recommend and justify a trading strategy (given relevant facts)**

The primary goal of any trading strategy is to balance the expected costs and risks associated with trading the order in the market consistent with the portfolio manager's trading objectives, risk aversion, and other known constraints. A portfolio manager's motivation to trade, risk aversion, trade urgency for the order, and other factors, such as order size and market conditions at the time of trading, are thus key in determining an appropriate trade strategy.

Will the value in completing the trade dissipate if the trade is not completed in a timely enough manner? Trade urgency, the importance of execution certainty, is critical in determining trade strategy. For alpha-driven trades, trading with greater urgency to maximize short-term alpha capture must be weighed against the costs of trading faster and expected alpha decay. For trades with low or no trade urgency, trading over a longer trade horizon or at the market close may be optimal.

Portfolio managers also have expectations or insights regarding short-term market conditions, such as price trends and market liquidity, particularly if these factors are used in the security selection process. For example, does the stock exhibit momentum, where any observed trend will continue through the end of the day, or does the stock exhibit reversion, where the observed trend is more likely to reverse during the day? Portfolio managers may also have insights into expected trading volumes for assets and whether trading volumes may be expected to continue or may reverse in direction. Traders will also have insights regarding volume patterns and potential information leakage during execution. These expectations combined with actual market conditions at the time of trading help inform an appropriate trade strategy.

The selection of a trade strategy is best illustrated through a discussion of common trade types. Trading strategies for the following types of trades involving equities, fixed income, currency, and derivatives are explained in this section:

- **Short-term alpha:** short-term alpha-driven equity trade (high trade urgency)
- **Long-term alpha:** long-term alpha-driven fixed-income trade (low trade urgency)
- **Risk rebalance:** buy/sell basket trade to rebalance a fund's risk exposure
- **Cash flow driven:** client redemption trade to raise proceeds
- **Cash flow driven:** cash equitization (derivatives) trade to invest a new client mandate

## 5.1. Short-Term Alpha Trade

A portfolio manager has determined that the market has overreacted to weak earnings announced in the pre-market trading session for Stock XYZ. The stock price is trading at a significant discount in the pre-market relative to the portfolio manager's valuation and now represents a significant buying opportunity based on the portfolio manager's analysis. The portfolio manager would like to buy 50,000 shares, which represents 10% of the stock's average daily volume. Based on the heavy pre-market trading, however, the trader believes that this order will only constitute 2% of the day's volume.

The pre-market price is currently \$50, down \$15 relative to the previous night's close. The portfolio manager believes that the stock's fair value is in the low \$60 range and sets her limit price at \$60.

In this situation, the portfolio manager believes that the market has overreacted to the weak earnings announced by the company. If she is correct and the market eventually adopts her view going forward, Stock XYZ's price should increase closer to her estimated fair value in the low \$60 range. In setting her limit price of \$60, the portfolio manager is also specifying the reference price for the trade, which, in this case, represents a price target benchmark.

Given the possibility of short-term price increases in XYZ, this order has associated trade urgency and the trader does not have the benefit of trading the order passively (such as using a VWAP or TWAP participation strategy) during the day, since XYZ's price could increase to fair value at any time. To trade this order, the trader would not likely attempt to use dark pool venues, given their greater risk of unfilled executions if offsetting orders do not arrive. The trader will likely want to trade a portion of the order in the opening auction and then continue trading any residual in the open market. Doing so provides greater execution certainty, which is important in this situation given the trade urgency of the order.

Since the order represents approximately 2% of expected volume, the trader would not likely place the full order into the opening auction. Research shows the US opening auction typically makes up between 1% and 4% of a day's volume,<sup>2</sup> so sending the entire order into the opening auction would result in the ordering being roughly 50%–200% of the expected opening auction volume, on average. Because this is an unusual trading day, the trader could use volume information from pre-market trading and any auction-related data made available by the exchanges to determine the optimal amount to place into the opening auction.

Given the trade urgency of the order, the very liquid market for XYZ, and the order size not being large relative to XYZ's expected volume, the trader could trade any remaining shares using an arrival price trade strategy that would attempt to execute the remaining shares close to market prices at the time the order was received. This strategy could be executed using a programmed strategy to electronically execute, also known as an algorithm, such as an arrival price algorithm. Most importantly, the trader will want to make sure that the orders

sent to the auction and traded in the open market use limit prices consistent with the portfolio manager's price view, reflected in her limit price of \$60.

## 5.2. Long-Term Alpha Trade

A portfolio manager believes that a company whose bonds he holds is likely to experience a deteriorating credit position over the next year. The deterioration in credit is expected to be gradual as information becomes available over the next several quarters, confirming the company's deteriorating financial position. The portfolio manager's position is not large in aggregate, but the market for these bonds is not very active, with infrequent transactions and low volumes. The portfolio manager approaches the trader to determine how best to liquidate his holdings in the bond so that he can exploit his view while still getting a favorable execution.

Because the market for these bonds is not very liquid, it is likely the trader will need to approach various dealers to get quotes for these bonds. Given the portfolio manager's view that the deterioration in credit will occur gradually over the coming year, there is no order urgency from a trading perspective. Because the position is not large, the trader believes he could execute it over the next day or two if needed.

The trader, however, may not want to execute this quickly for two reasons. First, the sudden trading in an illiquid security may inadvertently leak information, leading the dealer involved to think the order is an information-based trade and consequently to price the trade less favorably for the trader. Second, requiring dealers to take on substantial illiquid inventory exposes them to risk, for which they will demand compensation in the form of inferior (unfavorable) pricing.

Therefore, a reasonable trade approach would be to sell these bonds off gradually over the course of a few days or even weeks, depending on the relative size of the bond holdings and their liquidity. By selling off smaller portions, varying the amounts sold, and trading over a longer execution horizon, the trader can reduce information leakage regarding the order and avoid placing pressure on dealer inventories, which would result in inferior pricing. Using this approach, the dealers will likely provide better (more favorable) initial quotes, and subsequent quotes may also be more favorable if the dealers have enough time between trades to reduce their inventory.

The use of reference prices for fixed-income trades executed over multiple days is not widespread and can be difficult in practice. A decision price, for example, would not only capture market impact and alpha loss but would also reflect unrelated market moves, which can be much larger than the former when a trade is spread out over days or weeks. Impact costs, for example, would decrease as the trade horizon lengthens, whereas price volatility impact would increase with time.

## 5.3. Risk Rebalance Trade

A macro fund manager is concerned that potential trade tariffs and a deteriorating financial situation in a number of key emerging markets may lead to a significant increase in currency volatility. The manager is holding long and short developed market currency positions and has, so far, not seen a significant impact on his fund's valuation because the fund's long and short positions have been constructed to offset one another, immunizing the fund from sudden price moves. The fund's mandate, however, specifies a target risk level of 10%. With the increase in volatility, the fund's risk level is currently closer to 14%. Although the increase has not caused the portfolio to breach any guidelines, the portfolio manager believes that volatility will remain at current levels for the next several months and wishes to reduce risk in a controlled and gradual manner by liquidating positions to bring the fund's volatility back to its target risk level. The portfolio manager approaches a trader to discuss an appropriate strategy.

In this situation, the macro fund manager is holding long and short positions and has no view as to whether the fund's value will rise or fall in the near term owing to the sudden increase in volatility. Consequently, the hedge fund manager simply wishes to reduce current positions (as opposed to rebalancing the fund's relative positions). The holdings in developed market currencies are actively traded, and it is unlikely the positions are large enough that they would dislocate (substantially move) the currency markets, as long as trading is done in an appropriate manner.

Although volatility has significantly increased, the risk exposure of the trade is more limited if the list of buys and sells is balanced in market risk exposure, such as a buy/sell trade list with a net beta of approximately zero (i.e., the trade-weighted average beta of the securities traded is zero). Therefore, the trader does not have the same trade urgency as a trade with a positive or negative net beta, such as one containing all buys or all sells, which might involve significantly more risk arising from exposure to potential market movement. Risk-averse market participants will typically have greater trade urgency for trades that have directional market exposure than for trades that are balanced, or hedged, in market exposure.

Since the portfolio is not in breach of its guidelines and the portfolio manager wishes to reduce risk on a controlled and gradual basis, the trader can trade this order in a passive manner to lower the fund's risk level. In this situation, using a TWAP reference price for the trade and a TWAP algorithm to execute over the next day or two (or longer, depending on the size of the position) would be an appropriate trading strategy. By trading all the orders over the same trading horizon using a TWAP strategy, the trader is maintaining the hedge that exists between the buys and sells, which helps reduce execution risk. And because currency markets in developed economies are very liquid and deep, trading algorithmically will not likely dislocate prices.



## 5.4. Client Redemption Trade

A client has decided to redeem its position in a small-cap/mid-cap value fund managed by ABC Investment Advisers. The fund holdings are US small- and mid-cap stocks, with the only constraints being that the stocks satisfy the criteria of the fund (e.g., stocks meet the definition of a small- or mid-cap stock, stocks are listed on a major exchange). Client redemptions from the fund are done at the fund's net asset value at the close of trading, where the NAV is calculated using the closing price of the stock's listing market. To raise the necessary cash to meet the client redemption request, the portfolio manager asks the trader to sell 0.1% of every position held in the fund.

In this scenario, the client will receive the NAV of the fund *regardless of how well or poorly the trader executes the trade*. Therefore, the trader bears risk (for executing at any price other than the closing price) unless she can guarantee that each position is executed at the closing price. A closing price reference price is, therefore, most appropriate for this trade. Because these stocks are traded on either the NASDAQ or the NYSE, the trader can send the order to the closing auction for these exchanges and receive the auction-guaranteed closing price on all orders submitted to the auction. Such a strategy eliminates all potential risk of executing at prices that are different from those used to calculate the fund's NAV.

However, the trader should make sure that the size of the orders does not have an undue impact on the closing price. Executing a relatively large sell order in the closing auction (e.g., 50% of the closing volume) may lead to a significant price decline at the close, lowering calculated NAV and resulting in less cash being returned to the client.

Following a strategy to receive a guaranteed closing price on all orders submitted eliminates risk to the fund (and trader) since the client is receiving proceeds at NAV. From a fiduciary standpoint, however, trading in a manner that will lead to a poorer (less favorable) execution for a client is inappropriate. An alternative approach that portfolio managers follow when their trades are large relative to expected liquidity in the closing auction is to execute in the market and in the closing auction. For example, they would identify a reasonable amount to send to the closing auction (e.g., 90% of the order to be sent to the closing auction), trade the order remainder in the market prior to the close of trading (e.g., 10% of the order to be traded VWAP in the market up to the close of trading),<sup>3</sup> and then send the identified amount (90% of the order) to the closing auction.

## 5.5. New Mandate Trade

An investment manager has just been awarded a \$150 million mandate to track the Russell 2000 Index benchmark with a 3% tracking error. The investment manager and the client have agreed that performance measurement of the mandate will begin at the current day's close.



The appropriate reference price for the trade is, therefore, also the closing price. Given the large size of the investment mandate, the trader is concerned that trading into the positions at the close of trading will cause significant price impact. The trader would instead prefer to trade into the positions over multiple days. The client, however, requests that the mandate be fully invested as quickly as possible. The portfolio manager for the fund also prefers not to have the fund holding cash, given that the performance evaluation for the mandate begins as of the close of trading. Holding a cash position in the fund exposes the portfolio manager to significant performance risk relative to the fund's Russell 2000 benchmark. For example, if the Russell 2000 increases while the fund is holding cash, the fund's uninvested cash amounts would result in underperformance (arising from cash drag) relative to the Russell 2000.

The trader can get more immediate exposure to the Russell 2000 by buying \$150 million worth of futures near the end of the trading day. After establishing this initial exposure, the trader can begin building the underlying stock positions over time and unwinding (selling) the equivalent futures exposure. This approach allows the client mandate to achieve full \$150 million exposure to the Russell 2000, eliminating the opportunity cost of holding cash balances in the fund. This approach also gives the trader additional time to establish the underlying positions, thereby receiving (hopefully) better execution prices. For smaller mandates in more liquid securities, the trader could possibly skip the equitization-via-futures step and instead invest directly in the underlying securities. For larger mandates, however, investing in the index via liquid futures contracts initially is often an effective means to equitize cash and reduce tracking error for the client mandate and fund.

Two considerations should be noted in this situation. First, futures markets may not have closing auctions, as is the case with the Russell 2000 futures contract. If no closing auction exists, the trader will likely want to time the trade as close to the benchmark close as possible; for example, in the United States, this equates to a 4:00 p.m. cash close. For a small trade that is less than the quoted size, the trader could send a market order at 4:00 p.m. For larger trades or less liquid futures, the trader may trade using a VWAP or TWAP algorithm into the market close. Second, this futures-based strategy assumes the fund's investment mandate allows the use of derivatives. If the fund's mandate does not allow the use of derivatives, such as futures, but does permit ETF usage, the trader could equitize cash using a liquid Russell 2000 ETF.

## IN-TEXT QUESTION

A portfolio manager for a global fixed-income index fund is required to trade for quarterly index changes taking place at the end of the trading day. To keep the fund in line with the anticipated index constituent changes, the portfolio manager generates a fund rebalance list consisting of buys and sells. He approaches the senior trader to discuss the best trade strategy for the list.

1. Identify the most appropriate reference price benchmark for his trade.
2. Select and justify the most appropriate trading strategy to execute his trade.

### **Solution:**

1. A closing price is the most appropriate reference price benchmark for an index fund. The portfolio manager needs to trade to maintain the same security holdings and weights as the benchmark index. Since the index fund will be valued using official closing prices, he should select the closing price as the reference price benchmark for trading the rebalance names. By executing the buys and sells at the close, he will be minimizing the fund's potential tracking error to the benchmark index.

The previous close would not be an appropriate reference price benchmark since it would be the security's closing price on the previous trading day. A previous close benchmark is often used by quantitative portfolio managers whose models or optimizers incorporate the previous close as an input or who wish to use this price as a proxy for the decision price. The opening price benchmark would not be an appropriate benchmark because it references the security's opening price on the day and is often selected by portfolio managers and traders who wish to begin trading at the market open. The opening price may also be used as a proxy for the decision price.

2. A market-on-close (MOC) trade strategy would be the most appropriate strategy for his rebalance list. Trading the rebalance list at the market's closing prices best aligns the trade execution prices with the same closing prices used for the fund's NAV and benchmark calculation, thus minimizing tracking error of the fund to the benchmark index.

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## **6. TRADE EXECUTION**

- e. describe factors that typically determine the selection of a trading algorithm class

Once the appropriate trade strategy is determined by the portfolio manager and the trader, the trade must be executed in a market and in a manner consistent with the trade strategy chosen. A variety of implementation choices are available based on the specific order, market, and

trade strategy involved. Trade implementation choices range from higher-touch approaches, which involve greater degrees of human interaction for order completion, to fully automated trade execution through electronic trading venues with varying levels of trade transparency. Higher-touch orders include principal and agency trades, the main difference being who assumes the risk of trading the order. In **principal trades**, the executing broker assumes all or part of the risk related to trading the order, pricing it into her quoted spread. In **agency trades**, the broker is engaged to find the other side of the trade but acts as an agent only, and risk for trading the order remains with the buy-side portfolio manager or trader. Electronic trading includes alternative or multilateral trading venues (ATS or MTF), direct market access (DMA), and dark pools.

## 6.1. Trade Implementation Choices

In general, trading in large blocks of securities requires a higher-touch approach involving greater human engagement and the need for a dealer or market maker to act as counterparty and principal to trade transactions.<sup>4</sup> For these transactions, also called *principal trades* or *broker risk trades*, market makers and dealers become a disclosed counterparty to their clients' orders and buy securities into or sell securities from their own inventory or book, assuming risk for the trade and absorbing temporary supply–demand imbalances. In the case of a less active security, the expected time to offset the trade for the dealer is longer. For taking on this additional risk, the dealer will demand greater compensation, generally by quoting a wider bid–ask spread.

Markets characterized by dealer-provided quotes may be referred to as *quote-driven*, *over-the-counter*, or *off-exchange markets*. In such bilateral dealer markets, customers trade at prices quoted by dealers. Depending on the instrument traded, dealers may work for commercial banks, investment banks, broker/dealers, or proprietary trading firms. Worldwide, most trading besides that in stocks, ETFs, and exchange-traded derivatives takes place in quote-driven markets, where the matching of buyers and sellers takes longer because of less frequent trading and greater market illiquidity.

In some cases, dealers may be unable or unwilling to hold the securities in their inventories and take on position (principal) risk. In agency trades, dealers try to arrange trades by acting as agents, or brokers, on behalf of the client. Brokers are often used for transactions in securities or markets in which finding a buyer or a seller is difficult.

High-touch approaches involve human sell-side traders as intermediaries. These traders, employed by sell-side brokerage firms, may first attempt to fill a customer order by matching it with offsetting orders from other customers before trying to fill it from their own position book. Crossing an order with a broker's own book is known as a broker risk trade or principal trade. If this does not occur, the broker would then route the order to the open

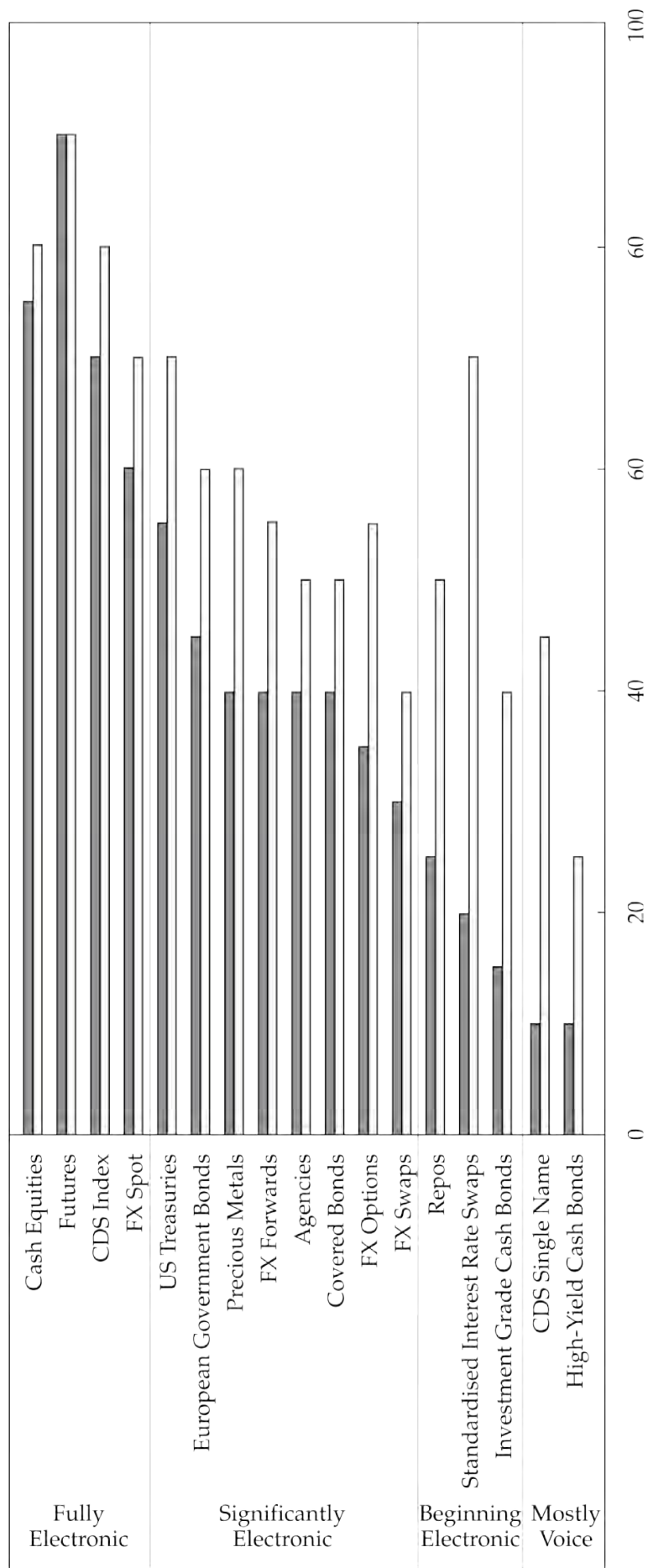
market and “slice,” or divide, the order into smaller pieces to trade in the market. This approach involves human judgment unique to each trade and is suited to trading illiquid securities in which the execution process is difficult to automate.

A variation of quote-driven markets often used to trade less liquid securities is a **request for quote** (RFQ). In RFQ markets, dealers or market makers do not provide quotes continuously but do so only upon request by a potential buyer or seller. These quotes are nonbinding and are valid only at the time they are provided.

For relatively liquid, standardized securities where continuous two-way trading may exist, buyers and sellers display prices and quantities at which they are willing to transact (limit orders) on an exchange or other multilateral trading venue. In order-driven markets, order-matching systems run by exchanges, brokers, and other alternative trading systems use rules to arrange trades. Trading is done electronically with multiple venues, often through a consolidated limit order book that presents a view of the limit buy (bid)/sell (ask) prices and order sizes for all venues with orders for a security. Centralized clearing for trades exists on those venues. Equities, futures, and exchange-traded options are generally traded using this approach.

**Exhibit 1** shows the proportion of trading that was conducted electronically in 2012 and 2015. In most asset classes, electronic trading increased over the period to more than 50% of total trading volume. Markets with higher trading activity have seen strong growth in electronic trading. For example, cash equities and futures are now predominantly traded electronically, whereas some other (generally less liquid) markets, such as high-yield bonds, still feature trading with a high-touch, manual approach.

#### **Exhibit 1. Electronic Trading in Various Asset Classes (in %)**



■ 2012 □ 2015

Automated execution approaches work well for liquid securities and most trade sizes other than extremely large orders (relative to the total volume traded of a particular security), which might require a more customized, high-touch approach. *Algorithmic trading*, or the use of programmed strategies to electronically trade orders, is well established in most equity, foreign exchange, and exchange-traded derivative markets. In fixed income, algorithmic execution is mostly limited to trading highly liquid government securities, such as US Treasury securities.

For liquid securities that trade in high volumes, high-touch execution approaches are generally inefficient, opaque, slow, and susceptible to front running. Front running occurs when speculative traders try to profit by buying ahead of other traders’ anticipated activity. Front running is illegal in many jurisdictions if the information acted on is improperly obtained. Moreover, given that they require human involvement for each execution, they tend to be costly. Hence, for straightforward trades in liquid securities’ low-touch automated execution strategies are often preferred whenever available. These generally involve direct market access (DMA) and/or execution algorithms.

**Direct market access** (DMA) gives all market participants a way to interact directly with the order book of an exchange, usually through a broker’s exchange connectivity. This activity is normally restricted to broker/dealers and market-making firms. With DMA, buy-side firms use a broker’s technology infrastructure and market access to execute orders themselves rather than handing orders over to the broker. DMA often involves the use of algorithms.

Alternatively, a broker can be instructed to execute client orders using certain execution algorithms. The desired urgency of an order is a key input for the choice and nature of the execution algorithm.

## 6.2. Algorithmic Trading

Algorithmic trading is the computerized execution of the investment decision following a specified set of trading instructions. An algorithm’s programmed strategies used to electronically execute orders will slice larger orders into smaller pieces and trade over the day and across venues to reduce the price impact of the order. The primary goal of algorithmic trading is to ensure that the implementation of the investment decision is consistent with the investment objective of the fund. In this section, we describe factors that

help determine the selection of a trading algorithm class.

Trading algorithms are primarily used for two purposes—trade execution and profit generation.

### **6.2.1. Execution algorithms**

An execution algorithm is tasked with transacting an investment decision made by the portfolio manager. The manager determines what to buy or sell on the basis of his investment style and investment objective and then enters the order into the algorithm. The algorithm will then execute the order by following a set of rules specified by the portfolio manager.

### **6.2.2. Profit-seeking algorithms**

A profit-seeking algorithm will determine what to buy and sell and then implement those decisions in the market as efficiently as possible. For example, these algorithms will use real-time price information and market data, such as volume and volatility, to determine what to buy or sell and will then implement the decision consistent with the investment objective. Profit-seeking algorithms are used by electronic market makers, quantitative funds, and high-frequency traders.

This section describes the common classification of execution algorithms and their use.

### **6.2.3. Execution Algorithm Classifications**

Although there are many different types of execution algorithms, they can generally be classified into the following categories.

#### **6.2.3.1. Scheduled (POV, VWAP, TWAP)**

Scheduled algorithms send orders to the market following a schedule that is determined by historical volumes or specified time periods. Scheduled algorithms include *percentage of volume (POV)* algorithms, *volume-weighted average price* algorithms, and *time-weighted average price* algorithms.

POV algorithms (also known as participation algorithms) send orders following a volume participation schedule. As trading volume increases in the market, these algorithms will trade more shares, and as volume decreases, these algorithms will trade fewer shares. Investors specify the POV algorithm through the participation rate, which determines the volume participation strategy. For example, a participation rate of 10% indicates that the algorithm

will participate with 10% of the market volume until the order is completed. In this case, for every 10,000 shares that trade in the market, the algorithm will execute 1,000 shares. An advantage of volume participation algorithms is that they will automatically take advantage of increased liquidity conditions by trading more shares when there is ample market liquidity and will not trade in times of illiquidity. While POV algorithms incorporate real-time volume, by following (or chasing) volumes, they may incur higher trading costs by continuing to buy as prices move higher and to sell as prices move lower. An additional disadvantage of these algorithms is that they may not complete the order within the time period specified.

VWAP and TWAP algorithms release orders to the market following a time-specified schedule, trading a predetermined number of shares within the specified time interval; for example, trade 5,000 shares between 10:00 a.m. and 1:00 p.m. An advantage of a time slicing strategy is that it ensures the specified number of shares are executed within the specified time period. A disadvantage of a time slicing strategy is that it will force the trades even in times of insufficient liquidity and will not take advantage of increased liquidity conditions when available.

VWAP algorithms slice the order into smaller amounts to send to the market following a time slicing schedule based on historical intraday volume profiles. These algorithms typically trade a higher percentage of the order at the open and close and a smaller percentage of the order during midday. Because of this, the VWAP curve is said to resemble a U-shaped curve. Following a fixed schedule as VWAP algorithms do may not be optimal for illiquid stocks because such algorithms may not complete the order in cases where volumes are low.

TWAP algorithms slice the order into smaller amounts to send to the market following an equal-weighted time schedule. TWAP algorithms will send the same number of shares and the same percentage of the order to be traded in each time period.

Scheduled algorithms are appropriate for orders in which portfolio managers or traders do not have expectations of adverse price movement during the trade horizon. These algorithms are also used by portfolio managers and traders who have greater risk tolerance for longer execution time periods and are more concerned with minimizing market impact. Scheduled algorithms are often appropriate when the order size is relatively small (e.g., no more than 5%–10% of expected volume), the security is relatively liquid, or the orders are part of a risk-balanced basket and trading all orders at a similar pace will maintain the risk balance.

### **6.2.3.2. Liquidity seeking**

Liquidity-seeking algorithms, also referred to as *opportunistic algorithms*, take advantage of market liquidity across multiple venues by trading faster when liquidity exists at a favorable price. These algorithms may trade aggressively with offsetting orders when sufficient liquidity is posted on exchanges and alternative trading systems at prices the algorithms



deem favorable (a practice called “liquidity sweeping” or “sweeping the book”). These algorithms may also use dark pools and trade large quantities of shares in dark venues when sufficient liquidity is present. If liquidity is not present in the market at favorable prices, these algorithms may trade only a small number of shares. These algorithms will often make greater use of market order types than limit order types.

Liquidity-seeking algorithms are appropriate for large orders that the portfolio manager or trader would like to execute quickly without having a substantial impact on the security price. Liquidity-seeking algorithms are also used when displaying sizable liquidity via limit orders could lead to unwanted information leakage and adverse security price movement. In these cases, the priority is to minimize information leakage associated with order execution and avoid signaling to the market the trading intentions of the portfolio manager or trader. These algorithms are also appropriate for trading securities that are relatively less liquid and thinly traded or when liquidity is episodic (e.g., the order book is typically thin with wide spreads but occasionally experiences tight spreads or thick books).

#### **6.2.3.3. Arrival price**

Arrival price algorithms seek to trade close to current market prices at the time the order is received for execution. Arrival price algorithms will trade more aggressively at the beginning of trading to execute more shares nearer to the arrival price, known as a front-loaded strategy. Arrival price algorithms tend to be time schedule based but can also be volume participation based.

Arrival price algorithms are used for orders in which the portfolio manager or trader believes prices are likely to move unfavorably during the trade horizon. In these cases, the portfolio manager wishes to trade more aggressively to capture alpha ahead of the unfavorable prices expected later in the trade horizon. These algorithms are also used by portfolio managers and traders who are risk averse and wish to trade more quickly to reduce the execution risk associated with trading more passively over longer time horizons. These algorithms are used when the security is relatively liquid or the order is not outsized (e.g., the order is less than 15% of expected volume) such that a participatory strategy is not expected to result in significant market impact from order execution.

#### **6.2.3.4. Dark strategies/liquidity aggregators**

Dark aggregator algorithms execute shares away from “lit” markets, such as exchanges and other displayed venues that provide pre- and post-trade transparency regarding prices, volumes, market spreads, and depth. Instead, these algorithms execute in opaque, or less transparent, trade venues, such as dark pools.

Dark aggregator algorithms are used in trading when portfolio managers and traders are concerned with information leakage that may occur from posting limit orders in lit venues

with pre- and post-trade transparency. These algorithms are used when order size is large relative to the market (i.e., a large percentage of expected volume) and when trading in the open market using arrival price or VWAP strategies would lead to significant market impact. These algorithms are appropriate for trading securities that are relatively illiquid or have relatively wide bid–ask spreads. Since trading in dark pools offers less certainty of execution (offsetting orders may never arrive), these algorithms are appropriate for trades in which the trader or portfolio manager does not need to execute the order in its entirety.

#### **6.2.3.5. Smart order routers**

**Smart order routers** (SORs) determine how best to route an order given prevailing market conditions. The SOR will determine the destination with the highest probability of executing the limit order and the venue with the best market price—known in the United States as the National Best Bid and Offer (NBBO)—for market orders. The SOR continuously monitors real-time data from exchanges and venues and also assesses ongoing activity in dark pools.

SORs are used when a portfolio manager or trader wishes to execute a small order by routing the order into the market as either a market(able) or non-marketable (limit) order.

#### ***Market orders.***

SORs are used for orders that are sufficiently small that they will not have a large market impact if sent as marketable orders—for example, when the order size is less than the quantity posted at the best bid or offer. SORs are also best used for orders that require immediate execution because of imminent price movement, high portfolio manager or trader risk aversion, or abnormally high risk levels. Using SORs for marketable orders is also appropriate in cases where the market moves quickly, such that having the trader choose the venue(s) could lead to inferior executions (e.g., the trader chooses the venue but the venue with the best price changes before she can send the order).

#### ***Limit orders.***

SORs are also used for orders that are small enough that posting the order as a limit order will not leak information to the market and move prices (e.g., orders that are similar to those currently posted in the market). In addition, SORs are appropriate for stocks that have multiple markets actively trading the stock and for which it is not obvious to which venues the order should be routed (e.g., there are multiple venues currently posting orders at the trader's limit price).

A portfolio manager has identified a stock with attractive long-term growth potential and would like to place an order of moderate size, relative to the stock's average traded volume. The stock is very liquid and has attractive short-term alpha potential. The portfolio manager expects short-term buying pressure by other market participants into the market close, ahead of the company's earnings call scheduled later in the day.

1. Explain when the following algorithms are used: (a) arrival price, (b) dark aggregator, and (c) SOR.
2. Discuss which of the three algorithms is most suited to trading this order.

### **Solution:**

1.
  - a. Arrival price algorithms are used for relatively liquid securities and when the order is not expected to have a significant market impact. Arrival price algorithms are also used when portfolio managers and traders have higher levels of risk aversion and wish to trade more aggressively at an accelerated pace to reduce the execution risk associated with trading over longer time horizons.
  - b. Dark aggregator algorithms are appropriate for trading securities that are relatively illiquid or that have relatively wide bid–ask spreads or for relatively large order sizes in which trading in the open market is expected to have a significant price impact. Additionally, they are used by portfolio managers and traders who are concerned with information leakage that may occur when posting limit orders in lit venues. Given their higher risk of unfilled executions, these algorithms are also used when the order does not need to be filled in its entirety.
  - c. Smart order routing systems are used to electronically send small orders into the market. Based on prevailing market conditions, SORs will determine which trade destinations have the highest probability of executing for limit orders and which trading venues have the best market prices for market orders and will route orders accordingly. SORs continuously monitor market conditions in real time in both lit and dark markets.
2. An arrival price algorithm would be most appropriate for trading this order because the portfolio manager has adverse price expectations. In this case, the portfolio manager wants to trade more aggressively to capture alpha ahead of less favorable prices expected later in the day. By trading the order more quickly, the portfolio manager can execute at more favorable prices ahead of the adverse price movement and the less favorable prices expected from other participants' buying pressure into

the close, in line with his trade urgency.

## Algorithmic Selection

Choosing the best algorithm to execute a given trade can be a difficult and complex decision. There has been a proliferation of choices for the buy-side trader, with multiple broker offerings and multiple algorithm types per broker, such as VWAP, POV, and implementation shortfall. For a given stock, what is the best algorithm to choose? Intuitively, it seems that selecting an algorithm by considering specific characteristics about the stock and its liquidity profile should be superior to selecting an algorithm without regard for these attributes. Additionally, it seems intuitive that stocks with similar characteristics might best be executed in a similar manner. This rationale has motivated firms that provide execution services to apply a machine learning technique called “clustering” to the problem of algorithmic strategy selection.

Clustering, generally used in unsupervised machine learning, groups data objects solely on the basis of information found in the data. The use of clustering for algorithmic strategy selection for stocks will generally include microstructure factors, such as bid–ask spread, trade size, price volatility, tick size, depth of the order book queue, and trading volume. Stocks are characterized from the results of the data analysis (i.e., placed into groups, or clusters, based on similarities informed by the data). For each cluster, the historical executions for each stock are examined for comparative performance. From this analysis, the optimal algorithmic strategy can be selected.

To illustrate a simple intuitive example, stocks with wider bid–ask spreads may be more effectively traded using an algorithm that executes more in off-exchange venues (such as dark pools) since on those venues trading can occur at mid-market if an offsetting order arrives and the cost of crossing the bid–ask spread (buying at the offer or selling at the bid) is high. In contrast, for a cluster of stocks with tight bid–ask spreads, the benefit of trading at mid-market is smaller and the optimal algorithm is likely to trade less on off-exchange/dark venues.

In some cases, the optimal decision may be clear from the data because the performance of one algorithm dominates all other choices. In other cases, even if the optimal choice is unclear, the historical execution data of the given cluster help narrow the research space and form the basis for further optimization using either traditional regression-based or machine learning techniques. Although our example is quite simple and the rationale intuitive, one might ask, if the answer is that obvious, why bother with

machine learning at all? In practice, the answers are usually much less obvious and the conditions far more complicated.

## High-Frequency Market Forecasting

One of the primary challenges in trading (and investing) is forecasting asset prices. Even for a long-term investor, the ability to forecast short-term market direction can help make execution more efficient.

Building a model to forecast short-term market movements involves two steps: The first is to identify key factors, or predictors (independent variables in a regression context), and the second is to estimate the model. One might identify many (hundreds, if not more) potential predictors; for example, for a period of time, one stock—perhaps for which there has been a significant news release—may “lead” the rest of the market and be a good predictor of short-term movement in other stocks.

LASSO (least absolute shrinkage and selection operator) is a machine learning technique used to help with this identification problem. LASSO is a penalized regression technique that relies on the underlying assumption of sparsity, meaning that at any point in time, even in the presence of many potential predictors, only a handful of variables are significant. LASSO minimizes the residual sum of squares, which has the effect of reducing many of the coefficients to zero, leaving only the most significant variables.

For example, consider a trader building a forecast model to predict the near-term value of the S&P 500 ETF (SPY). There are a multitude of variables that she might want to consider, including the order book imbalance (excess of buys or sells for a given price) on each exchange, SPY trade executions, SPY returns over a number of recent time horizons, and similar attributes for correlated instruments, such as other ETFs, equity index futures contracts, and stocks making up the underlying portfolio of the ETF. It is clear that there are hundreds of potential variables. Working with a regression model to identify the most important variables would likely be unwieldy and challenging, given potential collinearity. Using LASSO, the trader can reduce the problem to a more manageable number of variables.

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## 7. COMPARISON OF MARKETS

**f. contrast key characteristics of the following markets in relation to trade implementation: equity, fixed income, options and futures, OTC derivatives, and spot currency**

Although algorithmic trading is common in highly liquid, technologically developed markets, such as equities, trades in other markets require different implementation treatment, with greater human involvement. In this section, we compare and contrast key characteristics relating to trade implementation for the following markets:

- Equities
- Fixed income
- Exchange-traded derivatives (options and futures)
- Off-exchange (OTC) derivatives
- Spot currencies

## 7.1. Equities

Equities are generally traded on exchanges and dark pools. Exchanges are known as lit markets (as opposed to dark markets) because they provide pre-trade transparency—namely, limit orders that reflect trader intentions for trade side (buy or sell), price, and size. Dark pools provide anonymity because no pre-trade transparency exists. However, regardless of the trading venue, transactions and quantities are always reported. On exchanges, trade price, size, quote, and depth of book data are publicly available. However, detailed book data can be costly and may be available only to some market participants.

Most countries with open economies have at least one stock exchange. The United States has a total of 13 stock exchanges. There are more than 40 **alternative trading systems** (ATS)/dark pools globally. In Europe, these alternative trading venues are called **multilateral trading facilities** (MTF) and *systematic internalisers* (SI). MTFs are operated by investment firms or market operators that bring together multiple third-party buying and selling interests in financial instruments. SIs are single-dealer liquidity pools. In the United States and Canada, these venues are called alternative trading systems (ATS). They are non-exchange trading venues that match buyers and sellers to find counterparties for transactions. They are typically regulated as broker/dealers rather than as exchanges (although an ATS can apply to be regulated as a securities exchange). In the United States, ATS must be approved by the Securities and Exchange Commission (SEC).

In Asia, although trading volume on alternative trading venues has grown rapidly over the

last few years, such activity remains less common than in North America and Europe. Even in markets with the highest share of dark pool trading, most equity trading still takes place on traditional exchanges. In emerging markets, dark pool trading volume is minimal compared with trading volume on traditional exchanges.

Equities are the most technologically advanced market. Algorithmic trading is common, and most trades are electronic. Equity exchanges may use different trading systems for stocks depending on their level of liquidity. Large, urgent trades, particularly in less liquid small-cap stocks, are generally executed as high-touch broker risk trades, where the broker acts as dealer and counterparty. Large, non-urgent trades may be executed using trading algorithms (particularly for more liquid large-cap stocks) or, for less liquid securities, a high-touch agency approach. For small trades in liquid securities, most buy-side traders use electronic trading.

In recent years, average trade sizes have generally decreased for most asset classes; market participants break down their trades into smaller pieces that they trade either sequentially on the same trading venue or simultaneously across different venues. In equities, growth in the number of trading venues has resulted in fragmentation of trading and increased competition among trading venues.

## 7.2. Fixed Income

Fixed-income markets are quite different from equity markets. Market transparency and price discovery for fixed-income markets are generally much lower; information available and how quickly it is made available vary by market. Individual bond issuers can have a large number of bonds outstanding with very different features—for example, different maturities, coupons, and optionality. As a result, fixed income is a very heterogeneous asset class that encompasses a large number of individual securities. Institutional investors will often hold bonds until maturity or may trade large quantities infrequently. Trade imbalances often occur in corporate bonds owing to illiquidity. As a result, sourcing market liquidity relies heavily on dealers acting as counterparties (i.e., principal trades), and matching buyers and sellers is generally difficult in the corporate bond market.

Fixed-income securities are generally traded in a bilateral, dealer-centric market structure.<sup>5</sup> Investors will generally get quotes from dealers, often banks, which make markets in the securities. Historically, these quotes were accessed via phone, but they increasingly are disseminated using electronic chat (e.g., Symphony, Bloomberg) or electronic RFQ platforms. Just as it was before the onset of these electronic platforms, dealers do not provide quotes continuously; they provide them only on request by a potential buyer or seller.

There is limited algorithmic trading in bond markets, except for on-the-run (most recently



issued) US Treasuries in benchmark maturities and bond and interest rate futures contracts. Although algorithmic/electronic trading in corporate bonds is growing, it remains a relatively low proportion of overall corporate bond trading.<sup>6</sup> The combination of market illiquidity and the large size and low frequency of potential trades creates challenges for algorithmic trading and electronic trading generally. For other fixed-income instruments, high-touch trading persists, particularly for larger trades and less liquid securities. Small trades and large, urgent trades are usually implemented through broker risk trades (via RFQs), where the broker acts as the counterparty, because securities are hard to source otherwise. Large, non-urgent trades are generally implemented using a high-touch approach, with brokers acting as agents to source liquidity (agency trades instead of principal trades).

### **7.3. Exchange-Traded Derivatives**

As of 2018, there were fewer than 1,000 liquid and highly standardized exchange-traded derivatives outstanding. The market is very large, and trading volume exceeds several trillion dollars per day. Most of the trading volume is concentrated in futures, although the number of futures is considerably smaller than the number of options outstanding. Similar to exchange-traded equities, market transparency is high and trade price, size, quote, and depth of book data are publicly available.

Electronic trading is widespread for exchange-traded derivatives; however, algorithmic trading is not as evolved as in equity markets and is currently used more for trading in futures than in options. Large, urgent trades “sweep the book” where market depth is relatively good. In these cases, trades are executed against the most aggressive limit orders on the other trade side first and then against decreasingly aggressive limit orders until the entire order has been filled. Large, non-urgent trades are generally implemented electronically through trading algorithms. Buy-side traders generally use direct market access, particularly for small trades.

### **7.4. Over-the-Counter Derivatives**

In recent years, regulators have been placing pressure on OTC markets to introduce central clearing facilities and to display trades publicly. Although liquidity has increased for more standardized OTC trades that are centrally cleared, liquidity has decreased for OTC instruments not suited to central clearing or trade reporting.

OTC derivative markets have historically been opaque, with little public data about prices, trade sizes, and structure details. Regulatory efforts have focused on increasing transparency and reducing counterparty risk in these markets. In the United States, the Dodd–Frank Wall Street Reform and Consumer Protection Act, enacted in 2010, significantly increased post-



trade transparency in the OTC derivative markets with the establishment of swap data repositories (SDRs) to which trade details must be submitted. Under the Dodd–Frank regulation, swaps entered into by parties exempt from mandatory clearing and exchange trading (and where at least one counterparty to the swap is a US person) are still subject to data reporting rules. Dodd–Frank forms part of a broader 2009 agreement by the G–20 countries whose primary long-term focus includes the trading of all OTC derivatives on exchanges or other electronic platforms with centralized clearing for all more standardized derivatives.

Trading OTC derivatives takes place through dealers. Because this type of security is typically traded by institutions, trade sizes are relatively large. Large, urgent trades are generally implemented as broker risk trades, where risk is transferred to a broker who takes the contract into his inventory. Large, non-urgent trades are generally implemented using a high-touch agency trade, where the broker attempts to match buyers and sellers directly. Doing so can be difficult, however, since OTC derivatives are often highly customized. Hence, at times, a strong price concession is required to find a buyer or seller.

## **7.5. Spot Foreign Exchange (Currency)**

There is no exchange or centralized clearing place for the majority of spot foreign exchange (currency) trades. Spot currency markets consist of a number of electronic venues and broker markets. The currency market is an entirely OTC market. Despite being a global market, there is almost no cross-border regulation.

The spot currency market consists of multiple levels. The top level is called the interbank market, where participants are mostly large international banks and other financial firms that act as dealers. Trades between these foreign exchange dealers can be extremely large. The next market level is generally made up of small and medium-sized banks and other financial institutions that turn to the dealers in the interbank market for their currency trading needs and that, therefore, pay slightly higher bid–ask spreads. The level below that one consists of commercial companies and retail traders that turn to the second-level institutions for their currency trading. Once again, a higher bid–ask spread applies to these market participants.

The spot currency market is sizable in terms of daily trading volume, with often more than \$1 trillion traded per day. Although large, the spot currency market is relatively opaque; there are usually only quotes available and only from some venues.

Electronic trading in currencies has grown substantially over the years in parallel with algorithmic trading strategies of equities. For large, urgent trades, RFQs are generally submitted to multiple dealers competing for a trade. Large, non-urgent trades are mostly executed using algorithms (such as TWAP) or a high-touch agency approach. Small trades are usually implemented using DMA.

## IN-TEXT QUESTION

A hedge fund manager has three trades that she would like to execute for her fund. The orders are for:

1. a large, non-urgent sell of OTC options,
2. a large, urgent sell of corporate bonds, and
3. a small, non-urgent buy of six liquid emerging market currencies.

Describe factors affecting trade implementation for each trade.

### Solution:

1. A large, non-urgent sell of OTC options would generally involve a broker agency trade in which the broker would act on behalf of the manager to find a matching buyer for the options. Depending on the level of contract customization, however, a significant price concession may be required by the manager to complete order execution.
2. A large, urgent sell of corporate bonds would usually involve a broker risk trade via the RFQ process. Because of corporate bond illiquidity, the likelihood of finding a matching buyer is low. For more immediate (urgent) order execution, a broker would be needed to act as counterparty to the trade, taking the bonds and their associated risk into his inventory.
3. Small, non-urgent trades in foreign exchange are generally executed using direct market access. DMA allows the buy-side trader to electronically route orders using the broker's technology infrastructure and market access and typically involves algorithmic trading.

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## 8. TRADE COST MEASUREMENT

- g. explain how trade costs are measured and determine the cost of a trade

After trade implementation is complete, it is important for portfolio managers to assess the trading that has taken place. Was the trade implemented with the trade strategy chosen? What costs were incurred from trade costs arise, and were these reasonable given market conditions? Did the broker, or algorithm selected for trade execution perform?

Unfortunately for the portfolio manager, trade implementation is a transaction cost. In economic terms, trade costs are value paid by buyers and value received by sellers but not received by buyers. In finance, the amount paid above the investment decision price for buy orders and the amount received below the decision price for sell orders. An important aspect of trade cost management is to identify where costs arise during implementation of the investment decision. Where these costs arise will help portfolio managers carry out more efficient implementation, and better portfolio construction. Lower trading costs and higher portfolio returns.

Proper trade cost management begins with an understanding of trade cost formulation.

## 8.1. Implementation Shortfall

The **implementation shortfall** (IS) metric<sup>7</sup> is the most important measurement used in finance. The IS metric provides portfolio managers with a measure of the costs associated with implementing the investment decision. This span of time from the decision to the completion of the trade allows portfolio managers to identify where costs arise during the trade.

IS is calculated as the difference between the return for a notional portfolio where all transactions are assumed to take place at the manager's decision price and the actual return, which reflects realized transactions, including all fees and commissions.

Mathematically, IS is calculated as follows:

$$IS = \text{Paper return} - \text{Actual return}$$

The paper return shows the hypothetical return that the fund would have achieved if the portfolio manager were able to transact all shares at the desired decision price without incurring any associated costs or fees (i.e., with no friction):

$$\text{Paper return} = (P_n - P_d)(S) = (S)(P_n) - (S)(P_d)$$







































































































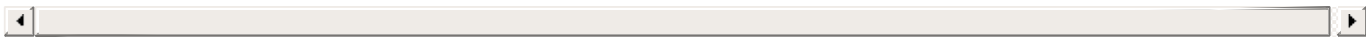




















# Reading 26

## Portfolio Performance Evaluation

by Marc A. Wright, CFA

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### LEARNING OUTCOMES

The candidate should be able to:

- a.** explain the following components of portfolio evaluation and their interrelationships: performance measurement, performance attribution, and performance appraisal;
- b.** describe attributes of an effective attribution process;
- c.** contrast return attribution and risk attribution; contrast macro and micro return attribution;
- d.** describe returns-based, holdings-based, and transactions-based performance attribution, including advantages and disadvantages of each;
- e.** interpret the sources of portfolio returns using a specified attribution approach;
- f.** interpret the output from fixed-income attribution analyses;
- g.** discuss considerations in selecting a risk attribution approach;
- h.** identify and interpret investment results attributable to the asset owner versus those attributable to the investment manager;
- i.** discuss uses of liability-based benchmarks;
- j.** describe types of asset-based benchmarks;
- k.** discuss tests of benchmark quality;

- l.** describe problems that arise in benchmarking alternative investments;
  - m.** describe the impact of benchmark misspecification on attribution and appraisal analysis;
  - n.** calculate and interpret the Sortino ratio, the appraisal ratio, upside/downside capture ratios, maximum drawdown, and drawdown duration;
  - o.** describe limitations of appraisal measures and related metrics;
  - p.** evaluate the skill of an investment manager.
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## 1. INTRODUCTION

Performance evaluation is one of the most critical areas of investment analysis. Performance results can be used to assess the quality of the investment approach and suggest changes that might improve it. They are also used to communicate the results of the investment process to other stakeholders and may even be used to compensate the investment managers. Therefore, it is of vital importance that practitioners who use these analyses understand how the results are generated. By gaining an understanding of the details of how these analyses work, practitioners will develop a greater understanding of the insights that might be gathered from the analysis and will also be cognizant of the limitations of those approaches, careful not to infer more than what is explicit or logically implicit in the results.

We will first consider the broad categories of performance measurement, attribution, and appraisal, differentiating between the three and explaining their interrelationships. Next, we will provide practitioners with tools to evaluate the effectiveness of those analyses as we summarize various approaches to performance evaluation. We will cover returns-based, holdings-based, and transactions-based attribution, addressing the merits and shortcomings of each approach and providing guidance on how to properly interpret attribution results. Again, by reviewing how each approach generates its results, we reveal strengths and weaknesses of the individual attribution approaches.

Next, we will turn to the subject of benchmarks and performance appraisal ratios. We will review the long-standing tests of benchmark quality and differentiate market indexes from benchmarks. We will also review different ratios used in performance appraisal, considering the benefits and limitations of each approach.

Lastly, we will provide advice on using these tools to collectively evaluate the skill of investment managers. This advice relies heavily on understanding the analysis tools, the

limitations of the approaches, the importance of data to the quality of the analysis, and the pitfalls to avoid when making recommendations.

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## 2. INTRODUCTION TO PERFORMANCE EVALUATION AND ATTRIBUTION

- a. **explain the following components of portfolio evaluation and their interrelationships: performance measurement, performance attribution, and performance appraisal**
- b. **describe attributes of an effective attribution process**
- c. **contrast return attribution and risk attribution; contrast macro and micro return attribution**
- d. **describe returns-based, holdings-based, and transactions-based performance attribution, including advantages and disadvantages of each**

Performance evaluation includes three primary components, each corresponding to a specific question we need to answer to evaluate a portfolio's performance:

- Performance measurement—what was the portfolio's performance?
- Performance attribution—how was the performance achieved?
- Performance appraisal—was the performance achieved through manager skill or luck?

We will consider each of these components on their own and the interrelationships between them.

Performance measurement provides an overall indication of the portfolio's performance, typically relative to a benchmark. In its simplest form, performance measurement is the calculation of investment returns for both the portfolio and its benchmark. This return calculation is a critical first step in the performance evaluation process, building the foundation on which performance evaluation is based. The investment return tells us what the portfolio achieved over a specific period, irrespective of peer or benchmark performance. For purposes of this reading, we will call this the *absolute return*. But it also provides the basis to understand the difference between the portfolio return and its benchmark return, the **excess return**.

In addition to return, performance measurement must consider the risk incurred to achieve that return. We measure risk using a variety of *ex post* (looking back in time) and *ex ante* (looking forward in time) techniques. For *ex post*, we might consider the volatility or standard deviation of the past returns, along with many other performance appraisal ratios considered later in this reading. The calculation of a portfolio's value at risk (VaR) at a point in time is an example of an *ex ante* measure. These measures of risk allow us to quantify the risk in a portfolio and better assess the performance.

Performance attribution then builds on the foundation of the investment returns and risk, helping us explain *how* that performance was achieved or that risk was incurred. Performance attribution can be used to explain either absolute returns or relative returns. It can be used to understand what portion of returns was driven by active manager decisions and what portion was a result of exposures not specifically targeted by the portfolio manager. Performance attribution can also be used to decompose the excess return into its component sources, where it is used to help explain why a manager over- or underperformed the target benchmark. Similarly, risk attribution can be used to decompose the risk incurred in the portfolio.

The third component of performance evaluation, performance appraisal, makes use of risk, return, and attribution analyses to draw conclusions regarding the *quality* of a portfolio's performance. Performance appraisal attempts to distinguish manager skill from luck. Did the portfolio manager's decisions help achieve a better outcome, or was the outcome due to market changes outside of the manager's control? If superior results can be attributed to skill, there is a higher likelihood that the manager will generate superior performance in the future. The analysis may affirm the management process or may contain insights for improving the process. This is a key feedback loop in the investment management process.

## EXAMPLE 1

### Performance Evaluation

1. Performance attribution:
  - A. measures the excess performance of a portfolio.
  - B. explains the proportion of returns due to manager skill.
  - C. explains how the excess performance or risk was achieved.
2. Performance appraisal:
  - A. identifies the sources of under- or outperformance.

- B. decomposes a portfolio's risk and return into their constituent parts.
- C. uses the results of risk, return, and attribution analyses to assess the quality of a portfolio's performance.

### **Solution to 1:**

C is correct. Performance attribution identifies the drivers of investment returns. A is not correct because measuring the excess performance of a portfolio is the subject of performance measurement. B is not correct because it is performance appraisal that distinguishes skill from luck.

### **Solution to 2:**

C is correct. Performance appraisal combines all the techniques of performance measurement and attribution to assess the quality of performance. Both A and B describe performance attribution.

## **2.1. Performance Attribution**

As previously described, performance attribution is a critical component of the portfolio evaluation process. Used by senior management, client relationship specialists, risk controllers, operations staff, portfolio managers, and sales and marketing professionals, attribution analysis provides important insights to the investment decision-making process. Clients and prospects also use attribution analysis as part of their evaluation of that process. Effective performance attribution analysis requires a thorough understanding of the investment decision-making process and should reflect the active decisions of the portfolio manager.

An effective performance attribution process must

- account for *all* of the portfolio's return or risk exposure,
- reflect the investment decision-making process,
- quantify the active decisions of the portfolio manager, and
- provide a complete understanding of the excess return/risk of the portfolio.

If the return or risk quantified by the attribution analysis does not account for all the return or risk presented to the client, then at best the attribution is incomplete and at worst the quality of the attribution analysis is brought into doubt. If the attribution does not reflect the investment decision-making process, then the analysis will be of little value to either the portfolio manager or the client. For example, if the portfolio manager is a genuine bottom-up stock picker who ignores sector benchmark weights, then measuring the impact of sector allocation against these weights is not measuring decisions made as part of the investment process; sector effects are merely a byproduct of the manager's investment decisions.

**Performance attribution** includes return attribution and risk attribution (although in practice, “performance attribution” is often used to mean “return attribution”). **Return attribution** analyzes the impact of active investment decisions on *returns*; **risk attribution** analyzes the *risk* consequences of those decisions. Depending on the purpose of the analysis, risk may be viewed in absolute or benchmark-relative terms. For example, when risk relative to a benchmark is the focus, a risk attribution analysis might identify and evaluate a portfolio's deviations from a benchmark's exposures to risk factors.

Performance attribution provides a good starting point for a conversation with clients, explaining both positive and negative aspects of recent performance. Return attribution analysis is particularly important when performance is weak; portfolio managers must demonstrate an understanding of their performance, provide a rationale for their decisions, and generate confidence in their ability to add value in the future. When it accurately reflects the investment decision-making process, return attribution provides quality control for the investment process and provides senior management with a tool to manage a complex business with multiple investment strategies.

The attribution process described earlier—understanding the drivers of a manager's returns and whether those drivers are consistent with the stated investment process—is a common application of attribution analysis. But attribution can also be conducted to evaluate the asset owner's tactical asset allocation and manager selection decisions (called **macro attribution**) or to evaluate the impact of the portfolio manager's decisions on the performance of the asset owner's total fund (called **micro attribution**). A defined-benefit pension plan makes the decision to allocate a given percentage of the fund to each asset class and decides which manager(s) to hire for each asset class. Macro attribution measures the effect of the sponsor's choice to deviate from the strategic asset allocation, including the effect of “gaps” between the strategic asset allocation and its implementation (e.g., where the sum of the managers' benchmarks is equal to something other than the benchmark index).

Micro attribution measures the impact of portfolio managers' allocation and selection decisions on total fund performance.

Performance attribution may be either returns based, holdings based, or transactions based. The decision to use one set of inputs rather than another depends on the availability of data as

well as the investment process being measured.

**Returns-based attribution** uses only the total portfolio returns over a period to identify the components of the investment process that have generated the returns. Returns-based attribution is most appropriate when the underlying portfolio holding information is not available with sufficient frequency at the required level of detail. For example, one might use returns-based attribution to evaluate hedge funds, because it can be difficult to obtain the underlying holdings of hedge funds. Returns-based attribution is the easiest method to implement, but because it does not use the underlying holdings, it is the least accurate of the three approaches and the most vulnerable to data manipulation.

Unlike returns-based attribution, **holdings-based attribution** references the beginning-of-period holdings of the portfolio. Calculated with monthly, weekly, or daily data, the accuracy of holdings-based attribution improves when using data with shorter time intervals. For longer evaluation periods, we link together the attribution results for the shorter measurement periods. Because holdings-based attribution fails to capture the impact of any transactions made during the measurement period, it may not reconcile to the actual portfolio return. For example, in a daily holdings-based attribution, securities are included at the end of the day they are purchased and excluded at the end of the day they are sold. If the transaction price is significantly different from the closing price, the attribution analysis can differ significantly from the actual performance.

The residual caused by ignoring transactions might be described as a timing or trading effect. Holdings-based analysis is most appropriate for investment strategies with little turnover (e.g., passive strategies). Holdings-based analysis may be improved by valuing the portfolio with the same prices used to calculate the underlying benchmark index, removing one potential difference between the portfolio and benchmark returns that is not a management effect.

The third approach, **transactions-based attribution**, uses both the holdings of the portfolio and the transactions (purchases and sales) that occurred during the evaluation period. For transaction-based attribution, both the weights and returns reflect *all transactions* during the period, including transaction costs. Transaction-based attribution is the most accurate type of attribution analysis but also the most difficult and time-consuming to implement. To obtain meaningful results, the underlying data must be complete, accurate, and reconciled from period to period. Because all the data are available, the entire excess return can be quantified and explained. The return used in the attribution analysis will reconcile with the return presented to the client, and attribution analysis can be used as a diagnostic tool to identify errors.

The choice of attribution approach depends on the availability and quality of the underlying data, the reporting requirements for the client, and the complexity of the investment decision-making process.

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## EXAMPLE 2

# Performance Attribution

1. Effective attribution analysis must:
  - A. use intraday transaction data.
  - B. reconcile to the total portfolio return or risk exposure.
  - C. measure the contribution of security and sector selection decisions.
2. Which of the following most accurately describes macro attribution?
  - A. Attribution analysis at the portfolio level
  - B. Attribution analysis of the fund sponsor decisions
  - C. Attribution analysis of asset allocation decisions
3. Risk attribution differs from return attribution in that it:
  - A. is not conducted relative to a benchmark.
  - B. quantifies the risk consequences of the investment decisions.
  - C. quantifies the investment decisions of the investment manager.
4. An analyst is *most likely* to use returns-based attribution when:
  - A. the portfolio has a low turnover.
  - B. the holdings for the portfolio are not available.
  - C. she wants the analysis to be as accurate as possible.

## Solution to 1:

B is correct. An effective attribution process accounts for all of the portfolio's return or risk exposure. A is not correct; an attribution analysis is improved with intraday transaction data, but an effective attribution analysis can be produced with a returns- or holdings-based approach. C is not correct because an attribution process that measures the sector selection effects of a bottom-up stock-picker does not measure the effectiveness of the investment decision-making process.

### **Solution to 2:**

B is correct. Macro attribution measures the effect of the sponsor's choice to deviate from the strategic asset allocation and the sponsor's manager selection decisions. A is not correct because attribution analysis at the portfolio level may be either macro attribution or micro attribution. C is not correct because macro attribution measures both asset allocation and manager selection decisions of the asset owner.

### **Solution to 3:**

B is correct. Risk attribution, unlike return attribution, attempts to quantify the risk consequences of the investment decisions. A is not correct because risk attribution may be conducted on either an absolute or a relative basis. C is not correct because risk attribution does not capture the return impact of a manager's investment decisions.

### **Solution to 4:**

B is correct. Returns-based attribution is typically used when the holdings data are not available. Neither A nor C is correct because returns-based attribution is the least accurate of the three approaches.

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## **3. EQUITY RETURN ATTRIBUTION**

### **e. interpret the sources of portfolio returns using a specified attribution approach**

Return attribution allows us to look across a specific time horizon and identify which investment decisions have either added value to or detracted value from the portfolio, relative to its benchmark. As feedback to the portfolio management process, return attribution quantifies the active decisions of portfolio managers and informs management and clients. In this way, return attribution can be thought of as “backward looking” or *ex post*, meaning that it is used to evaluate the investment decisions for some historical time horizon.

**Return attribution** is a set of techniques used to identify the sources of excess return of a portfolio against its benchmark, quantifying the consequences of active investment decisions.

Specific return attribution approaches have been designed to evaluate particular types of

assets. In this section, we will consider two common approaches for equity attribution: Brinson–Fachler and factor-based attribution. We will also review the output and findings from a typical fixed-income attribution approach.

Practitioners may also encounter the concept of geometric attribution and arithmetic attribution, two approaches to measuring attribution effects over longer periods. **Arithmetic attribution** approaches are designed to explain the **excess return**, the arithmetic difference between the portfolio return,  $R$ , and its benchmark return,  $B$ .

When using an arithmetic attribution approach, the attribution effects will sum to the excess return. Arithmetic approaches are straightforward for a single period, for which there is no difference between the sum of the attribution effects and the excess return. However, when combining multiple periods, the sub-period attribution effects will *not* sum to the excess return. Because the excess return is calculated by *geometrically* linking the sub-period returns, adjustments must be made to “smooth” the *arithmetic* sub-period attribution effects over time. Multiple smoothing approaches exist in the industry, including algorithms suggested by David [Cariño \(1999\)](#) and Jose [Menchero \(2000\)](#).

Geometric attribution approaches extend the arithmetic approaches by attributing the geometric excess return ( $G$ ), as defined below:

$$G = \frac{1 + R}{1 + B} - 1 = \frac{R - B}{1 + B}$$

Note that the geometric excess return is simply the arithmetic excess return divided by the wealth ratio of the benchmark (1 plus the return on the benchmark during the period).

In a geometric attribution approach, the attribution effects will compound (multiply) together to total the geometric excess return. Because the attribution effects compound together to exactly equal the geometric excess return, the compounding works across multiple periods. Therefore, no smoothing is required to adjust the geometric attribution effects across multiple periods.

Practitioners typically choose arithmetic attribution approaches when they want to use the attribution analysis with non-practitioner clients or in marketing reports. With results that add up to the total excess return for all periods, arithmetic approaches are more intuitively understood. Geometric approaches tend to be limited to practitioners who understand the approach and who appreciate that they do not have to adjust the attribution effects over time.

### 3.1. A Simple Return Attribution Example

Suppose a portfolio’s return for the past year was 5.24% and the portfolio’s benchmark return

for that same period was 3.24%. In this case, the portfolio achieved a positive arithmetic excess return of 2.00% ( $5.24\% - 3.24\% = 2.00\%$ ) over the past year.

To understand how the 2.00% was achieved, we apply return attribution. In this example, return attribution will quantify two typical sources of excess return: *security selection* and *asset allocation*. Security selection answers the question, Was the return achieved by selecting securities that performed well relative to the benchmark or by avoiding benchmark securities that performed relatively poorly? Asset allocation answers the question, Was the return achieved by choosing to overweight an asset category (e.g., economic sector or currency) that outperformed the total benchmark or to underweight an asset category that underperformed the total benchmark? (The term “allocation” is used somewhat differently here. It is not measuring the plan sponsor’s asset allocation decision but, rather, the *manager*’s decision to allocate among countries, sectors, or, in cases where the manager has a broad mandate, asset classes.)

Models of equity return attribution often attempt to separate the investment process into those two key decisions—selection and allocation—assigning each a magnitude and direction (plus or minus) for both decisions. For instance, for the portfolio referenced previously, we might calculate the return attribution results shown in [Exhibit 1](#):

Exhibit 1. Total Portfolio Return Attribution Analysis (Time Period: Past 12 Months)				
Portfolio Return	Benchmark Return	Excess Return	Allocation Effect	Selection Effect
5.24%	3.24%	2.00%	−0.50%	2.50%

As we noted, the investment decisions generated a positive excess return of 200 basis points (bps) relative to the benchmark. We use the “return attribution analysis” to see how this 200 bps was generated. First, note that the *negative* allocation effect indicates that the allocation decisions over the past 12 months, whatever they were, had a negative impact on the total portfolio performance. They *subtracted* 50 bps from the excess return. In contrast, the *positive* selection effect indicates that the security selection decisions—decisions to overweight or underweight securities relative to their benchmark weights—*added* 250 bps to the excess return. Our return attribution analysis implies that the portfolio manager’s security selection decision was far superior to his or her asset allocation decision for the past 12 months.

## 3.2. Equity Return Attribution—The Brinson–Hood–Beebower Model

The foundations of return attribution were established in two articles, one written by Brinson and Fachler (1985) and the other by Brinson, Hood, and Beebower (1986). The Brinson–Fachler model is more widely used in performance attribution today, but we introduce the Brinson–Hood–Beebower (BHB) model first to lay an important foundation.

BHB is built on the assumption that the total portfolio and benchmark returns are calculated by summing the weights and returns of the sectors within the portfolio (Equation 1) and the benchmark (Equation 2):

### Equation (1)

$$\text{Portfolio return } R = \sum_{i=1}^{i=n} w_i R_i$$

### Equation (2)

$$\text{Benchmark return } B = \sum_{i=1}^{i=n} W_i B_i$$

where

$w_i$  = weight of the  $i$ th sector in the portfolio

$R_i$  = return of the portfolio assets in the  $i$ th sector

$W_i$  = weight of the  $i$ th sector in the benchmark

$B_i$  = return of the benchmark in the  $i$ th sector

$n$  = number of sectors or securities

The sum of the weights in both the portfolio and the benchmark must equal 100%. The presence of leverage would require a position with a negative weight (borrowings or short positions) to balance to 100%.

Attribution analysis quantifies each of the portfolio manager's active decisions that explain the difference between the portfolio return,  $R$ , and the benchmark return,  $B$ . Note that for this example, we are concerned with only single-period, single-currency return attribution models.

Exhibit 2 provides data for a three-sector domestic equity portfolio, used to illustrate the BHB model.

### Exhibit 2. BHB Model Illustration—Portfolio and Benchmark Data

Sector	Portfolio Weight	Benchmark Weight	Portfolio Return	Benchmark Return
Energy	50%	50%	18%	10%
Health care	30%	20%	−3%	−2%
Financials	20%	30%	10%	12%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>10.1%</b>	<b>8.2%</b>

Total portfolio return  $R = (50\% \times 18\%) + (30\% \times -3\%) + (20\% \times 10\%) = 10.1\%$

Total benchmark return  $B = (50\% \times 10\%) + (20\% \times -2\%) + (30\% \times 12\%) = 8.2\%$

Thus, the excess return is 1.9% ( $10.1\% - 8.2\% = 1.9\%$ ), or 190 bps.

We will use the weights and returns data shown in Exhibit 2 to calculate the basic attribution effects using the BHB model, including the allocation effect, the security selection effect, and the interaction effect. The allocation effect refers to the value the portfolio manager adds (or subtracts) by having portfolio sector weights that are different from the benchmark sector weights. A sector weight in the portfolio greater than the benchmark sector weight would be described as *overweight*, and a sector weight less than the benchmark sector weight would be described as *underweight*.

To calculate allocation, we first calculate the contribution to allocation ( $A_i$ ) for each sector. The contribution to allocation in the  $i$ th sector is equal to the portfolio's sector weight minus the benchmark's sector weight, times the benchmark sector return:

#### Equation (3)

$$A_i = (w_i - W_i)B_i$$

Using the data from Exhibit 2, we calculate individual sector allocation effects as follows:

- Energy:  $(50\% - 50\%) \times 10\% = 0.0\%$
- Health care:  $(30\% - 20\%) \times -2.0\% = -0.2\%$
- Financials:  $(20\% - 30\%) \times 12\% = -1.2\%$

To find the total portfolio allocation effect,  $A$ , we sum the individual sector contributions to allocation:

#### Equation (4)

$$A = \sum_{i=1}^{i=n} A_i$$

$$\text{Total allocation effect} = 0.0\% - 0.2\% - 1.2\% = -1.4\%$$

We can then use the results to state the following conclusions:

- The portfolio weight in the energy sector is equal to the benchmark weight; therefore, there is no contribution to allocation in energy.
- In health care, the portfolio manager held a higher weight than the benchmark (30% versus 20%), but the sector underperformed the aggregate benchmark ( $-2.0\%$  versus  $8.2\%$ ). Therefore, the decision to overweight health care lowered the overall excess return; the contribution to allocation is  $-0.2\%$ .
- In financials, the portfolio manager chose to underweight versus the benchmark (20% versus 30%). But because financials outperformed the aggregate benchmark ( $12\%$  versus  $8.2\%$ ), the decision to underweight financials also lowered the overall excess return; the contribution to allocation is  $-1.2\%$ .
- Overall, the combined allocation effect for this portfolio was  $-1.4\%$ , demonstrating that the weighting decisions negatively contributed to the performance of the portfolio.

The other attribution effect in the BHB model is security selection—the value the portfolio manager adds by holding individual securities or instruments within the sector in different-from-benchmark weights.

To calculate selection, we first calculate the contribution to selection ( $S_i$ ) for each sector. The contribution to selection in the  $i$ th sector is equal to the benchmark sector weight times the portfolio's sector return minus the benchmark's sector return.

#### Equation (5)

$$S_i = W_i(R_i - B_i)$$

Using the data from [Exhibit 2](#), we calculate individual sector selection effects as follows:

- Energy:  $50\% \times (18\% - 10\%) = 4.0\%$
- Health care:  $20\% \times (-3\% - -2.0\%) = -0.2\%$
- Financials:  $30\% \times (10\% - 12\%) = -0.6\%$

To find the total portfolio selection effect,  $S$ , we sum the individual sector contributions to selection:

### Equation (6)

$$S = \sum_{i=1}^{i=n} S_i$$

$$\text{Total selection effect} = 4.0\% + -0.2\% + -0.6\% = 3.2\%$$

We can use the results to state the following conclusions:

- The portfolio's energy sector outperformed the benchmark's energy sector by 800 bps ( $18\% - 10\%$ ); 800 bps times the benchmark weight of 50% for this sector results in a 4.0% contribution to selection.
- The portfolio's health care sector underperformed the benchmark's health care sector by 100 bps [ $(-3\%) - (-2\%)$ ]; 100 bps times the benchmark weight of 20% for this sector results in a contribution of  $-0.2\%$ .
- The portfolio's financials sector underperformed the benchmark's financials sector by 200 bps ( $10\% - 12\%$ ); 200 bps times the benchmark weight of 30% to this sector results in a contribution of  $-0.6\%$ .
- Overall, the combined selection effect for this portfolio was 3.2%.

In the BHB model, selection and allocation do not completely explain the arithmetic difference. For example, in the attribution analysis based on [Exhibit 2](#), allocation ( $-1.4\%$ ) and selection (3.2%) together represent just 1.8% of the arithmetic difference between the portfolio return of 10.1% and the benchmark return of 8.2%; 0.1% is missing. To explain this remaining difference in the excess return, the BHB model uses a third attribution effect, called "interaction." The **interaction effect** is the effect resulting from the interaction of the allocation and selection decisions combined.

To calculate interaction, we first calculate the contribution to interaction for each sector. The contribution to interaction in the  $i$ th sector is equal to the portfolio sector weight minus the benchmark sector weight, times the portfolio sector return minus the benchmark sector



return:

### Equation (7)

$$I_i = (w_i - W_i)(R_i - B_i)$$

Using the data from [Exhibit 2](#), we calculate individual sector selection effects as follows:

- Energy:  $(50\% - 50\%) \times (18\% - 10\%) = 0.0\%$
- Health care:  $(30\% - 20\%) \times (-3\% - -2.0\%) = -0.1\%$
- Financials:  $(20\% - 30\%) \times (10\% - 12\%) = 0.2\%$

To find the total portfolio interaction effect, we sum the individual sector contributions to interaction:

### Equation (8)

$$I = \sum_{i=1}^{i=n} I_i$$

$$\text{Total interaction effect} = 0.0\% + -0.1\% + 0.2\% = 0.1\%$$

We can use the results to state the following conclusions:

- For the energy sector, the portfolio weight equals the benchmark weight and thus there is no contribution to interaction.
- Because the manager had an overweight to a sector in which selection was negative, the contribution from interaction in health care was also negative,  $-0.1\%$ .
- In the financials sector, the manager was underweight by 10% and selection was negative. The effect of being underweight in a sector in which the manager underperforms leads to a contribution from interaction of  $+0.2\%$ .
- Total contribution from interaction is  $+0.1\%$ , representing the combined effect of the interaction of the selection and allocation effects.

## EXAMPLE 3

# Interpreting the Results of a BHB Attribution

## BHB Attribution Analysis Results Table

Region	Portfolio Return	Benchmark Return	Portfolio Weight	Benchmark Weight	Allocation
Americas	2.80%	1.20%	30%	30%	0.00%
APAC	-1.50%	-0.50%	20%	30%	0.05%
EMEA	0.70%	1.50%	50%	40%	0.15%
<b>Total</b>	<b>0.89%</b>	<b>0.81%</b>	<b>100%</b>	<b>100%</b>	<b>0.20%</b>

Use the table above to answer the following questions.

- Why is the contribution to selection for Europe, the Middle East, and Africa (EMEA) negative?
  - The total benchmark return is less than the total portfolio return.
  - The manager selected securities in EMEA that underperformed the benchmark.
  - The manager underweighted an outperforming sector.
- Why is the contribution to allocation for Asia Pacific (APAC) equal to +5 bps?
  - The benchmark weight and the portfolio weight are equal.
  - The manager has an overweight position in an overperforming region.
  - The manager has an underweight position in an underperforming region.
- Which of the following conclusions from the above attribution analysis is *most* correct?
  - The manager's security selection decisions were better in the Americas than in APAC.
  - The manager's security selection decisions were better in EMEA than in APAC.
  - The manager's allocation decisions were better in APAC than in EMEA.

4. Which of the following conclusions from the above attribution analysis is *most* correct?
- A. Overall, the manager made better allocation decisions than selection decisions.
  - B. Overall, the manager made better selection decisions than allocation decisions.
  - C. Contribution from interaction was most noticeable in the Americas.

### **Solution to 1:**

B is correct. The manager selected securities that underperformed the benchmark, with a portfolio return for EMEA of 0.7% versus a benchmark return for EMEA of 1.5%.

### **Solution to 2:**

C is correct. The manager is underweight in APAC, 20% versus a benchmark weight of 30%. The APAC portion of the portfolio underperformed, with a  $-0.50\%$  benchmark return versus the total benchmark return of  $0.81\%$ .

### **Solution to 3:**

A is correct. As reflected in the contribution to selection, the manager's security selection decisions were better in the Americas ( $0.48\%$ ) than in APAC ( $-0.30\%$ ).

### **Solution to 4:**

A is correct. Overall, the manager made better allocation decisions ( $0.20\%$ ) than selection decisions ( $-0.14\%$ ).

## **3.3. Brinson–Fachler Model**

The Brinson–Fachler (BF) model differs from the BHB model only in how individual sector allocation effects are calculated.

In the BHB model, all overweight positions in sectors with positive returns will generate positive allocation effects irrespective of the overall benchmark return, whereas all

overweight positions in negative markets will generate negative allocation effects. Thus, overweighting a sector  $i$  that earns a positive return,  $B_i > 0$ , results in a positive allocation effect,  $A_i = (w_i - W_i)B_i > 0$ , even when the sector return is less than the overall benchmark return (i.e.,  $B_i < B$ ). When the sector return is negative,  $0 > B_i$ , overweighting produces a negative allocation effect,  $A_i = (w_i - W_i)B_i < 0$ .

Clearly, if the portfolio manager is overweight in a negative market that has outperformed the overall benchmark, the effect should be positive.

The BF model solves this problem by modifying the asset allocation factor to compare returns with the overall benchmark as follows:

### Equation (9)

$$B_S - B = \sum_{i=1}^{i=n} (w_i - W_i) B_i = \sum_{i=1}^{i=n} (w_i - W_i) (B_i - B)$$

Because  $\sum_{i=1}^{i=n} w_i = \sum_{i=1}^{i=n} W_i = 1$ , the constant  $B$  can be introduced. The contribution to asset allocation in the  $i$ th sector is now:

### Equation (10)

$$A_i = (w_i - W_i)(B_i - B)$$

Note that in [Equation 10](#), the allocation effect at the portfolio level,  $B_S - B$ , is unchanged from the BHB model.

The contribution to arithmetic excess return from sector allocation for the portfolio data shown in [Exhibit 2](#) is  $B_S - B = 6.8\% - 8.2\% = -1.4\%$ . Revised BF sector allocation effects are calculated for the portfolio data in [Exhibit 2](#) as follows, using  $A_i = (w_i - W_i)(B_i - B)$ :

Energy	$(50\% - 50\%) \times (10\% - 8.2\%) = 0.0\%$
Health care	$(30\% - 20\%) \times (-2.0\% - 8.2\%) = -1.02\%$
Financials	$(20\% - 30\%) \times (12\% - 8.2\%) = -0.38\%$
<b>Total</b>	$0.0\% - 1.02\% - 0.38\% = -1.4\%$

The impact in health care is much greater. In addition to being overweight in a negative market, which costs  $-0.2\%$ , the portfolio manager is correctly penalized the opportunity cost

of not being invested in the overall market return of 8.2%, generating a further cost of  $10\% \times -8.2\% = -0.82\%$  and resulting in a total impact of  $-1.02\%$ . To describe it another way, the portfolio is 10% overweight in a market that is underperforming the overall market by  $-10.2\%$  (i.e.,  $-2.0\% - 8.2\%$ ) and generating a loss of  $-1.02\%$

The impact in financials is much smaller. Although being underweight in a positive market cost  $-1.2\%$ , we must add back the opportunity cost of being invested in the overall market return of 8.2%, generating a contribution of  $-10\% \times -8.2\% = 0.82\%$  and resulting in a total impact of  $-0.38\%$ . To describe it another way, the portfolio is 10% underweight in an industry that is outperforming the overall market by 3.8% (i.e.,  $12.0\% - 8.2\%$ ), generating a loss of  $-0.38\%$ . As expected, at the portfolio level, the allocation effect of  $-1.4\%$  remains the same as that calculated with the BHB model.

The revised attribution effects are summarized in [Exhibit 3](#).

Exhibit 3. BF Return Attribution Results						
	Portfolio Weight	Benchmark Weight	Portfolio Return	Benchmark Return	Allocation	Se
Energy	50%	50%	18%	10%	0.0%	
Health care	30%	20%	-3%	-2%	-1.02%	-
Financials	20%	30%	10%	12%	-0.38%	-
Total	100%	100%	10.1%	8.2%	-1.4%	

EXAMPLE 4

Allocation Using the BF Model

Exhibit 4. Sample Portfolio Data

	Portfolio Weight	Benchmark Weight	Portfolio Return	Benchmark Return
--	------------------	------------------	------------------	------------------

Technology	20%	30%	-11.0%	-10.0%
Telecommunications	30%	40%	-5.0%	-8.0%
Utilities	50%	30%	-8.0%	-5.0%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>-7.7%</b>	<b>-7.7%</b>

Using the BF method, the allocation effect of utilities based on the portfolio data in Exhibit 4 is:

- A. -1.50%.
- B. 0.54%.
- C. 1.35%.

### Solution:

B is correct:  $(w_i - W_i)(B_i - B) = (50\% - 30\%)(-5.0\% + 7.7\%) = 0.54\%$ . The portfolio is 20% overweight in a sector outperforming the overall benchmark by 2.7%, therefore contributing 0.54% to the overall allocation effect.

A is incorrect:  $W_i B_i = 30\% \times -5.0\% = -1.5\%$  is the contribution to the benchmark return from utilities.

C is incorrect:  $w_i(B_i - B) = 50\% \times (-5.0\% + 7.7\%) = +1.35\%$ . Only the portfolio weight of 50% has been used, not the overweight position of 20%.

## 4. FIXED- INCOME RETURN ATTRIBUTION

### f. interpret the output from fixed-income attribution analyses

As we have seen, return attribution allows us to analyze a portfolio's excess return by comparing the accounting information (weights and returns) in the portfolio with the information in the benchmark. The Brinson–Fachler model focuses on security selection,

asset allocation, and the interaction of selection and allocation. But what if we want to assess other decisions within the investment process?

Another type of return attribution uses fundamental factor models to decompose the contributions to excess return from *factors*. Fundamental factor analysis allows us to quantify the impact of specific active investment decisions within the portfolio, showing how they add or remove value relative to the benchmark. We want to remove the effects of the market to identify the excess return generated by the active investment decisions. To do that, we return to our definition of excess return:  $\text{Excess return} = R - B$ .

Many different factor models can be used to decompose excess returns. The choice of factor model is driven by which aspects of the investment process you want to measure. One of the factor models commonly used in equity attribution analyses is the Carhart four-factor model, or simply the **Carhart model**, given in Equation 11 (Carhart 1997). The Carhart model explains the excess return on the portfolio in terms of the portfolio's sensitivity to a market index (RMRF), a market-capitalization factor (SMB), a book-value-to-price factor (HML), and a momentum factor (WML).

### Equation (11)

$$R_p - R_f = a_p + b_{p1}\text{RMRF} + b_{p2}\text{SMB} + b_{p3}\text{HML} + b_{p4}\text{WML} + E_p$$

where

$R_p$  and  $R_f$  = the return on the portfolio and the risk-free rate of return, respectively

$a_p$  = “alpha” or return in excess of that expected given the portfolio's level of systematic risk (assuming the four factors capture all systematic risk)

$b_p$  = the sensitivity of the portfolio to the given factor

RMRF = the return on a value-weighted equity index in excess of the one-month T-bill rate

SMB = small minus big, a size (market-capitalization) factor (SMB is the average return on three small-cap portfolios minus the average return on three large-cap portfolios)

HML = high minus low, a value factor (HML is the average return on two high-book-to-market portfolios minus the average return on two low-book-to-market portfolios)

WML = winners minus losers, a momentum factor (WML is the return on a portfolio of the past year's winners minus the return on a portfolio of the past year's losers)

$E_p$  = an error term that represents the portion of the return to the portfolio,  $p$ , not explained by the model

By analyzing the results of a factor return attribution analysis, we can identify the investment approach and infer the relative strengths and/or weaknesses of the investment decisions. For example, using the Carhart factor model, we calculate the following results for a hypothetical manager.

### Exhibit 5. Sample Carhart Factor Model Attribution

	Factor Sensitivity			Factor Return	Contribution to Active Return	
	Portfolio	Benchmark	Difference		Absolute	Proportion of Total
Factor	(1)	(2)	(3)	(4)	(3) × (4)	Active
RMRF	0.95	1.00	−0.05	5.52%	−0.28%	−13.30%
SMB	−1.05	−1.00	−0.05	−3.35%	0.17%	8.10%
HML	0.40	0.00	0.40	5.10%	2.04%	98.40%
WML	0.05	0.03	0.02	9.63%	0.19%	9.30%
A. Factor tilts return					2.12%	102.40%
=						
B. Security selection					−0.05%	−2.40%
=						
C. Active return (A + B) =					2.07%	100.00%

This attribution analysis yields information about this portfolio's investment approach, how the manager generated excess return, and his or her ability to consistently add value relative to the benchmark.

Let's first look at the analysis of the benchmark (column 2). The sensitivity to RMRF of 1 indicates that the assigned benchmark has average market risk, consistent with it being a broad-based index. The benchmark's negative sensitivity to SMB indicates a large-cap orientation. Assuming, of course, that the benchmark is a good fit for the manager's stated strategy, we can describe the approach as large cap without a value/growth bias (HML is zero) or a momentum bias (WML is close to zero).

Let's now look at where the portfolio manager's approach differed from that of the benchmark. Based on the factor sensitivities shown in column 1 (positive sensitivity to HML of 0.40) and the differences relative to the benchmark shown in column 3, we can see that the



manager likely had a value tilt but was otherwise relatively neutral to the benchmark. We would expect the portfolio to hold more value-oriented stocks than the benchmark, and we would want to evaluate the contribution of this tilt.

We can examine the effects of this decision by looking at the balance of the table. Positive active exposure to the HML factor—the bet on value stocks—contributed 204 bps to the realized active return, about 98% of the 207 bps of total realized active return. The manager’s minor active exposures to small stocks and momentum also contributed positively to return, whereas the active exposure to RMRF was a drag on performance. However, because the magnitudes of the exposures to RMRF, SMB, and WML were relatively small, the effects of those bets were minor compared with the value tilt (HML).

What about the manager’s ability to contribute return through stock selection? Again, assuming that the benchmark is a good fit for the manager’s investment process, the overall active return from security selection is the portion of return not explained by factor sensitivities. In this period, the contribution from selection was slightly negative (−0.05%).

In the aggregate, the manager’s positive active return was largely the result of the large active bet on HML (+0.40) and a high return to that factor during the period (+5.10%). Is this type of tilt consistent with the manager’s stated investment process? If yes, the manager can be credited with an active decision that contributed positively to return. If no, then the excess return in the period is unlikely to result from manager skill but, rather, is a byproduct of luck. What does the manager’s investment process say about the role of security selection? If the manager does not profess skill in security selection but instead focuses on sector or factor allocation, then the minimal contribution of security selection should not be perceived as a negative reflection on manager skill.

## EXAMPLE 5

### Factor-Based Attribution

Use the data from [Exhibit 5](#) to answer the following questions.

1. Which of the following statements is *not* correct?
  - A. The manager’s slight small-cap tilt contributed positively to return.
  - B. The manager’s slight momentum tilt contributed positively to return.
  - C. The manager’s below-benchmark beta contributed negatively to return.
2. What investment approach, not taken by the portfolio manager, could have delivered more value to the portfolio during the investment period?

- A. A momentum-based approach
- B. A growth-oriented approach
- C. A small-cap-based approach

### Solution to 1:

A is the correct answer. The negative coefficient on SMB indicates that the manager had a slight large-cap bias relative to the benchmark. The slight tilt on WML (+0.02) combined with a positive return to the factor resulted in a positive contribution to return. The below-benchmark beta of RMRF (−0.05) combined with a positive return to the factor resulted in a negative contribution to return.

### Solution to 2:

A is correct. Had the manager overweighted momentum stocks during the period, the momentum factor (WML) return of 9.63% would have contributed significant positive performance to the portfolio.

## 4.1. Fixed-Income Return Attribution

Fixed-income portfolios are driven by very different sources of risk, requiring attribution approaches that attribute returns to decisions made with respect to credit risk and positioning along the yield curve. Building on work by Groupe de Reflexion en Attribution de Performance, or GRAP, outlined in [Giguère \(2005\)](#) and [Murira and Sierra \(2006\)](#), we will discuss three typical approaches to fixed-income attribution:

- Exposure decomposition—duration based
- Yield curve decomposition—duration based
- Yield curve decomposition—full repricing based

Candidates are not responsible for *calculating* fixed-income attribution but should be able to interpret the results of a fixed-income attribution analysis.

### 4.1.1. Exposure Decomposition—Duration Based

Exposure decomposition is a top-down attribution approach that seeks to explain the active management of a portfolio relative to its benchmark, typically working through a hierarchy of decisions from the top to the bottom. These decisions might include portfolio duration bets, yield curve positioning or sector bets, each relative to the benchmark. The term “exposure decomposition” relates to the decomposition of portfolio risk exposures by means of grouping a portfolio’s component bonds by specified characteristics (e.g., duration, bond sector). The term “duration based” relates to the typical use of duration to represent interest rate exposure decisions.

Models that take an exposure decomposition approach are similar to Brinson-type equity attribution models, where we might group the portfolio by its market value weights in different economic sectors. In this case, however, we group the portfolio by its market value weights in duration buckets (i.e., exposure to different ranges of duration). This approach simplifies the data requirements and allows straightforward presentation of results relative to other fixed-income approaches. For these reasons, the exposure decomposition approach is used primarily for marketing and client reports, where an important benefit is that users can easily understand and articulate the results of active portfolio management.

#### ***4.1.2. Yield Curve Decomposition—Duration Based***

The duration-based yield curve decomposition approach to fixed-income attribution can be either executed as a top-down approach or built bottom-up from the security level. This approach estimates the return of securities, sector buckets, or years-to-maturity buckets using the known relationship between duration and changes in yield to maturity (YTM), as follows:

$$\% \text{ Total return} = \% \text{ Income return} + \% \text{ Price return},$$

where  $\% \text{ Price return} \approx -\text{Duration} \times \text{Change in YTM}$ .

Duration measures the sensitivity of bond price to a change in the bond’s yield to maturity. So, the percentage price return of a bond will be approximately equal to the negative of its duration for each 100 bp change in yields. The change in yield to maturity of the portfolio or instrument can be broken down into yield curve factors and spread factors to provide additional insights. These factors represent the changes in the risk-free government curve (e.g., changes in level, slope, and curvature) and in the premium required to hold riskier sectors and bonds. When they are combined and applied to the duration, we can determine a percentage price change for each factor.

For example, a manager may have a view as to how the yield curve factors will change over time. We can use the attribution analysis to determine the value of the yield curve views as they unfold over time.

This approach is applied to both the portfolio and the benchmark to identify contributions to

total return from changes in the yield to maturity. Comparing the differences between the benchmark's return drivers and the portfolio's return drivers gives us the *effect of active portfolio management decisions*.

In this regard, this group of models is quite different from the exposure decomposition. One consequence of this difference is that we require more data points to calculate the separate absolute attribution analyses for the portfolio and the benchmark. Thus, the yield decomposition approach exchanges better transparency for more operational complexity. These models are typically used when preparing reports for analysts and portfolio managers, rather than in marketing or client reports.

### **4.1.3. Yield Curve Decomposition—Full Repricing**

Instead of estimating price changes from changes in duration and yields to maturity, bonds can be repriced from zero-coupon curves (spot rates). Recall that a bond's price is the sum of its cash flows discounted at the appropriate spot rate for each cash flow's maturity. The discount rate to compute the present value depends on the yields offered on the market for comparable securities and represents the required yield an investor expects for holding that investment. Typically, we discount each cash flow at a rate from the spot curve that corresponds to the time the cash flow will be received.

As with the duration-based approaches, instruments can be repriced following incremental changes in spot rates, whether resulting from changes in overall interest rates, spreads, or bond-specific factors. This bottom-up security-level repricing can then be translated into a contribution to a security's return and aggregated for portfolios, benchmarks, and active management.

This full repricing attribution approach provides more precise pricing and allows for a broader range of instrument types and yield changes. It also supports a greater variety of quantitative modeling beyond fixed-income attribution (e.g., *ex ante* risk). This approach is better aligned with how portfolio managers typically view the instruments. However, it requires the full capability to reprice all financial instruments in the portfolio and the benchmark, including the rates and the characteristics of the instrument. Its complex nature can make it more difficult and costly to administer operationally and can make the results more difficult to understand, particularly for non-fixed-income professionals.

All three approaches can be applied to single-currency and multi-currency portfolios. We can most clearly demonstrate the principles of fixed-income attribution by using a single-currency domestic portfolio, without digressing into the relative merits of the various multi-currency approaches. Therefore, this example is a single-currency example.

4.1.4. Fixed-Income Attribution—Worked Example

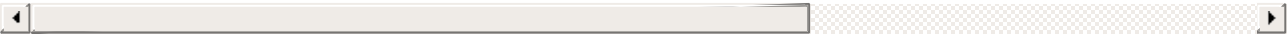
Let’s begin with an example of exposure decomposition analysis.

Exhibit 6 shows a breakdown of the portfolio and the benchmark by weights, duration, and each bucket’s contribution to duration, aggregated by sector and duration buckets. For this example, the short-, mid-, and long-duration buckets are defined as follows:<sup>1</sup>

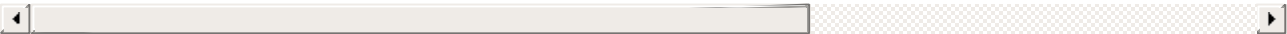
Bucket	Duration
Short	Less than or equal to 5
Mid	Greater than 5 and less than or equal to 10
Long	Greater than 10

Exhibit 6. Sample Exposure Decomposition: Relative Positions of Portfolio and Benchmark

	Portfolio Weights				Portfolio Duration		
	Short	Mid	Long	Total	Short	Mid	Long
Government	10.00%	10.00%	20.00%	40.00%	4.42	7.47	10.21
Corporate	10.00%	20.00%	30.00%	60.00%	4.40	7.40	10.06
Total	20.00%	30.00%	50.00%	100.00%	4.41	7.42	10.12



	Benchmark Weights				Benchmark Duration		
	Short	Mid	Long	Total	Short	Mid	Long
Government	20.00%	20.00%	15.00%	55.00%	4.42	7.47	10.21
Corporate	15.00%	15.00%	15.00%	45.00%	4.40	7.40	10.06
Total	35.00%	35.00%	30.00%	100.00%	4.41	7.44	10.14



Portfolio Weights				Portfolio Re			
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	Short	Mid	Long	Total	Short	Mid	I
Government	10.00%	10.00%	20.00%	40.00%	-3.48%	-5.16%	-4
Corporate	10.00%	20.00%	30.00%	60.00%	-4.33%	-6.14%	-5
Total	20.00%	30.00%	50.00%	100.00%	-3.91%	-5.81%	-5

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	Benchmark Weights				Benchmark F		
	Short	Mid	Long	Total	Short	Mid	I
Government	20.00%	20.00%	15.00%	55.00%	-3.48%	-5.16%	-4
Corporate	15.00%	15.00%	15.00%	45.00%	-4.33%	-6.14%	-5
Total	35.00%	35.00%	30.00%	100.00%	-3.84%	-5.58%	-5

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From [Exhibit 6](#), we can make the following inferences regarding the manager's investment decisions:

- With a higher duration than the benchmark (8.17 compared with 7.19 for the benchmark), the manager likely expected the rates to fall and took a bullish position on long-term bonds (interest rates) by increasing exposure to the long end of the interest rate curve (e.g., investing 50% of the portfolio in the longest-duration bucket versus 30% for the benchmark).
- Based on the overweight in the corporate sector (60% versus the 45% benchmark weight), the manager likely expected credit spreads to narrow.<sup>2</sup> Notice that this bet increases the 4.94 contribution to duration of the corporate sector in the portfolio compared with the 3.28 contribution to duration for the benchmark. This allocation makes the portfolio more exposed to market yield fluctuations in the corporate sector.
- The total portfolio return is -5.03%, relative to a total benchmark return of -4.83%, showing an underperformance of -0.20% over the period.

We can then use the portfolio and benchmark information from [Exhibit 6](#) to calculate the portfolio's attribution results. These results are summarized in [Exhibit 7](#). (Note that candidates are expected to be able to interpret, but not calculate, these results.)

Total interest rate allocation is the contribution from active management resulting from the manager's active exposures to changes in the level and shape of the yield curve. This can be

decomposed into the duration effect (the contribution to active management from taking a different-from-benchmark aggregate duration position) and the curve effect (the specific points along the yield curve at which the manager made his benchmark-relative duration bets).

Sector allocation measures the effect of the manager's decision to overweight corporate bonds, whereas the selection effect measures the impact of the manager's decision to hold non-benchmark bonds in the portfolio. The hypothetical portfolio underlying this example contains only one bond that is not in the benchmark—a long-duration corporate bond, Corp. (P). Accordingly, there is no selection effect in the other duration buckets.

### Exhibit 7. Sample Exposure Decomposition: Attribution Results

Duration Bucket	Sector	Duration Effect	Curve Effect	Total Interest Rate Allocation	Sector Allocation	Bond Selection
Short	Government					0.00%
	Corporate				0.04%	0.00%
	<i>Total</i>	0.40%	0.12%	0.52%	0.04%	0.00%
Mid	Government					0.00%
	Corporate				−0.05%	0.00%
	<i>Total</i>	0.23%	0.03%	0.26%	−0.05%	0.00%
Long	Government					0.00%
	Corporate				−0.22%	0.07%
	<i>Total</i>	−1.25%	0.37%	−0.88%	−0.22%	0.07%
Total		−0.62%	0.52%	−0.10%	−0.23%	0.07%

Using the results from [Exhibit 7](#), we can draw the following conclusions about the investment decisions made by this manager:

- The portfolio underperformed its benchmark by 20 bps.
- 62 bps were lost by taking a long-duration position during a period when yields increased (benchmark returns were negative in each duration bucket).

- 52 bps were gained as a result of changes in the shape of the yield curve. Given the manager's overweighting in the long-duration bucket, we can infer that the yield curve flattened.
- 23 bps were lost because the manager overweighted the corporate sector during a period when credit spreads widened (the benchmark corporate returns in each duration bucket were less than the government returns in those same duration buckets).
- 13 bps were added through bond selection.

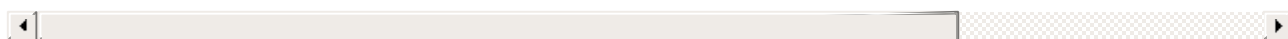
**Exhibit 8** provides an example of a sample duration-based yield curve decomposition attribution analysis. Again, we do not include the calculations for this analysis but instead present the results and suggested interpretations.

### Exhibit 8. Yield Curve Decomposition—Duration Based: Active Return Contribution

Bond	Yield	Roll	Shift	Slope	Curvature	Spread	Specific
Gov't. 5% 30 June 21	-0.19%	-0.04%	0.43%	0.01%	0.15%	0.00%	0.00%
Gov't. 7% 30 June 26	-0.22%	-0.03%	0.71%	0.04%	0.04%	0.00%	0.00%
Gov't. 6% 30 June 31	0.12%	0.01%	-0.48%	0.05%	0.09%	0.00%	0.00%
Corp. 5% 30 June 21	-0.11%	-0.02%	0.21%	0.05%	0.05%	0.04%	0.02%
Corp. 7% 30 June 26	0.12%	0.01%	-0.35%	-0.02%	-0.02%	-0.07%	0.00%
Corp. (B)	-0.39%	-0.03%	1.41%	-0.26%	-0.11%	0.30%	0.00%



6% 30							
June							
31							
Corp. (P)	0.78%	0.06%	-2.82%	0.52%	0.33%	-0.60%	0.15%
6% 30							
June							
31							
Total	0.11%	-0.04%	-0.89%	0.39%	0.53%	-0.33%	0.17%
	<i>Time:</i>	<i>0.08%</i>	<i>Curve Movement:</i>	<i>0.03%</i>			



*Note:* There may be minor differences due to rounding in this table.

Using the data from [Exhibits 6](#) and [8](#), we can infer the following about the portfolio investment process over this period:

- **Yield:** The portfolio overweighted corporate bonds and longer-term maturities relative to the benchmark (from [Exhibit 6](#)), which generally offer higher yield than government bonds and short-term maturities. This decision contributed 11 bps to the excess return (from [Exhibit 8](#)).
- **Roll:** The portfolio overweighted longer maturities (from [Exhibit 6](#)). Because of the shape of the yield curve, bonds with longer maturities generally sit on a flatter part of the yield curve, where the roll return is limited. The overweighting of the longer maturities reduced the portfolio roll return by 4 bps.
- **Shift:** The portfolio overall duration of 8.17 is greater than the benchmark duration of 7.19 (from [Exhibit 6](#)), which reduced the portfolio return by 89 bps.
- **Slope:** The slope flattening caused the long-term yields to increase less than yields on shorter terms to maturity. The overweight at the long end of the curve contributed 39 bps to the excess return.
- **Curvature:** The reshaping of the yield curve resulted in a larger yield increase at the five-year maturity point. The manager underweighted that part of the yield curve. This decision contributed 53 bps to the excess return.
- **Spread:** The manager overweighted the corporate sector, which resulted in a 33 bp reduction in return because corporate spreads widened.

- *Specific spread*: Looking at the bond-specific spreads in [Exhibit 8](#), the corporate 5% 30 June 2021 bond added 2 bps of selection return and the corporate (P) 6% 30 June 2031 bond added 15 bps of selection return. These decisions added a total of 17 bps to active return.
- *Residual*: A residual of  $-0.14\%$  is unaccounted for because duration and convexity can only *estimate* the percentage price variation. It is not an accurate measure of the true price variation. The residual becomes more important during large yield moves, which is the case here, with a  $+1\%$  yield shift.

## EXAMPLE 6

# Fixed-Income Return Attribution

Use the data in [Exhibits 7](#) and [8](#) to answer the following questions.

1. Which decision had the most positive effect on the overall performance of the portfolio?
  - A. Taking a long-duration position
  - B. Security selection of bond issues
  - C. Overweighting the long end of the yield curve
2. Explain the contribution of the long-duration bucket to overall portfolio performance.

## Solution to 1:

C is correct: 52 bps were gained by overweighting the long end of the yield curve during a period when the slope of the yield curve flattened.

## Solution to 2:

The long-duration bucket cost the portfolio 97 bps of relative return. From [Exhibit 7](#), the curve and selection effects were positive (37 bps and 13 bps, respectively) whereas the duration and sector allocation effects were negative ( $-125$  bps and  $-22$  bps, respectively). The negative duration effect indicates that the manager took a longer-than-benchmark-duration position in the long-duration bucket, a decision that hurt performance because interest rates rose. The positive curve effect implies that the manager's specific positioning along the long end of the yield curve benefited from

changes in the shape of the yield curve. This implication is further supported by the positive slope effect shown in [Exhibit 8](#). Taken together, the duration and curve effects accounted for the majority of the manager's underperformance relative to the benchmark. In the long-duration bucket, the manager overweighted corporate bonds relative to the benchmark. This decision penalized returns because credit spreads widened, which can be inferred from the weaker performance of the long-duration corporate segment of the benchmark (−5.42%) relative to the long-duration government segment (−4.38%). The positive selection effect of 13 bps implies that the manager's specific bond selections added to return. This implication is supported by the specific spread contribution reflected in [Exhibit 8](#).

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## 5. RISK ATTRIBUTION

### **g. discuss considerations in selecting a risk attribution approach**

Performance attribution, on its own, is typically insufficient to evaluate the investment process. In addition to performance, we need to understand the impact of exposure to risk by including risk attribution.

Risk attribution identifies the sources of risk in the investment process. For absolute mandates, it identifies the sources of portfolio volatility. For benchmark-relative mandates, it identifies the sources of tracking risk. Managers seek opportunities for profit by taking specific exposures to risk (e.g., portfolio volatility or tracking risk). Risk attribution identifies these risks taken and, together with return attribution, quantifies the contributions to both the return and risk of the investment manager's active decisions.

Risk attribution should reflect the investment decision-making process. [Exhibit 9](#) classifies investment decision-making processes and suggests appropriate risk attribution approaches. The columns indicate whether the focus is absolute risk or benchmark-relative risk. The rows categorize investment decision-making processes as bottom up, top down, or factor based. A bottom-up approach focuses on individual security selection. Top-down approaches focus first on macro decisions, such as allocations to economic sectors, and then on security selection within sectors. A factor-based approach looks for profits by taking different-from-benchmark exposures to the risk factors believed to drive asset returns.

## Exhibit 9. Selecting the Appropriate Risk Attribution Approach

Investment Decision- Making Process	Type of Attribution Analysis	
	Relative (vs. Benchmark)	Absolute
Bottom up	Position's marginal contribution to tracking risk	Position's marginal contribution to total risk
Top down	Attribute tracking risk to relative allocation and selection decisions	Factor's marginal contribution to total risk and specific risk
Factor based	Factor's marginal contribution to tracking risk and active specific risk	

For portfolios that are managed against benchmarks, a common measure of risk is tracking risk (TR), also often called tracking error. The objective of an attribution model for a benchmark-relative portfolio is to quantify the contribution of active decisions to TR. For bottom-up benchmark-relative investment processes, each position's marginal contribution to TR multiplied by its active weight gives the position's contribution to TR. For benchmark-relative top-down investment processes, the active return is explained first by the allocation decisions. Risk attribution, accordingly, will identify the total contribution of allocation and selection to TR.

For absolute mandates, the risk of the portfolio is explained by exposures to the market, size and style factors, and the specific risk due to stock selections. The attribution model quantifies the contribution of each exposure and of specific risk. Suppose that the manager follows an absolute bottom-up process where the measure of risk is the volatility (standard deviation) of returns. In this case, we want to measure the contribution of selection decisions to overall portfolio risk. To do this, we need to know the marginal contribution of each asset to the portfolio risk—the increase or decrease in the portfolio standard deviation due to a slight increase in the holding of that asset. If we know the marginal contribution of a security to absolute portfolio risk, we can then calculate the overall risk contribution of the portfolio manager's selection decisions.

In all cases, risk attribution explains only where risk was introduced into the portfolio. It needs to be combined with return attribution to understand the full impact of those decisions. For example, if a manager has added to excess return through asset allocation (e.g., positive return attribution allocation effect), we use risk attribution to understand whether those allocation decisions introduced additional risk. As such, risk attribution complements the

return attribution by evaluating the risk consequences of the investment decisions.

## EXAMPLE 7

### Risk Attribution

Manager A is a market-neutral manager following a systematic investment approach, scoring each security on a proprietary set of risk factors. He seeks to maximize the portfolio score on the basis of the factor characteristics of individual securities. He has a hurdle rate of T-bills plus 5%.

Manager B has a strong fundamental process based on a comprehensive understanding of the business model and competitive advantages of each firm. He also uses sophisticated models to make explicit three-year forecasts of the growth of free cash flow to determine the attractiveness of each security's current valuation. His objective is to outperform the MSCI World ex-US Index by 200 bps.

Manager C specializes in timing sector exposure and generally avoids idiosyncratic risks within sectors. Using technical analyses and econometric methodologies, she produces several types of forecasts. The manager uses this information to determine appropriate sector weights. The risk contribution from any single sector is limited to 30% of total portfolio risk. She hedges aggregate market risk and seeks to earn T-bills plus 300 bps.

1. Which risk attribution approach is most appropriate to evaluate Manager A?
  - A. Marginal contribution to total risk
  - B. Marginal contribution to tracking risk
  - C. Factor's marginal contributions to total risk and specific risk
2. Which risk attribution approach is most appropriate to evaluate Manager B?
  - A. Marginal contribution to total risk
  - B. Marginal contribution to tracking risk
  - C. Factor's marginal contributions to total risk and specific risk
3. Which risk attribution approach is most appropriate to evaluate Manager C?
  - A. Marginal contribution to total risk

**B.** Marginal contribution to tracking risk

**C.** Factor's marginal contributions to total risk and specific risk

### **Solution to 1:**

A is correct. Manager A is a bottom-up manager with an absolute return target. B is incorrect because tracking risk is not relevant to an absolute return mandate. C is incorrect because, as a market-neutral manager, Manager A is not seeking to take different-from-market exposures.

### **Solution to 2:**

B is correct. Manager B is a bottom-up manager with a relative return target. A and C are incorrect because they are best suited to absolute return mandates.

### **Solution to 3:**

C is correct. Manager C is a top-down manager with an absolute return target. A factor-based attribution is best suited to evaluate the effectiveness of the manager's sector decisions and hedging of market risk.

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## **6. RETURN ATTRIBUTION ANALYSIS AT MULTIPLE LEVELS**

### **h. identify and interpret investment results attributable to the asset owner versus those attributable to the investment manager**

To this point, the return attribution presented in the Brinson examples focused on the bottom-up approach, where we calculated attribution effects at security and sector levels and summed those effects to determine their impact at the total portfolio and fund levels. We can use a similar return attribution approach at multiple levels of the decision process to evaluate the impact of different decisions.

## 6.1. Macro Attribution—An Example

Consider an example in which the top level is the fund sponsor (e.g., a university endowment or a defined-benefit pension plan sponsor). At the fund sponsor level, the first decision might be to allocate a certain weight to asset classes—the strategic asset allocation. If the fund sponsor does not manage funds internally, it would delegate a second investment decision to the investment managers to decide on any tactical deviations from the strategic asset allocation. The sponsor might also select multiple portfolio managers to manage against specific mandates within a given asset class.

The attribution analysis that we use to determine the impact of these fund sponsor decisions is sometimes called macro attribution. The attribution of the individual portfolio manager decisions is sometimes called micro attribution.

Assume our hypothetical fund sponsor has the following total equity benchmark:

- 50% large-cap value equities
- 25% small-cap value equities
- 25% large-cap growth equities

The fund sponsor hires two investment managers to manage the equity portion of the fund. Value Portfolio Manager manages the large-cap and small-cap value allocations, and Growth Portfolio Manager manages the growth equity allocation. The investment returns are shown in [Exhibit 10](#).

**Exhibit 10. Performance of Value and Growth Equity Managers**

	<b>Fund Weight</b>	<b>Fund Return</b>	<b>Benchmark Weight</b>	<b>Benchmark Return</b>
<b>Total</b>	<b>100%</b>	<b>0.95</b>	<b>100%</b>	<b>−0.03</b>
Value Portfolio Manager	78%	0.99	75%	0.32
<i>Small-cap value equities</i>	20%	2.39	25%	1.52
<i>Large-cap value equities</i>	58%	0.51	50%	−0.28
Growth Portfolio Manager	22%	0.82	25%	−1.08

<i>Large-cap growth equities</i>	22%	0.82	25%	−1.08
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To evaluate the decisions of the fund sponsor, we perform a return Brinson–Fachler attribution analysis using the set of weight and return data in [Exhibit 10](#). “Allocation” measures the tactical asset allocation decision of the sponsor against its own strategic benchmark. In this example, the fund sponsor overweighted value equities and underweighted growth equities. “Selection” measures the fund sponsor’s manager selection decision: Did the selected managers add value relative to their assigned benchmarks?

For the decision to hire the Value Portfolio Manager, we would calculate the effects as follows:

$$\text{Allocation} = (78\% - 75\%)[0.32 - (-0.03)] = 0.01$$

- The fund sponsor overweighted value equities (78% – 75%).
- Value equities outperformed the fund’s aggregate benchmark [0.32 – (−0.03)].
- The decision to overweight value equities added to portfolio return.

$$\text{Selection} + \text{Interaction} = [(75\%)(0.99 - 0.32)] + [(78\% - 75\%)(0.99 - 0.32)] = 0.52$$

- The value manager outperformed the value benchmark (0.99 – 0.32). Thus, the fund sponsor’s manager selection decision, independent of the decision to overweight value equities, added value.
- The fund sponsor overweighted a manager who outperformed his benchmark [(78% – 75%)(0.99 – 0.32)]. This is the interaction effect. (For simplicity, we combine interaction with selection, rather than showing interaction separately. By combining with selection, we assume that the selection decisions include the interaction and leave the allocation decision separate.) The interaction effect was positive.

For the decision to hire the Growth Portfolio Manager, we would calculate the effects as follows:

$$\text{Allocation} = (22\% - 25\%)[-1.08 - (-0.03)] = 0.03$$

- The fund sponsor underweighted growth equities (22% – 25%)
- Growth equities underperformed the fund’s aggregate benchmark (−1.08 versus −0.03)



- The decision to underweight growth equities added to portfolio return

$$\text{Selection} + \text{Interaction} = [(25\%)(0.82 - (-1.08))] + [(22\% - 25\%)(0.82 - (-1.08))] = 0.42$$

- The growth manager outperformed the growth benchmark (+0.82 versus -1.08). Thus, the fund sponsor's manager selection decision, independent of the decision to underweight growth equities, added value.
- The fund sponsor underweighted a manager who outperformed his benchmark  $[(-3\%)(0.82 - (-1.08))]$ . The interaction effect was negative.

The results are summarized in [Exhibit 11](#).

### Exhibit 11. Macro Attribution

Return Attribution (Plan Sponsor Level)	Selection + Interaction	Allocation	Total
Total	0.94	0.04	0.98
Value Portfolio Manager	<b>0.52</b>	<b>0.01</b>	<b>0.53</b>
Growth Portfolio Manager	<b>0.42</b>	<b>0.03</b>	<b>0.45</b>

Return attribution analysis is most often calculated with reference to the portfolio's agreed-upon benchmark. But it is entirely possible to attribute one portfolio against another when both are using the same or a similar investment strategy. The purpose of such analysis might be to explain an unexpected difference in return between two portfolios managed by the same portfolio manager using the same investment decision-making process.

## 6.2. Micro Attribution—An Example

Using the same return data, we now move to the next level of the investment decision-making process and will evaluate the impact of the portfolio managers' decisions on total fund performance. We calculate the return attribution effects using the Brinson–Fachler approach at the segment level (i.e., small-cap value, large-cap value, and large-cap growth):

$$\text{Allocation} = (w_i - W_i)(B_i - B)$$

$$\text{Selection} + \text{Interaction} = W_i(R_i - B_i) + (w_i - W_i)(R_i - B_i)$$

We calculate the attribution effects for the small-cap value equities:

$$\text{Allocation} = (20\% - 25\%)[1.52 - (-0.03)] = -0.08$$

$$\text{Selection} + \text{Interaction} = [(25\%)(2.39 - 1.52)] + [(20\% - 25\%)(2.39 - 1.52)] = 0.17$$

Using the same approach for large-cap value equities and large-cap growth equities yields the results shown in [Exhibit 12](#). (Note that the numbers are rounded to two decimal places and may not sum because of this rounding.)

### Exhibit 12. Segment-Level Return Attribution

Return Attribution (Segment Level)	Fund Weight	Selection + Interaction	Allocation	Total
<b>Total</b>	<b>100%</b>	<b>1.05</b>	<b>-0.07</b>	<b>0.98</b>
Value Portfolio Manager	78%	0.63	-0.10	0.53
<i>Small-cap value equities</i>	<i>20%</i>	<i>0.17</i>	<i>-0.08</i>	<i>0.10</i>
<i>Large-cap value equities</i>	<i>58%</i>	<i>0.46</i>	<i>-0.02</i>	<i>0.44</i>
Growth Portfolio Manager	22%	0.42	0.03	0.45
<i>Large-cap growth equities</i>	<i>22%</i>	<i>0.42</i>	<i>0.03</i>	<i>0.45</i>

In [Exhibit 12](#), the attribution results in italics are calculated at the segment level. The attribution results at the next level above, the Value Portfolio Manager and Growth Portfolio Manager, are sums of the segment-level results. For example, the allocation effect for the Value Portfolio Manager is equal to the sum of the small-cap and large-cap segments:  $-0.08 + -0.02 = -0.10$ .

Summing up the segment-level results for each manager, we reach the following conclusions:

- The total outperformance at the overall fund level of 98 bps is almost entirely the result of positive security selection decisions (105 bps in total).
- The decision of the Value Portfolio Manager to underweight small cap in favor of large cap detracted from total fund performance because the small-cap value benchmark outperformed the total benchmark (1.52% versus -0.03%), leading to an allocation effect of -0.10.

- The large-cap value benchmark underperformed the total benchmark (−0.28% versus −0.03%). Because the portfolio was underweight large-cap value, this led to a positive allocation effect of 0.03.
- In total, allocation decisions contributed −7 bps.

Note that in using the total fund benchmark in this analysis, we are evaluating the *impact* of the Value Portfolio Manager's decision on the performance of the total fund.

We can extend the attribution analysis down another level and examine the investment manager's results relative to the investment process. The manager may have an investment process that specifically targets country allocations.<sup>3</sup> At this level of analysis, the same allocation formula will calculate the impact of country allocation decisions within the manager's portfolio and the selection formula will calculate the impact of selection decisions within each country.

If the portfolio manager has an investment process that specifically targets sector allocations within each country, the allocation formula can be used to calculate the impact of sector selection decisions within countries and the selection decisions within sectors.

Whatever the level of analysis, the return attribution must reflect the decision-making process of the portfolio manager. For example, a eurozone investment strategy might use a country allocation process with security selection within each country or a sector allocation process with security selection within each industrial sector. Exhibits 13 and 14 illustrate the different results that might be reached from an analysis based on the investment process. In each case, an arithmetic Brinson approach has been used.

### Exhibit 13. Country Allocation

	Portfolio Weight	Benchmark Weight	Portfolio Return	Benchmark Return	Allocation	Sel Int
France	20%	30%	8.0%	6.0%	0.15%	(
Germany	20%	35%	8.0%	7.0%	0.07%	(
Holland	20%	10%	9.0%	15.0%	0.76%	–
Italy	30%	15%	10.0%	9.0%	0.23%	(
Spain	10%	10%	3.0%	3.5%	0.00%	–
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>8.3%</b>	<b>7.45%</b>	<b>1.20%</b>	<b>–</b>

## Exhibit 14. Industry Sector Allocation

	Portfolio Weight	Benchmark Weight	Portfolio Return	Benchmark Return	Allocation
Energy	25%	30%	18.0%	12.0%	−0.23%
Health care	30%	20%	−3.0%	−6.0%	−1.35%
Financial	20%	30%	10.0%	12.0%	−0.46%
Transportation	10%	15%	12.0%	8.0%	−0.03%
Metals and mining	15%	5%	10.0%	5.0%	−0.25%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>8.3%</b>	<b>7.45%</b>	<b>−2.30%</b>

Exhibit 13 suggests that the manager demonstrated good country allocation but negative security selection within countries, whereas Exhibit 14 suggests that the manager demonstrated poor sector allocation but strongly positive security selection within industrial sectors. This apparent “contradiction” illustrates the importance of designing an attribution approach around the investment decision-making process used by the manager.

Drilling down to the lowest level, the same allocation and selection formulas can be used to calculate the contribution of individual security decisions within sectors. For example, the allocation formula can be used to determine the impact of over- or underweighting individual securities, whereas the selection formula can be used to determine the contribution arising from a difference in the return of a security in the portfolio and the return of the same security in the benchmark. If the pricing sources used in the portfolio and the benchmark are identical, then any difference in return will be caused by transaction activity. Transaction activity because of trading expenses and bid–offer spreads will negatively affect returns, but occasionally because of timing, the portfolio manager may be able to trade at advantageous prices during the day and recover all the transaction costs by the end of the day, resulting in a positive effect.

Exhibit 15 shows the security-level return attribution effects for a small portfolio of oil stocks against a customized benchmark consisting of the same oil stocks. This approach would be used by a pure stock picker, the only decisions in the portfolio being individual stock weighting and timing decisions.

## Exhibit 15. Security-Level Return Attribution Effects of Pure Stock Picker

	Portfolio Weight	Benchmark Weight	Portfolio Return	Benchmark Return
Chevron	24%	30%	10%	7.0%
ConocoPhillips	21%	25%	8%	7.0%
ExxonMobil	41%	35%	5%	7.0%
Marathon Oil	6%	5%	4%	7.05%
Newfield Expl.	8%	5%	-5%	7.0%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>5.97%</b>	<b>7.0%</b>

The arithmetic allocation effects of each security using the Brinson

Chevron	$(24\% - 30\%) \times (10\% - 7.0\%)$
ConocoPhillips	$(21\% - 25\%) \times (8.0\% - 7.0\%)$
ExxonMobil	$(41\% - 35\%) \times (6.0\% - 7.0\%)$
Marathon Oil	$(6\% - 5\%) \times (4.0\% - 7.05\%)$
Newfield Exploration	$(8\% - 5\%) \times (-5.0\% - 7.0\%)$

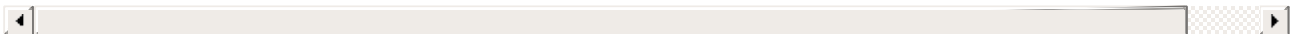
Allocation in this context measures the value added from individual transactions occur for only one security during the period—ExxonMobil selection effects (transaction costs and timing) occur for this security as follows:

$$\text{ExxonMobil} \quad 41\% \times (5.0\% - 6.0\%) = -(4.1\%)$$

EXAMPLE 8

## Macro Attribution

AAA Asset Management runs a fixed-income fund of funds. The fund's benchmark is a blended benchmark comprising 80% Bloomberg Barclays Global















































































































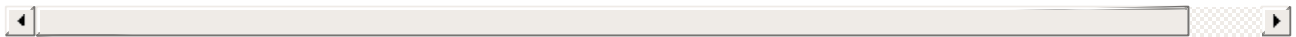






























# Reading 27

## Investment Manager Selection

by Jeffrey C. Heisler, PhD, CFA, and Donald W. Lindsey, CFA

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** describe the components of a manager selection process, including due diligence;
- b.** contrast Type I and Type II errors in manager hiring and continuation decisions;
- c.** describe uses of returns-based and holdings-based style analysis in investment manager selection;
- d.** describe uses of the upside capture ratio, downside capture ratio, maximum drawdown, drawdown duration, and up/down capture in evaluating managers;
- e.** evaluate a manager's investment philosophy and investment decision-making process;
- f.** evaluate the costs and benefits of pooled investment vehicles and separate accounts;
- g.** compare types of investment manager contracts, including their major provisions and advantages and disadvantages;
- h.** describe the three basic forms of performance-based fees;
- i.** analyze and interpret a sample performance-based fee schedule.

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# 1. INTRODUCTION

Most investors do not hold securities directly but rather invest using intermediaries. Whether the intermediary is a separately managed account or a pooled investment vehicle, such as mutual funds in the United States, unit trusts in the United Kingdom, Undertakings for the Collective Investment of Transferable Securities (UCITS) in the European Union, hedge funds, private equity funds, or exchange-traded funds (ETFs), a professional investment manager is being entrusted with helping investors achieve their investment objectives. In all of these cases, the selection of appropriate investment managers is a challenge with important financial consequences.

Evaluating an investment manager is a complex and detailed process that encompasses a great deal more than analyzing investment returns. The investigation and analysis in support of an investment action, decision, or recommendation is called **due diligence**. In conducting investment manager due diligence, the focus is on understanding how the investment results were achieved and on assessing the likelihood that the investment process that generated these returns will produce superior or at least satisfactory investment results going forward. Due diligence also entails an evaluation of a firm's integrity, operations, and personnel. As such, due diligence involves both quantitative and qualitative analysis.

This reading provides a framework that introduces and describes the important elements of the manager selection process. Although it is important to have a well-defined methodology, this reading is not intended to be a rigid checklist, a step-by-step guide, or an in-depth analysis but rather to present a structure from which the reader can develop their own approach.

We assume that the investment policy statement (IPS) has been drafted, the asset allocation determined, and the decision to use an outside adviser has been made. As a result, the focus is on determining which manager offers the “best” means to implement or express those decisions. The discussion has three broad topics:

- Outlining a framework for identifying, evaluating, and ultimately selecting investment managers (Sections 2 and 3).
- Quantitative considerations in manager selection (Sections 4 and 5).
- Qualitative considerations in manager selection (Sections 6–9).

The reading concludes with a summary of selected important points.

## 2. A FRAMEWORK FOR INVESTMENT MANAGER SEARCH AND SELECTION

- a. describe the components of a manager selection process, including due diligence;

An underlying assumption of investment manager due diligence is that a consistent, robust investment process will generate a similar return distribution relative to risk factors through time, assuming the underlying dynamics of the market have not dramatically changed. One important goal of manager due diligence is to understand whether the manager’s investment process, people, and portfolio construction satisfy this assumption—that is, will the investment process generate the expected return from the expected sources? The manager search and selection process has three broad components: the universe, a quantitative analysis of the manager’s performance track record, and a qualitative analysis of the manager’s investment process. The qualitative analysis consists of investment due diligence, which evaluates the manager’s investment process, and operational due diligence, which evaluates the manager’s infrastructure and firm. [Exhibit 1](#) details these components.

**Exhibit 1. Manager Selection Process Overview**

Key aspects	Key Question
<b>Universe</b>	
Defining the universe	What is the feasible set of managers that fit the portfolio need?
▪ Suitability	Which managers are suitable for the IPS?
▪ Style	Which have the appropriate style?
▪ Active vs. passive	Which fit the active versus passive decision?
<b>Quantitative Analysis</b>	
Investment due diligence	Which manager “best” fits the portfolio need?
Quantitative	What has been the manager’s return distribution?
▪ Attribution and	Has the manager displayed skill?

## Appraisal

- Capture ratio      How does the manager perform in “up” markets versus “down” markets?
- Drawdown      Does the return distribution exhibit large drawdowns?

## Qualitative Analysis

Investment due diligence      Which manager “best” fits the portfolio need?

Qualitative      Is the manager expected to continue to generate this return distribution?

- Philosophy      What market inefficiency does the manager seek to exploit?
- Process      Is the investment process capable of exploiting this inefficiency?
- People      Do the investment personnel possess the expertise and experience necessary to effectively implement the investment process?
- Portfolio      Is portfolio construction consistent with the stated investment philosophy and process?

Operational due diligence      Is the manager’s track record accurate, and does it fully reflect risks?

- Process and procedure      Is the back office strong, safeguarding assets and able to issue accurate reports in a timely manner?
  - Firm      Is the firm profitable, with a healthy culture, and likely to remain in business? Is the firm committed to delivering performance over gathering assets?
  - Investment vehicle      Is the vehicle suitable for the portfolio need?
  - Terms      Are the terms acceptable and appropriate for the strategy and vehicle?
  - Monitoring      Does the manager continue to be the “best” fit for the portfolio need?
-

## EXAMPLE 1

# Components of the Manager Selection Process

1. Qualitative analysis of the manager selection process includes:
  - A. attribution.
  - B. defining the universe.
  - C. investment and operational due diligence.
2. Which of the following is considered a key aspect of operational due diligence?
  - A. People
  - B. Philosophy
  - C. Procedures

### Solution to 1:

C is correct. Qualitative analysis consists of investment due diligence, which evaluates the manager's investment process, and operational due diligence, which evaluates the manager's infrastructure and firm.

### Solution to 2:

C is correct. Process and procedures are key aspects of operational due diligence, whereas people and philosophy are key aspects of investment due diligence.

## 2.1. Defining the Manager Universe

The manager selection process begins by defining the universe of feasible managers, those managers that potentially satisfy the identified portfolio need. The objective is to reduce the manager universe to a manageable size relative to the resources and time available to evaluate it. This process also involves balancing the risks of too narrow a search, which



potentially excludes interesting managers, and too broad a search, which leads to little gain in reducing the list of potential managers. Like many interesting problems, this step is a combination of art and science. In the initial screening process, the search parameters can be narrowed and widened to determine which managers enter and exit and to evaluate whether these additions or deletions improve the universe.

The IPS and the reason for the manager search largely determine the universe of managers considered and the benchmark against which they are compared. A new search based on a strategic or tactical view, such as adding a new strategy or risk exposure, will examine a broad universe of comparable managers and look to select the best within the universe. Adding a manager to increase capacity or diversification within a strategy already held will look for a complement to current holdings. Replacing a single manager in a particular strategy will look for the best manager within the strategy universe. The IPS in part determines what the relative terms “best,” “complement,” and “cost/benefit” mean.

Typically, a search starts with a benchmark that represents the manager’s role within the portfolio. The benchmark also provides a reference for performance attribution and appraisal. There are several approaches to assigning a manager to a benchmark:

- **Third-party categorization:** Database or software providers and consultants typically assign managers to a strategy sector. This categorization provides an easy and efficient way to define the universe. The risk is that the provider’s definition may differ from the desired portfolio role. As such, it is important to understand the criteria used by the provider.
- **Returns-based style analysis:** The risk exposures derived from the manager’s actual return series has the advantage of being objective. The disadvantage is additional computational effort and the limitations of returns-based analysis.
- **Holdings-based style analysis:** This approach allows for the estimation of current factor exposures but adds to computational effort and depends on timing and amount of transparency.
- **Manager experience:** The assignment can be based on an evaluation of the manager and observations of portfolios and returns over time.

Not surprisingly, a hybrid strategy that combines elements of each approach is recommended. Using third-party categorizations is an efficient way to build an initial universe that can then be complemented and refined with quantitative methods and experience. The screening should avoid using performance at this point. The focus should be on understanding the manager’s risk profile and identifying candidates to fill the desired role in the portfolio. Lastly, the universe of potential managers is not static—it will evolve through time not only as manager strategies evolve but also as a result of the entry and exit of managers.

### 3. TYPE I AND TYPE II ERRORS IN MANAGER SELECTION

- b. contrast Type I and Type II errors in manager hiring and continuation decisions;

Certain concepts from the area of inferential statistics known as hypothesis testing can be relevant to the decision to hire an investment manager or to retain or dismiss a manager previously hired.

The determination of whether a manager is skillful typically starts with the null hypothesis (the hypothesis assumed to be true until demonstrated otherwise) that the manager is not skillful. As a result, there are two types of potential error:

- Type I: Hiring or retaining a manager who subsequently underperforms expectations. Rejecting the null hypothesis of no skill when it is correct.
- Type II: Not hiring or firing a manager who subsequently outperforms, or performs in line with, expectations. Not rejecting the null hypothesis when it is incorrect.

Exhibit 2. Type I and Type II Errors

		Realization	
		Below expectations (no skill)	At or above expectations (skill)
Decision	Hire/Retain	Type I	Correct
	Not Hire/Fire	Correct	Type II

Type I and Type II errors can occur anytime a decision is made regarding the hiring or firing of a manager. The decision maker must determine which error is preferred based on the expected benefits and costs of changing managers.

#### 3.1. Qualitative considerations in Type I and Type II errors

Decision makers appear predisposed to worry more about Type I errors than Type II errors. Potential reasons for this focus on Type I errors are as follows:

- Psychologically, people seek to avoid feelings of regret. Type I errors are errors of commission, an active decision that turned out to be incorrect, whereas Type II errors are errors of omission, or inaction. As a result, Type I errors create explicit costs, whereas Type II errors create opportunity costs. Because individuals appear to put less weight on opportunity costs, Type I errors are psychologically more painful than Type II errors.
- Type I errors are relatively straightforward to measure and are often directly linked to the decision maker's compensation. Portfolio holdings are regularly monitored, and managers' out- and underperformance expectations are clearly identified. Type II errors are less likely to be measured—what is the performance impact of not having selected a particular manager? As such, the link between compensation and Type II errors is less clear.
- Similarly, Type I errors are more transparent to investors, so they entail not only the regret of an incorrect decision but the pain of having to explain this decision to the investor. Type II errors, firing (or not hiring) a manager with skill, are less transparent to investors, unless the investor tracks fired managers or evaluates the universe themselves.

Although Type I errors are likely more familiar and more of a concern to most decision makers, a consistent pattern of Type II errors can highlight weaknesses in the manager selection process. One approach to examine this issue is to monitor not only managers currently held but also managers that were evaluated and not hired as well as managers that were fired. The goal of monitoring is to determine the following:

- Are there identifiable factors that differentiate managers hired and managers not hired?
- Are these factors consistent with the investment philosophy and process of the decision maker?
- Are there identifiable factors driving the decision to retain or fire managers?
- Are these factors consistent with the investment philosophy and process of the decision maker?
- What is the added value of the decision to retain or fire managers?

The objective is to avoid making decisions based on short-term performance (trend following) and to identify any evidence of behavioral biases (regret, loss aversion) in the evaluation of managers during the selection process.

## 3.2. Performance implications of Type I and Type II errors

The cost of Type I errors is holding a manager without skill, as opposed to the cost of Type II errors, which is not holding managers with skill. The cost is driven by the size, shape, mean, and dispersion of the return distributions of the skilled and unskilled managers within the universe. The smaller the difference in sample size and distribution mean and the wider the dispersion of the distributions, the smaller the expected cost of the Type I or Type II error. More-efficient markets are likely to exhibit smaller differences in the distributions of skilled and unskilled managers, indicating a lower opportunity cost of retaining and the lower the cost of hiring an unskilled manager.

The extent to which a strategy is mean-reverting also has a bearing on the cost of Type I and Type II errors. If a strategy's performance is mean reverting, firing a poor performer (or hiring a strong performer) only to see a reversion in performance results is a Type I error. A Type II error would be trimming or not hiring strong performers and hiring managers with weaker track records. There is evidence that individual investors significantly underperform the average mutual fund because of poor timing and fund selection decisions. A study of institutional plan sponsor allocation decisions found that investment products receiving contributions subsequently underperformed products experiencing withdrawals. The study estimated that more than \$170 billion was lost during the period examined (Stewart, Neumann, Knittel, and Heisler 2009).

### EXAMPLE 2

## Type I and Type II Errors

1. A Type I error is:
  - A. hiring or retaining a manager that subsequently underperforms expectations.
  - B. hiring or retaining a manager that subsequently outperforms, or performs in line with, expectations.
  - C. not hiring or firing a manager who subsequently outperforms, or performs in line with, expectations.
2. A Type II error is:
  - A. hiring or retaining a manager that subsequently underperforms expectations.
  - B. hiring or retaining a manager that subsequently outperforms, or performs in

line with, expectations.

C. not hiring or firing a manager who subsequently outperforms, or performs in line with, expectations.

3. The difference in expected cost between Type I and Type II errors is *most likely*:

A. higher the smaller the perceived difference between the distribution of skilled and unskilled managers.

B. lower the smaller the perceived difference between the distribution of skilled and unskilled managers.

C. zero.

### **Solution to 1:**

A is correct. The error consists of rejecting the null hypothesis (no skill) when it is correct.

### **Solution to 2:**

C is correct. The error consists of not rejecting the null hypothesis (no skill) when it is incorrect.

### **Solution to 3:**

B is correct. The less distinct the distribution of skilled managers from unskilled managers, the lower the opportunity cost of retaining and cost of hiring an unskilled manager. That is, the smaller the perceived difference between the distribution of skilled and unskilled managers, the lower the cost and incentive to fire a manager.

---

## **4. QUANTITATIVE ELEMENTS OF MANAGER SEARCH AND SELECTION**

c. describe uses of returns-based and holdings-based style analysis in investment manager

selection;

Performance appraisal captures most aspects of quantitative analysis, evaluating a manager's strengths and weaknesses as measured by that manager's ability to add value to a stated benchmark. Although the determination of whether the manager possesses skill is important, it is equally important to understand the manager's risk profile. The manager has likely been selected to fill a particular role in the portfolio. As such, although it is important to select a skillful manager, the "best" manager may be one that delivers the desired exposures and is suitable for the investor's assumptions, expectations, and biases.

## 4.1. Style Analysis

An important component of performance appraisal and manager selection is understanding the manager's risk exposures relative to the benchmark and how they evolve over time. This understanding helps define the universe of potential managers and the monitoring of selected managers. The process is referred to as style analysis.

A manager's self-reported risk exposures, such as portfolio concentration, industry exposure, capitalization exposure, and other quantitative measures, are the starting point in style analysis. They provide a means to classify managers by style for defining the selection process, a point of reference for evaluating the returns-based and holdings-based style analysis, and an interesting operational check on the manager.

The results of the returns-based style analysis (RBSA) and the holdings-based style analysis (HBSA) should be consistent with the manager's philosophy and the investment process. If not, the process might not be repeatable or might be implemented inconsistently. It is essential to look at all portfolio construction and risk management issues.

The results of the returns-based style analysis and the holdings-based style analysis should be tracked over time in order to ascertain if the risk trends or exposures are out of line with expectations or the manager's stated style. Deviations may signal that issues, such as style drift, are developing.

Returns-based and holdings-based style analyses provide a means to determine the risks and sources of return for a particular strategy. To be useful, style analysis must be:

- *Meaningful:* The risks reported must represent the important sources of performance return and risk.
- *Accurate:* The reported values must reflect the manager's actual risk exposures.
- *Consistent:* The methodology must allow for comparison over time and across multiple

managers.

- *Timely*: The report must be available in a timely manner so that it is useful for making informed investment decisions.

Style analysis is most useful with strategies that hold publicly-traded securities where pricing is frequent. It can be applied to other strategies (hedge funds and private equity, for example), but the insights drawn from a style analysis of such strategies are more likely to be used for designing additional lines of inquiry in the course of due diligence rather than for confirmation of the investment process.

**Returns-based style analysis** (RBSA) is a top-down approach that involves estimating a portfolio's sensitivities to security market indexes representing a range of distinct factors. Although RBSA adds the additional analytical step of estimating the risk factors, as opposed to using a third-party or self-reported style categorization, the analysis is straightforward and typically does not require a large amount of additional, or difficult to acquire, data. RBSA should identify the important drivers of return and risk factors for the period analyzed and can be estimated even for complicated strategies. In addition, the process is comparable across managers and through time, and the use of returns data provides an objective style check that is not subject to window dressing. The analysis can be run immediately after the data is available, particularly in the case of publicly traded securities. As such, RBSA has many of the attributes of effective risk reporting.

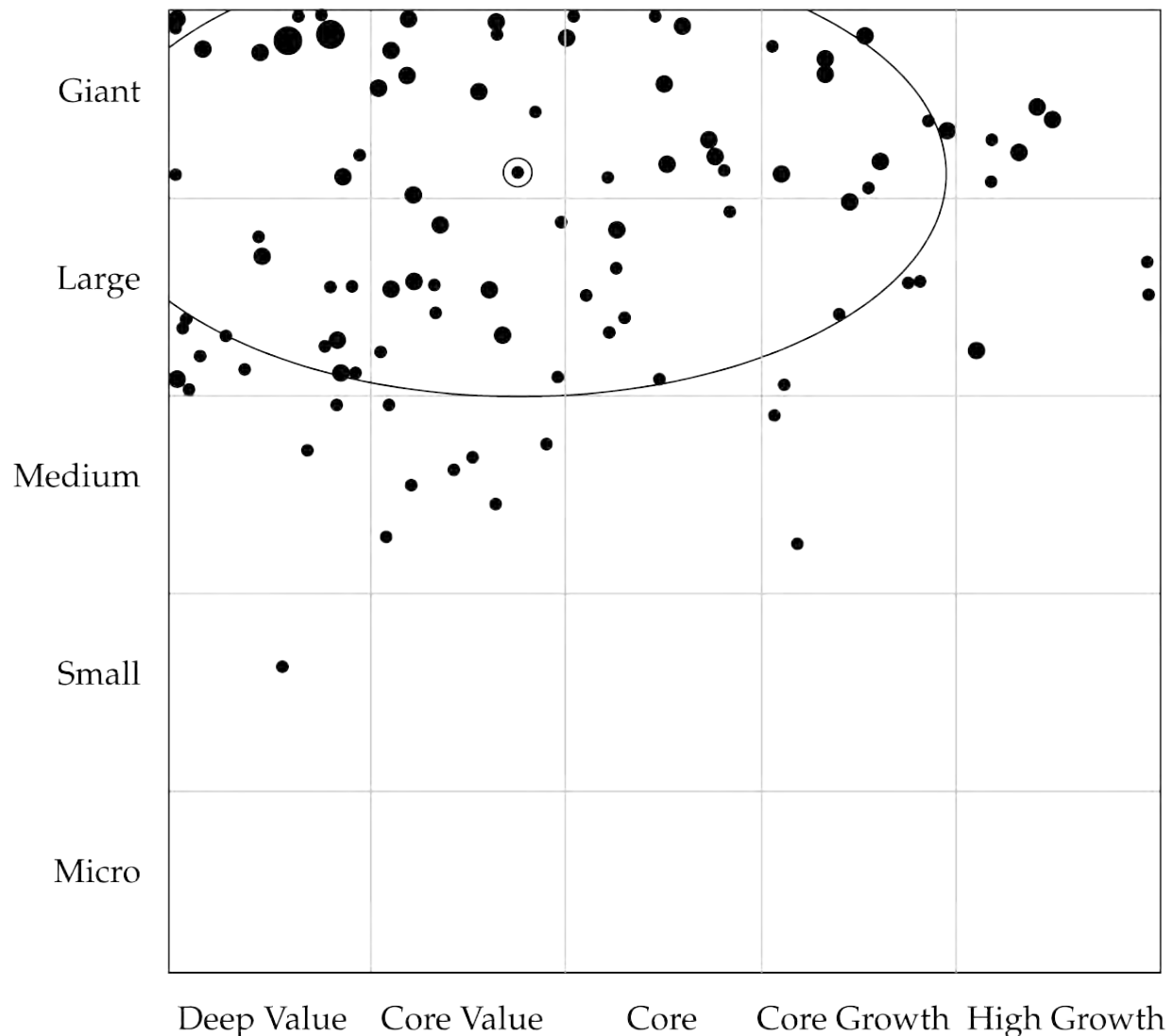
The disadvantage is that RBSA is an imprecise tool. Although the additional computational effort required is not onerous, accuracy may be compromised, because RBSA effectively attributes performance to an unchanging average portfolio during the period. This attribution limits the ability to identify the impact of dynamic investment decisions and may distort the decomposition across sources of added value. Furthermore, the portfolio being analyzed might not reflect the current or future portfolio exposures. If the portfolio contains illiquid securities, stale prices may understate the risk exposure of the strategy. This is a particular problem for private equity (PE) and venture capital (VC) managers that hold illiquid or non-traded securities. VC and PE firms report performance based on the internal rate of return of cash distributions and appraisals of ongoing projects. As a result, reported performance can understate the volatility of return for shorter horizons or time periods with limited liquidity events. Longer periods generally provide more-accurate estimates of the manager's underlying standard deviation of return. The timeliness of any analysis depends on the securities that take the longest to price, which can be challenging for illiquid or non-traded securities.

**Holdings-based style analysis** (HBSA) is a bottom-up approach that estimates the risk exposures from the actual securities held in the portfolio at a point in time. This approach allows for estimation of current risk factors and offers several advantages. Similar to RBSA, HBSA should identify all important drivers of return and risk factors; be comparable across managers and through time; provide an accurate view of the manager's risk exposures,

although potentially subject to window dressing; and be estimated immediately after the data become available.

**Exhibit 3** presents a typical holdings-based style map. The manager being evaluated, along with the other managers in the universe, is placed along the size (y-axis) and style (x-axis) dimensions. The portfolio holdings of the manager being evaluated exhibit a large-cap value bias in what is otherwise a rather diverse universe.

**Exhibit 3. Example of Holdings-Based Style Analysis**



Source: Morningstar Direct, The Mutual Fund Research Center.

As with RBSA, HBSA has some disadvantages. The computational effort increases with the complexity of the strategy and depends on the timing and degree of the transparency



provided by the manager. This extra effort can be challenging for hedge fund, private equity, and venture capital managers that may be averse to or unable to provide position-level pricing. Even with mutual funds, the necessary transparency may come with a time lag. The usefulness of the analysis may be compromised, because the portfolio reflects a snapshot in time and might not reflect the portfolio going forward, particularly for high-turnover strategies. Some factors may be difficult to estimate if the strategy is complex because HBSA requires an understanding of the underlying strategy. In general, HBSA is typically easier with equity strategies. If the portfolio has illiquid securities, stale pricing may underestimate the risk exposure of the strategy. The report's timeliness depends on the securities that take the longest to price, which can be challenging for illiquid or non-traded securities.

### EXAMPLE 3

## Style Analysis

1. Which of the following is an advantage of RBSA?
  - A. It is a more precise tool than HBSA.
  - B. It does not require potentially difficult to acquire data.
  - C. It is more accurate than HBSA when the portfolio contains illiquid securities.
2. Which of the following is an advantage of HBSA?
  - A. It works well for high-turnover strategies.
  - B. It can identify important drivers of return and risk factors and is comparable across managers and through time.
  - C. It effectively attributes performance to a snapshot of the portfolio at a particular time and thus is not subject to window dressing.

### Solution to 1:

B is correct. The data needed for RBSA are usually easier to obtain than the data required for HBSA. RBSA is not a precise tool, and it is not more accurate than HBSA when the portfolio holds illiquid securities.

### Solution to 2:

B is correct. Although HBSA allows for estimation of current risk factors and is comparable across managers and through time, the necessary computational effort

increases with the strategy's complexity and depends on the timing and degree of the transparency provided by the manager. Some factors may be difficult to estimate if the strategy is complex because this approach requires an understanding of the underlying strategy. In general, HBSA is typically easier for equity strategies. If the portfolio has illiquid securities, stale pricing may underestimate the risk exposure of the strategy. Window dressing and high turnover can compromise the results because the results are attributed to a snapshot of the portfolio.

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## 5. CAPTURE RATIOS AND DRAWDOWNS IN MANAGER EVALUATION

- d. describe uses of the upside capture ratio, downside capture ratio, maximum drawdown, drawdown duration, and up/down capture in evaluating managers;

Because large losses require proportionally greater gains to reverse or offset, drawdowns and capture ratios can be important factors in investment manager evaluation. A manager that experiences larger drawdowns may be less suitable for an investor closer to the end of their investment horizon. Capture ratios help assess manager suitability relative to the investor's IPS, especially in relation to the investor's time horizon and risk tolerance.

Recall that: 1) Upside capture (UC) measures capture when the benchmark return is positive. UC greater than 100% suggests out-performance relative to the benchmark. 2) Downside capture (DC) measures capture when the benchmark return is negative. DC less than 100% generally suggests out-performance relative to the benchmark. 3) The **capture ratio** (CR)—upside capture divided by downside capture—measures the asymmetry of return. 4)

**Drawdown** is the cumulative peak-to-trough loss during a particular continuous period and **drawdown duration** is the total time from the start of the drawdown until the cumulative drawdown recovers to zero.

Let's illustrate the use of capture ratios in the analysis of manager returns. Consider the four stylized return profiles in [Exhibit 4](#).

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### Exhibit 4. Return Profile Summary

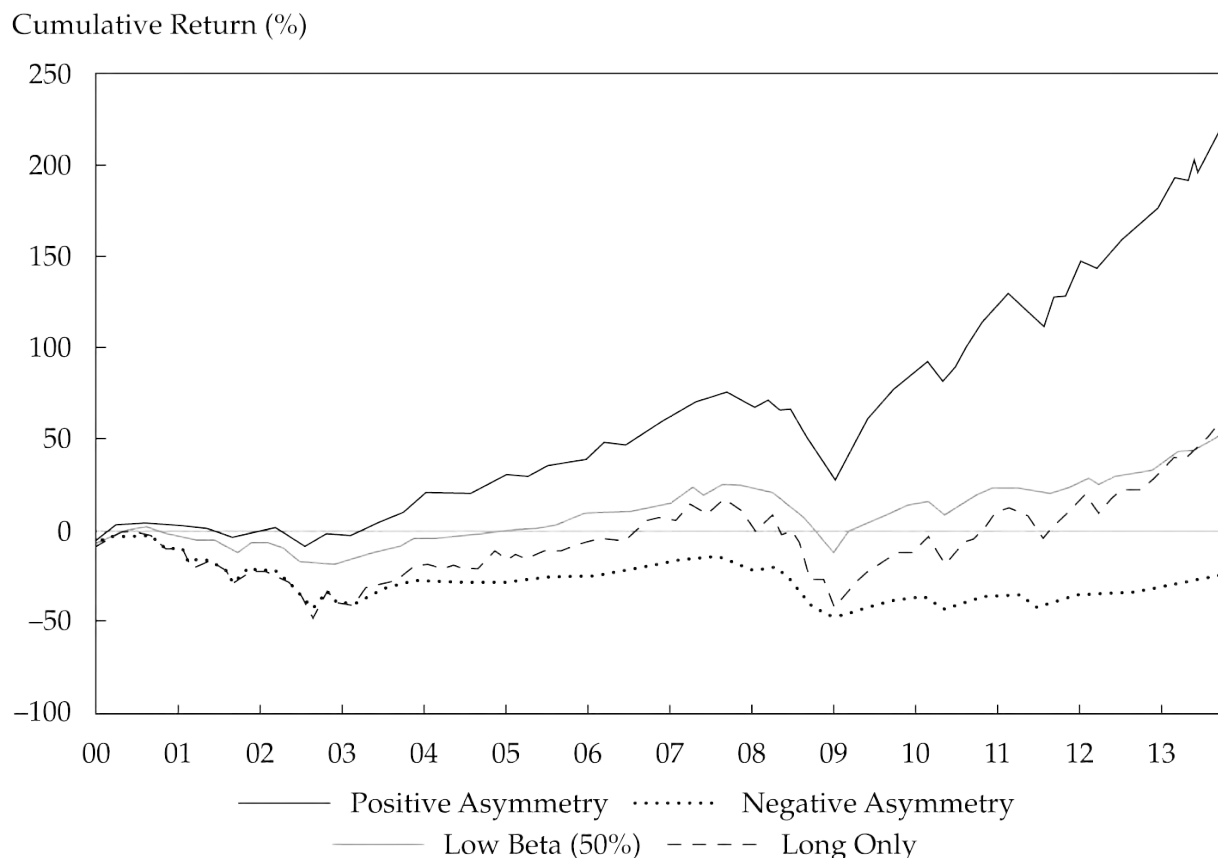
<b>Profile</b>	<b>Upside Capture</b>	<b>Downside Capture</b>	<b>Ratio</b>
Long only	100%	100%	1.0
Positive asymmetry	75%	25%	3.0
Low beta	50%	50%	1.0
Negative asymmetry	25%	75%	0.3

Each strategy's allocation to the S&P 500 Total Return (TR) Index and to 90-day T-bills (assuming monthly rebalancing to simplify the calculations) is based on the realized monthly return from January 2000 to December 2013. (This time period encompasses two significant drawdowns: the "tech bubble burst" of the early 2000s and the extreme drawdown of the Global Financial Crisis in 2008–2009.)

- The long-only profile is 100% allocated to the S&P 500 throughout the period.
- The low-beta profile is allocated 50% to the S&P 500 throughout the period.
- The positive asymmetry profile is allocated 75% to the S&P 500 for months when the S&P 500 return is positive and 25% when the S&P 500 return is negative.
- The negative asymmetry profile is allocated 25% to the S&P 500 for months when the S&P 500 return is positive and 75% when the S&P 500 return is negative.

The remainder for all profiles is allocated to 90-day T-bills. [Exhibit 5](#) shows each profile's cumulative monthly return for the period.

#### **Exhibit 5. Each Profile's Cumulative Monthly Return, January 2000–December 2013**



**Exhibit 6** provides summary statistics for each profile based on monthly returns from January 2000 to December 2013. Although the long-only profile outperformed the low-beta profile over the full period, this outperformance resulted from the strong up market of 2013—the long-only profile lagged the low-beta profile for most of the period. The low beta profile achieved higher risk-adjusted returns and only half the volatility for the full period. The low-beta profile declined only 18.8% from January 2000 to September 2002, compared with the long-only decline of 42.5%. As a result, the low-beta profile had higher cumulative performance from January 2000 to October 2007 despite markedly lagging the long-only profile (56.0% to 108.4%) from October 2002 to October 2007.

Although a low-beta approach may sacrifice performance, it shows that limiting drawdowns can result in better absolute and risk-adjusted returns in certain markets.

Not surprisingly, positive asymmetry results in better performance relative to long only, low beta, and negative asymmetry. Although the positive asymmetry profile lags in up markets, this lag is more than offset by the lower participation in down markets. Not surprisingly, the negative asymmetry profile lags.

<b>Strategy</b>	<b>Long Only</b>	<b>Low Beta</b>	<b>Positive Asymmetry</b>	<b>Negative Asymmetry</b>
Cumulative return	64.0%	54.2%	228.1%	-24.4%
Annualized return	3.60%	3.14%	8.86%	-1.98%
Annualized standard deviation	15.64%	7.79%	9.61%	10.01%
Sharpe ratio	0.10	0.14	0.71	-0.40
Beta	1.00	0.50	0.61	0.64
Drawdown (maximum)	-50.9%	-28.3%	-26.9%	-48.9%

We've shown that positive asymmetry is a desirable trait. When evaluating a manager that exhibits positive asymmetry in its returns, we need to understand whether the strategy is inherently convex or whether the profile is a result of manager skill. For example, a hedging strategy implemented by rolling forward out-of-the-money put options will typically return many small losses because more options expire worthless than are compensated for by the occasional large gain during a large market downturn. A manager employing this strategy will likely exhibit consistent positive asymmetry in his returns, but the positive asymmetry is likely a due to the nature of the strategy rather than on investment skill.

Let's consider now the use of drawdowns in the analysis of manager returns. Drawdowns are stress-tests of the investment process and can expose potentially flawed or inconsistently implemented investment processes, inadequate risk controls, or operational issues. Did the manager implement the stated investment process consistently? If yes, what lessons were learned and how might the investment process have been adapted as a result? If the drawdown resulted from a deviation from the stated investment process, why? During a large or long drawdown, a manager could start to worry more about business risk than investment risk and act in their own best interest rather than that of their investors. How a manager responds to a large drawdown as it occurs, and what lessons are learned, provide evidence of the robustness and repeatability of the investment, portfolio construction, and risk management processes, as well as insight into the people implementing the processes.

## Events of August 2007

Starting on 7 August 2007, many quantitative equity long–short strategies began to experience large drawdowns. Many managers had never experienced such losses or market conditions and started to sell positions as stop-loss and risk management policies were triggered (Khandani and Lo 2011). This activity added to additional selling pressure, and the S&P 500 declined 13.4% by 8 August. Those managers that sold ended up locking in large losses because the underperforming stocks and market subsequently recovered, with the S&P 500 down only 5.7% for the month. In many cases, those funds that sold experienced redemptions or ended up closing.

As August 2007 demonstrated, distinguishing prudent risk management from a misalignment of interests is not always straightforward. Should a manager continue to actively trade a portfolio if the market environment no longer reflects their investment philosophy? In addition, traders will claim that it is better to cut losses because losses can signal that something has changed or that the timing of the trade is not right. Conversely, selling into a down market raises the risk of crystallizing losses and missing any subsequent reversal. The decision maker must assess whether the manager's behavior was a disciplined application of the investment process, reflected a misalignment of interests, or simply resulted from panic or overreaction by the manager.

One aspect of suitability for the IPS is the investment horizon and its relationship to risk capacity. An investor closer to retirement, with less time to recover from losses, places more emphasis on absolute measures of risk. If there has been no change to investment policy and no change in the view that the manager remains suitable, the temptation to exit should be resisted to avoid exiting at an inauspicious time. Investors with shorter horizons, with lower risk capacity, or prone to overreact to losses may be better served by allocating to managers with shallower and shorter expected drawdowns.

## The Concept of Active Share

**Active share** measures the difference in portfolio holdings relative to the benchmark. A manager that precisely replicates the benchmark will have an active share of zero; a manager with no holdings in common with the benchmark will have an active share of one.

Given a strategy with  $N$  securities ( $i = 1, 2, \dots, N$ ), active share is calculated as

$$\text{Active Share} = \frac{1}{2} \sum_{i=1}^N |\text{Strategy Weight}_i - \text{Benchmark Weight}_i|$$

Typically, managers are somewhere along the spectrum. The categorization of active share and tracking risk in [Exhibit 7](#) has been suggested for active managers. It is clear that full replication will appear as a closet indexer. A manager that uses sampling techniques to build the portfolio may, however, appear as a diversified stock picker depending on the universe under consideration and the dispersion of active share of the constituents. Tracking risk will be low, but active share might not be because only a subset of constituents is held. One reason is that high and low are relative to the universe being examined and the category definitions used. As such, it is important to examine risk factors and portfolio construction techniques of both active and passive managers.

**Exhibit 7. Active Share vs. Tracking Risk**

		Active Share	
		Low	High
Tracking risk	High	Sector rotation	Concentrated stock pickers
	Low	Closet indexer	Diversified stock pickers

## 6. THE MANAGER'S INVESTMENT PHILOSOPHY

- e. evaluate a manager’s investment philosophy and investment decision-making process;

The goal of manager due diligence is to weigh the potential risks that may arise from entering into an investment management relationship and entrusting assets to a firm. Although it is impossible to eliminate all potential risks, the allocator must assess how the firm will manage the broad range of risks it is likely to face in the future. This section outlines the general aspects of manager due diligence and the particular questions the investor needs to answer.

Investment due diligence examines and evaluates the qualitative considerations that illustrate

that the manager's investment process is repeatable and consistently implemented. The objective is to understand whether the investment philosophy, process, people, and portfolio construction satisfy the assumption that past performance provides some guidance for expected future performance. In other words, are the conclusions drawn from performance measurement, attribution, and appraisal reliable selection criteria? In addition, it is important to remember that investment managers are businesses. Regardless of the strength of the investment process or historical performance, investment management firms must be operated as successful businesses to ensure sustainability. Operational due diligence examines and evaluates the firm's policies and procedures, to identify potential risks that might not be captured in historical performance and to assess the firm's sustainability.

## 6.1. Investment Philosophy

The investment philosophy is the foundation of the investment process. Every investment strategy is based on a set of assumptions about the factors that drive performance and the manager's beliefs about their ability to successfully exploit these sources of return. The investment manager should have a clear and concise investment philosophy.

First, every manager makes assumptions about market efficiency, including the degree and the time frame. Passive strategies assume markets are sufficiently efficient and that active management cannot add value after transaction costs and fees. As a result, passive strategies seek to earn risk premiums. A **risk premium** is the expected return in excess of a minimal-risk ("risk-free") rate of return that accrues to bearing a risk that is not easily diversified away—so-called systematic risk.

Passive strategies seek to capture return through exposure to systematic risk premiums, such as equity risk, duration risk, or credit risk. These strategies can also look to capture alternative risk premiums, such as liquidity risk, natural disaster risk (e.g., insurance-linked securities, such as catastrophe bonds and quota shares), volatility risk, or some combination of these premiums (e.g., distressed strategies seek to capture credit and liquidity risk premiums).

In contrast, active strategies assume markets are sufficiently inefficient that security mispricings can be identified and exploited. These opportunities typically arise when market behavior deviates from the manager's fundamental assumptions. Generally speaking, inefficiencies can be categorized as behavioral or structural.

- *Behavioral inefficiencies* are perceived mispricings created by the actions of other market participants, usually associated with biases, such as trend following or loss aversion. These inefficiencies are temporary, lasting long enough for the manager to identify and exploit them before the market price and perceived intrinsic value converge.



- *Structural inefficiencies* are perceived mispricings created by external or internal rules and regulations. These inefficiencies can be long lived and assume a continuation of the rules and regulations rather than a convergence.

Active strategies also typically make assumptions about the dynamics and structures of the market, such as the following: The correlation structure of the market is sufficiently stable over the investment horizon to make diversification useful for risk management; prices eventually converge to intrinsic value, which can be estimated by using a discounted cash flow model; or market prices are driven by predictable macroeconomic trends.

It is important to evaluate these assumptions and the role they play in the investment process to understand how the strategy will behave through time and across market environments.

- Can the manager clearly and consistently articulate their investment philosophy? It is hard to have confidence in the repeatability and efficacy of an investment process if the manager, and investment personnel, cannot explain the assumptions that underpin the process. This clarity also provides a consistency check that the investment process and personnel are appropriate for the stated philosophy.
- Are the assumptions credible and consistent? That is, does the decision maker agree with the assumptions underlying the strategy, and are these assumptions consistent with the investment process? A decision maker who believes a market is efficient would likely not find the assumptions of an active manager in that market credible. In the decision maker's judgment, the assumptions must support a repeatable and robust investment process.
- How has the philosophy developed over time? Ideally, the philosophy is unchanged through time, suggesting a repeatable process. If philosophy has evolved, it is preferred that changes are judged to be reasonable responses to changing market conditions rather than a series of ad hoc reactions to performance or investor flows. Such changes suggest a lack of repeatability and robustness.
- Are the return sources linked to credible and consistent inefficiencies? The decision maker must judge whether the investment philosophy is based on an inefficiency that is based on an informational advantage, likely a behavioral inefficiency by interpreting information better than other market participants, or a structural inefficiency that suggests the investment process is repeatable.

If the source of return is linked to a credible inefficiency, there is the additional issue of capacity. Capacity has several related aspects, such as the level of assets the strategy or opportunity can absorb without a dilution of returns, the number of opportunities or securities available, and the ability to transact in a timely manner at or near the market price—that is, liquidity. Overall, capacity is the level, repeatability, and sustainability of returns that the inefficiency is expected to support in the future.

- Does the inefficiency provide a sufficient frequency of opportunity and level of return to cover transaction costs and fees? If so, does this require leverage?
- Does the inefficiency provide a repeatable source of return? That is, can the opportunity be captured by a repeatable process, or is each opportunity unique, requiring a different process of skill set to exploit?
- Is the inefficiency sustainable? That is, at what asset level would the realized return from the inefficiency be unacceptably low? Sustainability will be a function of the market's depth and liquidity, as well as how much capital is allocated, either by the manager or competitors, to the inefficiency.

## Uncommon Ways of Passing the Investment Philosophy Test

### **1. Managers that measure the success of the steps of the process and not just the ultimate outcome.**

For example, consider a bond manager that makes the claim that his or her credit research not only predicts upgrades and downgrades, but makes those predictions before the expectation of a rating change is reflected in the market price. This manager tracks every prediction to see if the market consensus (as reflected by price) and rating agencies come around to his or her view. I get comfort from the facts that (1) such managers know their views only have value if they are not only correct but different than consensus, and (2) they track how prices eventually come to reflect, or not reflect, their views. Similarly, managers that evaluate their own performance with strategy benchmarks designed to replicate their selection universe demonstrate they understand the importance of attempting to differentiate alpha from noise (see [Kuenzi \[2003\]](#)).

### **2. Managers that recognize that every strategy they come up with is potentially subject to being arbitrated away.**

For example, consider a quantitative equity manager that plays many themes at once. Each theme is viewed as having a finite life, and the performance of each theme is isolated and monitored so as to observe the decay in the value of the theme. The manager considers his or her competitive advantage to be in the identification of new themes, and in the technology for measuring the contribution of each theme to performance. A similar idea is presented in the adaptive market hypothesis of [Lo \[2004\]](#), where the market is always tending toward efficiency, but the types of trades needed to move it towards efficiency rotate and evolve over time.

### 3. Managers that claim they exploit inefficiencies, and identify the specific inefficiency they are exploiting with every position they take.

Most managers that say they exploit inefficiencies use this claim as a broad justification for their investment process, but are unable to identify the specific inefficiency they are exploiting in any given decision they make. Those that routinely specify how their information or point of point differs from that reflected in price are much more credible.

### 4. Managers that know their companies so well that they are quicker to interpret change, even though they have no explicit alpha thesis.

There is always an exception to the rule. Sometimes a manager is simply talented and cannot articulate an alpha thesis.

Despite examples such as these, it remains frustratingly difficult to distinguish between true alpha-generators and alpha-pretenders. I believe there is more that alpha-generators can do to distinguish themselves, and that consultants should be more insistent that they do it.

*Excerpted from: John R. Minahan, CFA, "The Role of Investment Philosophy in Evaluating Investment Managers: A Consultant's Perspective on Distinguishing Alpha from Noise," Journal of Investing, Vol. 15 (2006). Copyright © 2006 by Institutional Investor Journals. Reprinted with permission.*

## EXAMPLE 4

### Investment Philosophy

1. Which of the following is **not** an important consideration when evaluating a manager's investment philosophy?
  - A. What are the compensation arrangements of key employees?
  - B. Are the investment philosophy assumptions credible and consistent?
  - C. Can the manager clearly and consistently articulate their investment philosophy?
2. Generally speaking, inefficiencies can be categorized as:
  - A. large and small.

**B.** internal and external.

**C.** structural and behavioral.

**3.** Which of the following is **not** an important consideration when evaluating the capacity of an inefficiency?

**A.** Does the strategy rely on unique information?

**B.** Does the inefficiency provide a repeatable source of return?

**C.** Does the inefficiency provide a sufficient frequency of opportunity and level of return to cover transaction costs and fees?

### **Solution to 1:**

A is correct. Employee compensation is a legal and compliance issue considered as part of operational due diligence.

### **Solution to 2:**

C is correct. Behavioral inefficiencies are created by the actions of other participants in the market. These inefficiencies are temporary, lasting long enough for the manager to identify and exploit them before the market price and perceived intrinsic value converge. Structural inefficiencies are created by external or internal rules and regulations. These inefficiencies can be long lived and assume a continuation of the rules and regulations rather than a convergence.

### **Solution to 3:**

A is correct. The uniqueness of information used by the manager is a consideration when evaluating the assumptions of the investment process.

## **6.2. Investment Personnel**

An investment process can only be as good as the people who create and implement it, and even the best process can be compromised by poor execution by the people involved. This view is not a question of liking the manager or team but of trusting that they possess the expertise and experience to effectively implement the strategy.

- Does the investment team have sufficient expertise and experience to effectively execute the investment process? The need for expertise is self-evident. The greater the experience, particularly managing the current strategy across market environments, the greater the confidence in the manager's ability to effectively execute the investment process. As noted with drawdowns, it is especially instructive to see how the manager responded to stressed markets and poor performance.
- Does the investment team have sufficient depth to effectively execute the investment process? A strategy that focuses on a small universe of publicly traded stocks might not require a large investment team. A global macro or multi-strategy fund, which holds positions across numerous global markets, likely requires a large team with expertise and experience supporting the manager.
- What is the level of key person risk? A strategy that is overly dependent on the judgment or particular skills of an individual or small team of people faces **key person risk**, an overreliance on an individual or individuals whose departure would negatively affect the strategy's performance.
- What kinds of agreements (e.g., non-compete) and incentives (ownership, bonus, pay) exist to retain and attract key employees to join and stay at the firm?
- What has been the turnover of firm personnel? High personnel turnover risks the loss of institutional knowledge and experience within the team.

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## 7. THE MANAGER'S INVESTMENT DECISION-MAKING PROCESS

- e. evaluate a manager's investment philosophy and investment decision-making process;

The investment decision-making process has four elements: signal creation, signal capture, portfolio construction, and portfolio monitoring.

### 7.1. Signal Creation (Idea Generation)

An investment signal is a data point or fact that can be observed early enough to implement as an investment position. The basic question is, how are investment ideas generated? The

efficient market hypothesis posits that the key to exploiting inefficiencies is to have information that is all of the following:

- **Unique:** Does the strategy rely on unique information? If so, how is this information collected, and how is the manager able to retain an informational edge, particularly in a regulatory environment that seeks to reduce informational asymmetries?
- **Timely:** Does the strategy possess an information timing advantage? If so, how is this information collected, and how is the manager able to retain a timing edge, particularly in a regulatory environment that seeks to reduce informational asymmetries?
- **Interpreted differently:** Interpretation is typically how managers seek to differentiate themselves. Does the manager possess a unique way of interpreting information? Or does the manager claim their strategy possesses a “secret sauce” component or that its team is simply smarter than other managers?

## 7.2. Signal Capture (Idea Implementation)

The second step is signal capture, translating the generated investment idea into an investment position.

- What is the process for translating investment ideas into investment positions?
- Is this process repeatable and consistent with the strategy assumptions?
- What is the process, and who is ultimately responsible for approving an investment position?

## 7.3. Portfolio Construction

The third element is portfolio construction; how investment positions are implemented within the portfolio. This element begins to capture the manager’s risk management methodology. Good investment ideas need to be implemented properly to exploit opportunities and capture desired risk premiums. It is also important that portfolio construction is consistent with the investment philosophy and process as well as the expertise of the investment personnel.

- How are portfolio allocations set and adjusted? The allocation process should be consistent with investment philosophy and process. For example, if the portfolio is actively managed, its turnover should agree with the frequency of signals generated and the securities’ liquidity. The allocation process should be well-defined and consistently

applied, supporting the repeatability of the investment process. For example, are allocations made quantitatively or qualitatively?

- Are portfolio allocations based on the manager's conviction? In other words, do the positions the manager believes will most likely outperform or exhibit the greatest outperformance receive the largest active overweighting, and the securities the manager believes will underperform receive the largest active underweighting?
- How have the portfolio characteristics changed with asset growth? Has the number and/or characteristics of the positions held changed to accommodate a larger amount of AUM?
- Does the portfolio use **stop-losses** to manage risk? If so, are they hard (positions are automatically sold when the loss threshold is reached) or soft (positions are evaluated when the loss threshold is reached)? Although stop-losses represent a clear risk management approach, the goal of protecting against large losses must be balanced with the risk of closing positions too frequently.
- What types of securities are used? Does the manager use derivatives to express investment ideas? What experience does the manager have investing in these securities? The manager should be sufficiently well-versed and experienced with the securities used to understand how they will behave in different market environments.
- How are hedges implemented? What security types are used? How are hedge ratios set? Consider a manager that focuses on stock selection to generate alpha and hedges to reduce or remove market risk. The hedges must be sized correctly, or they can be ineffective (underhedged) or they can overwhelm stock selection (overhedged), with performance driven more by beta than by alpha.
- How are long and short ideas expressed? Are they paired—that is, each long position has a corresponding short position—or are long and short positions established independently? How long and short positions are allocated is important for understanding the portfolio's overall exposure. If long and short positions are paired, with the idea of capturing alpha as prices converge while offsetting market risk, the positions must be well-matched and sized correctly.

An important risk is liquidity. Strategies that are not intending to capture a liquidity risk premium must be aware of portfolio liquidity in terms of adapting to changing information, changing market conditions, and changing investor liquidity demands. An existing portfolio consisting of illiquid securities will be more costly to change, not only to take advantage of new opportunities but also to trade because of higher transaction costs. There is the additional cost of having to sell positions at inopportune times as a result of market events or investor liquidity demands. When assessing security liquidity, it is important to consider all of the assets under management for that particular manager and investment process.

- What percentage of the portfolio can be liquidated in five business days or less? What percentage requires more than 10 business days to liquidate? The less liquid the portfolio, the higher the transaction costs if the manager is forced to sell one or more positions. A more liquid portfolio offers flexibility if the manager faces unexpected investor liquidity demands or rapidly changing market conditions.
- What is the average daily volume weighted by portfolio position size?
- Have any of the portfolio holdings been suspended from trading? If so, what is the name of the company, and what are the circumstances pertaining to the suspension?
- Are there any holdings in which ownership by the firm across all portfolios collectively accounts for more than 5% of the market capitalization or float of the security?
- What is the firm's trading strategy? Does the investment manager tend to provide liquidity or demand it? Has the trading strategy changed in response to asset growth?

## 7.4. Monitoring the Portfolio

The investment decision-making process is a feedback loop that consists of ongoing monitoring of the portfolio in light of new information and analysis. This monitoring includes an assessment of both external and internal considerations. External considerations include the economic and financial market environments. Has anything meaningful occurred that might affect the manager's ability to exploit the market inefficiency that is the strategy's focus? Internal considerations include the portfolio's performance, risk profile, and construction. Has anything changed that might signal potential style drift or other deviations from the investment process? Ongoing monitoring and performance attribution help to ensure that the manager remains appropriate for the clients' mandates.

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## 8. OPERATIONAL DUE DILIGENCE

- f. evaluate the costs and benefits of pooled investment vehicles and separate accounts;
- g. compare types of investment manager contracts, including their major provisions and advantages and disadvantages;

Performance appraisal assumes that reported returns are accurate and fully reflect the



manager's risk profile. Unfortunately, as we have seen, this assumption is not always true. Although investment due diligence is one step toward understanding these risks, one must remember that investment management firms are *businesses*, and in many cases they are small businesses with a high degree of business risk. Regardless of the strength of the investment process or the historical investment results, investment management firms must be operated as a successful business in order to ensure their sustainability. This requirement creates the potential for a misalignment of interests between the manager and the investor. Operational due diligence analyzes the integrity of the business and seeks to understand and evaluate these risks by examining and evaluating the firm's policies and procedures.

Weaknesses in the firm's infrastructure represent latent risks to the investor. A strong back office (support staff) is critical for safeguarding assets and ensuring that accurate reports are issued in a timely manner. The manager should have a robust trading process that seeks to avoid human error. A repeatable process requires consistent implementation. The allocator needs to understand the following:

- What is the firm's trading policy?
- Does the firm use soft dollar commissions? If so, is there a rigorous process for ensuring compliance?
- What is the process for protecting against unauthorized trading?
- How are fees calculated and collected?
- How are securities allocated across investor accounts, including both pooled and separately managed accounts? The allocation method should be objective (e.g., based on invested capital) to avoid the potential to benefit some investors at the expense of others.
- How many different strategies does the firm manage, and are any new strategies being contemplated? Is the firm's infrastructure capable of efficiently and accurately implementing the different strategies?
- What information technology offsite backup facilities are in place?
- Does the firm have processes, software, and hardware in place to handle cybersecurity issues?

An important constituent of the infrastructure is third-party service providers, including the firm's prime broker, administrator, auditor, and legal counsel. They provide an important independent verification of the firm's performance and reporting.

- Are the firm's third-party service providers known and respected?

- Has there been any change in third-party providers? If so, when and why? This information is particularly important with regard to the firm's auditor. Frequent changes of the auditor is a red flag and may mean the manager is trying to hide something.

The risk management function should be viewed as an integral part of the investment firm and not considered a peripheral function. The extent to which integration exists provides insight into the firm's culture and the alignment of interests between the manager and the investor. The manager should have a risk manual that is readily available for review:

- Does the portfolio have any hard/soft investment guidelines?
- How are these guidelines monitored?
- What is the procedure for curing breaches?
- Who is responsible for risk management?
- Is there an independent risk officer?

## 8.1. Firm

An investment management firm must operate as a successful business to ensure sustainability. A manager that goes out of business does not have a repeatable investment process. An important aspect of manager selection is assessing the level of business risk.

- What is the ownership structure of the firm?
- What are the total firm AUM and AUM by investment strategy?
- What is the firm's breakeven AUM (the asset base needed to generate enough fee revenue to cover total firm expenses)?
- Are any of the firm's strategies closed to new capital?
- How much capital would the firm like to raise?

A firm that is independently owned may have greater autonomy and flexibility than a firm owned by a larger organization, but it may have a higher cost structure and lack financial support during market events, raising potential business risks. Outside ownership could create a situation in which the outside owner has objectives that conflict with the investment strategy. For instance, the outside owner might want to increase the asset base to generate higher fee revenue, but this action could prevent the portfolio from holding lower-capitalization stocks. Ideally, ownership should be spread across as many employees as is

feasible and practical. A firm managing a smaller asset base may be more nimble and less prone to dilution of returns but will likely have lower revenues to support infrastructure and compensate employees. At a minimum, the asset base needs to be sufficient to support the firm's current expenditures.

Last, and by no means least important, are legal and compliance issues. It is critical that the firm's interests are aligned with those of the investor.

- What are the compensation arrangements for key employees? For example, are any people compensated with stock in the firm, and if so, what happens to this stock when they leave the firm?
- Do employees invest personal assets in the firm's strategies? Investing their own money in the same products in which the firm's clients invest creates an alignment of interests, but too large a proportion of their own assets invested in this one product may create personal/business risk for the manager that overrides the alignment of interests.
- Does the firm foster a culture of compliance?
- What is covered in the compliance manual?
- Has the firm or any of its employees been involved with an investigation by any financial market regulator or self-regulatory organization?
- Has the firm been involved in any lawsuits?
- Are any of the firm's employees involved in legal actions or personal litigation that might affect their ability to continue to fulfill their fiduciary responsibilities?

Hiring a manager requires trust. A firm's culture as expressed by its compliance policies and procedures should provide a level of confidence that the manager's and investor's interests are aligned.

## The Investment Process

Bernard "Bernie" L. Madoff ran one of the biggest frauds in Wall Street history. One of the first indications that something was amiss at Bernard L. Madoff Investment Securities arose when Harry Markopolos was unable to reconcile the return track record with the investment process. In addition to observing the unrealistically consistent nature of the claimed returns, Markopolos concluded that there was no way to generate the returns using the claimed investment process. Further analysis convinced him that

Madoff's returns resulted not from front running—that is, taking positions to exploit knowledge of investor trade flows—but rather from fraud.

In hindsight, there were many red flags over the years that indicated there was something wrong with Madoff's investment management process. The firm claimed to generate steady returns in every market environment. Mr. Madoff was known to dismiss questions about his strategy, arguing that his business was too complicated for outsiders to understand. He also operated as a broker/dealer with an asset management division, profiting from trading commissions rather than the investment management fees that hedge funds charged. The structure seemed odd to other investment professionals, raising concerns about the firm's legitimacy. Another red flag was raised when it became known that the firm used a small, unknown auditor with only three employees. If, as Mr. Madoff claimed, the strategy was so complex that no one could understand it, a small, three-person audit firm would be unlikely to be able to effectively audit the financial statements (Zuckerman 2008).

## Self-Reported Risk Factors

Requesting and obtaining self-reported risk factors not only is important for understanding the manager's investment process but also provides an interesting operational check. A manager should readily comply with all requests for risk reporting. If not, it suggests a lack of transparency that may become challenging for monitoring the manager and strategy in the future. Additionally, it might indicate an inability to generate essential reports, which raises questions about the firm's policies and procedures.

All risk reporting should be meaningful, consistent, accurate, and timely. A lack of meaningful reporting indicates that the reports are not useful in monitoring the manager and that there is a lack of transparency. In the worst case, the manager does not understand the risk exposures or does not want to disclose them.

A lack of consistent reporting also reduces the usefulness of the reporting. Inconsistent reports preclude the ability to track levels and trends of important risk factors. The manager may be choosing to selectively report particular risks that they deem important or interesting. In the worst case, it may mean that the manager is selectively reporting in order to hide risks created by deviations from the stated investment process.

A lack of accuracy suggests that the manager cannot properly measure portfolio risks or

is intentionally misreporting results. A lack of timeliness reduces the reports' usefulness and suggests either inefficient procedures or attempts to manipulate the flow of information. In all of these cases, poor risk reporting, at a minimum, suggests a reevaluation of the manager and, if issues are identified, potential termination.

## 8.2. Investment Vehicle

There are two broad options for implementing investment strategies: individual separate accounts and pooled (or commingled) vehicles. An additional operational consideration is the evaluation of the investment vehicle—its appropriateness to the investment strategy and its suitability for the investor. Separate accounts offer additional control, customization, tax efficiency, reporting, and transparency advantages, but these come at a higher cost.

In a pooled or commingled vehicle, the money from multiple investors is held as a single portfolio and managed without potential customization for any investor. Such vehicles include open-end funds, closed-end funds, exchange-traded funds, exchange-traded notes, and hedge funds. As the name infers, a separately managed account (SMA) vehicle holds the money in a segregated account in the investor's name. The funds are managed to a particular mandate with the potential to customize the strategy for each investor. The advantages of SMA vehicles include the following:

- **Ownership:** In an SMA, the investor owns the individual securities directly. This approach provides additional safety should a liquidity event occur. Although the manager continues to make investment decisions, these decisions will not be influenced by the redemption or liquidity demand of other investors in the strategy. An SMA also provides clear legal ownership for the recovery of assets resulting from unforeseen events, such as bankruptcy or mismanagement.
- **Customization:** SMAs allow the investor to potentially express individual constraints or preferences within the portfolio. SMAs can thus more closely address the investor's particular investment objectives.
- **Tax efficiency:** SMAs offer potentially improved tax efficiency because the investor pays taxes only on the capital gains realized and allows the implementation of tax-efficient investing and trading strategies.
- **Transparency:** SMAs offer real-time, position-level detail to the investor, providing complete transparency and accurate attribution to the investor. Even if a pooled vehicle provides position-level detail, such information will likely be presented with a delay.

If the SMA is customized, additional investment due diligence may be required to account for differences in security selection or portfolio construction. In addition, there are operational due diligence considerations.

- **Cost:** Separate accounts represent an additional operational burden on the manager, which translates into potentially higher costs for the investor. SMAs do not scale as easily as pooled vehicles. Once a pooled investment is established and the fixed costs paid, the cost of each new investor is largely the incremental costs of custody, trading larger positions, and generating an additional report. With an SMA, a new account must be established for each investor. In addition, SMAs are likely to face higher transaction costs to the degree that trades cannot be aggregated to reduce trade volumes. These costs are a function of the extent to which the strategy is customized or traded differently to accommodate different investor needs.
- **Tracking risk:** Customization of the strategy creates tracking risk relative to the benchmark, which can confuse attribution because performance will reflect investor constraints rather than manager decisions.
- **Investor behavior:** Transparency, combined with control and customization, allows for potential micromanagement by the investor—that is, the investor attempting to manage the portfolio. Such an effort not only negates the benefit of hiring a manager but is particularly problematic if these changes decrease the portfolio's value. Potential investor behaviors include performance chasing, familiarity bias (being overly averse to unfamiliar holdings), and loss aversion (a tendency to disaggregate the portfolio and not appreciate the value of hedging).

The allocator's goal is to evaluate the costs and benefits of the vehicle used and judge its suitability for the IPS:

- Is the vehicle structure consistent with the investment process?
- Does the manager have the operational infrastructure necessary to manage the SMA?
- Is there a benefit to holding the securities in a separate account? If so, are these benefits sufficient to compensate for additional costs?
- Is tax efficiency an important objective of the IPS?
- Are there concerns that the available transparency and ability to customize will result in decisions by the investor that do not add value?

## EXAMPLE 5

# Pooled Investments and Separate Accounts

Which of the following are advantages of separately managed accounts compared with pooled investments?

- A. Typically lower cost
- B. Potential management of the portfolio by the investor
- C. Ability to take close account of individual client constraints or preferences

## Solution:

C is correct. With SMAs, the investor owns the individual securities directly and can potentially express individual constraints or preferences within the portfolio. In particular, SMAs offer potentially improved tax efficiency because the investor pays taxes only on the capital gains realized and allows the implementation of tax-efficient investing and trading strategies.

## 8.3. Evaluation of the Investment's Terms

An additional and important aspect of manager selection is understanding the terms of the investment as presented in the prospectus, private placement memorandum, and/or limited partnership agreement. These documents are, in essence, the contract between the investor and the manager, outlining each party's rights and responsibilities. Although these documents cover numerous topics, this section focuses on liquidity and fees. The objective of the decision maker is to determine whether the liquidity and fee structure make the manager suitable for the investor's needs and the "best" manager for expressing a particular portfolio need.

### 8.3.1. *Liquidity*

Different vehicles provide different degrees of liquidity. Liquidity is defined as the timeliness with which a security or asset can be sold at or near the current price. The same criteria can be applied to managers.

The most liquid vehicles are closed-end funds and ETFs. As listed securities, they can be bought and sold intra-day, and the price received will depend on the trading volume and

depth of the fund. The obvious advantage of these funds is ease of trading, although there can be some price uncertainty for less liquid funds, particularly when trying to buy or sell a large number of shares. Open-end funds are slightly less liquid, providing daily liquidity but also price certainty; shares are bought and sold at the end-of-day NAV.

Unlike open-end funds, ETFs, or closed-end funds, limited partnerships, such as hedge funds, venture capital funds, and private equity funds, typically require investors to invest their money for longer periods. Hedge fund liquidity has four basic features: redemption frequency, notification period, lockup, and gates. Redemption frequency indicates how often an investor can withdraw capital from the fund, and the notification period indicates how far in advance of the redemption investors must tell the fund of their intention to redeem. A lockup is the initial period, after making an investment, during which investors cannot redeem their holding. Lockups have two types: a hard lock, which allows for no redemptions, and a soft lock, which charges a fee, paid into the fund, for redemptions. A mutual fund redemption fee is equivalent to a hedge fund soft lock. Gates limit the amount of fund assets, or investor assets that can be redeemed at one redemption date.

Private equity and venture capital funds provide the least liquidity. Investors are contractually obligated to contribute specific amounts (capital calls) during the investment phase and then receive distributions and capital as investments are harvested during the remaining term of the fund. A typical investment phase is 5 years. The typical life of a fund is 10 years, with the option to extend the term for two 1-year periods.

The obvious disadvantage of partnership liquidity terms is the reduced flexibility to adjust portfolio allocations in light of changing market conditions or investor circumstances, as well as the reduced ability to meet unexpected liquidity needs. The advantage of such terms is that they do lock up capital for longer horizons, allowing funds to take long-term views and hold less liquid securities—such as start-up companies, buyouts, turnarounds, real estate, or natural resources—with reduced risk of having to sell portfolio holdings at inopportune times in response to redemption requests. An additional advantage, which was apparent during the 2008 financial crisis, is that limited liquidity imposes this long horizon view on investors, reducing or removing their ability to overreact.

Because SMA assets are held in the investor's name, the securities in the portfolio can be sold at any time. As a result, an SMA's liquidity will depend on the liquidity of the securities held. An SMA holding listed large-cap stocks will likely be highly liquid, whereas an investor in an SMA that holds unlisted or illiquid securities will have to accept a discount when selling.

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## 9. MANAGEMENT FEES<sup>1</sup>



- h.** describe the three basic forms of performance-based fees;
- i.** analyze and interpret a sample performance-based fee schedule.

Investors seek strong performance net of fees. Managers charge fees to cover operating costs and earn a return on their capital—primarily human capital. A manager's fixed costs are relatively small and primarily cover the costs of technology and the long-term lease of office space. Variable costs, which consist largely of payroll and marketing costs, dominate the income statements of asset management companies. Because a considerable portion of employee compensation comes in the form of bonuses, senior management can reduce bonus payouts as fee revenue declines in order to smooth a company's profitability.

Investors are increasingly sensitive to management fees. Average asset-weighted expense ratios (management fees and fund expenses) incurred by mutual fund investors have fallen substantially. In 2000, equity mutual fund investors incurred expense ratios of 0.99 percent, on average, or 99 cents for every \$100 invested. By 2016, that average had fallen to 0.63 percent, a decline of 36 percent. Hybrid and bond mutual fund expense ratios also have declined. The average hybrid mutual fund expense ratio fell from 0.89 percent in 2000 to 0.74 percent in 2016, a reduction of 17 percent. The average bond mutual fund expense ratio fell from 0.76 percent in 2000 to 0.51 percent in 2016, a decline of 33 percent. The decline is a function of several factors: the allocation of the fixed portion of expenses over a larger asset base, increasing investor preference for no-load share classes, and the increasing allocations to lower-cost index funds. Aside from these structural factors lowering average expense ratios, there has been more generalized downward pressure on fees—the average expense ratio of actively managed equity mutual funds has declined from 1.06% in 2000 to 0.82% in 2016. Likewise, the average expense ratio of actively managed bond mutual funds has declined from 0.78% in 2000 to 0.58% in 2016.<sup>2</sup>

Investment firms charge fees in several different ways. In general, mutual funds charge fees based on assets under management in a fund.<sup>3</sup> Some classes of mutual funds, including those with reduced fees, require minimum balances. In contrast, institutional managers frequently offer declining percentage fees on increasing account sizes for separate or commingled pool accounts. Institutional accounts frequently specify minimum account sizes or minimum dollar fees. Fixed-percentage fees facilitate managers' and investors' planning for future cash flows, whereas dollar fees are subject to the variability of asset values.

Fee structures can influence which managers will be willing to accept a particular investment mandate. They can also strongly affect manager behavior. Economic theory suggests that the principal-agent problem is complicated by the fact that an agent's skills and actions are not fully visible to the principal. Although principals control asset availability, agents control both their expenditure of effort and portfolio risk. Moreover, the agent and principal may have different preferences; each might care about different time horizons and agents might

not view losses the same way that principals do.<sup>4</sup> Finally, total performance is, to some extent, beyond the control of either party. As a result of these factors, the principal's and agent's interests may not be fully aligned. In reality, managers are motivated to work hard even without incentive fees because they want to retain current clients and expand their client base and pricing power. Incentives are useful, however, to help *ensure* that managers routinely act in their clients' best interest.

## 9.1. Assets under Management Fees

Assets under management fees, also called *ad valorem* fees (from the Latin for “according to value”), result from applying stated percentage rates to assets under management. These fees reward managers who attract and retain assets, generate added value, and experience benefits from rising markets. Managers primarily grow their assets through skillful investing, hard work, and effective marketing. A manager's success, however, also results partly from luck, especially in the short term. Managers benefit from rising portfolio values, which are attributable to the combination of alpha and beta decisions, but are also, at least for long-only managers, greatly affected by market cycles beyond the manager's control. A decline in *ad valorem* percentages as assets grow helps reduce the fee impact on investors from rising markets, but does not eliminate it.

Once a manager's assets are large, he might not want to risk losing them. Assets are typically “sticky”—that is, once investors allocate their assets to a manager, the manager often does not need to generate the same level of returns to retain the assets as he did to attract them. Empirical evidence suggests this stickiness is the case, to some extent, for mutual fund assets. To motivate such managers to work harder or discourage them from closet indexing, an incentive fee determined by future performance may be useful.

## 9.2. Performance-Based Fees

Performance-based fees are determined by portfolio returns and are designed to reward managers with a share of return for their skill in creating value. Performance can be calculated by using either total or relative return, and the return shared can be a percentage of total performance or performance net of a base or fixed fee. Performance-based fees are structured in one of three basic ways:

1. A symmetrical structure in which the manager is fully exposed to both the downside and upside (Computed fee = Base + Sharing of performance);
2. A bonus structure in which the manager is not fully exposed to the downside but is fully

exposed to the upside [Computed fee = Higher of either (1) Base or (2) Base plus sharing of positive performance]; or

3. A bonus structure in which the manager is not fully exposed to either the downside or the upside [Computed fee = Higher of (1) Base or (2) Base plus sharing of performance, to a limit].

Performance fees are paid annually or, in some cases, less frequently. These fees may include maximum and high-water mark (or clawback) features that protect investors from situations such as paying for current positive performance before the negative effects of prior underperformance have been offset. Private equity, hedge fund, and real estate partnerships commonly earn performance fees on total returns and typically do not limit the amount of the performance fee. Hedge funds commonly include high-water mark features.

Consider the example of private equity partnerships, in which base fees are commonly applied to committed (not just invested) capital. Performance fees are earned as profits are realized, and invested capital is returned to investors. A common provision that helps protect private equity limited partners (the investors) is a requirement that the limited partners receive their principal and share of profits before performance fees are distributed to the general partner (the manager).

Specific performance-based fee structures are designed by both clients and managers. A formula is agreed upon based on the anticipated distribution of returns and the perceived attractiveness of the investment strategy. Managers who can command attractive terms, such as real estate managers that are in high demand and have limited capacity, have the power to stipulate the highest base fees and profit sharing in their fee agreements. Fee schedules are typically designed by fund managers, included in marketing materials, and set forth in partnership agreements. Large investors may influence the terms of fee schedules or negotiate side letters for special treatment.

A simple performance-based fee, as illustrated in [Exhibit 8](#), specifies a base fee below which the computed fee can never fall. In this case, the manager is protected against sharing for performance below 25 bps. To make the result symmetrical around the commonplace 50 bps fee, the manager does not share in active performance beyond 2.75%.

#### Exhibit 8. Sample Performance-Based Fee Schedule

Panel A. Sample Fee Structure	
Standard fee	0.50%
Base fee	0.25%
Sharing*	20%

Breakeven active return	1.50%
Maximum annual fee	0.75%

### Panel B. Numerical Examples for Annual Periods

	Active Return				
	$\leq 0.25\%$	1.00%	1.50%	2.00%	$\geq 2.75\%$
Billed fee	0.25%	0.40%	0.50%	0.60%	0.75%
Net active return	$\leq 0.00\%$	0.60%	1.00%	1.40%	$\geq 2.00\%$

\* On active return, beyond base fee.

If investment outcomes result from a mix of skill and luck (i.e., a probability distribution around a positive mean alpha), then performance fees constitute risk sharing. Fee structures must be designed carefully to avoid favoring one party over the other. Performance-based fees work to align the interests of managers and investors because both parties share in investment results. Investors benefit by paying performance-based fees, rather than standard fees, when active returns are low. Managers may work harder to earn performance-based fees, inspiring the term “incentive based.” Empirical evidence suggests a correlation between performance-based fees and higher alphas (also, lower fees) for mutual funds and higher risk-adjusted returns for hedge funds.<sup>5</sup> Asset managers may consider performance-based fees attractive because such fees provide an opportunity to enhance profits on the upside and ensure guaranteed, although perhaps minimal, streams of revenue from base fees when performance is poor.

Performance-based fees can also create tensions between investors and managers. Investors must pay base fees even when managers underperform. Management firm revenues decline when cash is needed to invest in operations or retain talent. In fact, the failure rate for poor-performing and even zero-alpha managers may tend to be higher when performance-based rather than standard fees are used.<sup>6</sup>

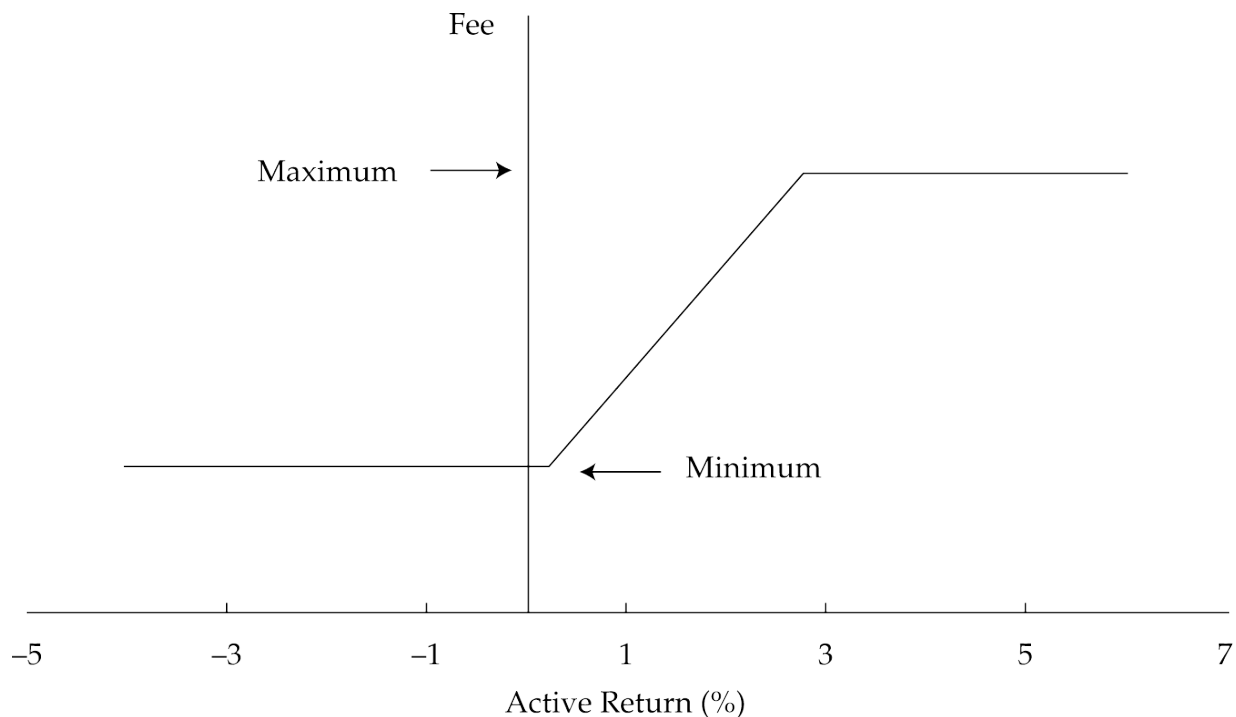
Performance-based fee structures may also lead to misestimates of portfolio risk. Such fee structures convert symmetrical gross active return distributions into asymmetrical net active return distributions, reducing variability on the upside but not the downside. As a result, a single standard deviation calculated on a return series that incorporates active returns, above and below the base fee, can lead to the underestimation of downside risk.<sup>7</sup>

Investors and managers may have different incentives when performance-based fees are

used. For example, according to a utility maximization model, fully symmetric fees, in which the manager is fully exposed to the downside, tend to yield closer alignment in risk and effort than bonus-style fees.<sup>8</sup> Understandably, symmetrical fee structures are unpopular with managers because of their impact on bankruptcy risk.

Bonus-style fees are the close equivalent of a manager's call option on a share of active return, for which the base fee is the strike price. Consider [Exhibit 9](#), which shows a familiar-looking option payoff pattern using the fee parameters defined in [Exhibit 8](#). In this case, the option payoff is modified by a maximum fee feature. The graph illustrates three fee components: a 25 bps base fee, plus a long call option on active return with a strike price equal to the minimum (base) fee, minus another (less valuable) call option with a strike price equal to the maximum fee.

**Exhibit 9. Payoff Line of Sample Performance-Based Fee Schedule**



Managers must retain clients year to year, avoid poor performance, and not violate management guidelines. But managers also tend to have an interest in increasing risk, which may conflict with these goals. Based on option pricing theory,<sup>9</sup> higher volatility leads to higher option value, which encourages managers to assume higher portfolio risk. This behavior has been observed in the marketplace.<sup>10</sup> As a result, investors, when possible, should carefully select benchmarks and monitor risk in their portfolios.<sup>11</sup> Senior management at investment firms should also ensure that their compensation systems penalize portfolio

managers for assuming excessive risk as well as reward them for earning superior returns.<sup>12</sup>

## Real Story: The Client's Free Option in a Performance Fee Agreement

Consider the case of an equity manager in the early 1990s offering a performance-based fee that consisted of a 10 bp base fee and a 20% share of active return in excess of the benchmark index (net of the 10 bps). The fee structure also included a maximum annual fee provision that reserved excess fees for subsequent years. Because there was no penalty for cancelling the fee agreement, clients could opt out of the performance-based fee in exchange for a standard flat fee when performance was particularly strong. This arrangement allowed them to avoid paying the manager's accrued, fully earned share, and is precisely what many clients did in the mid-1990s following a period of high active returns.

Other problems exist with performance-based fees. When managers have clients with varying fee structures, it is in their (short-term) interest to favor customers that have performance-based fees. Although doing so may be unethical or potentially illegal, managers can direct trades or deals (including initial public offerings) to performance-fee clients to their benefit and to the detriment of others. It may be difficult for clients to monitor this activity. Fortunately, most managers recognize that such actions, once discovered, could destroy their careers or lead to criminal charges. Here again, due diligence, including the review of internal compliance systems, will help limit an investor's exposure to unscrupulous managers.

When managers can control the timing of profit realization, as is often the case with private equity partnerships, they may have an incentive to hold on to assets until a profit can be realized. Managers may do so even when clients would benefit from selling assets at a loss and investing the proceeds outside of the partnership. In contrast, hedge fund managers have an incentive to return assets in poor-performing partnerships when the high-water mark is substantially above current value (i.e., the performance-fee option is considerably out of the money). This action results in the investor missing the opportunity to recoup previously paid fees based on future strong performance.

Funds of funds (FoFs) commonly charge fees in addition to the fees charged by the underlying funds.<sup>13</sup> These fees pay for the investor's access to the underlying funds and for the FoFs' due diligence, portfolio construction, and monitoring. In addition to these two sets

of fees, investors are required to share the profits from well-performing funds and incur the full loss from poorly performing funds.<sup>14</sup> To protect investors from high fees, hedge fund consortiums have recently begun to offer fees based on the total portfolio value of underlying funds, rather than the sum of fees at the individual fund level.

## The Impact of Fee Structure on Performance

Consider four fee structures applied to the same 12-month return series:

- 0.50% management fee, 0% performance fee
- 0.50% management fee, 15% performance fee
- 1.50% management fee, 0% performance fee
- 1.50% management fee, 15% performance fee

The fees are accrued at the end of each month. This example illustrates the important effects of fee level and structure on net returns. Figure 10 shows, the average monthly gross return is 0.72% with a 1.0% standard deviation. Not surprisingly, charging a management fee (MF) lowers the realized return without affecting the standard deviation of the series. The performance fee is a constant shift in the level and thus does not affect volatility. The performance fee (PF) also lowers the level of realized returns but does not lower the realized standard deviation. This dynamic occurs because the performance fee is accrued, and in down months, it is subtracted from the balance to reflect the appropriate fee for the cumulative performance. The performance fee has the effect of adjusting the monthly returns toward zero and thus lowers the volatility. The larger the performance fee, the more pronounced the effect. Figure 10 shows a graph of the cumulative returns for each fee structure.

**Exhibit 10. Effects of Expense on Portfolio Performance**

Monthly Gross Return			
MF =	MF = 0.5%		
0%			
PF =	PF =	PF =	PF =















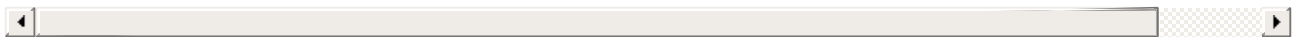












































































# Study Session 14

## Cases in Portfolio Management and Risk Management

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This study session provides three cases that integrate material across Level III study sessions. Each case provides a stylized scenario involving several issues that are used to illustrate how to evaluate the needs of a client and synthesize techniques to provide appropriate solutions.

The first case study considers issues associated with the development of a strategic asset allocation (SAA) for a long-horizon institutional investor—a university endowment—with special challenges including supporting spending policies while ensuring the long-term sustainability of the endowment and establishing optimal exposure to illiquid investment strategies in the context of a diversified portfolio. These issues are explored from the perspective of a large university endowment undertaking a review of its asset allocation and then implementing proposed allocation changes and a tactical overlay program.

The second case study explores issues raised in a private wealth management setting of providing advice on risk management to individuals and families. These issues include the extent to which identified and evaluated risks can be reduced, addressed using insurance policies, or self-insurance. Families' financial circumstances and risks evolve over time, and the arrangements addressing the risks should be reviewed and updated. Risk management solutions recommended by advisers should take the overall wealth of the family into consideration. The choice of an adviser may also pose practical and ethical challenges.

The third case study looks at various challenges faced by institutional investors from a risk management perspective including: financial risks, enterprise risk management, environmental risks, and social risks. The focus of the reading is a theoretical case study addressing risk management aspects of a Sovereign Wealth Fund's (SWF) potential long-term direct investments in infrastructure and private equity. The structure of the case itself brings the learner inside two Investment Committee (IC) meetings where various aspects of risk are discussed, and potential investments evaluated. The learner is expected to review IC memos and IC discussions and analyze various risk elements of the investment opportunities as the case unfolds over a 5-year period. Ultimately, the learner is expected to make recommendations for improvement.



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# READING ASSIGNMENTS

- Reading 28** Case Study in Portfolio Management: Institutional  
by Gabriel Petre, CFA
- Reading 29** Case Study in Risk Management: Private Wealth  
by Giuseppe Ballocchi, PhD, CFA
- Reading 30** Case Study in Risk Management: Institutional  
by Steve Balaban, CFA, Arjan Berkelaar, PhD, CFA, Nasir Hasan, and  
Hardik Sanjay Shah, CFA

# Reading 28

## Case Study in Portfolio Management: Institutional

by Gabriel Petre, CFA

*Gabriel Petre, CFA, is at World Bank (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss tools for managing portfolio liquidity risk;
- b.** discuss capture of the illiquidity premium as an investment objective;
- c.** analyze asset allocation and portfolio construction in relation to liquidity needs and risk and return requirements and recommend actions to address identified needs;
- d.** analyze actions in asset manager selection with respect to the Code of Ethics and Standards of Professional Conduct;
- e.** analyze the costs and benefits of derivatives versus cash market techniques for establishing or modifying asset class or risk exposures;
- f.** demonstrate the use of derivatives overlays in tactical asset allocation and rebalancing.

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## 1. INTRODUCTION

The development of a strategic asset allocation (SAA) for long-horizon institutional investors like university endowments raises special challenges. These include supporting spending policies while ensuring the long-term sustainability of the endowment and establishing

optimal exposure to illiquid investment strategies in the context of a diversified portfolio.

Large university endowments typically have significant exposure to illiquid asset classes. The exposure to illiquid asset classes impacts the portfolio's overall liquidity profile and requires a comprehensive liquidity management approach to ensure liquidity needs can be met in a timely fashion.<sup>1</sup> In addition, capital market conditions and asset prices change, resulting in a need to change asset allocation exposures and/or rebalance the portfolio to maintain a profile close to the strategic asset allocation.

Derivatives are often used by institutions to manage liquidity needs and implement asset allocation changes. The cash-efficient nature of derivatives and their high levels of liquidity in many markets make them suitable tools for portfolio rebalancing, tactical exposure changes, and satisfying short-term liquidity needs—all while maintaining desired portfolio exposures.

This case study explores these issues from the perspective of a large university endowment undertaking a review of its asset allocation and then implementing proposed allocation changes and a tactical overlay program. Rebalancing needs for the endowment arise as market moves result in the drift of the endowment's asset allocation.

The case is divided into two major sections. The first section addresses issues relating to asset allocation and liquidity management. The case introduces a framework to support management of liquidity and cash needs in an orderly and timely manner while avoiding disruption to underlying managers and potentially capturing an illiquidity premium. Such concepts as time-to-cash tables and liquidity budgets are explored in detail. Aspects relating to rebalancing and maintaining a risk profile similar to the portfolio's strategic asset allocation over time are also covered.

The second section explores the use of derivatives in portfolio construction from a tactical asset allocation (TAA) overlay and rebalancing perspective. The suitability of futures, total return swaps, and exchange-traded funds (ETFs) is discussed based on their characteristics, associated costs, and desired portfolio objectives. The case also presents a cost-benefit analysis of derivatives and cash markets for implementing rebalancing decisions. Environmental, social, and governance (ESG) considerations arising in the normal course of investing are also explored.

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## **2. BACKGROUND: LIQUIDITY MANAGEMENT**

### **a. discuss tools for managing portfolio liquidity risk**

## **b. discuss capture of the illiquidity premium as an investment objective**

For an institutional investor, such as an endowment or a pension fund, liquidity management refers to the set of policies and practices that ensure the portfolio complies with investment policy yet can meet cash outflow needs in a timely and orderly manner without incurring excessive costs. Optimal liquidity management helps ensure that distressed sales of illiquid assets are avoided, especially in weak market conditions, and that the portfolio can benefit from the expected illiquidity premium associated with long-term private market allocations.

The importance of liquidity management was emphasized in the 2008 global financial crisis when many institutional investors with significant allocations to illiquid asset classes and regular cash outflow requirements struggled to meet these outflows.

During this time, public markets experienced significant losses, liquidity conditions deteriorated, and distributions from many private market investments stopped. For many university endowments, another source of liquidity—donations—also dropped significantly, further amplifying liquidity issues. In some cases, endowments were forced to liquidate securities at steep discounts, drastically cut funding for some programs dependent on endowment distributions, and/or borrow funds collateralized by the endowment, increasing leverage and the risk profile of the portfolio.

Institutional investors have several important “tools” at their disposal to manage a portfolio’s liquidity risk. These include:

- liquidity profiling and time-to-cash tables,
- rebalancing and commitment strategies,
- stress testing analyses, and
- derivatives.

## **2.1. Liquidity Profiling and Time-to-Cash**

For any investor, the assessment of liquidity needs starts with identifying potential cash inflows and cash outflows for a defined investment horizon. In the case of endowments, cash outflows include distributions to the university and meeting capital call requirements for illiquid investments (e.g., real assets, private equity, hedge funds, and structured products). Once the sources and uses of cash have been identified, the institutional investor establishes the need for liquidity and the desired liquidity maturity profile for the overall portfolio. As part of this process, a **liquidity classification schedule (time-to-cash table)** is created and an overall **liquidity budget** is defined.<sup>2</sup> The liquidity classification schedule defines

portfolio categories (or “buckets”) based on the estimated time it would take in the normal course of business to convert assets in that particular category into cash. The liquidity budget assigns portfolio weights considered acceptable to each liquidity classification in the time-to-cash table and establishes a liquidity benchmark for the portfolio construction process.

An example of a time-to-cash table is provided in [Exhibit 1](#). It defines liquidity classifications based on the time expected to liquidate an investment without liquidation having a significant impact on market conditions and the resulting sale price for the investment. The impact on market conditions is based on the expected market price immediately before and after trading if the sell order was executed. In the case of investments managed by third-party managers, the time-to-cash also depends on the contractual terms governing the type of investment vehicle used. Typically, private investments requiring more than one year to exit are viewed as illiquid. In the case of hedge funds, contractual terms (e.g., lockups, notification periods, withdrawal windows) vary based on the manager and underlying strategy. A manager’s ability to deny withdrawal requests during stress periods (“to activate gates”) to protect fund investors and prevent forced liquidations will impact time-to-cash.

**Exhibit 1. Time-to-Cash Table and Liquidity Budget**

Time to Cash	Liquidity Classification	Liquidity Budget (% of portfolio)
< 1 Week	Highly Liquid	At Least 10%
< 1 Quarter	Liquid	At Least 35%
< 1 Year	Semi-Liquid	At Least 50%
> 1 Year	Illiquid	Up to 50%

The granularity of a time-to-cash table may vary to include monthly or semi-annual categories depending on the investor’s liquidity preferences, liquidity needs, and other circumstances. The core principle is to identify liquidity categories relevant to the types of cash outflows the investor will face and to match overall portfolio characteristics with liquidity needs through the design of the resulting asset allocation. The next step is to define an overall liquidity budget specifying portfolio allocations for the different time-to-cash buckets (as shown in the last column of [Exhibit 1](#)).<sup>3</sup> In the case of highly liquid, liquid, and semi-liquid categories, minimum portfolio weights are identified. For the illiquid category, a maximum portfolio weight is identified.

The liquidity budget reflects the acceptable liquidity requirements that the portfolio must meet, even in a liquidity stress scenario. The results of stress test analyses are therefore

important inputs in developing the liquidity budget.

To operationalize the concepts represented in the liquidity budget, the institutional investor does an analysis of the underlying liquidity characteristics of the portfolio investments and monitors these characteristics over time. The analysis should look through the broad definition of asset classes to the underlying investments used for exposure. Different investments within the same asset class (such as public equities) may have very different liquidity profiles. Commingled funds (funds that are pooled and managed together in a single account) may be less liquid than exchange-traded funds (ETFs) or mutual funds and may have different liquidity profiles than separate accounts. Furthermore, there could be differences in the liquidity profile of similar investment vehicles in the same asset class depending on the underlying strategy used by the investment manager. For example, a commingled fund following a concentrated, small-cap active strategy in emerging market equities may offer investors only quarterly liquidity as compared to a commingled fund investing in large-cap emerging market equities, which may offer monthly or weekly liquidity. For these reasons, it is appropriate to conduct liquidity analysis on a bottom-up basis for each investment, aggregate at the portfolio level, and monitor changes over time to keep the portfolio within liquidity budget parameters. An example of liquidity profiling for a portfolio’s underlying investments is shown in [Exhibit 2](#). The portfolio example uses investments in separate accounts, commingled funds, futures, ETFs, and active managers to achieve its asset class exposure to both public and private markets.

**Exhibit 2. Liquidity Profiling for a Portfolio**

Asset Class	Asset Class Allocation (% of portfolio)	Investment Allocation (% of overall portfolio)	Investment Vehicle	Liquidity Classification		
				Highly Liquid	Liquid	Semi-Liquid
Cash	1%	1%	Separate Account	100%	0%	0%
Fixed Income	14%	5%	Separate Account	100%	0%	0%
		8%	Commingled Fund	100%	0%	0%
		1%	Futures	100%	0%	0%
Domestic Equity	17%	8%	Commingled Fund	0%	50%	50%
		8%	Separate Account	0%	100%	0%

		1%	Futures	100%	0%	0%
International Developed Equity	10%	6%	Commingled Fund	0%	50%	30%
		4%	Separate Account	0%	80%	20%
Emerging Market Equity	12%	9%	Commingled Fund	0%	75%	25%
		3%	ETF	100%	0%	0%
Private Equity	18%	18%	Funds 1–85	0%	0%	0%
Real Assets	13%	4%	Funds 1–8	0%	0%	75%
		6%	Funds 9–33	0%	0%	0%
		3%	Funds 34–50	0%	0%	20%
Diversifying Strategies	15%	4%	Funds 1–5	0%	0%	100%
		6%	Funds 6–11	0%	25%	25%
		5%	Funds 12–19	0%	0%	75%
<b>Overall Portfolio</b>	<b>100%</b>	<b>100%</b>		<b>19%</b>	<b>26%</b>	<b>22%</b>

## 2.2. Rebalancing, Commitments

The discussion so far has focused on liquidity management and the ability of an institutional portfolio to meet cash outflows in an orderly manner as they come due. Another consideration is the impact of changes in the liquidity profile on the overall risk of the investment portfolio and the ability to keep the portfolio close to desired risk targets. Illiquid assets carry extremely high rebalancing costs. Because asset liquidity tends to decrease in times of market stress, it is important to have sufficient liquid assets and rebalancing mechanisms in place. This will ensure the portfolio's risk profile remains within acceptable risk targets and does not “drift” as the relative valuations of different asset classes fluctuate during stress periods. Rebalancing mechanisms include the following:

**Systematic rebalancing policies.** Rebalancing disciplines, such as calendar rebalancing and percent-range rebalancing, are intended to control risk relative to the strategic asset allocation. In these cases, pre-specified tolerance bands for asset class weights are used. The size or width of the bands should consider the underlying volatility of each

investment category to minimize transaction costs. This means more-volatile investment categories should usually have wider rebalancing bands. Transaction costs, correlations between asset classes, and investor risk tolerance are other factors that may influence the size of the band selected.

**Automatic adjustment mechanisms.** These are mechanisms designed to maintain a stable risk profile when exposure drifts from targeted exposure. An example is using adjustments to a public market allocation that is correlated to a private market allocation to rebalance private market risk. This approach uses liquid public assets as a proxy for illiquid private assets. For example, assume private equity investments have an equity beta of 1. In a situation where the allocation to private equity increases by 1% versus the target, the allocation to public equities would automatically be adjusted down by 1% to maintain a stable systematic market risk profile. Note, however, that although systematic market risk is unchanged, illiquidity risk of the portfolio is now higher. Alternatively, the adjustment could be further refined to maintain a constant equity beta, assuming private equity has a beta to public equities of greater than 1 (caused by leverage, for example).<sup>4</sup> Similar public market proxies can be used to represent private real estate, infrastructure, or other illiquid instruments based on their underlying risk characteristics.

Multi-year funding strategies for private markets that incorporate a steady pace of commitments to reach a target allocation and/or to keep the allocation close to target over time are other means to ensure the portfolio remains consistent with desired risk objectives. Private market funds pose specific challenges for investors in maintaining a desired exposure over time as investors do not control the pace at which committed capital is drawn or the pace at which capital distributions are returned. Although unpredictable at an individual fund level, these patterns become more predictable within a portfolio of private market investments.

The objective of a multi-year funding strategy is to design a commitment-pacing strategy that will result in the desired portfolio exposure to the asset class over time. The commitment-pacing strategy translates into an annual level of commitments and is typically the result of a cash flow modeling exercise that takes into account expectations about the speed at which committed capital is drawn, the pace of distributions, the evolution in overall asset size, as well as other circumstances specific to the investor. The cash flow modeling exercise would project forward the expected asset class exposure (as a percentage of the overall portfolio) at various commitment levels, thus reducing the risk of overshooting the target allocation. Scenario analysis should also be used to consider the impact of different market stress conditions. The evolution of the asset allocation must be monitored over time, with adjustments to the commitment pace made as necessary.

## 2.3. Stress Testing



A robust liquidity framework ensures that liquidity needs can be met in a timely fashion during periods of normal market and stress market conditions. Understanding how the portfolio's liquidity profile may change in addition to how the liquidity needs of the institution may change during stress periods is therefore critical. Comprehensive stress testing exercises would seek to “stress” (i.e., presume extremely adverse market conditions for) both assets and liabilities simultaneously to understand how these may be impacted during stress conditions. With respect to assets, the stress test can cover distributional assumptions regarding prices (e.g., volatility, return), correlations across assets, as well as liquidity characteristics. Liability shocks can also be factored in, for example, by increasing expected endowment distributions to support the university during the stress periods. The design of the stress tests can be informed by historical events (e.g., the 2008 global financial crisis), statistical models (e.g., extreme value theory), and/or by scenario analysis (e.g., analyzing the potential impact of a hypothetical scenario with respect to a set of variables on the overall portfolio).

## **2.4. Derivatives**

Derivatives can be used to manage cash outflow needs and changing risk exposures. The cash-efficient nature of derivatives makes them desirable tools for rebalancing. A futures overlay program allows an institutional investor to rebalance exposures to public asset classes (for example, on a monthly or quarterly basis) while leaving allocations to external active managers unchanged. Derivatives can also be used to modify a portfolio's liquidity profile through the use of leverage—for example, using futures contracts (long futures position) to gain economic exposure to US equities and then deploying the cash that is not required for posting margin into other investments with different liquidity profiles or to satisfy short-term liquidity needs. Derivatives can also be used to generate additional cash by employing leverage at the overall portfolio level.

## **2.5. Earning an Illiquidity Premium**

An attractive feature for investors in illiquid investments, such as private equity or private real estate, is the expectation of extracting an illiquidity premium in addition to premiums associated with underlying market risk factor exposures in an illiquid strategy. The illiquidity premium (also called the liquidity premium) is the expected compensation for the additional risk of tying up capital for a potentially uncertain time period. Quantitative estimates for the illiquidity premium suggest evidence of a positive illiquidity premium in private equity and private real estate and of illiquidity premium size being positively correlated to the length of the illiquidity horizon.<sup>5</sup>

An alternative approach for estimating the illiquidity risk premium is based on the idea that the size of the discount an investor should receive in return for committing capital for an uncertain period of time can be represented by the value of a put option with an exercise price equal to the marketable price of the illiquid asset at the time of purchase. (The “marketable price” is a hypothetical price at which the illiquid asset could be sold if it were freely traded; it can be estimated by various means.) In this case, the price of the illiquid asset can be derived by subtracting the put price from the marketable price of the asset. If both the marketable price and the illiquid asset price are estimated or known, then the expected return for each can be calculated, with the difference in expected returns representing the illiquidity premium (in %). This approach was initially developed by Chaffe (1993) and later improved upon by Staub and Diermeier (2003). They also find there should be a positive correlation between the length of the illiquidity horizon and the size of the illiquidity premium.

A significant body of literature documents a positive relationship between lack of liquidity and expected returns in the case of public equity. For example, Pastor and Stambaugh (2001) find that expected returns are impacted by systematic liquidity risk and estimate a 3% return over the 1996–2003 period in the United States for a zero-net-investment portfolio that holds low-liquidity stocks long and high-liquidity stocks short.

Overall, though, it is difficult to isolate the illiquidity premium with precision and separate its effects from such other risk factors as the market, value, and size in the case of equity investments. Furthermore, estimates of the illiquidity premium are based on broad market indexes, yet an investor in these asset classes would typically invest in only a small subset of the universe with the result that individual investment experience could be very different and more susceptible to idiosyncratic factors.<sup>6</sup> These challenges further emphasize the importance of liquidity budgeting in facilitating capture of the illiquidity premium while controlling for risk.

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## 3. QUINCO CASE: BACKGROUND

### **c. analyze asset allocation and portfolio construction in relation to liquidity needs and risk and return requirements and recommend actions to address identified needs**

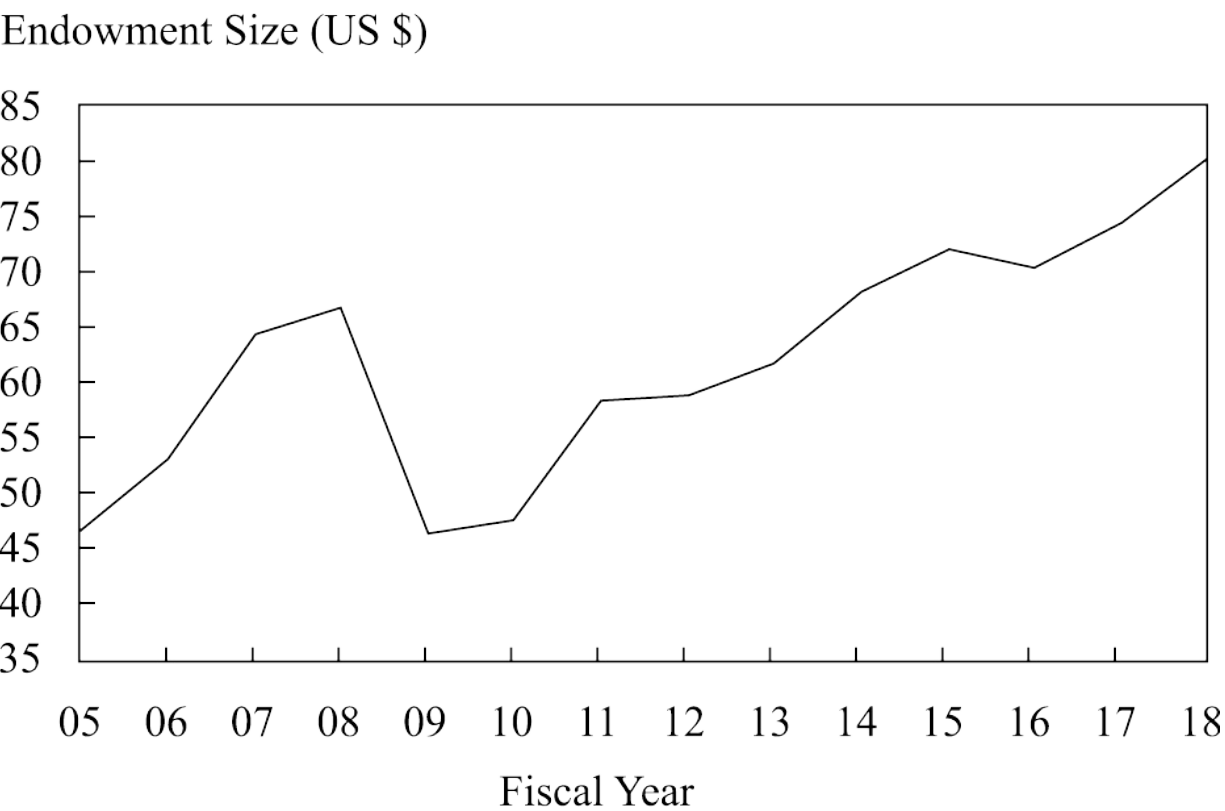
Quadrivium University (QU) is an independent liberal arts college located in a vibrant mid-sized city with a growing and diverse population. The university was founded in 1916 by James Greaves and Colin Healey, two entrepreneurs with a passion for astronomy and mathematics who settled in the area in the early 1900s. Over time, the university has built an outstanding reputation as one of the top schools in the country. Consistent with the founders’ interests, the programs in astronomy and mathematics are highly regarded, attracting

applicants from all over the world.

The Quadrivium University endowment was established in 1936 through a \$15 million donation from Healey, whose goal was to provide financial aid to new undergraduate students. A quarter of new students receive Healey grants, and this percentage has increased steadily over time.

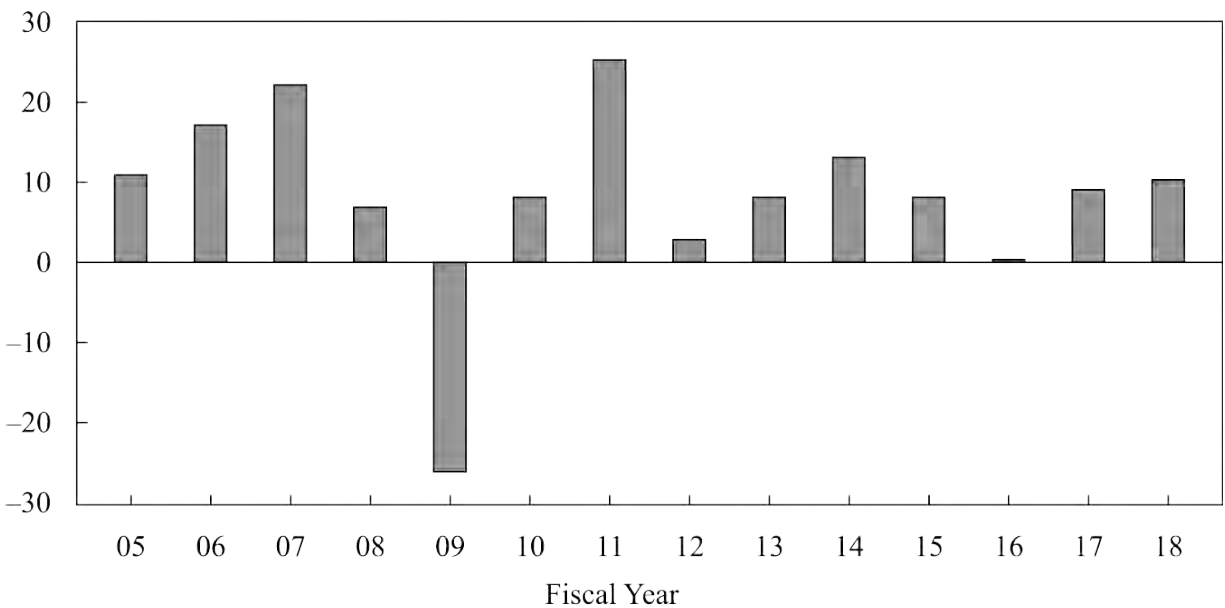
As of the current fiscal year, QU has an endowment of \$8 billion, of which \$6 billion represents funds used for general unrestricted support and unrestricted funds functioning as endowment. The remaining funds have various donor-specified use restrictions. Although a significant portion of the endowment’s growth has been from investment returns, the endowment also benefits from a strong and deep alumni network that provides regular donations and access to highly regarded industry contacts and money managers. [Exhibit 3](#) shows the market value of the endowment over recent years, and [Exhibit 4](#) shows the realized investment returns over the same period.

**Exhibit 3. Market Value of QU Endowment**



**Exhibit 4. Investment Returns for QU Endowment**

Annual Net Investment Return (%)



QU has an annual operating budget of \$583 million, and 70% of the operating budget is used to fund salaries and benefits for faculty and administrative staff. In addition, the budget is used to pay down debt associated with a major upgrade of the main campus facilities, pay expenses associated with the maintenance of physical infrastructure, and fund various research and financial aid programs.

Annual distributions from the endowment provide funding for approximately 60% of the university's operating budget, including its financial aid programs. In absolute dollar terms, the size of annual distributions has increased steadily in the last five years as the size of the endowment fund has grown. Similarly, the percentage of the operating budget covered by distributions from the endowment has increased. The board of the university has recently expressed a preference for a predictable pattern of distributions to allow for better planning of resource deployment through its programs. Consistent with that preference, the spending policy of the endowment was changed following the 2008 global financial crisis. Pre-crisis, the university used a simple spending rule: Spending equaled the long-term desired spending rate of 5% multiplied by the market value of the endowment at the beginning of the fiscal year. Post-crisis, the university changed its spending rule to a geometric smoothing rule, sometimes called the Yale formula.

The current spending rule is designed to produce a 5% long-term spending rate in a way that shields annual distributions from fluctuations in the endowment's market value. The endowment uses a weighted-average formula of the previous year's spending amount and the endowment's market value at the end of the previous fiscal year multiplied by the long-term desired spending rate:

$$\text{Spending for current fiscal year} = (66\% \times \text{Spending for previous fiscal year}) + 34\% \times (5\%$$

× Endowment market value at the end of previous fiscal year).

For QU, the previous fiscal year's spending was \$358.1 million, while the endowment's market value at the end of the previous fiscal year was \$7,002.3 million. In this case, QU's spending for the current fiscal year would be:

Spending for current fiscal year =  $(66\% \times \$358.1 \text{ million}) + 34\% \times (5\% \times \$7,002.3 \text{ million}) = \$355.4 \text{ million}$ .

Consistent with the spending policy, the endowment's investment objective is to achieve long-term returns that support the spending rate while preserving the value of the endowment in real terms over time (thus safeguarding the long-term sustainability of the program). For QU, a 5% spending rate per year combined with long-term expected inflation for colleges and universities of 2–3% per year translates into a 7–8% nominal return per year objective over the long term. QU's associated risk objective is 12–14% annualized return volatility (standard deviation of portfolio returns must be between 12–14%).

### **3.1. Quadrivium University Investment Company (QUINCO)**

Quadrivium University is overseen by a board of trustees ("the Trustees"), generally consisting of prominent, wealthy alumni who are elected to the position. QUINCO is the university investment office, which manages QU's endowment. The office was established in 1993 at a time when endowment assets were \$1 billion. From a governance perspective, the office is organizationally distinct from the university, although it is not a separate legal entity. The president of the investment office, Aaron Winter, reports to the university president and to the QUINCO board of directors ("the Board"). The Board is comprised of 11 members appointed by the Trustees. The president of QUINCO, the university president, and the treasurer of the university serve as ex-officio members. The QUINCO Board is responsible for approving investment policy and guidelines and providing guidance on key policy matters. Implementation of the investment policy has been fully delegated to QUINCO staff, who are empowered to make changes to the portfolio within the parameters of the investment guidelines.

QUINCO has 13 investment professionals, who are university employees. The investment model is one where the investment strategy is implemented through external investment managers. The Board has consistently re-affirmed its view that such a model provides greater flexibility for changing investment portfolio exposures when circumstances warrant while reducing internal staffing needs compared to an in-house investment management model. Internal investment staff are focused on asset allocation, risk management, and selecting, monitoring, and terminating external investment managers.

The following five investment categories are part of the current asset allocation: fixed income, public equities, private equity, real assets (composed of primarily private real estate and natural resources), and diversifying strategies (primarily hedge fund strategies targeting high absolute returns with low correlations to traditional asset classes, like public equity and fixed income). Alternative investments are considered to be private equity, real assets, and diversifying strategies. Private equity and real assets are recognized as illiquid (alternative) investments. The investment team is organized by investment category, with a senior portfolio manager leading each area and supported by an analyst. In addition, the team includes a portfolio strategist in charge of asset allocation and risk management, also supported by an analyst, and the president of the office, who acts as the chief investment officer (CIO). Senior portfolio managers have primary responsibility for investment decisions within their investment category, while the portfolio strategist has responsibility for ongoing endowment rebalancing decisions, overlays, and tactical asset allocation tilts. All external investment manager decisions and tactical asset allocation deviations are discussed and approved by the internal investment committee. Winter chairs the committee, which includes all senior portfolio managers and the portfolio strategist. The QUINCO Board is responsible for granting final approval of external investment managers.

## **3.2. Investment Strategy: Background and Evolution**

QUINCO has distinguished itself as a steady and progressive institutional investor with a focus on long-term objectives; it is unlikely to make abrupt wholesale changes to its investment strategy. This strategy is, in part, driven by leadership stability, with the investment office having had the same president (Winter's predecessor) for the first 25 years of existence. Another important factor has been an established culture focused on maintaining best-in-class investment practices and institutionalizing that knowledge through robust processes and systems.

For the first years of existence, the endowment invested only in public markets, mostly equities and bonds. In its early days, the belief was that the limited size and investment resources of the endowment would present challenges in accessing, monitoring, and properly managing complex, nontraditional investment strategies. Since the mid-1990s, as the size of the endowment grew, the QUINCO Board has embraced the belief that exposure to nontraditional, or alternative, asset categories is beneficial for the long-term prospects of the endowment—enhancing investment risk diversification and providing potentially higher risk-adjusted returns in a greater variety of market environments. To express this belief, the Board has supported an increase in internal investment expertise by hiring seasoned investment professionals and expanding QUINCO's investment staff. Over the next two decades, the endowment portfolio increased its exposure to such alternative investments as private equity, real assets, and hedge funds.

These investments have performed well for the endowment; in particular, private equity and real assets were very strong contributors to the portfolio return over that period, in line with expectations. In aggregate, however, exposure to alternatives in the portfolio is still below the average exposure of other large university endowments that are considered by the Board to be the endowment's relevant peer universe.

The evolution of the endowment's asset allocation is shown in [Exhibit 5](#).

### Exhibit 5. Evolution of the Strategic Asset Allocation

	Evolution of Investment Policy Targets							
	1996	1999	2002	2005	2008	2011	2014	2017
Cash	1%	1%	1%	1%	1%	1%	1%	1%
Fixed Income	29%	24%	24%	19%	16%	16%	14%	14%
Domestic Equity	40%	35%	26%	24%	23%	21%	20%	17%
International Developed Equity	24%	24%	20%	17%	15%	15%	12%	10%
Emerging Market Equity	0%	3%	10%	15%	15%	12%	12%	12%
Private Equity	3%	5%	8%	10%	12%	14%	16%	18%
Real Assets	3%	5%	6%	7%	9%	11%	12%	13%
Diversifying Strategies	0%	3%	5%	7%	9%	10%	13%	15%

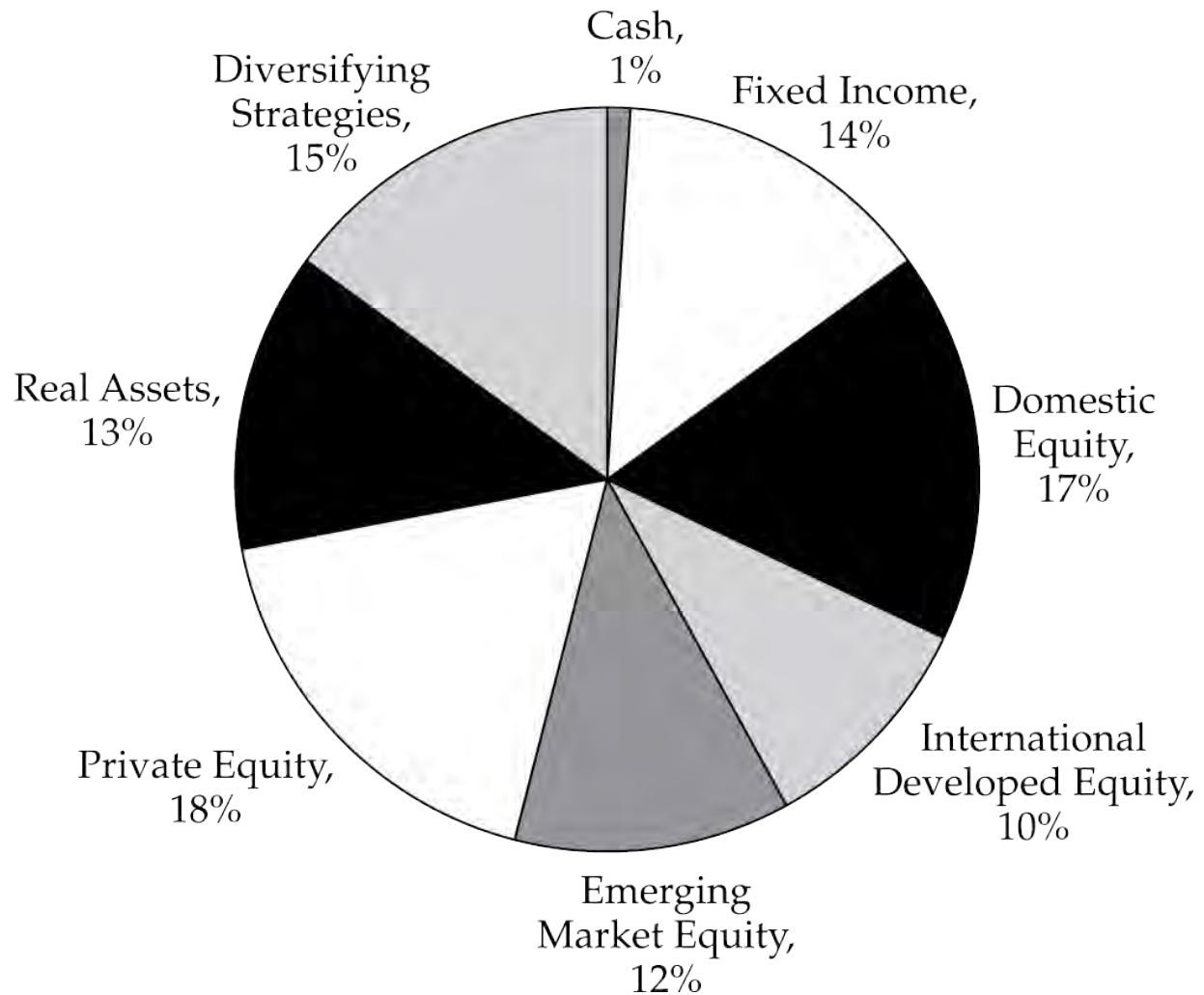
The QUINCO Board oversees a comprehensive strategic asset allocation review every three years. The last review of the asset allocation occurred two years ago. At that time, the Board approved a continued increase to alternative investments at the expense of developed market equities (both domestic and international).

### 3.2.1. Current Scenario

Winter, a QU alumnus who joined QUINCO five years ago, took over the role of investment office president and CIO last year. This is the first time he will be overseeing an asset allocation review. The endowment's current asset allocation is shown in [Exhibit 6](#).



## Exhibit 6. Current Strategic Asset Allocation



Based on discussions with the Board, Winter asks his portfolio strategy team—consisting of team lead, Julia Thompson, her asset allocation analyst, and the senior portfolio managers for fixed income and public equities—to address the following considerations during the review process:

- The desired liquidity profile for the endowment and corresponding framework for liquidity management.
- The investment outlook and efficiency of the strategic asset allocation. A long period of falling interest rates and rising asset prices in the developed world drove most traditional asset classes to the upper bounds of historical valuation ranges, lowering future expected returns in these markets.
- The role of tactical asset allocation (TAA) in QU endowment's investment strategy.



Given the long-term nature of the strategic asset allocation, some Board members are wondering whether a tactical asset allocation program might improve risk-adjusted returns for the portfolio.

- Endowment underperformance relative to a peer universe of large endowments. Although the QU endowment had better returns than most of its peers during the 2008 global financial crisis, the portfolio has largely underperformed its peers since then.

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## 4. QUINCO CASE: STRATEGIC ASSET ALLOCATION

### **c. analyze asset allocation and portfolio construction in relation to liquidity needs and risk and return requirements and recommend actions to address identified needs**

Thompson and the strategy team have completed their analysis, including the considerations raised by Winter and the Board, and are now ready to present to the Board. As part of their work, Thompson updated the long-term, forward-looking capital market assumptions used for the mean–variance optimization process and asset allocation recommendations.

In developing their long-term capital market assumptions, Thompson and the strategy team considered and applied unsmoothing (or de-smoothing) techniques. These techniques were applied to illiquid investments to remove the impact of positive serial correlation on risk estimates caused by stale market pricing. From experience, Thompson knows that the uncertainty of risk and return estimates for illiquid assets is amplified by such aspects as infrequent trading, associated leverage, and long investment horizons. In attempting to estimate risk for illiquid assets, the team’s challenges include the availability, quality/reliability, and frequency of pricing data. Thompson knows these issues would result in stale pricing or a smoother pattern of reported returns because of fewer data points with lower observed return volatility. If used as an input in their mean–variance optimization models without adjustment, the artificially low volatility would make illiquid asset classes appear more attractive, resulting in higher allocations to illiquids in the “optimal” portfolio. To prevent this, Thompson and her team applied unsmoothing techniques to better reflect the underlying risk of illiquid asset classes. After applying unsmoothing techniques to private equity, resulting volatility ends up being significantly higher than volatility that is observed or experienced for these assets. [Exhibits 7 and 8](#) show these updated assumptions.

## Assumptions

Asset Class	Expected Real Return (annual geometric mean, next 10 years)	Expected Nominal Return (annual geometric mean, next 10 years)	Standard Deviation of Returns (annual)	Sharpe Ratio
Cash	0.9%	3.4%	1.7%	
Fixed Income	1.8%	4.3%	6.3%	0.14
Domestic Equity	5.0%	7.6%	18.1%	0.23
International Developed Equity	4.8%	7.4%	19.7%	0.20
Emerging Market Equity	6.0%	8.7%	26.6%	0.19
Private Equity	8.5%	11.2%	24.0%	0.32
Real Assets	4.5%	7.1%	13.3%	0.27
Diversifying Strategies	4.0%	6.6%	10.0%	0.31

Note: Inflation assumed to be 2.5% per year.

## Exhibit 8. Forward-Looking Correlation Matrix

	Cash	Fixed Income	Domestic Equity	International Developed Equity	Emerging Market Equity	Private Equity
Cash	1.00					
Fixed Income	0.11	1.00				
Domestic Equity	0.03	0.13	1.00			

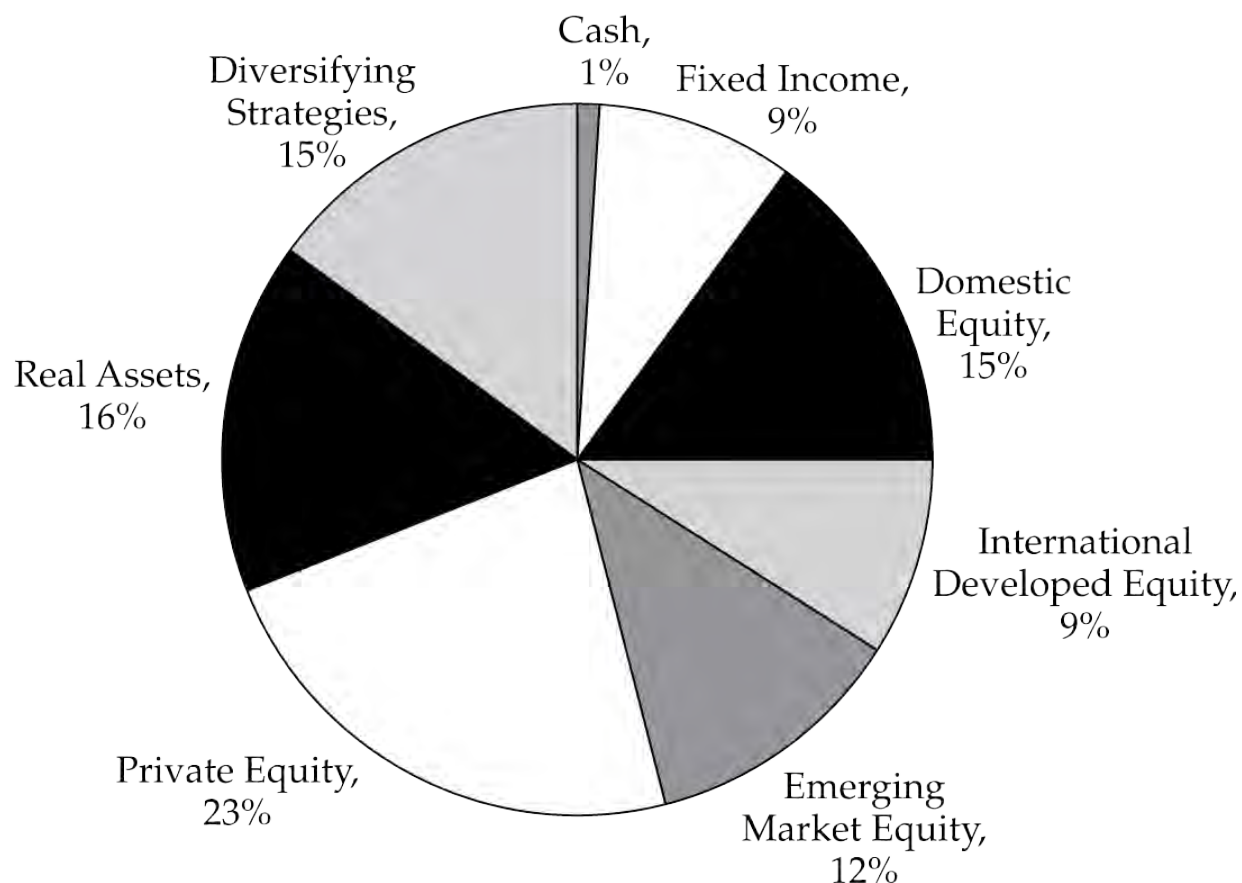
International Developed Equity	0.02	0.14	0.91	1.00		
Emerging Market Equity	0.04	(0.18)	0.69	0.71	1.00	
Private Equity	0.02	(0.11)	0.68	0.65	0.59	1.00
Real Assets	0.07	(0.16)	0.35	0.35	0.25	0.42
Diversifying Strategies	0.18	0.18	0.40	0.40	0.45	0.35



Analysis by Thompson and her team uncovered the main reasons for peer underperformance since the 2008 crisis: a lower risk profile of the portfolio and a lower allocation to illiquid investments, in particular, private equity. As such, an important change being proposed by Thompson and the team is an increase in exposure to private markets. The change would increase the private equity allocation from 18% to 23% and the real assets allocation from 13% to 16%. To accommodate both increases, the allocations to public equities and fixed income would decrease. The proposed target allocations are presented in [Exhibit 9](#).

In terms of implementation, Thompson and her team expect that the transition to the higher target allocations in private equity and real assets will occur gradually over the next two to three years.

### Exhibit 9. Proposed Strategic Asset Allocation Targets



Optimization results in [Exhibit 10](#) are based on the team’s assumptions ([Exhibits 7 and 8](#)) and show that a higher allocation to private equity and real assets would improve the expected long-term risk–return profile of the endowment. The team also includes the results of Monte Carlo simulations that show the probability of an erosion in longer term purchasing power. Thompson notes that the resulting risk profile measured by the volatility is consistent with quantitative guidelines developed for the endowment’s risk tolerance. Based on interaction with the Board, the risk tolerance has been specified as a volatility range of 12% to 14% based on long-term measures of risk.

#### Exhibit 10. Proposed vs. Current SAA: Expected Risk/Return Properties

Portfolio Characteristic	Proposed SAA	Current SAA
Expected nominal return (annual average, geometric, next 10 years)	7.8%	7.5%
Expected real return (annual average, geometric, next 10 years)	5.3%	5.0%

Standard deviation of returns (annual)	13.2%	12.5%
Sharpe ratio	0.34	0.33
Probability of 25% erosion in purchasing power over 20 years with 5% spending rate	30%	35%

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*Note:* The probability of erosion in purchasing power was derived based on a Monte-Carlo simulation with a 20-year investment horizon, assuming expected return and volatility characteristics will be the same as for the next 10 years.

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When asked to justify the proposed strategic asset allocation (SAA), including the higher allocation to private markets, Thompson highlights the optimization results from [Exhibit 10](#) to the Board, noting that the primary driver of the proposed asset allocation changes is the expected improvement in the portfolio's long-term risk/return profile.

Thompson is aware the proposed asset allocation implies a small increase in the overall risk profile of the endowment as measured by the volatility of portfolio returns (13.2% for the proposed SAA versus 12.5% for the current portfolio). She believes that the increase in risk is justified by the following:

- Lower return expectations for all asset classes relative to past expectations due to higher current valuations. This implies that a higher level of risk must be taken to achieve the same level of returns. At the time of the last review, the then-current SAA had an expected return of 5.3% in real terms, although now it is expected to generate a 5.0% real return going forward. Lower return expectations can only be compensated in part by efficiency improvements in the asset allocation. Although the proposed SAA is slightly more efficient (higher Sharpe ratio of 0.01), this efficiency improvement alone is not enough to generate a 5.3% expected real return for the same level of short-term risk/volatility as the current SAA.
- A portfolio risk profile that is currently more conservative when compared to other endowment peers.
- A lower expected Sharpe ratio (expected risk–return profile) for fixed income (compared with recent history), suggesting a lower allocation to these strategies may be warranted.
- Monte-Carlo simulations, suggesting that the proposed asset allocation has a higher probability of achieving the real return target over a 20-year horizon, while better preserving the purchasing power of the endowment with the current spending policy of 5%.

## IN-TEXT QUESTIONS:

1. Discuss arguments in favor of increasing the endowment's allocation to illiquid investments.
2. Using additional information provided in [Exhibit 10](#) and your knowledge of illiquid investments from prior curriculum content, justify Thompson's proposed asset allocation and explain the trade-offs involved in terms of portfolio volatility.

## Guideline Answers:

1. In general, for a long-horizon institutional investor, the ability to tolerate illiquidity creates an opportunity to improve portfolio diversification and expected returns as well as access a broader set of investment strategies. In mean–variance optimization models, the inclusion of illiquid assets in the eligible investment universe may shift the efficient frontier upwards, theoretically resulting in more-efficient investment portfolios (i.e., portfolios with a higher expected return for a given level of risk).

Thompson and her team believe the above to be true in the case of QU's endowment. In addition, further arguments are in favor of increasing the allocation to illiquidity risk. Thompson believes the specific circumstances of the endowment continue to support an increase in exposure to illiquid investments. To date, the team's historical experience with illiquid investments has been positive with strong realized returns. The endowment has been building exposure to these strategies over the last two decades in a gradual manner. As a result, the illiquid portfolios are now well-established, mature, and well-diversified in terms of fund managers, strategies, and vintages. At the same time, the long presence in the market and the ability to access QU alumni networks have helped the endowment develop a strong network of connections in the industry and gain access to best-in-class managers in these spaces—building a reputation as a well-informed, patient, and reliable long-term investor. As revealed in the case text, the QU endowment has a lower exposure to illiquid investments than most institutional investor peers with similar risk profiles and objectives. Analysis by Thompson and her team has identified this as one of the reasons for the QU endowment's underperformance in recent years relative to peers.

Thompson and the strategy team should also examine whether the allocation to private equity and real assets is exposed to idiosyncratic risk factors. Avoiding large allocations to a small number of funds helps ensure that idiosyncratic risk factors are largely diversified away.

2. As Thompson highlights to the Board, the primary driver of the proposed asset

allocation is the expected improvement in the portfolio's long-term risk/return profile. The proposed SAA has a higher expected real return compared to the current SAA (5.3% vs. 5.0% in real terms) and a slightly higher Sharpe ratio (0.34 vs. 0.33).

The proposed asset allocation also has a higher probability of achieving the endowment's return target over the long-term. One way to get a better sense of this is through Monte Carlo simulations. For example, using such simulations, the team concludes that there is a 70% chance of maintaining at least 75% of purchasing power over a 20-year horizon for the proposed SAA versus a 65% chance for the current SAA, assuming a 5% spending rate.

There is an implicit trade-off in this case between the short-term risk measure (volatility) and the long-term risk represented by the probability of purchasing power erosion over a 20-year horizon.

### **Trade-off 1: Portfolio volatility**

Thompson has considered the increase in overall risk profile for the endowment (portfolio return volatility increases from 12.5% to 13.2%) and believes the increase to be justified.

Thompson believes future returns will be lower for all asset classes. Lower return expectations imply that a higher level of risk must be taken to achieve the same level of returns. Although the proposed SAA is slightly more efficient, as indicated by its higher Sharpe ratio, this improvement in portfolio efficiency is not sufficient to generate the 5.3% expected real return for the same level of short term risk/volatility as the current SAA.

Optimization results also suggest that the proposed asset allocation has a higher probability of achieving the real return target while preserving the purchasing power of the endowment given the current 5% spending policy. Finally, Thompson also considers that QU's portfolio risk profile is still currently more conservative than its peers.

### **Trade-off 2: Implementation costs**

Thompson and her team analyzed the costs associated with implementing the proposed portfolio allocation changes. Private equity and private real estate strategies typically have higher investment management fees and performance fees than fixed-income and public equity strategies. By using "net of fees" return assumptions, Thompson and her team incorporated the impact of higher expected investment management fees arising from higher allocations to more-illiquid investments.

Before concluding that the QU endowment should adjust its asset allocation to illiquid investments, Thompson should confirm that the resulting risk profile (return volatility of 13.2% and the probability of erosion in purchasing power shown in [Exhibit 10](#)) is consistent with the endowment's risk tolerance (willingness and capacity to bear risk). Thompson also should confirm that with the increased allocation to illiquid investments, the resulting asset allocation remains consistent with the liquidity budget.

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## 5. QUINCO CASE: LIQUIDITY MANAGEMENT

### c. analyze asset allocation and portfolio construction in relation to liquidity needs and risk and return requirements and recommend actions to address identified needs

Given the increasing complexity in the investment portfolio and the university's reliance on regular distributions from the endowment, QUINCO needs a robust framework for managing liquidity. During her time at QUINCO, Thompson has worked to enhance QUINCO's overall liquidity management framework. This includes improving the tools used in that process and taking a comprehensive, enterprise-wide approach. Using her approach, the expected cash outflows and inflows for the endowment portfolio are modeled over various time horizons both under normal circumstances and in periods of severe market stress.

Thompson is concerned that the portfolio's liquidity characteristics will deteriorate in periods of severe market stress. She believes a deterioration in liquidity could potentially occur for the following reasons:

- **Capital calls in private markets exceeding capital distributions.** This would increase the allocation to private markets in the overall portfolio.
- **Activation of gates.** Some investment vehicles that provide quarterly or annual liquidity, like hedge funds or real estate funds, have provisions in their investment prospectuses allowing the investment manager to refuse investor withdrawal requests (activate gates) during stress periods to protect remaining investors in the fund. The inability to withdraw from funds leads to a more illiquid profile overall.
- **The smoothing effect.** Investments in private markets tend to incorporate market valuations with a lag that leads to a relative increase in their portfolio weighting during periods of market stress and a relative decrease in the portfolio weighting of more liquid



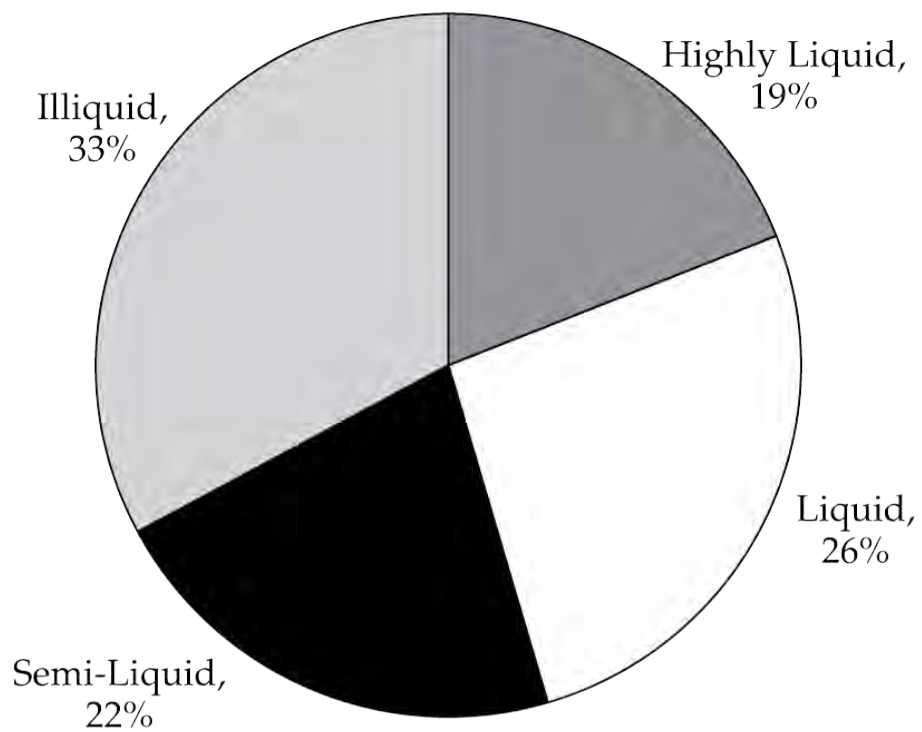
assets. This does not reduce the effective liquidity of the portfolio in dollar terms, but it does impact the percentage of assets in the overall portfolio that could be used to satisfy liquidity needs in periods of market stress.

To address her concerns, Thompson asks her team for an analysis of the current and proposed QU portfolios under normal and stress market conditions. The team's analysis of each portfolio's liquidity profile is shown in [Exhibits 11](#) and [12](#).

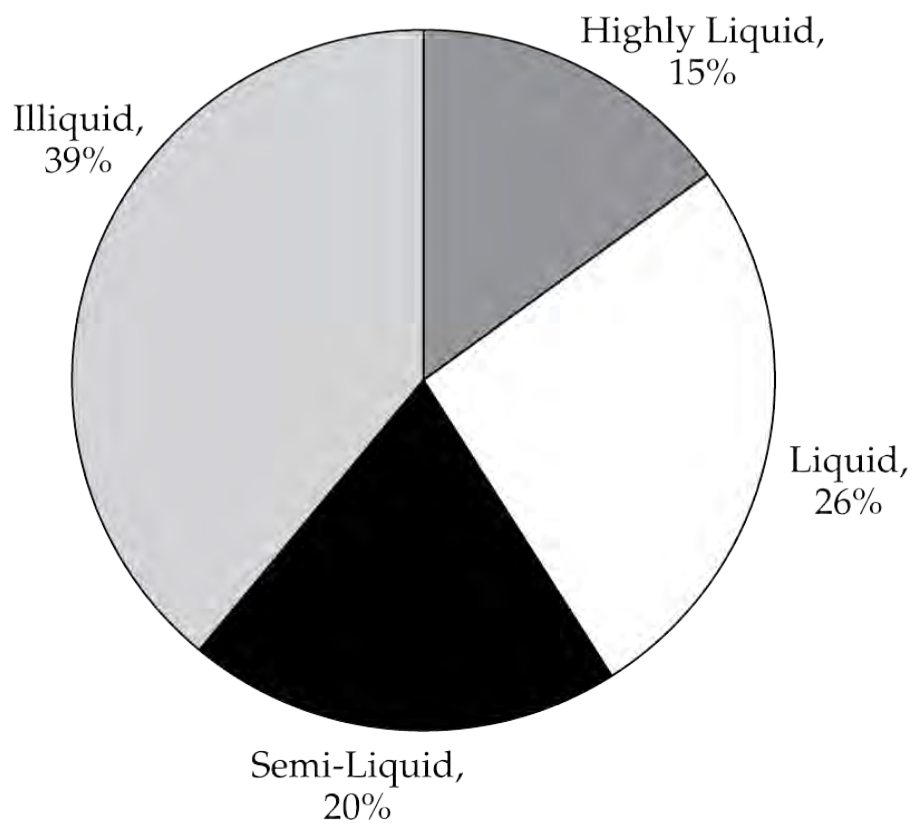
[Exhibit 11](#) shows the current QU portfolio under normal and stress conditions.

#### **Exhibit 11. QU Endowment Liquidity Profile: Current Portfolio (Normal and Stress Conditions)**

### *A. Liquidity Profile - Normal Conditions*



### *B. Liquidity Profile - Stress Conditions*

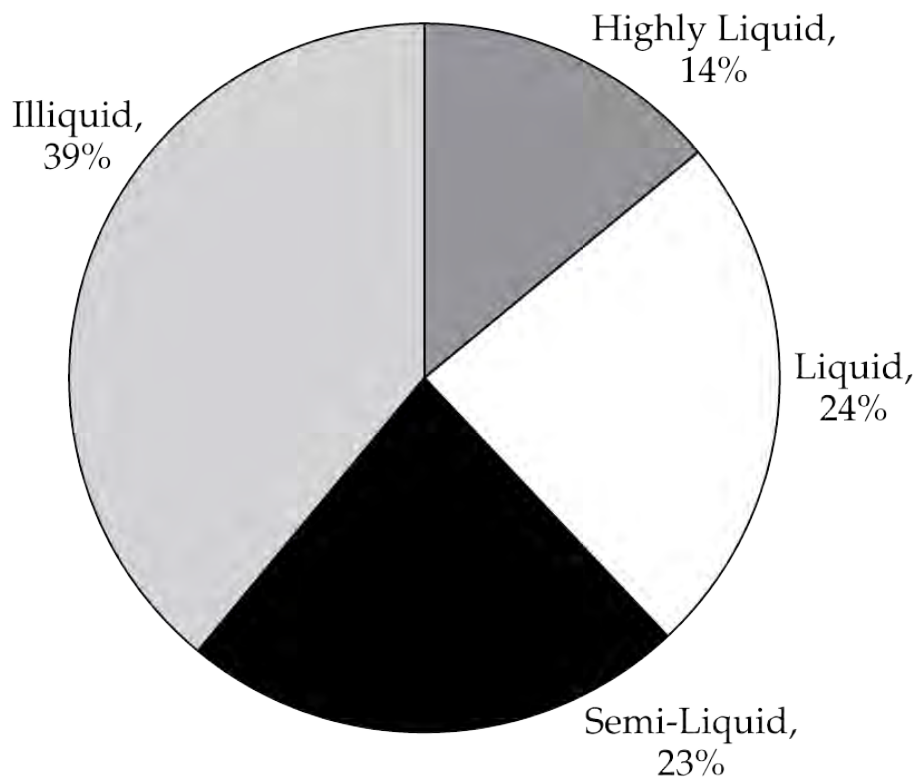


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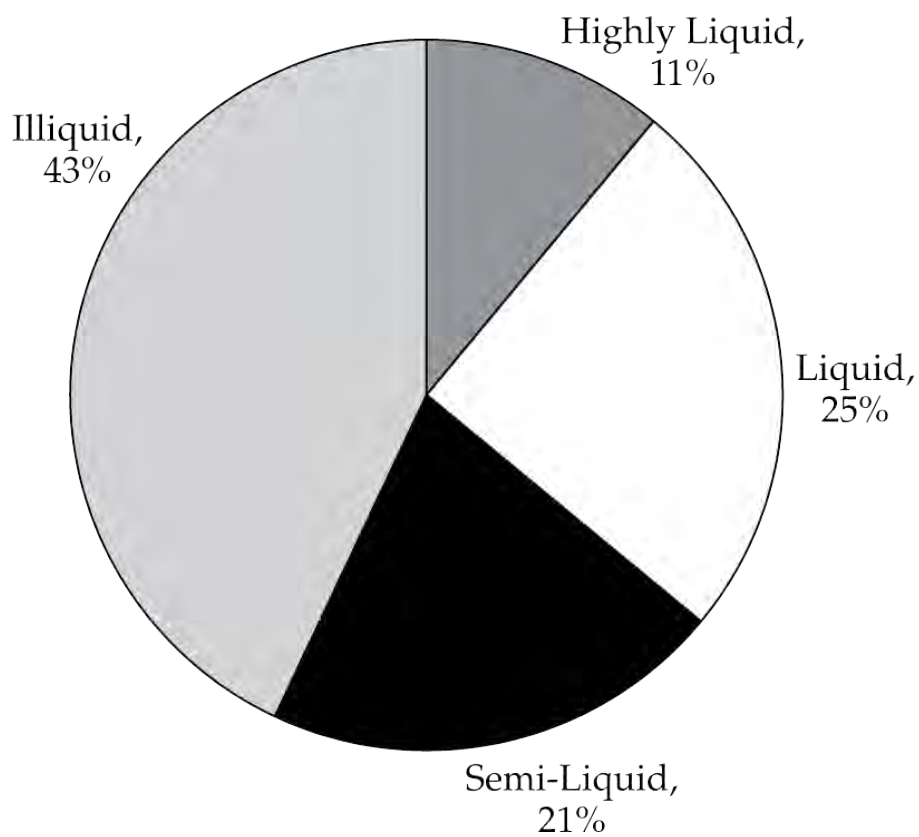
Exhibit 12 shows the proposed QU strategic asset allocation portfolio under normal and stress conditions.

**Exhibit 12. QU Endowment Liquidity Profile: Proposed Strategic Asset Allocation (Normal and Stress Conditions)**

### *A. Liquidity Profile - Normal Conditions*



### *B. Liquidity Profile - Stress Conditions*



## IN-TEXT QUESTIONS:

1. Explain how current spending policy might affect liquidity needs in a market downturn.
2. Describe various tools that QUINCO might use to manage its portfolio liquidity risk.
3. What impact will the proposed asset allocation changes have on the endowment's liquidity profile?

## Guideline Answers:

1. The design of the spending rate policy incorporates a smoothing, countercyclical element leading to spending rates below 5% in a period of sustained strong investment returns but higher than 5% in a protracted weak return environment. This design of the spending rate policy exacerbates the endowment's liquidity needs in severe market downturns.
2. Among the tools QUINCO could use are cash flow-forecasting and commitment-pacing models, liquidity budgets, and stress test analyses. To begin, Thompson estimates expected cash outflows and inflows. For cash outflows, Thompson projects distributions from the endowment to the university. These uses of cash can then be factored into the estimation of expected outflows and inflows through the spending rate policy in which the university seeks to spend, on average, 5% annually of the endowment while preserving the endowment's purchasing power over time.

For the private equity and real estate portfolios, Thompson and her team can use cash flow-forecasting models and commitment-pacing models to project the expected increase in the allocation to private markets. These help the team project cash outflows needed for future investment commitments (committed but undrawn capital calls) in private markets. These flows could become particularly relevant in stress periods when distributions from prior investments in those markets might cease as general partners find it difficult to exit investments (because of depressed valuations and lack of transaction activity). Future investment commitments are legal obligations of the endowment, so the staff needs to ensure capital calls are met because the general partner may accelerate capital calls as opportunities arise in depressed markets. Thompson and her team should ensure diversification across fund vintage years to avoid overexposure to particular parts of the economic cycle

and should also follow a strategy that commits capital on a steady and regular basis to minimize the need to make large allocation changes (or adjustments) with associated transaction costs. Avoiding large allocations to very few funds will help minimize idiosyncratic portfolio risk.

At the same time, cash inflows into the endowment from donors will likely drop significantly during stress periods, further increasing liquidity needs. Liquidating risk assets or high-beta assets after periods of negative return is often not desirable from a valuation standpoint when future returns may be expected to be more attractive, particularly following periods of sharp drawdowns. Given her experience with these markets, Thompson should recognize the need for the team's approach to be flexible. Access to the top private market managers is often highly competitive, and opportunities to invest with these managers may not be available at times when the portfolio is making allocation increases.

Incorporating this information, Thompson can develop a liquidity budget for the endowment like that shown in [Exhibit 1](#), which specifies minimum acceptable liquidity targets based on the expected time needed to convert portfolio holdings to cash. The liquidity budget should be monitored by Thompson and her team on a regular basis as part of the liquidity management framework in place at QUINCO. Thompson and her team can also do an analysis of the portfolio's current liquidity characteristics under normal market conditions, like that shown in [Exhibit 2](#).

Thompson and her team should continue to undertake regular stress tests (such as the liquidity profile analysis done by her team) using historical and hypothetical scenarios to estimate how much the liquidity profile of the portfolio could drift under certain assumptions and to assess whether the minimum liquidity budget is still satisfied. The analysis can also be used to inform the team's asset allocation and implementation decisions for investment vehicles and strategies.

3. Compared to the liquidity profile of the current portfolio, the proposed asset allocation implies a shift toward more-illiquid investments, as shown in the following table:

Liquidity Category	Current Portfolio: Normal (%)	Current Portfolio: Stress (%)	Current Portfolio: Stress vs. Normal (%)	Proposed: Normal (%)	Proposed Portfolio: Stress (%)	Proposed Portfolio: Stress vs. Normal (%)
Highly Liquid	19	15	-4	14	11	-
Liquid	26	26	0	24	25	1

<b>Semi-Liquid</b>	22	20	-2	23	21	-
<b>Illiquid</b>	33	39	6	39	43	4

As a result, there will be a reduction in the highly liquid and liquid categories in the endowment's liquidity profile and a commensurate increase in the semi-liquid and illiquid categories under both normal and stress conditions. The proposed allocation results in an increase in the overall illiquidity profile because a higher percentage of the portfolio will be invested in private equity and private real estate, which are the most illiquid asset classes in the portfolio.

Thompson needs to ensure that even under stress conditions the proposed allocation continues to comply with the liquidity budgeting framework in place for the fund, which satisfies the various liquidity needs of the portfolio for both cash outflows and rebalancing. From an ongoing management perspective, and particularly at times when the liquidity profile of the proposed allocation is closer to the minimum thresholds set through the liquidity budget, Thompson and her team should plan to closely monitor the portfolio's liquidity profile and stress test it periodically to make sure portfolio liquidity remains adequate.

Based on this analysis, the QUINCO Board approves the proposed changes to the asset allocation and instructs the team to proceed with implementation. These changes are also presented to the Quadrivium Trustees as part of the university treasurer's financial report at the Trustees' next regular meeting.

## 6. QUINCO CASE: ASSET MANAGER SELECTION

### d. analyze actions in asset manager selection with respect to the Code of Ethics and Standards of Professional Conduct

It is now three months later, and Winter, Thompson, and the rest of the QUINCO team have begun implementing changes to the strategic asset allocation by seeking additional external managers. Winter is very pleased with their progress to date but has encountered a somewhat

interesting situation.

Among the firms responding to QUINCO's request for proposal (RFP) seeking a new private equity manager is Genex Venture Capital (GVC). GVC is proposing that QUINCO invest in its new "GVC Fund II" offering. GVC is a US-based venture capital fund operating in the biotech space. GVC would be a new relationship for QUINCO. The firm has adopted the CFA Institute Asset Manager Code for its employees. The founder and managing partner at GVC is Virginia Hall, CFA, a prominent alumna of Quadrivium University who was elected to the university's board of trustees three years ago. Hall has made several generous donations to the university over the years, and the building that houses the school's student center and main dining facility is named in her honor. Both the university president and university treasurer have urged Winter to favorably consider GVC's proposal given Hall's importance to the university. Winter has suspicions that Hall has contacted the university president and treasurer to advocate for her company.

The investment committee narrows the competition for the allocation of QUINCO's private market assets to GVC and Beacher Venture Investments (Beacher). Beacher is another venture capital investment firm operating in the same space and is a direct competitor to GVC.

Both GVC and Beacher are invited to make a presentation to QUINCO's investment committee. GVC's presentation is led by Jason Allen, one of Winter's former colleagues from the endowment they both worked for previously. Allen has joined GVC as a managing director as part of GVC's efforts to build the team in preparation for Fund II. Although Allen's presentation on behalf of GVC is thorough and well-documented, Winter is troubled by two aspects. The presentation is targeted to QUINCO but clearly incorporates information that is based on or could only have come from the university treasurer's non-public reports to the Quadrivium board of trustees or another university source. In addition, the performance presentation of GVC's historical returns shows substantially higher returns than performance reported by third-party performance databases.

Of the two finalists, Beacher has a longer track record and is a more established name in the industry; however, there are some concerns over the historical performance of its previous fund. At the same time, some investment committee members have expressed reservations over GVC's short track record. Given the overlap in sector and strategy between the two firms, the investment committee asks Bud Davis, a CFA charterholder and senior portfolio manager on QUINCO's private equity team, to return with a formal proposal to invest in one of the firms.

Davis presents an update on the fundraising efforts of each firm's fund and notes that GVC is facing challenges in raising the desired fund amount of \$300 million for Fund II. Potential investors are apparently concerned with the significant increase in funding size of the fund (Fund I had raised \$100 million) and question whether GVC has the infrastructure to scale operations.



Davis makes a strong case for investing with GVC, highlighting confidence in the manager and their differentiated approach to sourcing and growing portfolio companies in the biotech space. Davis tells the investment committee that because of the longer-than-expected fundraising period, GVC is eager to secure QU's commitment for Fund II; as a result, Davis has negotiated a discount on GVC's investment management fee. Following that discussion, the investment committee approves the recommendation from the team to invest with GVC.

After the decision is made to hire GVC, Winter calls Allen to tell him the good news and offer his congratulations. During the conversation, Allen expresses his satisfaction in having QUINCO as one of the fund's investors and praises Davis's strong commitment and drive. Allen goes on to mention that Davis's spouse, Andrea, is Hall's daughter. Winter expresses his surprise at this fact and later asks Davis about his wife's relationship to Hall. Davis responds that he believes this information is common knowledge and that he thought Winter and members of the QUINCO investment committee knew this information.

### IN-TEXT QUESTION:

What ethical considerations arise regarding the actions and conduct of individuals involved in manager selection?

### Guideline Answer:

***Aaron Winter, QUINCO CIO***

Winter faces several ethical dilemmas in this case. The main issue is the disclosure of a potential conflict of interest, Standard of Professional Conduct VI(A), regarding the hiring of an external investment manager with close ties to the university. Winter's independence and objectivity, Standard of Professional Conduct I(B), in making the hiring recommendation could be compromised by the implicit and explicit pressure he is receiving to hire GVC. He should disclose this conflict to the QUINCO Board as part of the hiring recommendation. He should also disclose that the managing director for GVC is a former colleague since that relationship could also be perceived as impairing his independence and objectivity, creating a conflict of interest. During the presentation, it appears that GVC has based their proposal on confidential information, Standard of Professional Conduct III(E), about the university, potentially obtained by Hall through her role as a Quadrivium Trustee or others at the university. As an employee of the University and QUINCO, Winter should make them aware of the possible breach of confidentiality. He also apparently has questions about the accuracy of the performance information, Standards of Professional Conduct I(C) and III(D), presented by GVC but fails to exercise appropriate due diligence, Standard of Professional Conduct V(A), by following up with GVC or investigating further to determine the veracity of the information.

## ***Virginia Hall, CFA, Quadrivium University Trustee and Managing Partner at GVC***

Virginia Hall has a conflict of interest, Standard of Professional Conduct VI(A), if she is pressuring university staff and QUINCO employees to influence the external manager hiring process in her company's favor. Hall's personal/business interests with GVC pose a potential conflict of interest with her duties as a Trustee of the university board. She has a duty as a Board member to act in the best interest of the university without regard to how it may benefit her, but she has an incentive to pressure the university to hire her company. She would be violating her duty of loyalty, Standard of Professional Conduct IV(A), to the university as a Trustee by putting her firm, and therefore her personal interest, ahead of the interests of the university. She should disclose her potential conflict and recuse herself from any part in the external manager hiring process. In addition, she has potentially gone further by sharing confidential information, Standard of Professional Conduct III(E), she has received as a trustee with GVC in an effort to assist GVC's response and boost the prospects of her company in being hired—another violation of her duty of loyalty as a Trustee. GVC neglected to disclose the relationship of one employee's relative (Hall's daughter, who is Davis's spouse) with QUINCO.

## ***Quadrivium University President/Quadrivium University Treasurer***

The university president and treasurer, as members of the QUINCO Board, have a duty to act in the best interest, Standard of Professional Conduct IV(A), of the university by hiring the external investment managers most appropriate for managing the private equity portion of the university's endowment. In pressuring Winter to hire GVC, they are clearly letting the outside consideration of maintaining good relations with a Trustee influence their hiring decision. It is also possible they provided confidential information, Standard of Professional Conduct III(E), to Hall or GVC to assist their bid to become an investment manager for QUINCO. They should disclose their conflict, Standard of Professional Conduct VI(A), and recuse themselves from decisions where their independence and objectivity, Standard of Professional Conduct I(B), are compromised. The university president and treasurer should also have in place a due diligence questionnaire/RFP to raise questions to new managers about potential conflicts of interest.

## ***Jason Allen, Managing Director at GVC***

Winter has noticed a discrepancy between the performance history of GVC in the presentation made by Allen and the performance record of the company as reported elsewhere. It is possible that Allen is inadvertently using inaccurate information or, worse, knowingly misrepresenting the performance record, Standards of Professional Conduct I(C) and III(D), of GVC.

### ***Bud Davis, CFA, Senior Portfolio Manager at QUINCO***

Through his spouse, Davis has a personal relationship with GVC, a company he is tasked with investigating and providing an opinion on the potential hiring as an outside manager. This could affect his independence and objectivity, Standard of Professional Conduct I(B), and creates, at minimum, the perception of a conflict of interest, Standard of Professional Conduct VI(A), that should be disclosed when making his recommendation. Davis should not rely on his belief that the relationship is “common knowledge” or widely known but should make an explicit disclosure of this potential conflict.

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## **7. QUINCO CASE: TACTICAL ASSET ALLOCATION**

- e. analyze the costs and benefits of derivatives versus cash market techniques for establishing or modifying asset class or risk exposures**
- f. demonstrate the use of derivatives overlays in tactical asset allocation and rebalancing**

As part of the investment strategy review, the Board decided to significantly increase the active risk budget assigned to the QUINCO team for use in a new tactical asset allocation (TAA) program. QUINCO’s active risk budget measures the deviation of the endowment’s portfolio from its investment policy targets and is expressed as an annual tracking error limit. The Board increased QUINCO’s active risk budget from 100 bps to 250 bps to allow the team to pursue greater excess returns versus the strategic asset allocation. By taking active risk relative to investment policy benchmarks through external managers in public asset classes as well as TAA positions, the QUINCO team hopes to add additional portfolio performance.

The implementation of the tactical asset allocation program and associated risk budget was fully delegated to Winter and his staff. At that time, the Board also informed that up to 150 bps (of the 250 bps) active risk budget could be used to implement the TAA program. One consideration the Board discussed was the use of leverage. The TAA program implementation could result in a levered position of the endowment portfolio (because derivatives are likely to be used in implementation and not every overweight exposure would

be offset by a corresponding underweight in another asset), so the Board agreed to permit a modest leverage position for the overall portfolio of up to 5% of the portfolio’s value.

Winter believes that the tactical asset allocation program will accommodate two types of active decisions:

- Overweight and underweight positions in one or more of the asset classes included in the investment policy portfolio.
- Provide exposure to asset classes and/or investment strategies outside the policy portfolio benchmark universe but compliant with the investment policy (e.g., high yield, emerging market, fixed income).

Winter began implementing the TAA program by building on a framework and research by Thompson and the asset allocation team that was informed by external parties (e.g., investment consultants, external tactical asset allocation managers, investment research houses). Using concepts of fair value and mean reversion in financial markets, fair value models were developed for various financial assets. To do this, the framework incorporated economic and financial data that had exhibited predictive power for future returns and risk over an investment horizon of one to three years. Current market pricing was then compared with output from the valuation models to determine whether the deviation from ‘fair value’ was large enough to be exploited in a cost-efficient manner.

In extensive out-of-sample backtests, the methodology had produced encouraging results. One of the strongest signals suggested that large-cap US equities, characterized broadly by the S&P 500 Index, were significantly below fair value with mean reversion expected over the next year. Based on this information, Thompson decides to implement a 1% overweight to US equities through a passive exposure.

Thompson is now considering three options to implement her decision: a total return swap, equity futures, and ETFs. Her goal is to implement the overweight position as effectively as possible from a cost and cash usage perspective. Thompson asks her team to look at the associated costs for each option.

The team’s cost comparison analysis is shown in [Exhibit 13](#).

**Exhibit 13. Cost Comparison Assuming a Fully-Funded Mandate**

Cost Component	ETF	Futures	Total Return Swap
Commission (round trip)	4.00	2.00	5.00
Management fee (annual)	9.50	0.00	0.00

Bid/offer spread (round trip)	2.50	2.00	6.00
Price impact (round trip)	15.00	10.00	0.00
Mispricing (tracking error, annual)	4.00	8.00	0.00
Cost to roll the futures contract	0.00	20.00	0.00
Funding cost	0.00	0.00	40.00
<b>Total cost</b>	<b>35.00</b>	<b>42.00</b>	<b>51.00</b>

*Notes:* The exhibit shows the team's cost comparison for the three implementation options—ETFs, futures, and total return swaps—for an \$80 million notional exposure to the S&P 500 Index (assuming a fully funded mandate) over a one-year investment horizon. All numbers are in basis points (bps) unless otherwise indicated.

The comparison assumes no leverage for the ETF and that the entire mandate amount (\$80 million) is deposited to earn the 3-month Libor rate for futures and the total return swap as to offset the 3-month Libor component of the implied financing rate (or the funding cost in the case of the swap).

After closely examining the cost comparison analysis, Thompson debates the pros and cons of each option with her team.

From a cash 'usage' perspective, ETFs would be least efficient as she would need to finance the full notional value of the ETF or use the margin features of the account. Even when using the margin, regulations would limit the margin to 50% of account value, implying a maximum of two times the leverage ratio. For example, for an \$80 million ETF exposure, the minimum margin that would have to be held in cash would be \$40 million. Thompson knows that using futures and total return swaps could generate a similar economic exposure to ETFs with a much lower capital commitment.

From a liquidity perspective, Thompson likes ETFs and futures, which appear efficient given their liquid trading and narrow bid-ask spreads. She also values the flexibility they offer to terminate exposure before intended maturity should the team's views on the market change. Thompson is concerned about the operational implications of holding futures because they require daily monitoring of margin requirements. In addition, she also worries about interest rate risk and exposure of QU to counterparty credit risk.

### IN-TEXT QUESTION:

Assuming a fully-funded position (no use of leverage), which implementation option should Thompson choose for the 1% tactical overweight to US equities?

## Guideline Answer:

**Expected Costs.** In the case of the ETF, the most significant cost component is price impact—the expected impact on market price from entering into (buying) and exiting out of (selling) the ETF position. This is estimated to be approximately 15 bps. The second largest cost component is the management fee charged by the ETF manager, which is expected to be 9.5 bps.

In the case of futures, the largest cost component is expected to be the cost to roll the futures contract on a quarterly basis (5 bps quarterly or 20 bps annual cost). This is driven by the upward-sloping (contango) shape of the yield curve. In addition to the futures roll cost and the price impact, another significant futures cost is the mispricing or tracking error of expected futures performance relative to the underlying index performance. Expected tracking error on the futures contracts is 8 bps.

Finally, for the total return swap, the cost is dominated by the funding cost, which is expected to be 40 bps.

From a total cost perspective, at 35 bps the ETF offers the most cost-efficient vehicle to implement the tactical overlay, with relatively tight bid–ask spreads that are similar to futures.

**Other Considerations.** ETFs and futures are typically standardized products that trade on exchanges. Total return swaps are over-the-counter contracts that are negotiated and customizable in such features as maturity, leverage, and cost. ETFs are the least cash-efficient option requiring the largest cash outlay, and Thompson would be able to gain similar economic exposure with futures and swaps using significantly less cash.

A position in futures contracts would need to be rolled over each quarter to maintain exposure. Given Thompson's concerns about the operational requirements for futures and the need for daily monitoring for margin requirements, a position in futures is likely less desirable to Thompson. For ETFs, ongoing management of the exposure is done by the ETF manager.

Futures and ETFs have associated tracking error versus the index intended to be replicated. For ETFs, the tracking error may result from premiums and discounts to net asset value, cash drag, or regulatory diversification requirements. For futures, tracking error arises because of liquidity (supply/demand conditions), dividend forecast errors, and interest rate differentials. For total return swaps, the replication is exact; Thompson would receive the total return of the index without incurring any tracking error to the benchmark S&P 500 Index because the swap counterparty is obligated to provide the index return.

However, Thompson is concerned about interest rate risk in the case of futures and

swaps. She is also concerned about the counterparty credit risk that QUINCO would be exposed to through a swap, which would additionally create complexities in managing net exposures over the duration of the contract.

To implement the tactical overlay given Thompson's considerations, the ETF provides the most cost-efficient vehicle, with adequate liquidity and relatively tight bid–ask spreads. ETFs also provide Thompson with the flexibility (noted as being important to her) to modify exposure before the end of the one-year horizon should her and her team's investment views change.

After considering with her team, Thompson believes implementing with ETFs appears to be the best option.

Later that day after further discussion, Thompson and the management team decide to implement the overlay using leverage. Thompson asks her team to complete a cost comparison analysis assuming a permissible leverage level of 4 times for all three options (meaning that cash needed to support the position would be 25% of the overlay notional amount).<sup>7</sup> The team's work is shown in [Exhibit 14](#).

#### **Exhibit 14. Additional Information with Respect to Impact of Leverage**

<b>Cost Component</b>	<b>ETF</b>	<b>Futures</b>	<b>Total Return Swap</b>
Cost of obtaining leverage	187.50	0.00	0.00
Additional financing/funding cost	0.00	150.00	150.00
Total additional cost	187.50	150.00	150.00

*Notes:* The additional cost components assume 4 times leverage over a one-year investment horizon. All numbers are in basis points (bps) unless otherwise indicated.

The team's assumptions for the analysis are as follows:

- The borrowing cost of obtaining leverage in the case of the ETF is assumed to be 3-month Libor + 50 bps.
- The 3-month Libor assumption used is 2% (opportunity costs).



- The same Libor rate was used to calculate the additional implied financing cost in the case of futures and the additional funding cost for the total return swap.
- The analysis focuses on the implementation cost of trade and does not consider the additional return earned by investing the cash that is not needed to support the transaction (75% of the overlay notional amount).

## IN-TEXT QUESTION:

Assuming a permissible leverage level of 4 times for all three options, and using the information in [Exhibit 14](#), would Thompson change her decision?

## Guideline Answer:

As shown in [Exhibit 14](#), the additional information changes the total cost estimates for the different implementation options. In the case of ETFs, to generate 4 times leverage, 75% of the desired nominal exposure would have to be borrowed to provide an overall exposure 4 times higher than the original capital. That is, for a desired nominal exposure of \$80 million, borrowing \$60 million (75% of \$80 million) provides 4 times leverage to an original capital amount of \$20 million.

The additional cost of obtaining leverage for each option would be as follows:

1. ETFs.  $(\$80 \text{ million} \times 0.75 \times 2.5\%) / \$80 \text{ million} = 1.875\%$ .
2. Futures.  $(\$80 \text{ million} \times 0.75 \times 2\%) / \$80 \text{ million} = 1.50\%$ . The additional financing cost for futures in this case (compared to the unlevered option) would occur because 75% of the amount would not be invested in 3-month Libor to offset the financing cost, thus increasing the overall cost for the futures.
3. Swaps.  $(\$80 \text{ million} \times 0.75 \times 2\%) / \$80 \text{ million} = 1.50\%$ . The additional financing cost for swaps in this case (compared to the unlevered option) would occur because 75% of the amount would not be invested in 3-month Libor to offset the financing cost, thus increasing the overall cost for the swaps.

Total costs for each option (in bps):

	ETF	Futures	Total Return Swap
Unlevered	35.00	42.00	51.00
Incremental cost	187.50	150.00	150.00
Total	222.50	192.00	201.00



Looking at the data, total costs for futures appear to be the lowest cost alternative (192 bps) followed by the total return swap (201 bps). Given a permissible leverage level of 4 times for all three options, and based on the data in [Exhibit 14](#), ETFs now look to be the most expensive option (222.50 bps).

Given the difference in costs, Thompson would consider implementation through futures. The main consideration between the use of ETFs and futures not captured in the comparative pricing analysis is the additional complexity and operational monitoring associated with a quarterly futures roll. If Thompson and the team can get comfortable with that risk, implementation through futures would be the more efficient option.

Looking at the data, and based on their desire to use leverage, Thompson believes that futures offer the more efficient alternative. She decides to establish a 1% long position to the S&P 500 Index using S&P 500 futures.

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## 8. QUINCO CASE: ASSET ALLOCATION REBALANCING

- e. analyze the costs and benefits of derivatives versus cash market techniques for establishing or modifying asset class or risk exposures**
- f. demonstrate the use of derivatives overlays in tactical asset allocation and rebalancing**

Three months have passed since Thompson and the team implemented the tactical overweight position to US equities. To date, the position has been performing well and in line with *ex ante* expectations. Global equity markets have rallied, reflecting a favorable global growth environment, and fixed-income markets have sold off as interest rates rose significantly in anticipation of higher inflationary pressures. As a result, the asset allocation of the endowment has drifted from policy targets.

QUINCO follows a calendar quarter rebalancing policy with a rebalancing corridor for each asset class. The allocation drift of the actual portfolio relative to the SAA is monitored monthly; however, to minimize transaction costs, short of extraordinary market

circumstances, rebalancing decisions are implemented at the end of each quarter. For public asset classes, systematic rebalancing occurs when the allocation to these assets is outside the rebalancing corridor at quarter end. When the allocation moves outside the corridor, Thompson and her team do have discretion to rebalance back to the target allocation or to the edge of the corridor.

For illiquid asset classes, given high transaction costs and practical challenges in rebalancing the allocation, rebalancing is normally undertaken through the reinvestment/commitment strategy as allocations approach the upper or lower edges of the corridor. In these cases, the pace of commitments could be altered from the expected pace to gradually shift the overall allocation to illiquid assets over time. The SAA, width of the rebalancing corridor, and the current allocation for the various asset classes are shown in [Exhibit 15](#):

#### Exhibit 15. SAA, Rebalancing Corridors, and Current (Actual) Allocations

	Target Allocation (SAA)	Corridor	Min/Max Target	Current Allocation
Cash	1%	±1%	0%–2%	0.8%
Fixed Income	9%	±3	6%–12%	6.5%
Domestic Equity	15%	±2.5	12.5%– 17.5%	17.3%
International Developed Equity	9%	±2%	7%–11%	11.5%
Emerging Market Equity	12%	±2%	10%– 14%	13.9%
Private Equity	23%	±5%	18%– 28%	19.2%
Real Assets	16%	±3%	13%– 19%	13.8%
Diversifying Strategies	15%	±3%	12%– 18%	17.1%
<b>Total</b>	<b>100.0%</b>			<b>100.0%</b>

Thompson observes that the allocation to international developed equity (11.50%) now exceeds the upper end of its corridor ( $9.00\% + 2.00\% = 11.00\%$ ) by 0.50%, while the

allocation to fixed income (6.50%) is below target (9.00%) but still within its rebalancing corridor (6.00%–12.00%).

Current allocations to private equity (19.20%) and real assets (13.80%) are close to the lower ends of their rebalancing corridors of 18.00%–28.00% and 13.00%–19.00%, respectively, as the team works to move toward the new targets approved by the Board in [Exhibit 9](#) (in the very short term, these allocations cannot be increased).

Based on the information in [Exhibit 15](#), Thompson sees a need to decrease the international developed equity allocation and increase the fixed-income allocation by the same amount. She meets with the team to discuss whether they should execute the rebalancing through the cash or derivatives market.

During the discussion, Thompson and her team consider the following factors: transaction costs, tracking error of the implementation vehicle versus the desired index exposure, tracking error implied by the current and post-rebalancing deviations from the target SAA weights, opportunity cost/impact to active strategies due to manager withdrawals and reallocations, implementation speed, and time horizon of the rebalancing trade.

Thompson knows that executing through the cash markets takes longer to implement than executing in the derivatives markets. Still, allocating to, or reallocating from, external managers may be warranted in certain cases, such as when the adjustments are viewed as more permanent and/or more significant in nature (as compared to smaller, more temporary adjustments that may be reversed within a shorter time frame if investment views change).

After meeting with her team, Thompson decides to rebalance back to the upper edge of the corridor (11.00%) by reallocating 0.50% (50 bps) from international developed equities to fixed income. The team's cost analysis is shown in [Exhibit 16](#).

#### **Exhibit 16. Cost Information: 50 bps Rebalancing Option**

<b>Cost Component</b>	<b>Cash Market</b>	<b>Futures (Equity/Fixed Income)</b>
Bid/offer spread	5.00	3.00
Price impact (total trades)	5.00	4.00
Mispricing (tracking error, quarterly)	0.00	17.00
Cash drag (impact of timing delays and disruptions to active manager portfolios)	20.00	0.00
Cost of rolling the futures contract	0.00	0.00

*Notes:* This exhibit shows the costs of reallocating 0.5% from international developed equities to fixed income in the cash and futures markets. The analysis assumes a 3-month (one quarter) investment horizon because the expectation is that the change in portfolio allocation is for a relatively short time period. Given the length of the investment horizon, no rolling of futures occurs. All numbers are in basis points (bps) unless otherwise indicated.

## IN-TEXT QUESTIONS:

1. Using [Exhibit 16](#), analyze the relative costs of the cash market and derivatives approaches to rebalancing.
2. Explain how considerations of implementation speed and time horizon of the rebalancing trade could affect the implementation choice.

## Guideline Answers:

1. Looking at the data in [Exhibit 16](#), Thompson can see that the two options appear similar from a cost perspective. The main cost driver associated with rebalancing through the cash market is cash drag (approximately 20 bps) caused by timing delays and disruptions to active manager portfolios. Rebalancing through cash markets would involve withdrawing funds from international developed equity active managers and increasing funds to current fixed-income managers and/or adding a new fixed-income manager. These activities would generate transaction costs and cash drag because the liquidation process for the equity manager(s) and the investment process for the fixed-income manager(s) would likely not happen simultaneously.

In the case of derivatives (short equity futures position and long fixed-income futures position), the biggest cost component is mispricing or tracking error. Creating a short exposure position for the MSCI EAFE Index (the benchmark for international ex USA and Canada developed-market equities) and a long fixed-income futures position would involve a higher tracking error (17 bps) compared to the tracking error of using one S&P 500 futures contract discussed previously (8 bps). In this case, using multiple futures instruments increases associated tracking error.

2. An additional factor is speed of implementation. In general, depending on the availability of derivatives for the asset classes involved, rebalancing using derivatives is likely to result in a shorter implementation time frame while leaving

the active managers in place. Given high levels of liquidity that would be used for MSCI EAFE Index replication, implementing derivatives could occur quickly.

Another important aspect is rebalancing size and expected trade. The larger the rebalancing, the more likely the rebalancing is a more permanent re-alignment, as opposed to a temporary reversal the next quarter.

Based on the expected costs and considerations and the rebalancing adjustment, using derivatives to rebalance the portfolio appears to be a good option. Implementing with derivatives gives the team the ability to adjust exposure to international developed equities if desired and quickly reverse decisions in full or in part while leaving the active managers in place.

After further discussion with her team, Thompson decides to instill international developed equity allocation back to the target allocation from the international developed equity allocation into fixed income. The analysis is shown in [Exhibit 17](#).

### Exhibit 17. Cost Information on Rebalancing Options

Cost Component	Cash and Market
Bid/offer spread	5.00
Price impact (total trades)	5.00
Mispricing (tracking error, annual)	0.00
Cash drag (impact of timing delays and disruptions to active manager portfolios)	50.00
Cost of rolling the futures contract	0.00
<b>Total cost</b>	<b>60.00</b>

*Notes:* This exhibit shows the costs of reallocating 2.5% from international developed equity into the cash and futures markets. The analysis assumes a one-year investment horizon and that the change in portfolio allocation is more permanent. Under normal market conditions, it is expected for these asset classes to move outside of the corridor again over that time period.

















































# Reading 29

## Case Study in Risk Management: Private Wealth

by Giuseppe Ballocchi, PhD, CFA

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** identify and analyze a family's risk exposures during the early career stage;
- b.** recommend and justify methods to manage a family's risk exposures during the early career stage;
- c.** identify and analyze a family's risk exposures during the career development stage;
- d.** recommend and justify methods to manage a family's risk exposures during the career development stage;
- e.** identify and analyze a family's risk exposures during the peak accumulation stage;
- f.** recommend and justify methods to manage a family's risk exposures during the peak accumulation stage;
- g.** identify and analyze a family's risk exposures during the early retirement stage;
- h.** recommend and justify a plan to manage risks to an individual's retirement lifestyle goals.

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## 1. INTRODUCTION AND CASE BACKGROUND

Giving advice on risk management to individuals and families raises a number of challenges. These challenges include the extent to which identified and evaluated risks can be reduced and/or addressed using insurance policies or self-insurance. Families' financial circumstances and risks evolve over time, and financial advisers should review and update the solutions addressing these risks accordingly. Risk management solutions recommended by advisers should consider the family's overall health, wealth, and long-term goals.

This case study explores some of the risk management issues for a married couple living in a hypothetical country in the Eurozone. The case spans several decades and follows the couple through different stages of life from their early career phase, when they are in their late twenties, all the way to retirement. We will show how risk management methods need to change as the family's circumstances evolve. Particularly important prior readings related to this case are the Level III readings "Risk Management for Individuals" and "Overview of Private Wealth Management."

The assumptions used are drawn from what is typical for many countries in Europe. The circumstances and risks that this married couple face are influenced by the environment in which they find themselves. Despite the differences between Europe and other parts of the world, however, their goals, the risks they face, and the assessment of their circumstances, as well as the suggested methods, are by no means unique to the region. The risk analysis methodology and its application would therefore be valid in a much broader context.

For simplicity, we assume that economic conditions and tax rates remain unchanged throughout the four decades that this case study spans. The terms "adviser" and "wealth manager" are used interchangeably throughout this case study. The amounts that appear in exhibits throughout the case study are rounded.

The case is divided into six major sections. Section 1.1 provides background information about the hypothetical country in which the Schmitt family resides. Sections 1–4 provide initial case facts relating to the family's early career stage and risk management analysis, as well as solutions relevant to that stage. In Sections 5 and 6, we revisit the couple in their career development stage when they are 45 years old. In Sections 7–10, we examine their lives at age 55, in peak accumulation phase, and age 64, when they are preparing to retire. The final section provides a summary of the case.

## **1.1. Background of Eurolandia**

This section provides background information about the social security system, healthcare, education and tax rates in the hypothetical country of Eurolandia. The case study assumes that the local social security system and regulatory conditions remain unchanged throughout the period under consideration. Economic conditions are assumed to be stable, with low but

stable growth, inflation at 1%, and the risk-free rate (the yield-to-maturity of 30-year government bonds) at 3%. Unless stated otherwise, the amounts of the state pension and social security benefits are expected to increase by 1% annually in real terms.

### **1.1.1. Government Pension Plan**

All Eurolandia residents who are employed are enrolled in the mandatory government pension plan. The plan is expected to provide retirement income for participants who have been enrolled for most of their working lives (35 years at a minimum in most cases) to cover at least basic living expenses upon retirement. This pay-as-you-go scheme fulfills that role at present, but its long-term viability is not necessarily guaranteed. Those who have paid the contributions for most of their working lives can expect to receive about a €13,500 annual pension from the government system. Those who have worked for the government (civil servants) enjoy a higher level of benefits and can expect to receive the higher of €20,000 per year, or 55% of their final salary. The foregoing amounts are what is currently paid to retirees. Unlike the arrangements in many other European countries, in Eurolandia the entitlement to civil servants' pension ends when the retiree dies, and surviving family members are not entitled to further payments. The foregoing amounts are expected to increase by 2% per year in nominal terms, more than offsetting the 1% inflation rate. Eurolandia's mean annual salary is €35,000.

### **1.1.2. Health System**

Basic health insurance is compulsory for Eurolandia residents, and contributions to the scheme are normally deducted from salary along with the government pension plan contributions. The health insurance offers comprehensive coverage of the vast majority of health care expenses and is considered adequate. It requires those seeking treatment to make small co-payments for a particular service. Supplemental health insurance is available through private companies. It covers optional treatments and offers shorter waiting times as well as access to a selection of privately run facilities that provide a high degree of comfort and that are not covered by the basic health insurance. The government provides basic long-term care.

### **1.1.3. Unemployment Insurance**

Unemployment insurance is compulsory in Eurolandia, and premiums are paid in the form of social security contributions. Unemployment benefits are capped at a low amount, however, far below what a successful professional would earn. Although the modest benefits (€800 per month) run for a limited amount of time, those in long-term unemployment still receive a form of means-tested income support and a range of means-tested benefits, such as housing

benefit. Means testing involves assessment of the person’s financial resources to determine the need for state benefit support. Those dependent on the social security system would qualify for up to €12,000 per adult per year.

**1.1.4. Disability Insurance**

As with unemployment insurance, the compulsory social security contributions provide basic disability insurance. This insurance provides benefits in the form of regular income if one is unable to work because of serious illness or disability. As with unemployment insurance, the level of benefits, however, is capped at what is considered to be a low amount of €1,500 per month (€18,000 per year), far below what a successful professional would earn. Government employees, including those working for state schools, qualify for a higher level of coverage after 10 years of service, providing benefits in the form of income replacement of €1,800 per month (€21,600 per year).

**1.1.5. Education**

Education for children aged six and older is provided and funded by the government. University education up to the first degree level is also funded by the government and is almost free to residents of the European Economic Area (EEA), a free trade zone that, among others, includes European Union countries. Government funding extends to master’s-level degrees that are also made accessible through a public subsidy. Government-funded schools and universities enjoy very good reputations.

**1.1.6. Social Security Contributions and Tax Rates**

To be entitled to the aforementioned social security benefits, employees pay 9% social security contributions on the portion of gross salaries that exceed €15,000 per year. The contributions are deductible from taxable income at source and are capped to a maximum of €10,000 per family per year. The marginal income tax rates for individuals are listed in [Exhibit 1](#). Unemployment and disability benefits are not subject to income tax.

**Exhibit 1. Marginal Tax Rates**

Yearly Taxable Income (€)	Marginal Tax Rate
0 to 15,000	0%
15,000 to 50,000	30%

Above 50,000

40%

*Note: The €15,000 and €50,000 thresholds and the €10,000 cap are annually adjusted for inflation. Mortgage interest is not tax deductible.*

The government encourages residents to save for retirement. There are tax incentives for voluntary contributions to government-regulated defined contribution (DC) occupational (employer-sponsored) and private pension savings plans. The government adds 25% to the amount of a member's contribution, meaning that for every €100 a member contributes to the scheme, the amount added becomes €125 thanks to €25 that comes from the government. Members of such schemes can, within certain limits, decide on the asset allocation. There is no tax on investment returns within regulated pension savings plans. Normal retirement age for both men and women is 65 and is expected to remain unchanged. Tax-free lump sum withdrawals from private pension savings plans, amounting to a maximum 25% of the fund, are allowed from age 55. Realized net capital gains on investments held outside regulated pension schemes (including rental property investments) are subject to capital gains taxes of 30% on amounts of gains exceeding €25,000 per person per year. No distinction is made between short-term and long-term holding periods, and the €25,000 level is expected to remain unchanged in the future.

## 1.2. The Schmitt Family in Their Early Career Stage

The following section provides initial facts as they apply to the Schmitt family. The subsequent sections then explain the risks the Schmitts face as well as the methods for addressing those risks.

### 1.2.1. Initial Case Facts

Paul and Jessica Schmitt, both 28 years old, recently got married. They are in their early career phase. Both graduated three years ago with master's degrees in, respectively, mathematics and computer science. Upon graduation, Paul found the teaching job to which he aspired, and he has been teaching mathematics at a local school ever since, earning a gross yearly salary of €45,600. After social security and tax deductions, his take-home pay is €33,670. Jessica, a born entrepreneur, joined an IT startup after graduating. Her gross yearly salary is now €24,000, which translates into €20,490 after taxes and social security contributions. Her salary has potential for a significant increase from the current relatively low level. She is also entitled to receive a discretionary bonus if her company becomes profitable. A bonus would potentially constitute a significant portion of her compensation.

She could earn a far better fixed salary elsewhere, but she prefers the upside potential that her current position could offer, and she really believes that her company will succeed.

Paul and Jessica have combined savings of €15,000. They have no other financial assets, except for their participation in the government pension plan, to which they have been contributing since they started working three years ago. Their only other notable asset is their old car. The Schmitts have no debt, because their living expenses while they were students were covered by their parents and by government funding. Tuition costs at the state university they attended were negligible. Their monthly expenses are €2,900, including rent of €1,000. [Exhibit 2](#) summarizes the Schmitts' circumstances.

### Exhibit 2. Summary of the Schmitts' Circumstances

	Jessica	Paul	Combined
Annual gross income (€)	24,000	45,600	69,600
Annual net income (€)	20,490	33,670	54,160
Source of income	Information technology start up	Teaching job at state school	
Annual Living expenses (€)			34,800
Financial assets (€)			15,000
Debt (€)			0
Car (€)			7,000

The Schmitts would like to ensure long-term financial security for the family that they are hoping to start soon. They would also like to buy a house in an area that is very popular with young couples and has seen substantial appreciation of property values. The Schmitts would welcome competent and unbiased financial advice, but they are unsure where to get it. They mention their wish to a relative, Mr. Muller, CFA. He is a retired financial advisor and is happy to help them.



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## 2. IDENTIFICATION AND ANALYSIS OF RISK EXPOSURES: EARLY CAREER STAGE

### a. identify and analyze a family's risk exposures during the early career stage

Muller follows the four key steps in the risk management process for individuals:

1. Specify the objective.
2. Identify risks.
3. Evaluate risks and select appropriate methods to manage the risks.
4. Monitor outcomes and risk exposures and make appropriate adjustments in methods.

### 2.1. Specify the Schmitts' financial objectives

Muller discusses the couple's financial objectives with Paul and Jessica. They describe those objectives as a house purchase in the very near future and hopefully starting a family. They wish to ensure long-term financial security and, looking ahead, a comfortable retirement. Muller acknowledges that most couples of their age usually do not pay much attention to the distant future. Although the Schmitts have almost their entire working career ahead of them, he confirms to them that it is essential to start planning for this long-term objective as early as possible. Moreover, there are likely to be tax advantages to be reaped by optimizing retirement savings, although there may be limited financial resources available to devote to that objective in the Schmitts' current stage of life—the early career stage.

Muller questions the couple about their current circumstances, including employment, and inquires further about the proposed house purchase. The Schmitts are keen to purchase a condominium they like very much at a cost of €270,000. If fully funded by a 25-year repayment mortgage at an initial interest rate of 3.6% per year fixed for 5 years, the monthly mortgage cost would come to approximately €1,360, compared with the €1,000 monthly rent that they are currently paying.

### 2.2. Identification of risk exposures

To better understand the young couple's financial health and to identify and analyze risks the

Schmitts face, Muller lists the couple's assets, liabilities, and financial objectives and assesses the characteristics of human capital as components of the Schmitts' total wealth. He observes that they are richly endowed with human capital:

- They are highly trained in fields that are, and are expected to remain, in high demand.
- They are young, in the career development phase, with many working years ahead of them.
- They have been employed for nearly three years, accruing valuable working experience.
- As citizens of an EU country, they are geographically mobile and legally entitled to work in other countries in the region.

Muller describes Paul's human capital, if he continues in his chosen career as a teacher, as very much bond-like. He has the status of a civil servant, a term used to describe someone who works in the state sector. His income is expected to increase with seniority, but has very modest upside potential. Paul benefits from excellent job security, limiting earnings risk from unemployment. Although Paul is entitled to work in many countries, the portability of his human capital as a teacher is limited because the required qualifications to obtain a teaching position vary significantly from country to country. Moreover, the privileges and accrued seniority related to his civil servant status are not easily transferable when moving to another country.

Jessica's human capital, if she remains in the same or a similar role, is very much equity-like. She faces significant uncertainties in her future cash flows from employment, but she can also benefit from substantial rewards if she meets her job objectives and her company does well. Muller and Jessica agree that she faces significant earnings risk, much more so than her husband. This is because she works for a startup that offers no coverage for loss of income resulting from disability or premature death. Only the coverage provided by the country's social insurance system would be available. Unemployment is also much more of a concern for her because, unlike her husband, she does not enjoy the job security of a civil servant. There can also be ambiguity in what triggers her bonus payments and her participation in the company profits. If she becomes a shareholder, following the award of stock options, the resulting asset will have some of the characteristics of a business asset. Jessica's human capital, driven by her globally applicable IT skill set, is portable across countries.

Muller notes that from a financial point of view, the Schmitts' marriage results in human capital diversification, with Paul's human capital being bond-like and Jessica's human capital being equity-like, subject to far more risk and upside than that of her husband.

**Exhibits 3 and 4** show the assumptions and the economic balance sheet as summarized by Muller. He repeatedly stresses that any calculations are subject to substantial uncertainty, especially in the early career stage, but such exercise provides a good starting point for the

risk analysis that needs to be performed. The asset side at this stage features the rather limited liquid financial assets, the vested state pension benefits (the mortality-weighted net present value [NPV] of the accrued benefit amount), and human capital. Human capital, reflecting the present value (PV) at a wage-risk adjusted discount rate, of the expected stream of income from employment, is calculated using the formula

**Equation (1)**

$$HC_0 = \sum_{t=1}^{t=N} \frac{p(s_t)w_{t-1}(1 + g_t)}{(1 + r_f + y)^t}$$

where

$HC_0$  = human capital

$p(s_t)$  = the probability of surviving to a given year (or age)

$w_t$  = the income from employment in period  $t$

$g_t$  = the annual wage growth rate

$r_f$  = the nominal risk-free rate

$y$  = the risk adjustment based on occupational income volatility

$N$  = the length of working life in years

The human capital values, shown in [Exhibit 4](#), are calculated using the formula in Equation 1 and are based on the assumptions in [Exhibit 3](#).

**Exhibit 3. Assumptions for the Calculation of Human Capital at Age 28**

	Jessica	Paul
Starting salary (net)	€20,490	€33,666
Assumed nominal salary growth rate	6%	3%
Discount rate (nominal risk-free)	3%	3%
Risk adjustment based on occupational income volatility	3%	0%
Remaining length of working life assuming retirement at age 65	37	37

*Note:* The probability of surviving to a given age is based on mortality tables (not shown here) used in Eurolandia.

The liability side shows financial objectives that can be modeled as liabilities. The €1.87 million present value of lifetime consumption needs is based on an assumed initial €2,900 monthly expenditure (€34,800 per year). Because the Schmitts do not know when they are likely to have children and when they will be incurring higher expenditures, Muller assumes that their expenses will rise by 6% (5% above inflation and assuming they will have a growing family) in each of the next 10 years and increase in line with 1% inflation from then on. Assuming life expectancy of 90 years, the PV of lifetime consumption calculation would cover 62 years in total.

#### Exhibit 4. The Schmitts' Economic Balance Sheet at the Age of 28

Assets (€)		Liabilities (€)	
Savings account	15,000	Debt	0
Accrued entitlement to state retirement benefits (Paul)	21,000		
Accrued DB government retirement plan (Jessica)	11,800		
Paul's human capital	1,174,800	PV of lifetime consumption	1,868,000
Jessica's human capital	694,700		
<b>Total assets</b>	<b>1,917,300</b>	<b>Total liabilities</b>	<b>1,868,000</b>
		<b>Net wealth</b>	<b>49,300</b>

*Note:* Figures are rounded. Because we take a holistic view of assets and liabilities, we include the participation in the country's compulsory retirement program as an asset. The Schmitts' ownership of an old car is disregarded for the purposes of the economic balance sheet.

Miller notes at the outset that both Paul and Jessica are in the early career stage, and they are rich in human capital but have very limited financial assets. They face the financial challenges of starting a family, with the possible purchase of a property. Given their very modest level of financial assets and the fact that their liabilities are very limited, the risk

analysis at this stage of life focuses on human capital. The estimation of its present value depends on a range of assumptions and is subject to uncertainty. But liabilities need to be met, especially if the couple has children. For this reason, a careful analysis of any gaps in the current insurance coverage must be conducted. Such analysis will lead to recommendations for risk management in order to preserve and optimize human capital, the most valuable asset that the Schmitts own, and also to meet lifestyle goals. Following systematic examination of their circumstances, Muller identifies the following risks that the Schmitts face and that he will need to evaluate:

- earnings risk resulting from loss of employment
- earnings risk resulting from health and disability
- premature death risk leading to costs imposed on the surviving partner
- car accident and repair costs
- liability risk (e.g., the risk of bodily injury or property damage caused when driving)

In addition to these risks, Muller wants to consider the effect of the proposed house purchase on the Schmitts' financial circumstances.

## **2.3. Analysis of identified risk**

Having identified the key risks facing the Schmitts, Mr. Muller, CFA, proceeds to evaluate those risks one by one, considering any existing coverage provided by the employer or the government social security system.

### **2.3.1. *Earnings risk***

Earnings risk resulting from loss of employment is particularly relevant for Jessica because of the nature of her employer's business. The likelihood of loss of employment is difficult to estimate but is higher than the probability of Paul's loss of employment. Because of her limited number of years of service, the amount of any statutory redundancy payments (required by law and related to the number of years of service) due from the employer would be limited. Because they have both been paying social security contributions, they would at least initially be entitled to €800 per month of unemployment benefit, representing just under half of Jessica's net salary and just under a third of Paul's monthly net pay.

Earnings risk resulting from health or disability is highly relevant despite the fact that both Paul and Jessica are young and in good health. If Jessica or Paul were unable to work

because of illness or disability, both events more likely than premature death, the benefits from the state social security system would amount to approximately €1,500 per month, replacing most of Jessica's initial €1,708 monthly after-tax income but only just over half of Paul's monthly after-tax income of €2,806. In Jessica's case, one needs to consider that her salary is expected to show healthy growth, as reflected in her human capital estimates, and social security benefits are, over time, set to replace decreasing proportion of her income from employment. Jessica's employment package does not include any disability coverage, while Paul's enhanced coverage resulting from his government employee status would apply only after another seven years of employment.

### ***2.3.2. Premature death risk***

In the case of an unlikely scenario of premature death, the risk to the remaining spouse is at this stage of life twofold. First, one-off costs such as the funeral would have to be paid and an emergency fund would have to be established, because the surviving spouse would have no partner to help deal with emergencies. Second, his or her lifestyle would be affected by the fact that the monthly household costs that they currently cover jointly, including rent, would become the remaining spouse's sole responsibility.

### ***2.3.3. Car accident and repair costs***

The Schmitts use an old car and have a compulsory third-party insurance policy in place, protecting them in case they need to pay other parties' repair costs or compensation. Given the basic nature of the policy, they are not protected from costs that would arise should they need to have their own car repaired or replaced, exposing them to risk. During their discussions with Muller, however, Paul and Jessica explain that they do not use their car very often.

### ***2.3.4. Liability risk***

Muller considers the bulk of liability risk arising from car accidents or from injuries sustained by those who visit one's property. The existing compulsory car policy is basic but does provide liability coverage. Because the Schmitts' property liability (as well as buildings and contents) is insured as part of their rental agreement, he does not consider any other liability risks significant given the local culture.

### ***2.3.5. House purchase***

In addition to the aforementioned risks that they already face, the proposed house purchase

would increase the couple's vulnerability to unexpected short-term expenditures. The Schmitts already have significant mismatch between financial assets and the sum of liabilities and financial objectives. Human capital is illiquid and represents future cash flows from earnings. The Schmitts' objective of purchasing a property requires a substantial amount of cash for the deposit (down payment), legal/notary's fees, additional transaction costs, and moving expenses. Significant sudden cash needs may arise if, for example, they need to replace their old car. To some extent, such cash needs, except for the house down payment, can be met through borrowing. The interest rates for consumer finance, however, are quite high and typically linked to a floating reference rate, thereby exposing the Schmitts to interest rate risk. Their ability to meet even small, short-term bills and cope with any unexpected expenditures would be limited if they decide to buy a property and use their limited savings to cover the transaction costs.

Muller explains that the house purchase decision itself should be weighed against continuing to rent. Paul and Jessica argue that their monthly spend on rent of €1,000 is not that different from the likely monthly mortgage payment of €1,360, so the house purchase should make little difference to their monthly budget that currently stands at €2,900. Muller points out, however, that the difference that does exist should not be disregarded and that property-related service charges and maintenance costs should be taken into consideration. At an annual 1% of property value (annual cost of €2,700 or €225 per month), the additional cost would dent the Schmitts' ability to build up any savings buffer.

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## 3. RISK MANAGEMENT RECOMMENDATIONS: EARLY CAREER STAGE

### **b. recommend and justify methods to manage a family's risk exposures during the early career stage**

Having assessed the risks that the Schmitts face, Muller provides the following recommendations to the young couple:

### **3.1. Recommendations for managing risks**

#### **3.1.1. *Earnings risk***

Earnings risk arising from loss of employment cannot be easily insured. Muller's recommendation is for the Schmitts to build up a savings "buffer" amounting to at least six months' worth of normal expenditures (buffer of €17,400 based on €2,900 monthly spend). That way they could effectively self-insure over time to be able to cope with circumstances during which they would rely on the unemployment benefits provided by the social security system.

Earnings risk resulting from serious illness or disability, exposing the couple to a shortfall in income if they were to rely on state benefits if one was to fall seriously ill or become disabled, can be addressed by taking out disability insurance. Consequently, Muller recommends that each of them take out a disability insurance policy that would replace their current income over and above the disability benefits insurance that the state provides, to maintain their living standards. As their salaries are expected to increase, in Jessica's case substantially from a low starting level, he recommends they go for a policy that guarantees the option to purchase additional coverage without underwriting. The amount of disability income coverage required to replace earnings and supplement the state social security disability benefit is calculated in [Exhibit 5](#). The difference between the amount of recommended coverage for each person reflects the fact that Paul's salary is notably higher than what the disability benefits from the social security system would replace. Muller recommends they buy policies that would provide benefit of €80,000 and €490,000 for Jessica and Paul, respectively. Muller states that the cost of such policy should be in line with fair value and emphasizes the need to carefully compare costs among different providers (*note: the analysis of the cost is beyond the scope of this case study*). He further adds that the policy purchase decision potentially has long term implications, hence the need for in-depth analysis.

#### Exhibit 5. Disability Insurance Coverage Calculation

	Jessica	Paul
Annual salary income (net) to be replaced	€20,490	€33,670
Amount of annual disability coverage provided by the social security system	€18,000	€18,000
Shortfall	€2,490	€15,670
Benefit period (until retirement age)	37 years	37 years
Assumed annual benefit adjustment (nominal)	2%	2%
Discount rate	3%	3%
PV of future earnings replacement required (calculated as PV of annuity due)	€77,700	€489,000



Note: Disability insurance benefits can take the form of a lump sum or a stream of payments over time.

Using calculator keystrokes for an annuity due with level payment, the growth of payments can be incorporated by adjusting the discount rate to account for the growth rate. The adjusted rate can be calculated as follows, as long as the discount rate is larger than the growth rate:  $(1 + \text{Discount rate}) / (1 + \text{Growth rate}) - 1$ , or  $(1.03/1.02) - 1 = 0.98\%$ . Set the calculator for beginning-of-period payments;  $n = 37$ , payment = €2,490, and  $i = 0.98\%$ . Then calculate PV.

### 3.1.2. Premature death risk

Although the couple has no children or mortgage to pay at present, the financial difficulties faced by the surviving spouse in the event of one person's death should be covered using a life insurance policy. Exhibit 6 illustrates how one could establish the level of life insurance coverage required.

#### Exhibit 6. Calculating the Amount of Life Insurance Coverage

Muller explains that the amount of coverage that the life insurance policy should provide can be calculated using two methods. One is based on the value of human capital (the *human life value* method), which estimates the amount of future earnings that must be replaced. The other is the *needs analysis* method, based on estimating the amount needed to cover survivor's living expenses. He adds that both methods rely on a number of assumptions that may turn out to be inaccurate.

Muller suggests focusing on the needs analysis method at this stage of the Schmitts' careers. He explains that in the absence of debts to be repaid and absence of children whose upbringing would need to be funded, the calculation is relatively simple and involves estimating only two main items:

- Cash needs required upon death of the insured person, including funeral and burial costs, any taxes or debt to be repaid, and establishment of an emergency fund. They agree on a figure of €30,000.
- The surviving spouse's ability to cope with ongoing costs. They currently spend €34,800 per year, of which about half is spent jointly on rent and general expenditures that will remain broadly unchanged in the future. They estimate that the surviving spouse would require at least €25,000 annually for ongoing costs and that those costs would, under such circumstances, grow at 2% in nominal terms. The present value of such annual flow for the rest of the person's life is then compared with the present value of the survivor's

earnings.

	<b>Paul's Life Cover (from Jessica's perspective)</b>	<b>Jessica's Life Cover (from Paul's p erspective)</b>
<b>Cash needs</b>		
Funeral and burial costs plus taxes	15,000	15,000
Emergency fund	15,000	15,000
Debts to be repaid	0	0
<b>Total cash needs</b>	<b>30,000</b>	<b>30,000</b>
<b>Capital needs</b>		
PV of surviving spouse's €25,000 annual living expenses (growing at 2% until death at age 90, discounted at 3%, annuity due)	1,169,000	1,169,000
Less PV of survivor's income until retirement at 65 (annuity due, assuming 3% growth and 3% discount rate for Paul and 6% growth and 3% discount rate plus 3% risk adjustment for Jessica)	758,000	1,246,000
<b>Total capital needs</b>	<b>411,000</b>	<b>-77,000</b>
<b>Total financial needs</b>	<b>441,000</b>	<b>-47,000</b>
Capital available:		
Cash, savings, investments	15,000	15,000
PV of vested retirement accounts (attributable to surviving spouse)	11,800	21,000
Existing life insurance coverage	0	0
<b>Total capital available</b>	<b>27,000</b>	<b>36,000</b>
Additional life insurance needs	414,000	-83,000

*Note:* Rounding used throughout.

Having analyzed the needs from the surviving partner’s point of view, Muller recommends that the couple purchase a life insurance policy on Paul’s life. He points out that although life and disability insurance is relevant already, if the Schmitts have children, the level of coverage would need to be reviewed and potentially increased significantly. For now, Paul and Jessica decide on a policy covering Paul’s life, providing benefit coverage of €400,000.

**3.1.3. Car accident and repair costs**

The existing car insurance coverage protects other parties but not the Schmitts. Having considered the cost of taking out more comprehensive coverage and taking into account their sparse use of the car, Muller advises the Schmitts not to spend resources on better coverage but self-insure instead with an adequate savings buffer.

**3.1.4. Risks to lifestyle arising from the proposed house purchase**

Muller advises the couple against the house purchase at this time. Despite recognizing numerous long-term benefits of home ownership, he argues that delaying the house purchase would lower their risk exposures. Muller also points out that a house cannot be considered fully as an investment asset but rather as a “mixed” asset, with elements of a personal asset (consumer item) as well as an investment asset. In addition, he sees risk to mortgage costs from increasing interest rates (once any fixed-rate period comes to an end). Instead of the house purchase, he suggests the Schmitts draw up a savings plan to build their savings and financial assets, because they risk being left virtually without financial assets if they were to purchase their home in the near future. The Schmitts’ total yearly after-tax income of slightly more than €54,000 means that they do have the ability to save, as a simple cash budget in [Exhibit 7](#) shows. The costs of paying the recommended insurance premiums (including the existing car insurance) that Muller estimates could roughly be in the region of €2,500 per year would easily be accommodated by the family budget.

**Exhibit 7. Summary Annual Budget of the Schmitt Family at Age 28**

Combined yearly gross pay	69,600
Less taxes and Social Security contributions	(15,440)
Net pay	54,160
Living costs (including rent)	(34,800)
Net cash available	19,360

Muller suggests that a comfortable savings buffer, amounting to at least six months of living expenses (i.e., €17,400), should be set aside and be available on demand (e.g., in an easy-access bank account or equivalent). An investment plan should be drawn up once savings in excess of the buffer become available. He recommends that the Schmitts draw up a contingency plan for the critical first year after the home purchase if indeed they go ahead with their intention to buy, in case a sudden liquidity need arises. After the first year, accumulated savings should provide such liquidity buffer. The contingency plan should identify the cheapest way of borrowing, most probably against the house equity.

### **3.1.5. Other risks**

Property insurance will be required if the Schmitts do decide to purchase a home. It is required as a condition for obtaining the mortgage, although Muller suggests that the amount of coverage equals the purchase cost of the property, not just the amount of mortgage debt. This consideration is particularly relevant as the Schmitts would be required to invest almost all of their liquid assets in their new home if the purchase goes ahead.

After a review of the basic health insurance coverage provided by mandatory social security contributions, Muller recommends not to enter into any additional private medical insurance at this time.

## **3.2. Monitoring outcomes and risk exposures**

Muller adds that no risk management strategy is complete without regular monitoring and reviewing of outcomes and risk exposures. He explains that adjustments to the risk management solutions must be made as circumstances change.

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# **4. RISK MANAGEMENT CONSIDERATIONS ASSOCIATED WITH HOME PURCHASE**

- b. recommend and justify methods to manage a family's risk exposures during the**

## early career stage

Contrary to Muller's recommendation, the Schmitts purchase their home in a sought-after area close to Jessica's workplace. The total purchase costs amount to €285,000, including all transaction costs, financed as follows:

1. Personal loan from Jessica's parents amounting to €80,000. The loan is not secured against the property. A secured loan would make obtaining a mortgage from the bank much more challenging, because the bank would not be the sole holder of a lien on the house if Jessica's parents held a secured loan.
2. Personal funds in the amount of €5,000. They reserve the rest of their assets to pay for moving expenses and furniture and to have a minimal liquidity buffer.
3. A 25-year mortgage of €200,000 at 3.6% fixed for five years, resulting in monthly payments of €1,012 consisting of both interest and capital repayment.

A condition of the mortgage is that the property is insured to at least the amount of the mortgage outstanding. The Schmitts take out property insurance with a coverage of €200,000, matching the mortgage amount, but less than what was suggested by Muller.

## 4.1. Review of risk Management Arrangements Following the House Purchase

Following the decision to purchase the newly built property, the Schmitts ask Muller to review and update the family's risk management arrangements. They discuss how the risks have changed and how risk management solutions should be modified.

Some risks identified earlier have changed, and new ones have appeared. Earnings risk from unemployment, disability or premature death has not changed, but the level of life coverage needs to be reevaluated because the couple now faces a liability in the form of a mortgage that would, in line with local customs, be expected to be repaid in full if Jessica or Paul died. The same would apply to the loan from Jessica's parents.

### EXAMPLE 1

## Calculation of Life Insurance Required

Using the needs analysis method ([Exhibit 6](#)), recalculate the amount of life insurance coverage the Schmitts require.

Assume that the surviving spouse continues to live in the newly purchased house, and also assume the following:

- The emergency fund would need to be increased to €30,000 because of the near-zero liquid cash resources available following the house purchase.
- The mortgage (€200,000) and loan from Jessica's parents (€80,000) are to be fully repaid, in line with local customs in the country.
- The survivor's annual costs fall to only €19,000 because of the fact that mortgage repayment costs drop out and are only partly offset by maintenance and service charges. Assuming such costs are to be paid for the rest the survivor's life (a further 62 years), and assuming a discount rate of 3% and an annual living cost increase of 2%, the PV of such future costs is about €888,000.
- The PV of the survivor's income from after-tax salary is €758,000 for Jessica and €1,246,000 for Paul, as per [Exhibit 6](#).
- Capital available is now only €12,000 and €21,000, represented by the PV of vested retirement savings accounts for Jessica and Paul, respectively.

## Solution:

	Paul's Life Cover (from Jessica's perspective)	Jessica's Life Cover (from Paul's p erspective)
<b>Cash needs</b>		
Funeral and burial costs plus taxes	15,000	15,000
Mortgage retirement	200,000	200,000
Other debt (Jessica's parents' loan)	80,000	80,000
Emergency fund	30,000	30,000
<b>Total cash needs</b>	<b>325,000</b>	<b>325,000</b>
<b>Capital needs</b>		
PV of surviving spouse's living expenses (until death assumed at 90)	888,000	888,000
Less PV of survivor's income until retirement at 65	758,000	1,246,000

(annuity due, assuming 3% growth and 3% discount rate for Paul and 6% growth and 3% discount rate plus 3% risk adjustment for Jessica)

<b>Total capital needs</b>	<b>130,000</b>	<b>–358,000</b>
<b>Total financial needs</b>	<b>455,000</b>	<b>–33,000</b>
Capital available:		
Cash, savings, investments	0	0
PV of vested retirement accounts (attributable to surviving spouse)	12,000	21,000
<b>Total capital available (excluding existing insurance coverage)</b>	<b>12,000</b>	<b>21,000</b>
<b>Insurance coverage required</b>	<b>443,000</b>	<b>–54,000</b>

Given that the couple already has policy coverage of €400,000 (Paul's life), they should consider raising the amount of coverage of Paul's life.

The Schmitts' advisor explains that they also face property risk and related liability risk. Their existing coverage, arranged to satisfy the mortgage lender, covers the outstanding loan amount of €200,000. Muller recommends that they increase the homeowner's coverage to the full amount of what the property is worth, currently €280,000. The policy, if the cost is reasonable, should also cover the building contents and should provide coverage of legal liability arising from the property.

Muller also points out that the transaction has left the Schmitts with very limited resources. They should aim to build up a cash cushion in the form of instant-access savings. Because they have chosen to borrow at a fixed rate, the Schmitts do not face any near-term risk from rising interest rates.

## EXAMPLE 2

### Review and Reassessment of Methods

Identify possible upcoming events that should require a reassessment of the family's risk management methods.

**Guideline answer:**

Paul and Jessica are buying their first property, and they hope to start a family. The property purchase and the resulting changes to the risk management solutions have been completed. Preparing for the birth of a child would be the point at which a reassessment of risk management methods becomes highly desirable. This is mainly because a loss of earnings of either Paul or Jessica would seriously impair the Schmitts' ability to pay for the child's upbringing.

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## 5. IDENTIFICATION AND ANALYSIS OF RISK EXPOSURES: CAREER DEVELOPMENT STAGE

### c. identify and analyze a family's risk exposures during the career development stage

The Schmitts decide to approach Ms. Stein, CFA, a private wealth management practitioner and a partner in the same firm as Mr. Muller, CFA, who has since passed away. To identify and analyze the Schmitts' risk exposures Stein makes a full inquiry into their financial circumstances. She subsequently discusses their goals and proceeds to identify risks.

### 5.1. Case Facts: The Schmitts Are 45

In the last 17 years, the Schmitts have made significant progress in their careers and remain in good health. Their incomes and assets have increased, particularly Jessica's salary, which has risen substantially. They have been able to repay most of their mortgage and build up a portfolio of shares of 10 local IT companies whose business they believe they know. The couple is also considering making a speculative investment into residential property (similar in size to their existing property) located in the area where the IT industry is based and where Jessica works. They have repaid the loan from Jessica's parents. They continue to put money aside into an instant-access savings account, building up almost an €80,000 liquidity "buffer." Jessica's employer now offers a defined contribution (DC) company pension scheme into which Jessica and her employer make combined annual contributions of €3,000 (includes the top-up from government). Paul, having spent a number of years working as a teacher in the state education sector, is now entitled to life insurance coverage at three times his salary as part of his employment package. Because he has spent more than 10 years in the teaching role, he is now also entitled to a higher €2,520 monthly benefit in case of disability. This amount is the original €1,800 per month to which tenured state employees were entitled



when Paul was 28, subsequently raised annually.

The Schmitts now have two children, Roxane and Peter, who are 12 and 7 years old, respectively. Peter suffers from mental development problems for which there does not appear to be a solution. He needs extra support at school. The Schmitts' living expenses have increased substantially and stand at €65,000 per year. Although Paul and Jessica increased the amount of life insurance coverage after Roxane's birth, they have not updated their insurance arrangements for many years. [Exhibit 8](#) provides a summary of the Schmitts' financial circumstances.

### Exhibit 8. Summary of the Schmitts' Financial Circumstances at Age 45

	Jessica	Paul	Combined
Yearly gross income (€)	80,000	66,000	<b>146,000</b>
Yearly after-tax income (€)	53,650	46,510	<b>100,160</b>
Source of income	Department head, IT	Teacher at state school	
Living expenses (€)			<b>65,000</b>
Pension provisions	Government pension scheme membership as mandated by law Plus Employer's DC scheme (annual contribution of €3,000 from Jessica and employer)	Government pension scheme as mandated by law. As a civil servant, enjoys better pension conditions No separate private pension fund	
Employer-provided insurance		Life, insurance lump sum coverage $3 \times €66,000 = €198,000$ .	
Private life	€200,000 life policy she took out after the birth of	Life policy of €440,000	

insurance	their first child.	
Disability insurance	Government insurance coverage of €25,200 per year. Private coverage of a lump sum of €112,200 (the original €80,000 policy taken out at age 28, reflecting 2% annual benefit adjustment)	Government insurance coverage of €30,245 per year (includes extra payment reflecting more than 10 years of service) Private coverage of a lump sum of €686,100 (the original €490,000 policy taken out at age 28, reflecting 2% annual benefit adjustment)

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## 5.2. Financial Objectives in the Career Development Stage

Stein first discusses financial objectives with the 45-year-old Schmitts. They wish to achieve the following goals:

- maximize household welfare and reduce the impact of any unexpected events, such as illness, disability, or premature death;
- plan for future costs of support for Peter; and
- have a comfortable retirement.

To help understand the family's circumstances and identify risks, Stein conducts a valuation of Jessica's and Paul's human capital. The exercise is easier now than was the case in the early career stage. The input parameters are less uncertain, because their salary levels now are more stable and predictable than in the early career stage, and the calculation of present values of expected future earnings is conducted over a shorter time horizon. [Exhibit 9](#) shows the assumptions used, including the reduction in risk adjustment on Jessica's salary. It also shows the resulting economic balance sheet. Although the valuation of human capital varies considerably under different assumptions, the result is that the value of the couple's human capital is substantial, amounting to a combined €1.9 million. Stein notes the financial objectives and notices their dependency on the couple's growing earnings.

## Human Capital Assumptions

	Jessica	Paul
Expected salary growth (nominal)	5%	2%
Discount rate ( $r_f$ )	3%	3%
Risk adjustment ( $\gamma$ )	1%	0%
Length of working life (up to age 65)	20	20
Probability of surviving to age 65	92%	92%

*Note:* Probability of surviving to a given age is based on mortality tables (not shown here) used in Eurolandia. They are assumed to be the same for men and women.

## Economic Balance Sheet

Assets	€	Liabilities	€
Savings account	77,000	Mortgage debt	35,000
Shares of IT companies	130,000		
Accrued DB government retirement plan (Paul)	227,000		
Accrued DB government retirement plan (Jessica)	130,000		
Employer pension value (Jessica)	10,000		
Property (main residence)	320,000		
Paul's human capital	798,000	PV of lifetime consumption needs	2,379,000
Jessica's human capital	1,093,000		
<b>Total assets</b>	<b>2,805,000</b>	<b>Total liabilities</b>	<b>2,414,000</b>

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**Net wealth                      391,000**

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*Note:* The present value of lifetime consumption needs is based on the assumption that the family's current level of expenditure (€65,000) from this point increases by 2% a year in nominal terms (1% above inflation) for the rest of their lives. Assumes remaining time period of 45 years and discount rate of 3%. Numbers in the exhibit are rounded.

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To better understand the family's regular cash flows, Stein also prepares a summary cash flow budget, shown in [Exhibit 10](#).

#### **Exhibit 10.    Summary Annual Budget of the Schmitt Family at Age 45**

	€
Combined yearly gross pay	146,000
Less taxes and Social Security contributions	45,800
<b>Net pay</b>	<b>100,200</b>
Less living costs (including mortgage cost)	65,000
Less (house repair, maintenance, service charges)	3,500
<b>Cash available for insurance and savings</b>	<b>31,700</b>
Insurance premiums	3,500
<b>Funds available to save or invest</b>	<b>28,200</b>
Currently used primarily to:	
Fund investment portfolio	22,000
Add to savings accounts	3,200
Contribute to Jessica's employer's pension plan	3,000

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### **5.3. Identification and Evaluation of Risks in the Career Development Stage**

## EXAMPLE 3

# Identification of Risks

Identify financial risks the Schmitts face. Discuss each risk in turn.

### Guideline answer:

The Schmitts face the following main risks:

- Earnings risk resulting from potential loss of employment. The risk of involuntary unemployment remains higher for Jessica than for Paul. Jessica is the higher earner, whereas Paul, a civil servant, could be expected to lose employment only under extreme circumstances. The amount at stake is greater than before because of the salary increases Jessica has enjoyed.
- Earnings risk resulting from disability. The Schmitts remain in good health, so the likelihood of them suffering from disability remains low but is higher than the risk of dying. Their salaries, however, provide their main source of income and funding of their current lifestyles. If one of them were to become disabled, the burden on the rest of the family would not only take the form of lost earnings. It would also limit the range of activities in which the surviving partner could engage, with possible implications for income and costs.
- Premature death risk. This risk remains relevant, because early death could have serious consequences for the family now that children need to be cared for. Not only would costs of bringing up children have to be covered, the surviving spouse would potentially suffer a reduction in income because all family responsibilities would now be performed only by the surviving spouse.
- Risk to the value of their growing but concentrated investment portfolio of shares of IT companies. This is the couple's main investment vehicle but is focused on a volatile sector, whose performance is correlated with Jessica's career prospects.
- Risk to their retirement lifestyle goals. If the couple's contributions to their retirement plans are insufficient or the plans perform poorly, their retirement funding could be insufficient for the standard of living they desire.
- Other risks include property and liability risks.

### **5.3.1. Assessment of earnings risk**

Earnings risk is significant because loss of employment is particularly relevant for Jessica. She is on a relatively high salary and works in a higher-risk sector compared with Paul. If she were to rely on unemployment benefits, at just under €13,500 per year, they would cover a quarter of her net income. In the event Paul were to become unemployed, such benefits would cover less than a third of his net salary.

Earnings risk resulting from disability would seriously affect the couple's ability to maintain their lifestyle and costs associated with providing for the children. In case of disability, Jessica would be entitled to about €25,200 per year, which is less than half of her net salary. Paul is less exposed because his salary is lower and his entitlement to state disability benefit is higher after more than 10 years of service. Relying on state benefits alone would provide €30,245, amounting to almost two-thirds of his net salary. In addition, the Schmitts have existing disability insurance in place, now providing total payout of €112,000 and €686,100 (if treated as a lump sum) in case of Jessica's or Paul's disability, respectively. Stein suggests that the level of coverage is reassessed before recommendation is made.

Premature death risk, now that the couple has children, requires attention. Death of one of the parents would not only have consequences due to one-off costs resulting from the death but would also mean that family expenditures, currently covered jointly, would have to be funded from the survivor's income. Furthermore, the surviving spouse would potentially suffer a reduction in income because family responsibilities would now be performed only by the surviving spouse, most likely preventing him or her from career progression and possibly forcing the person to work part time. Alternatively, such services would have to be provided by others at a cost.

Although the amount of financial assets available to the family has increased substantially in recent years, at an aggregate amount approaching €210,000, they amount to more than the Schmitts' joint yearly gross earnings of €146,000. Stein points out, however, that those amounts are not significant for the couple to be able to cope with unexpected events beyond the short term. The adviser notes the Schmitts would like to avoid the extreme situation where the children would face not only the tragic loss of a parent (or both) but also a deterioration in living standards. Life insurance would provide support for their young children, who are likely to rely on them for financial support for at least the next 10 years and possibly longer in the case of their son Peter.

### **5.3.2. Analysis of the investment portfolio risks**

Risk to the investment portfolio stems from the fact that Jessica and Paul prefer to invest in a relatively small number of companies they believe they know, all of which are IT companies in their home country. Stein points out the correlation between their IT stock holdings and

Jessica's human capital, which is also tied to the prospects for the IT sector. If prospects for IT companies suffer, both the value of Jessica's human capital and that of their investment portfolio would decrease at the same time. Their risk-bearing ability is rather limited, which is important because their financial assets are rather modest compared with their spending needs—particularly in the presence of earnings risk related to Jessica's employment, a risk that is difficult to insure against. Moreover, because there is a relatively high concentration of IT employees where the Schmitts live, the value of the real estate that the Schmitts own there is likely to be positively correlated with Jessica's human capital as well.

### **5.3.3. *Analysis of the retirement savings plans***

Stein then takes a closer look at the risk to the Schmitts' retirement lifestyle goals. Through their mandatory social security contributions, the couple will be entitled to a government pension. In addition, Jessica's employer now provides a DC company pension, albeit with a limited amount of employer contributions. At the current rate of recently started contributions of €3,000 per year (combining those from Jessica's employer, her own payments, and the tax incentive), and assuming they grow at 3% annually, the estimated fund value would be near €150,000 at the age of 65, according to the fund administrator. At a typical annuity yield of 5%, such a sum would provide annual retirement income of €7,500. Stein estimates that if they remain employed until their retirement, and if there is no impairment in the benefits that are promised, the Schmitts will have a total gross retirement income, including state pensions, amounting to €76,000. This figure is about half of what they are earning now. Although their spending in retirement is likely to be lower than their current consumption, there is a risk that retirement income will be insufficient. Moreover, it is possible, and even likely, that the benefits offered by the state pension may be reduced before they retire, because the state pay-as-you-go system is under a significant strain.

### **5.3.4. *Other risks***

Stein also reviews the property and liability risks. The Schmitts have what is considered to be adequate health insurance through the government-mandated plan, which provides even quite advanced and costly treatment. It is a “no frills” arrangement, however, without any additional comfort or luxury environment. Property risk is covered by their existing buildings insurance, which includes liability coverage. The property value insured is the one they took out when buying their property: €200,000, well below the current estimated value of €320,000.

# 6. RISK MANAGEMENT RECOMMENDATIONS: CAREER DEVELOPMENT STAGE

- d. recommend and justify methods to manage a family’s risk exposures during the career development stage

## 6.1. Disability insurance

Exhibit 11 shows Stein’s calculation of disability coverage requirement based on the amount of earnings potentially lost in the case of disability.

Exhibit 11. Disability Insurance Coverage Calculation at Age 45

	Jessica	Paul
Salary income (net) to be replaced	53,650	46,510
Amount of annual disability coverage currently provided by the social security system	25,200	30,245
Annual shortfall	28,400	16,265
Benefit period (until retirement age)	20 years	20 years
Assumed annual benefit adjustment	2%	2%
Discount rate	3%	3%
PV of future earnings replacement required (annuity due)	519,000	297,000

*Note:* The purpose is to provide replacement for current income. This table shows the benefit in the form of a lump sum payout.

The current level of coverage is €112,200 for Jessica and €686,100 for Paul. Stein explains that because Paul would now be entitled to a much higher level of disability income from the state system, his level of additional required coverage is now lower. Given Jessica’s pay rises in recent years, resulting in higher amounts of income to be replaced in case of disability, Stein recommends that the Schmitts change the level of coverage. Her suggestion is to



increase the amount of coverage to €520,000 for Jessica and to reduce it to €300,000 for Paul.

## 6.2. Life insurance

Stein explains that the amount of coverage that a life insurance policy should provide can be calculated using either the human capital (the human life value method), which estimates the amount of earnings that must be replaced, or the needs analysis method, based on estimating the amount needed to cover survivors’ living expenses. Stein adds that although the methods are distinct in their approach, both rely on a number of assumptions that may turn out to have been inaccurate. For example, it is very difficult to estimate the financial needs of surviving children who are still very young. [Exhibit 12](#) illustrates the two methods.

### EXHIBIT 12. LIFE INSURANCE AMOUNT REQUIRED AT AGE 45

**Human life value method**

Stein first works out the amount of lost income replacement, adjusting after-tax income for the amount of annual expenses and the value of the person’s employee benefits. Assuming the survivors would need the lost income replacement immediately, she works out the present value of an annuity due.

Human life value method at age 45		
	Paul’s Life Cover (from Jessica’s perspective)	Jessica’s Life Cover (from Paul’s perspective)
	€	€
Pretax income	66,000	80,000
After-tax income	46,510	53,650
Less adjustment for the deceased person’s annual expenses that would not exist	10,000	10,000
Add value of employee benefits (retirement contribution) that family will no longer receive	10,000	4,000

Subtotal (after taxes)	46,510	47,650
Amount of pretax income required to replace after-tax income (30% rate assumed)	66,440	68,070
Annual growth rate (to reflect career advancement)	2%	5%
Discount rate	3%	3%
Present value of annuity due	1,213,000	1,644,000
Less existing life insurance (including €198,000 provided by Paul's employer)	638,000	200,000
Recommended additional life insurance	575,000	1,444,000

*Note:* Amounts are rounded.

## Needs analysis

Stein estimates the cash needs required upon death of the insured person, including funeral and burial costs as well as mortgage debt. She next estimates capital needed to fund the family's living expenses by discounting future cash flow needs to their present value. Stein then considers the amount of the surviving spouse's future income, which she assumes would remain unchanged in real terms because the surviving spouse, being a single parent, would most likely be unable to achieve career progression. Finally, she deducts capital and savings available.

### Needs analysis method at age 45

	Paul	Jessica
	€	€
<b>Cash needs</b>		
Cash needs (funeral and burial costs & taxes)	30,000	30,000
Mortgage retirement	35,000	35,000
<b>Total cash needs</b>	<b>65,000</b>	<b>65,000</b>

### Capital needs

PV of surviving spouse's living costs (assumed to be currently €35,000 for 45 years)	1,281,000	1,281,000
PV of Roxane's living cost (€9,000 for 10 years until graduation at age 22)	86,000	86,000
PV of Peter's living cost (€13,000 for 83 years until age 90)	743,000	743,000
Less PV of survivor's income until retirement at 65	824,000	777,000
<b>Total capital needs</b>	<b>1,286,000</b>	<b>1,333,000</b>
<b>Total financial needs</b>	<b>1,351,000</b>	<b>1,398,000</b>
Capital available:		
Cash, savings, investments	207,000	207,000
PV of vested retirement accounts (attributable to surviving spouse)	140,000	227,000
Existing life insurance coverage (including benefit provided by Paul's employer)	638,000	200,000
<b>Total capital available</b>	<b>985,000</b>	<b>634,000</b>
Additional life insurance needs	366,000	764,000

*Note:* The annuity-due PV calculations of living costs assume a 2% annual increase and 3% discount rate. A 1% nominal increase in survivor's income is also assumed.

Stein notes that the human life method suggests a significantly higher increase in the recommended life insurance coverage that stems from different approaches used by the two methods. One may view the differing amounts as a range within which to choose the amount of coverage, taking into account the cost of premiums. The amount of life cover selected may depend on which method is more relevant to the family's circumstances. Taking into account the Schmitts' focus on their ability to meet family expenses, Stein recommends that the Schmitts increase their private insurance coverage from the existing €440,000 to €900,000 in the case of Paul and from €200,000 to €1 million in the case of Jessica.

She adds that it is quite important to obtain such coverage while the Schmitts enjoy good health. If they were to develop any medical conditions later in life, obtaining such insurance

would be much more problematic, and available coverage would be subject to exclusions and other limitations. She also suggests that the needed coverage can be met by a temporary life insurance, providing coverage until retirement age in about 20 years, when at least one child is expected to be (or is well on its way to being) independent.

## 6.3. Investment risk recommendations

### EXAMPLE 4

#### Investment Risk Recommendations

Recommend and justify changes to the Schmitts' investment portfolio.

##### Guideline answer:

Stein has noted the correlation of the €130,000 of investment holdings in IT companies with Jessica's human capital. They should aim to hold an investment portfolio with as low correlation to one's human capital as possible. They should also move away from the concentrated nature of holdings of which they usually hold 10. In order for the Schmitts to achieve better diversification, Stein recommends that, at a minimum, any new investments are no longer made directly into shares of IT companies. Instead, they should be making regular investments into pooled investment vehicles—such as funds that are diversified across a wide range of regions, sectors, and securities—which can be done at low cost. Cost efficiency is paramount because any amount saved from initial charges or annual costs, compounded over many years, may make significant difference to long-term returns. If an active approach to investing is chosen, the additional costs that stem from such an approach should be justified by sufficient active risk-adjusted return.

### EXAMPLE 5

#### Real Estate in Investment Portfolio

The Schmitts earlier mentioned the possibility of making speculative investment in residential property (similar in size to their existing property) in the area where IT companies, including Jessica's offices, are based. Identify issues that an adviser should

consider before making a recommendation.

### **Guideline answer:**

The issue to consider is how the prospects for the local property market depend on the performance for and employment in the local IT industry. Jessica's own employment prospects depend on this industry, and purchasing a property in the area would increase the Schmitts' exposure to the local IT industry.

Funding of the purchase would also need to be considered because the cost could exceed €300,000 given that the Schmitts' property, similar in size and value to the one they are considering, is worth about €320,000. The Schmitts do not have sufficient resources available. Devoting a large proportion of their investment portfolio to a deposit and funding the rest of the purchase price using a loan would expose them to risks such as interest rate risk. A greater share of their wealth would be tied to the prospects of the local IT industry as they would no longer hold exposure to equities, foregoing benefits from diversification. They should be made aware of the fact that holding an investment property would represent a large, concentrated, illiquid position and that there are costs associated with owning and managing rental property.

## **6.4. Retirement planning recommendation**

### **EXAMPLE 6**

## **Recommendation for Retirement Saving at the Career Development Stage**

Recommend methods to manage risk to retirement lifestyle goals.

### **Guideline answer:**

Analysis of retirement plans identified a significant shortfall in the Schmitts' projected retirement income. To address the risk of having insufficient funds to maintain their lifestyle in retirement, the couple should give serious consideration to increasing the amount dedicated to retirement needs. Their monthly after-tax income of €8,350 exceeds their monthly expenditures by about €2,700, which even after the payment of insurance premiums leaves them with €2,350 (€28,200 per year) to invest. This provides

them with an opportunity to boost retirement savings and build up their investment portfolio instead of continuing to build up their liquidity buffer, which is now approaching €80,000 (invested in a low-interest, instant-access bank account). The Schmitts should instead increase contributions into Jessica's pension scheme or open separate private pension plans. Doing so would also allow them to take advantage of the tax benefits of retirement saving because income and capital gains within the regulated plans are tax free, and contributions into the plans are supplemented with the 25% top-up payments from the state. Although the funds from pension plans are normally inaccessible before retirement, the tax advantages, compared with investing outside such plans, can be significant.

## 6.5. Additional suggestions

Stein recommends that they update their property insurance coverage to reflect the current market value.

Supplementary private health insurance could be considered to cover dental care, alternative medicine, hospitalization in a private room, and other health costs. The reason in favor of obtaining such coverage now is that it will be cheaper while they are still relatively young and healthy, whereas it would be much more costly to obtain if and when they suffer from preexisting conditions. An important consideration is the lack of portability of such supplementary medical insurance were the Schmitts to move and/or to retire to another country.

Stein concludes her recommendations by adding that a risk management strategy for individuals should not only consist of establishing objectives, identifying risks, evaluating risks, and selecting methods to manage those risks, but also that outcomes and risk exposures should be monitored and methods for addressing them reviewed and adjusted as necessary.

The Schmitts accept their adviser's recommendations. They drop the idea of purchasing a property near the IT business district; they stop adding to their instant-access savings that form their liquidity buffer and instead increase their contributions to Jessica's employer pension plan. The Schmitts continue their contributions to the investment portfolio but start moving away from individual securities, instead investing in diversified equity funds.

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## 7. IDENTIFICATION AND ANALYSIS OF RISK

# EXPOSURES: PEAK ACCUMULATION STAGE

- e. identify and analyze a family’s risk exposures during the peak accumulation stage
- f. recommend and justify methods to manage a family’s risk exposures during the peak accumulation stage

The Schmitts are now 55 years old and are in their peak accumulation phase. In the last 10 years, they made further progress in their careers. Their incomes continued to increase. Correspondingly, Jessica’s employer’s contributions into the company pension scheme have increased meaningfully. Jessica herself has also been actively contributing to her employer’s occupational pension scheme and into her recently opened private pension, taking advantage of tax incentives. The part of the technology sector in which Jessica’s company operates is experiencing volatility arising from a rapidly changing market environment. Paul’s employment remains stable. He has been regularly contributing to a private pension plan.

The Schmitts’ assets, invested in a number of diversified funds now with a 70% equity (mostly global equity with a small amount in Eurolandia equities) and 30% fixed income mix (split about evenly between domestic government bonds and corporate bonds), have grown substantially thanks to regular investing and investment returns. The value of their property has suffered a decline in real terms as a consequence of the stagnation in Eurolandia’s real estate market and of the fact that the area where the property is located has lost its earlier appeal.

Although the Schmitts have already repaid their mortgage, their liabilities have increased. They are still supporting Roxane’s living expenses because she just completed her bachelor’s degree and is starting post-graduate studies. They are providing the best possible special needs education for Peter, who is now 17 and has made progress but will most likely need assistance for the rest of his life. The Schmitts feel retirement planning has become a crucial issue because they plan to retire in 10 years. They maintain a healthy lifestyle. They meet with Stein to review their risk management arrangements in relation to their lifestyle goals. Together they produce a summary of their financial circumstances, shown in [Exhibit 13](#).

**Exhibit 13. Summary of the Schmitts’ Financial Circumstances at the Age of 55**

	Jessica	Paul	Combined
	€	€	€
Yearly	120,000	80,000	200,000

<b>gross income</b>			
<b>After-tax income</b>	77,888	53,888	131,776
<b>Source of income</b>	Department head, IT	State teaching job	
<b>Living expenses</b>			75,000
<b>Property</b>			340,000
<b>Bank accounts</b>			80,900
<b>Investment portfolio</b>			611,400
<b>Pension provisions</b>	As mandated by law (state pension), plus a company-sponsored pension scheme €113,000 plus €15,000 in private pension savings	As mandated by law. Paul, as a civil servant, plus €47,500 in private pension savings	
<b>Disability insurance</b>	Government insurance coverage of €30,720 per year Private coverage of a lump sum of €633,900 (policy benefit was increased to €520,000 at age 45, adjusted for 2% annual benefit adjustment)	Government insurance cover of €36,870 per year (includes extra payment reflecting more than 10 years of service) Private coverage of a lump sum of €365,700 (policy provided €300,000 at age 45, adjusted for 2% annual benefit adjustment)	
<b>Life insurance coverage (up to age 65)</b>	€1,000,000 private policy <i>Note:</i> This amount reflects the recommendation given at age 45.	€900,000 private policy plus 3× salary insurance coverage of €240,000 provided by the employer	



# 7.1. Review of Objectives, Risks, and Methods of Addressing Them

Stein sets out to establish the Schmitts’ financial objectives and review the financial risks they face. She then proceeds to provide recommendations.

## 7.1.1. Financial objectives

Stein asks the Schmitts to update her on their financial objectives. Paul and Jessica explain that their objectives remain broadly unchanged. They wish to achieve the following:

- Provide financial security for the family in the next 10 years while they remain in full-time employment.
- Have a comfortable retirement, which they anticipate will happen in 10 years when they both reach the age of 65.
- Be in a position (after their retirement) to provide long-term support and assistance for their son Peter for the rest of his life,
- Leave a meaningful inheritance for Roxane.

Stein explains that she will assess the couple’s existing insurance arrangements with regard to their financial security while they still are working and earning salaries. She will then focus on assessing risks relating to their three long-term planned goals: the “comfortable retirement,” “Peter’s long-term assistance,” and “inheritance for Roxane” goals.

Stein proceeds to update the Schmitts’ financial and economic balance sheets, shown in Exhibit 14.

**Exhibit 14. Financial and Economic Balance Sheet at Age 55**

### Human Capital Assumptions

	Jessica	Paul
Expected salary growth (nominal)	2%	2%
Discount rate ( $r_f$ )	3%	3%

Risk adjustment ( $y$ )	1%	0%
Remaining length of working life (up to age 65)	10	10

*Note:* Probability of surviving to a given age is based on mortality tables (not shown here) used in Eurolandia.

## Economic Balance Sheet (€)

Assets		Liabilities	
Savings account	80,900	Mortgage debt	0
Investment portfolio	611,400		
Accrued DB government retirement plan (Paul)	457,000		
Accrued DB government retirement plan (Jessica)	263,000		
Employer pension value (Jessica)	113,500		
Private pension fund (Jessica)	15,000		
Private pension value (Paul)	47,500		
Property (main residence)	340,000		
Paul's human capital	486,600	PV of lifetime consumption needs	2,235,000
Jessica's human capital	668,100		
<b>Total assets</b>	<b>3,083,000</b>	<b>Total liabilities</b>	<b>2,235,000</b>
		<b>Net wealth</b>	<b>848,000</b>

*Note: Human capital values are calculated based on an assumption of 2% nominal salary growth rate until retirement in 10 years, discounted at 3%, adjusted for mortality rates and applying a further 1% risk adjustment to Jessica's income.*

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Lifetime consumption needs are calculated as annuity due based on annual costs of €75,000 over 35 years, with an annual increase of 2%, discounted at 3%.

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## EXAMPLE 7

### Comparison of Economic Balance

Compare the economic balance sheet at age 55, shown in [Exhibit 14](#), with the one produced 10 years ago, shown in [Exhibit 9](#).

#### Guideline answer:

The Schmitts' human capital has decreased in absolute terms over time as they approach retirement, which is now 10 years away. Their human capital has also decreased relative to their financial resources, which have seen a significant increase. The Schmitts have repaid their debts, and their net wealth is now much more substantial than 10 years earlier.

## EXAMPLE 8

### Liquidity Needs

Discuss the Schmitts' financial position with regard to their ability to meet any unexpected liquidity needs.

#### Guideline answer:

The level of their financial assets provides sufficient liquidity if their circumstances were to change. The Schmitts are now significantly richer in financial assets than they were 10 years earlier. They have a balance of almost €81,000 in their instant-access savings account and more than €600,000 in diversified funds that they should be able to

easily exit if such need arose.

### 7.1.2. Review of Risks and Related Risk Management Methods

Having gathered information about the Schmitts' financial circumstances and goals, Stein identifies the risks and prepares summary information (in Exhibits 15, 16, and 17) to help analyze those risks.

#### Exhibit 15. Earnings Shortfall in Case of Disability at Age 55

	Jessica	Paul
Salary income (net) to be replaced	€77,900	€53,900
Amount of annual disability coverage currently provided by the social security system	€30,720	€36,870
Annual shortfall	€47,180	€17,030

*Note:* Jessica and Paul's annual earnings shortfalls at the age of 45 were €28,450 and €16,265, respectively. Rounding is used throughout.

#### Exhibit 16. Disability Insurance Coverage Assumptions

Benefit period (until retirement age)	10 years	10 years
Assumed annual benefit adjustment	2%	2%
Discount rate	3%	3%
PV of future earnings replacement required	€452,000	€163,000

### EXAMPLE 9

## Analysis of Earnings Risk during Peak

# Accumulation Stage

Using the information provided by the Schmitts to their adviser and the information in Exhibits 13, 15, and 16, analyze the earnings-related risks arising from unemployment and disability that the Schmitts face now that they are in the peak accumulation life stage.

## Guideline answer:

The Schmitts continue to face earnings risk resulting from unemployment. Jessica continues to work in a sector that shows volatile profitability. A loss of her job at her current age of 55 could make it difficult for her to find alternative employment at significantly above-average salary and level of seniority. Two facts mitigate the seriousness of this concern. First, the Schmitts have a substantial amount of savings and investments to buffer any loss of earnings. Second, Paul's employment appears secure.

The risk to their earnings from disability remains, but the level of coverage should be reassessed because their circumstances have changed and they are closer to retirement.

The amount of annual earnings not protected by the social security system is higher than was the case at age 45 for Jessica because of her salary growth. But the fact that the period over which they would rely on such benefit payments is now only 10 years means that the present value of the disability protection needed is now lower: €452,000 for Jessica and €163,000 for Paul, well below the level of their existing coverage (€633,900 and €365,700).

Stein assesses the level of life insurance coverage needed using the human life and needs analysis methods. Starting with the human life method, the higher level of salaries would be expected to increase the amount of income required to replace the deceased person's earnings. Because the remaining period of earning a salary is now reduced to 10 years until retirement, however, the present value of future earnings would be expected to decline, as Exhibit 17 shows.

### Exhibit 17. Human Life Method Insurance Coverage Calculation at Age 55

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Pretax income	8
After-tax income	5
Less adjustment for the deceased person's annual expenses that will not exist	1
Add value of employee benefits that the family will no longer receive	1
Subtotal (after taxes)	5
Amount of pretax income required to replace after-tax income (30% tax rate)	7
Annual growth rate	
Discount rate	
Present value of pretax income to be replaced (annuity due, 10 years)	7
Less existing life insurance (including current benefit €240,000 provided by Paul's employer)	1,1
Recommended additional life insurance	-4

Stein should also carry out needs analysis method to help establish amount of life insurance coverage. The calculation is made since there are no further debts to repay. The couple's daughter Roxane has expected not to require ongoing support once she completes her studies less than two years (Stein excludes the short-term support for 1 year in calculation in [Exhibit 18](#)).

#### **Exhibit 18. Needs Analysis Method Insurance Coverage Age 55**

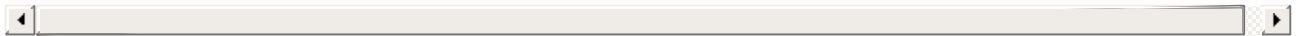
	<b>Paul's Life Cover (from Jessica's perspective)</b>
<b>Cash needs</b>	<b>€</b>





































































# Reading 30

## Integrated Cases in Risk Management: Institutional

by Steve Balaban, CFA, Arjan Berkelaar, PhD, CFA, Nasir Hasan, and Hardik Sanjay Shah, CFA

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## LEARNING OUTCOMES

The candidate should be able to:

- a.** discuss financial risks associated with the portfolio strategy of an institutional investor;
- b.** discuss environmental and social risks associated with the portfolio strategy of an institutional investor;
- c.** analyze and evaluate the financial and non-financial risk exposures in the portfolio strategy of an institutional investor;
- d.** discuss various methods to manage the risks that arise on long-term direct investments of an institutional investor;
- e.** evaluate strengths and weaknesses of an enterprise risk management system and recommend improvements.

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## 1. INTRODUCTION

The focus of this reading is a fictional “case study.” The case itself will focus on the portfolio

of a sovereign wealth fund (SWF) specifically looking at risk in terms of the SWF's long-term investments. There are three Learning Outcome Statements (LOS) within the case. Prior to the case, we provide two LOS outside the case. These LOS will provide some background information that will be helpful to the candidate in understanding the case.

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## 2. FINANCIAL RISKS FACED BY INSTITUTIONAL INVESTORS

- a. **discuss financial risks associated with the portfolio strategy of an institutional investor**

### 2.1. Long-Term Perspective

Institutional investors (also referred to as *asset owners*) such as pension funds, sovereign wealth funds, endowments, and foundations are distinct from other institutional investors such as banks and insurance companies in terms of the time horizon over which they invest their assets. This long-term perspective allows these institutions to take on certain investment risks that other institutional investors simply cannot bear and to invest in a broad range of alternative asset classes, including private equity, private real estate, natural resources, infrastructure, and hedge funds. This section will focus on the financial risks associated with the portfolio strategy of long-term institutional investors and in particular will focus on investments in illiquid asset classes. Banks and insurance companies are excluded from the discussion because they are typically much more asset/liability focused and face much tighter regulatory constraints to ensure capital adequacy.

This section will not cover the quantitative aspects of risk management or the mechanics behind various risk metrics, such as standard deviation and conditional value at risk, or risk management techniques, such as Monte Carlo simulation and factor modelling. Those topics are covered in other parts of the CFA Program curriculum. Instead, this reading will cover key risk considerations faced by long-term institutional investors as they invest in a range of traditional and alternative asset classes, including private equity and infrastructure. An important distinguishing feature of long-term institutional investors is their ability to invest in illiquid asset classes. Since the late 1990s, such asset classes have become an ever more important part of the investment portfolios of pension funds, sovereign wealth funds, endowments, and foundations. In this reading, we put particular emphasis on the financial risks that emanate from illiquid investments because these risks tend to be least well

quantified but can pose an existential threat to long-term investors if not addressed and managed carefully. The focus is on how market and liquidity risk interact to create potential challenges at the overall portfolio level and affect the institutional investor's ability to meet its long-term objectives.

Section 2.2 briefly discusses the various lenses through which risk management can be viewed. Risk management is a very broad topic, and the goal is to simply provide the reader with a frame of reference. Section 2.3 focuses on the key financial risks that institutional investors face. The focus is on portfolio-level, top-down, long-term financial risk. Risk management for long-term institutional investors should primarily be concerned with events that may jeopardize the organization's ability to meet its long-term objectives. The interaction between market and liquidity risk plays a critical role. In Section 2.4 we discuss the challenges associated with investing in illiquid asset classes from a risk management perspective. We discuss two important aspects of illiquid asset classes: the uncertainty of cash flows and return-smoothing behavior in the return pattern. Section 2.5 describes how institutional investors address and manage liquidity risk at the overall portfolio level.

## **2.2. Dimensions of Financial Risk Management**

The aim of risk management is to avoid an existential threat to the organization. In other words, risk management should focus on what types of events can jeopardize the organization's ability to meet its long-term objectives. Existential threats can arise from both financial risks (e.g., market losses and liquidity risk in the form of the inability to meet cash flows) and non-financial risks (e.g., reputational risks). In this reading, we solely focus on financial risk. Financial risk needs to be viewed through multiple lenses. There is no simple template to financial risk management. It is not simply a matter of calculating, for example, the value at risk of a portfolio. There are several dimensions to sound financial risk management, and we cover them briefly in the following subsections. Our goal is to simply provide a frame of reference for the reader because risk management is a very broad topic.

### **2.2.1. *Top-down vs. bottom-up risk analysis***

Risk management requires both a top-down and a bottom-up perspective. From a top-down perspective, the board and chief investment officer (CIO) set overall risk guidelines for the portfolio that serve as guardrails within which the investment team is expected to operate. Risk management involves measuring, monitoring, and reporting portfolio results versus the guidelines. The investment team is tasked with implementing the overall investment strategy either through hiring external asset managers or by directly purchasing and managing securities and assets. The investment team takes a more bottom-up, sub-portfolio approach to managing the risks of each individual portfolio or asset class, while assessing and monitoring

their interaction and impact on the risk level of the overall portfolio.

### ***2.2.2. Portfolio-level risk vs. asset-class-specific risk***

Although risk management for an institutional investor is ultimately about controlling overall portfolio-level risk, risks also need to be managed and controlled at the asset-class or strategy level so that no particular asset class or strategy will have an undue adverse effect on the overall portfolio. Different asset classes require different risk management techniques. Some risk metrics and methods make sense for publicly traded asset classes, but they may not be meaningful when assessing the risk of, for example, illiquid asset classes or hedge fund investments. For some asset classes, such as public equities, detailed security-level information might be available, whereas for other asset classes, such as hedge funds, only monthly manager returns may be available. In the case of a public equity portfolio, risk analysis might be very granular and rely on sophisticated factor models, whereas risk analysis for hedge fund investments might simply involve calculating the historical volatility of observed returns. Because of differences in data transparency, data frequency, and risk methods used, it is difficult—if not impossible—to aggregate these results at the overall portfolio level. It is not uncommon for institutional investors to have an overall risk management system for portfolio-wide risk metrics in addition to asset-class-specific systems or approaches that provide a more in-depth risk view tailored to a particular asset class.

### ***2.2.3. Return-based vs. holdings-based risk approaches***

Financial risk management systems are typically described as being return based (risk estimation relies on the historical return streams of an external manager or a portfolio of securities) or holdings based (risk estimation relies on individual security holdings and the historical returns of those securities in the portfolio). Both approaches have their pros and cons, and they are not mutually exclusive. Return-based systems are relatively easy to implement but may produce risk estimates that are biased because they rely on past returns from a strategy that may be very different today compared with, for example, five years ago. Holdings-based risk systems, in contrast, tend to be more costly and time-consuming to implement. For many institutional investors that invest in hedge funds and illiquid asset classes, holdings-based risk systems for the entire portfolio are typically not feasible because of a lack of transparency on holdings and their related investment strategy (a multi-strategy fund may maintain a long position in a security within one strategy book and a short position in another strategy book), data being available with a one-month to three-month lag, and significant turnover in certain types of hedge fund investments.

### ***2.2.4. Absolute vs. relative risk***



Investors are interested in both absolute risk and relative risk. Absolute risk concerns the potential for overall losses and typically relies on overall portfolio-level metrics, such as standard deviation, conditional value at risk, and maximum drawdown. Relative risk concerns underperformance versus policy benchmarks and relies on such metrics as tracking error (the standard deviation of returns relative to a benchmark).

### ***2.2.5. Long-term vs. short-term risk metrics***

Modern risk systems used by institutional investors typically focus on calculating volatility, value at risk, and conditional value at risk using sophisticated risk factor techniques. Given the heavy reliance on the current portfolio composition and the granular modeling of each component in the portfolio, these risk systems are most useful in providing an estimate for the potential for near-term losses. Institutional investors are also interested in calculating longer-term risks, such as the probability of losses, the probability of not being able to meet cash flows, and the probability of maintaining purchasing power or meeting a certain return target over longer time periods, such as 5 years, 10 years, 20 years, and so forth.

These long-term risk metrics are typically calculated using Monte Carlo simulation, where asset-class returns are simulated on the basis of a set of forward-looking capital market assumptions (typically expected returns, volatilities, and correlations) and total assets are calculated including cash flows, such as benefit payments and contributions in the case of pension funds and payouts (spending amounts) in case of endowments and foundations. These methods, although typically much less granular than a risk management system, are better able to incorporate future portfolio changes, different rebalancing methods, and cash flows.

### ***2.2.6. Quantitative vs. qualitative risks***

At the end of the day, risk management is not simply a quantitative endeavor. Quantitative risk management techniques are backward looking by nature and typically parametric (i.e., they rely on historical data to estimate parameters). Although history can serve as a guide, it does not provide a prediction of the future. Risk management is about assessing the potential for future losses, and quantitative tools need to be complemented with qualitative assessments. However, with qualitative assessments, it is important for risk managers to be aware of their own biases because they are basing these assessments on their own past experience. Thus, it is important for risk managers to recognize and mitigate the backward-looking bias in both quantitative (explicit) and qualitative (implicit) risk analysis.

### ***2.2.7. Pre- and post-investment risk assessment***

Finally, although risk management efforts typically focus on measuring the risks of existing investments, a sound risk management philosophy ensures a proper assessment of financial risks prior to making investments. Institutional investors typically put a lot of effort into operational and investment due diligence prior to making investments. In addition to analyzing past investment performance, it is critical when hiring external managers to evaluate the character of the key decision makers, the business ethics of the firm, the investment experience of the team, the quality of operations (such as accounting and trade settlements), and the risk management practices of the external manager. As part of their investment due diligence, institutional investors also look at the quality of the non-executive directors of the fund, the integrity and independence of external auditors, fee structures, master fund and feeder fund structure, custodians, and safekeeping on assets. These considerations are even more important for illiquid investments because it is very difficult to exit from them (investors cannot easily change their mind). After investing, risk management might take on a more quantitative role, but continued due diligence and monitoring are of equal importance. In the case of external managers, this obligation resides with the team responsible for the hiring and firing of the managers. In the case of internal management, an in-house risk management team may be tasked with the ongoing due-diligence and monitoring responsibilities.

The various risk dimensions we have described should provide a sense of the wide-ranging nature of risk management as a discipline. For this reading, we focus exclusively on the key financial risks that long-term institutional investors face. We take a portfolio-level, top-down perspective and are primarily concerned with how illiquid asset classes and the interaction between market and liquidity risk affect an institutional investor's ability to meet its long-term objectives. This risk is unique to long-term institutional investors. The next section will provide a more in-depth description of this risk.

## **2.3. Risk Considerations for Long-Term Investors**

Long-term institutional investors have the ability to invest a significant part of their portfolio in risky and illiquid assets because of their long-term investment horizon and relatively low liquidity needs. The past two decades have seen a steady increase in the allocation to illiquid asset classes, such private equity, private real estate, and infrastructure, by pension funds, sovereign wealth funds, endowments, and foundations. These asset classes create unique risk management challenges and can pose an existential threat if the risks are not addressed and managed carefully. As stated before, the ultimate objective of risk management is to ensure that the organization survives and can meet its long-term objectives.

We start with briefly describing and reviewing the main objectives of long-term institutional investors and their key risk considerations. [Exhibit 1](#) provides an overview by institutional investor type. The ultimate risk consideration for each of these institutional investors is their

ability to meet the payouts that they were set up to provide. This risk is largely affected by how the overall investment portfolio performs over time. On the one hand, a very low-risk portfolio that consists primarily of fixed-income investments is unlikely to cause a problem in providing the required payouts in the short run but will almost certainly jeopardize the organization’s ability to provide the required payouts in the long run. On the other hand, a very risky and illiquid portfolio is expected to provide high expected returns in the long run but could cause significant pain in the short run during a significant market downturn or financial crisis. Long-term institutional investors aim to strike the right balance between these two extremes in designing their investment policy or strategic asset allocation.

**Exhibit 1. Objectives and Risk Considerations by Institutional Investor Type**

<b>Institutional Investor</b>	<b>Main Objective</b>	<b>Key Risk Consideration</b>
Pension funds	Provide retirement income to plan participants	Inability to meet pension payouts to beneficiaries
Sovereign wealth funds	Varies by type of SWF but most have been set up to provide some future financial support to the government	Inability to provide financial support to the government
Endowments and Foundations	Provide financial support in perpetuity while maintaining intergenerational equity	Inability to provide financial support to the institution or to the mission

This process usually involves a Monte Carlo simulation exercise where asset-class returns are simulated on the basis of a set of forward-looking capital market assumptions and total assets are calculated including cash flows, such as benefit payments and contributions in the case of pension funds and payouts (spending amounts) in the case of endowments and foundations. Monte Carlo simulation allows institutional investors to calculate such metrics as the probability of maintaining purchasing power and the probability of a certain loss or drawdown (e.g., 25%) over a specific time period (e.g., 5 or 10 years) and to determine the appropriate trade-off between two such metrics. What is often ignored in this type of analysis, however, is the important interaction between potential market losses and liquidity. Pension funds, SWFs, endowments, and foundations are unique in that they can often tolerate significantly more market and liquidity risk than other investors. Their long-term investment horizon allows them to survive a significant market correction and even operate in a counter-cyclical way during a market crisis. As institutional investors invest more in such illiquid

asset classes as private equity, private real estate, and infrastructure, however, their ability to tolerate market losses may diminish.

Institutional investors need liquidity to meet payouts (retirement payments in the case of pension plans, payouts to the university or foundation in the case of endowments and foundations, etc.), meet capital calls on their illiquid investments, and rebalance their portfolios. During a significant market downturn, these needs can become stretched and impact the institution’s ability to meet cash flows, particularly if a large part of the portfolio is invested in illiquid asset classes, such as private equity, real estate, and infrastructure. [Exhibit 2](#) shows the main liquidity needs and the main sources of liquidity for long-term institutional investors. Each of these liquidity needs and sources may be adversely affected during a financial crisis.

**Exhibit 2. Liquidity Needs and Sources for Institutional Investors**

Liquidity Needs	Liquidity Sources
Outflows (e.g., pension payouts to beneficiaries, university payouts, and financial support to the government)	Inflows (e.g., pension contributions, gifts, donations, government savings)
Capital calls for illiquid investments	Distributions from illiquid investments
Portfolio rebalancing	Investment income and proceeds from selling liquid asset classes (cash, fixed income, public equities)

We first start with discussing how liquidity needs may increase during a crisis. First, payouts might increase as the beneficiary requires additional financial support. For example, a university may need additional funds from its endowment to support its operations as other sources of income dry up, or a government might require additional financial support from the sovereign wealth fund to mitigate the crisis situation. Second, there might be an acceleration of capital calls as attractive investment opportunities present themselves during a crisis. Finally, rebalancing flows will be more significant during a crisis because of significant market movements. Good governance and best practice suggest that investors rebalance their portfolios at regular intervals. Sticking to rebalancing practices is particularly important during a financial crisis because failure to rebalance may prevent investors from fully participating in the rebound after the crisis.

Having discussed how the needs for liquidity may increase during a significant market

downturn, we next turn to how sources of liquidity might dry up under those circumstances. First, inflows might decrease in a crisis. For example, donors might be struggling financially and donate less to their alma mater, or plan sponsors might be faced with budgetary challenges and, therefore, less inclined to contribute to the pension fund. Second, distributions from illiquid investments might be reduced because there are no attractive exit points due to depressed prices or lower profitability. Finally, investments that are otherwise liquid might become less liquid or simply undesirable to exit from. The main sources of liquidity during a financial crisis are typically cash and fixed-income investments. And most long-term institutional investors hold relatively low allocations to cash and fixed income in their portfolios.

Illiquid asset classes (such as private equity, real estate, and infrastructure) are not available to meet liquidity needs during a crisis. These asset classes cannot be rebalanced or redeemed because they are long term in nature and the assets can be locked up for 5–10 years or even longer. Semi-liquid asset classes, such as hedge fund investments, should not be expected to be liquid and available to meet liquidity needs during a financial crisis because many of these managers might impose redemption gates or have lockups in place or their investments might turn out to be less liquid than anticipated. Finally, although public equity investments are technically liquid, investors may be reluctant to sell part of their public equity portfolio to meet liquidity needs because the market value of these investments may have gone down significantly in a crisis. In addition, investors might not want to redeem from certain active external managers, even if the investments are liquid, because it may impact the future relationship with that manager (particularly for high-demand active managers with limited available capacity).

In conclusion, the main risk that long-term institutional investors face is having insufficient liquidity during a significant market downturn to meet their obligations and rebalance their portfolios. Liquidity needs tend to increase in a crisis while sources of liquidity dry up. This risk increases as institutional investors allocate more to illiquid asset classes. The combination of financial losses and not being able to meet cash flows or rebalance the portfolio because of insufficient liquidity can become a matter of survival. Managing this risk is, therefore, very important for long-term institutional investors. In the next section, we will discuss in more detail the risks associated with illiquid asset classes. In Section 2.5, we will discuss the various ways in which institutional managers manage liquidity risk.

## **2.4. Risks Associated with Illiquid Asset Classes**

Illiquid asset classes, such as private equity, real estate, and infrastructure, offer the potential for returns in excess of those on publicly traded asset classes, such as public equity and fixed income. The higher expected return of these asset classes comes at a cost to investors in the form of illiquidity. Illiquid asset classes are typically subject to a drawdown structure where

committed capital is called at an unknown schedule and investors receive profits at an unknown schedule. As a result, investors need to hold sufficient liquid assets to meet capital calls from their private fund managers. The uncertain pattern of cash flows poses both a liquidity and a risk management challenge for investors in illiquid asset classes.

In addition to the importance of adequately managing liquidity needs when investing in illiquid assets, these asset classes tend to be subject to stale pricing, appraisal-based valuations, and a lagged response to movements in public markets. As a result, illiquid asset classes exhibit returns that are smooth, understating the true volatility and correlation with publicly traded asset classes. For example, the standard deviation of observed returns for private equity is often smaller than that of public equity. Although this feature may be appealing for institutional investors, it causes traditional asset allocation models, such as mean–variance optimization, to over-allocate to private asset classes because the Sharpe ratios of observed returns are superior to those of publicly traded asset classes.

Finally, illiquid asset classes cannot be rebalanced easily and costlessly. Although investors could potentially, for example, sell their private equity stakes in the secondary market, this cannot be done instantaneously and investors may have to accept a significantly lower price compared with the true market value.

### ***2.4.1. Cash flow modeling***

Illiquid asset classes are subject to a drawdown structure. The investor (typically the limited partner, or LP, in the partnership agreement) commits capital, and this capital gets drawn down over time at the discretion of the general partner, or GP. Investors need to figure out both the commitment strategy (i.e., how much to commit each year) to reach a certain target allocation to illiquid assets and the liquidity needs to meet capital calls when required. Committing too much can pose severe liquidity risk because the percentage allocation to illiquid asset classes may soar due to the so-called denominator effect (total assets under management, or AUM, falls by a larger amount than the repricing of illiquid asset classes). Committing too little may prevent the investor from reaching the target allocation and may result in falling short of return expectations.

In managing liquidity needs and determining the appropriate commitment strategy to illiquid asset classes, investors need to be able to predict future cash flows.

### ***2.4.2. Addressing return smoothing behavior of illiquid asset classes***

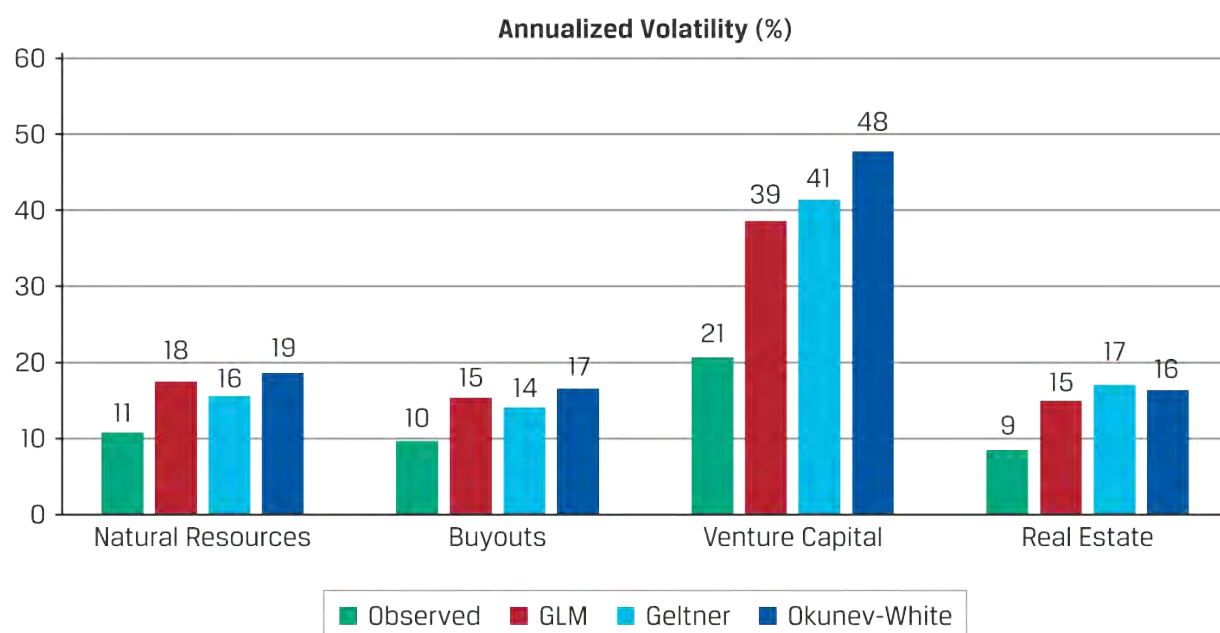
To calculate the true underlying economic risks of illiquid asset classes as part of their risk management efforts, institutional investors typically use one of two approaches: (1) Use



public market proxies in place of private asset classes—for example, use small-cap public equities as a proxy for private equity—or (2) unsmooth observed returns of private asset classes. The objective of the latter is to remove the serial correlation structure of the original return series. The implicit assumption is that the serial correlations in reported returns are entirely due to the smoothing behavior funds engage in when reporting results. A common and simple technique to unsmooth the returns of illiquid asset classes and hedge funds is a method developed by [Geltner \(1993\)](#) to address appraisal-based valuations in real estate. The method proposed by Geltner removes only the first-order serial correlation in observed returns. [Okunev and White \(2003\)](#) extended the method of [Geltner \(1993\)](#) to include higher-order serial correlations. An alternative to the Geltner method is the GLM method proposed by [Getmansky, Lo, and Makarov \(2004\)](#). They assumed that observed returns for illiquid asset classes and hedge funds follow a moving-average process.

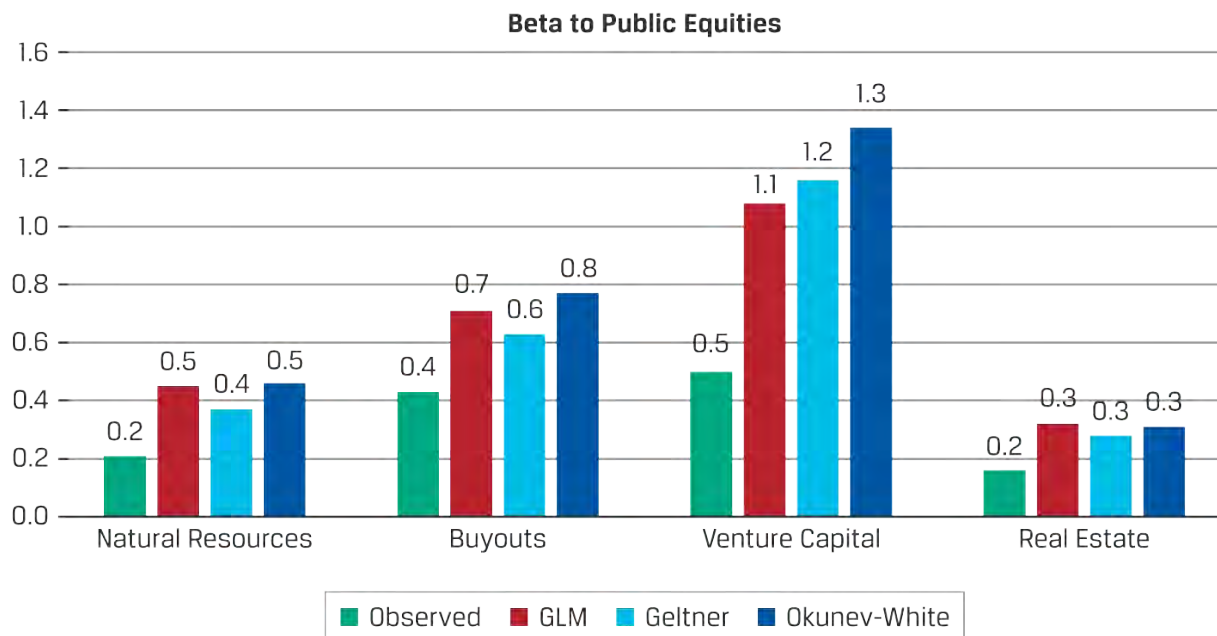
To show the effect of these different methods on the annualized volatility of various illiquid asset classes, we use quarterly historical returns for global buyouts, global venture capital, global private real estate, and global private natural resources for the period from Q1 1990 until Q4 2019. [Exhibit 3](#) shows the annualized volatility of the observed returns and the volatility of adjusted returns using the three methods briefly discussed earlier. For the Okunev–White and GLM methods, we use up to four lags. [Exhibit 4](#) shows the beta to global equity returns. For global equity returns, we use quarterly returns for the MSCI World Index from 1990 to 2019.

### Exhibit 3. Impact of Unsmoothing on Annualized Volatility



Source: Data is from Cambridge Associates.

## Exhibit 4. Impact of Unsmoothing on Beta to Public Equities



Source: Data is from Cambridge Associates.

As illustrated in Exhibits 3 and 4, after applying unsmoothing techniques, the resulting returns exhibit higher volatility and are typically more correlated with public equity markets. These unsmoothed return series can then be used along with returns on publicly traded asset classes to determine the covariance matrix to be used in a mean–variance optimization exercise when determining the appropriate allocation to illiquid asset classes and hedge funds. Mean–variance optimization, however, still falls short as an adequate asset allocation tool for institutional investors because it is not able to take into account the illiquid nature of some asset classes. Illiquid asset classes cannot be rebalanced easily without a potential significant price concession. Single-period optimization methods, such as mean–variance optimization, fail when illiquid asset classes are introduced, because such techniques implicitly assume that investors keep portfolio weights constant over time (i.e., portfolio weights are rebalanced perfectly) and they ignore the drawdown structure of illiquid asset classes and the uncertainty of cash flows. Currently, there are not any widely accepted alternatives. Most investors simply constrain the allocations to illiquid asset classes in the mean–variance optimization to achieve reasonable and practical portfolios.

### 2.4.3. Direct vs. fund investments in illiquid asset classes

In recent years, large pension funds and sovereign wealth funds have increasingly opted to invest directly in illiquid asset classes rather than through the more typical limited partner



(LP)—general partner (GP) setup. Some large pension funds and SWFs have built up a large team of merchant banking professionals who are equally capable as a large private equity fund team. The main motivation behind such a move is to save on the high fees that institutional investors typically pay to GPs (2% base fee on committed capital and 20% fee on profits or over a certain hurdle rate). Being able to save on these fees should make the investments more profitable over the long term. Direct investments provide an institutional investor with control over each individual investment. This situation puts the investor in a better position to manage liquidity. In the case of direct investments, there are no unfunded commitments, making it easier to manage capital. The investor also has full discretion over the decision when to exit investments and will not have to be forced to sell in a down market. As a result, direct investments partially alleviate some of the liquidity challenges typically associated with private asset classes and resolve some of the principal–agent issues associated with fund investing.

There are also disadvantages to direct investments in private asset classes. Direct investments in private equity, real estate, or infrastructure require a dedicated and experienced in-house team. In some instances, rather than building out an in-house team for private investments, large pension funds and sovereign wealth funds acquire a general partner. For example, Ontario Teachers' Pension Plan purchased Cadillac Fairview, a large operating company for real estate. Managing and assembling an in-house team adds several challenges compared with the more nimble setup in the case of fund investing. The sourcing of deals may be constrained by the talent and network of the in-house team. As a result, it may be more difficult to diversify the portfolio across geography and industries. Direct investment portfolios may have higher concentration risk because direct investors opt for larger investments due to staffing issues and scalability. This risk could adversely affect the liquidity of these investments because they might be harder to sell and, therefore, potentially less liquid. If the investor relies on external managers for deal sourcing or a partnership agreement, there is a risk of adverse selection. Finally, the governance structure is not set up as well in the case of direct investing compared with fund investments. In contrast to fund managers, employees of a pension fund or sovereign wealth fund may not be able to sit on the board of a private company. Institutional investors may not be able to afford the liability issues associated with direct investing. For fund investments, the investor is a limited partner and has limited liability, whereas with direct investments, the investor may be considered a general partner, with additional liability risks. Finally, institutional investors may find it difficult to adequately compensate internal staff to ensure that they hire and retain talent. This is usually a problem for public pension funds because there is public pressure to keep compensation down.

## **2.5. Managing Liquidity Risk**

In this section, we discuss some of the tools used by institutional investors to manage overall

liquidity risk in their portfolios.

Liquidity management steps:

### **1. Establish liquidity risk parameters.**

Institutional investors typically create liquidity guidelines regarding what percentage of assets needs to be liquid and available on a daily or monthly basis. In addition, given the drawdown structure of illiquid asset classes, institutional investors need to keep track of uncalled commitments, not simply invested capital. It is typical for institutional investors to have internal guidelines or bands around the sum of invested capital and uncalled commitments as a percentage of total assets. In addition to such bands, they may have automatic or semiautomatic escalation triggers, such as reducing commitments to illiquid asset classes or even actively seeking to reduce investments through secondary sales once the sum of invested capital plus uncalled commitments reaches a certain level (expressed as a percentage of total assets). These liquidity risk parameters can either be internal or be included in an investment policy statement approved by the board.

### **2. Assess the liquidity of the current portfolio and how it evolves over time.**

The second step in managing liquidity risk at the overall portfolio level is to have a clear sense of the liquidity of the portfolio and measure liquidity parameters versus guidelines. Most institutional investors have an internal report that shows what percentage of the portfolio can be liquidated within a day, within a week, within a month, within a quarter, and within a year and what percentage of the portfolio takes more than a year to be liquidated. It is important not only to have a snapshot of that report at a given point in time but also to understand how it evolves over time as the portfolio changes. A good starting point for developing these statistics is to simply look at the legal terms that are in place with external managers. This is particularly relevant for active managers and hedge funds that have redemption notices and lockups included in the investment agreement. In the case of internal management, an even more granular assessment can be made depending on the types of securities being held and using market liquidity measures to gauge how much of these securities can be sold over different time frames during a financial crisis. As discussed in Section 2.3, investors may also want to take into account how redeeming from certain external managers during a crisis may impact the future relationship with that manager (in other words, they may not want to redeem even if the investments are liquid and instead include these investments in a less liquid category).

### **3. Develop a cash flow model and project future expected cash flows.**

The third step is to understand and model the various cash flows. As discussed in Section 2.3, institutional investors make payouts (retirement payments, foundation

spending, etc.), they receive inflows (gifts and donations for an endowment, pension contributions for a pension plan, etc.), they have to meet capital calls for illiquid asset classes and receive distributions, and they have to rebalance their portfolios. Most institutional investors model each of those cash flows and project future expected cash flows. Section 2.4 briefly discussed how capital calls and distributions are modeled for illiquid asset classes.

#### **4. Stress test liquidity needs and cash flow projections.**

The standard cash flow modeling and projections assume business as usual, but it is important to stress test these cash flow projections and liquidity needs. As discussed in Section 2.4, cash flows are affected by market movements. For example, donations might be lower in a crisis and payouts might be higher. Institutional investors stress test their cash flow projections and liquidity needs. It is important to point out that this process is more of an art than a science and there is no universally accepted method for stress testing (as there are universally accepted methods for market risk calculations).

#### **5. Put in place an emergency plan.**

Finally, institutional investors should put in place an emergency action plan. Such an action plan should include what to liquidate—and in what order—in a crisis to meet cash flows and how to rebalance the portfolio in a crisis. Having such a plan in place can help avoid the risk of panicking in a crisis. Sharing the emergency action plan with the board to get buy-in can also help when a crisis occurs and mitigate the risk of board members pressuring the investment team to make sub-optimal short-term decisions.

**Exhibit 5** summarizes the five steps in developing a liquidity management plan.

### **Exhibit 5. Liquidity Management Steps**

1. Establish liquidity risk parameters.
2. Assess the liquidity of current portfolio, and monitor the evolution over time.
3. Develop a cash flow model and project future cash flows.
4. Stress test liquidity needs and cash flow projections.
5. Develop an emergency action plan.

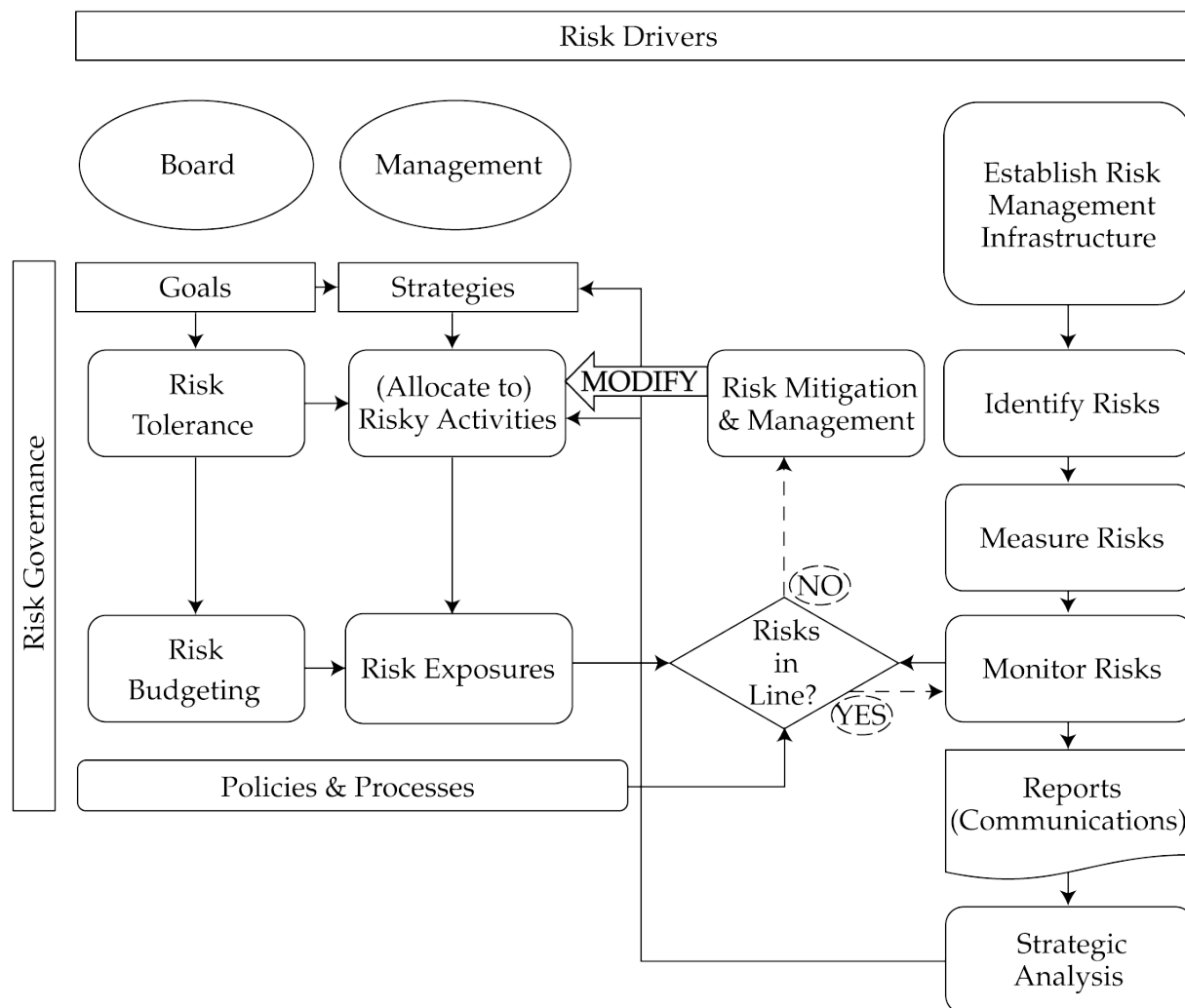
Long-term institutional investors are able take on certain investment risks that other

institutional investors simply cannot bear. Since the late 1990s, they have increasingly invested in a broad range of alternative asset classes, including private equity, private real estate, natural resources, infrastructure, and hedge funds. In this reading, we focus on the financial risks that emanate from illiquid investments because these risks tend to be less well quantified but can pose an existential threat to long-term investors if not addressed and managed carefully. The focus has been on how market and liquidity risk interact to create potential challenges at the overall portfolio level and affect the institutional investor's ability to meet its long-term objectives. We propose several steps institutional investors can take to better manage liquidity at the overall portfolio level.

## 2.6. Enterprise Risk Management for Institutional Investors

**Exhibit 6** provides a high-level view of a risk management framework in an enterprise context:

### **Exhibit 6. Risk Management Framework in an Enterprise Context**



Source: “Risk Management: An Introduction,” CFA Program Level I curriculum reading (2021).

We can apply this framework to the setting of an institutional investor in the following manner. The risk management process for an institutional investor starts with the board setting the overall risk tolerance for the organization that is consistent with its objectives and constraints. Risk tolerance should capture the amount of market risk that an institutional investor is willing and able to take in order to maximize expected returns, and it informs the most important investment decision that is made by the board—namely, the strategic asset allocation. Risk tolerance can be expressed in asset-only (for sovereign wealth funds, endowments, and foundations) or asset/liability terms (for pension funds and insurance companies). Typical risk measures used for setting the risk tolerance of institutional investors include volatility, maximum drawdown, and value at risk or conditional value at risk (sometimes referred to as *expected tail loss*, or *ETL*).

In addition to setting the overall risk tolerance (for market losses), the board usually approves additional risk parameters, limits, requirements, and guidelines (some quantitative and others procedural) that are codified in an investment policy statement (IPS). These may include

liquidity risk parameters if the institutional investor has a significant allocation to illiquid asset classes, an active risk budget to limit and control the amount of active management pursued by investment staff, restrictions on leverage and the use of derivatives, ethical investment guidelines, and possibly credit risk parameters and constraints in the case of significant fixed-income investments (for example, for an insurance company). These additional guidelines and constraints are put in place to ensure that the investment activities are consistent with the board's risk tolerance and expectations (and with regulatory requirements if applicable).

Management (i.e., the investment team) is tasked with implementing the strategic asset allocation (SAA) and investing the assets either internally or through external managers across the various asset classes included in the SAA. The investment team is also responsible for managing and monitoring the risks associated with the implementation of the SAA and reporting to the board. The objective is not to minimize or eliminate risk but to measure and attribute risk to various risk exposures and factors to ensure that the investments adequately compensate the institution for the risks being taken. Institutional investors typically perform risk factor analysis to better understand the fund's risk exposures, such as exposure to equity risk, interest rate risk, credit risk, inflation risk, currency risk, and liquidity risk. This analysis includes both quantitative modeling and qualitative risk assessments. Quantitative tools may involve sophisticated risk management systems based on returns or holdings, scenario analysis, and stress testing. Other risks are more qualitative in nature, such as potential reputational risk from certain types of investments.

For public equity investments, active risk versus a benchmark needs to be measured and monitored. Institutional investors may have an explicit active risk budget in place. Part of the risk budgeting effort involves ensuring that the active risk budget accurately reflects the areas where most excess return can be expected. In addition, the investment team will want to ensure that most of the active risk in public equities comes from stock picking and not simply from loading on certain equity risk factors, such as growth, momentum, or quality.

For private equity investments, the board may want to understand whether the returns achieved on the investment adequately compensated the fund for giving up liquidity. One way to answer that question is by comparing the returns on the private equity investment with the return of public equities. Currency risk tends to sometimes be overlooked by institutional investors. This risk can have an outsized and unexpected impact on the overall return. Although currency risk can be hedged in some cases, doing so is typically costly or even impossible when investing in emerging and frontier markets. The risk of currency devaluation needs to be acknowledged and assessed prior to making investments. Another risk that gets overlooked is asset allocation drift. The investment portfolio should be rebalanced on a regular basis to bring it back in line with the strategic asset allocation that was approved by the board.

The risk management infrastructure of the institutional investor should be set up to identify and measure the aforementioned risks and monitor how they change over time and whether

they are in line with the guidelines set up by the board in the IPS and with additional—more granular—internal guidelines set by the Chief Investment Officer and risk team. The risk team is usually tasked with risk reporting to the various stakeholders, which may include an internal investment committee and the board to ensure adequate risk oversight. The investment team should recognize when risk exposures are not aligned with the overall risk tolerance and guidelines and take action to bring them back into alignment. These actions may involve hedging, rebalancing, and secondary sales or in the case of illiquid investments, reducing commitments.

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## 3. ENVIRONMENTAL AND SOCIAL RISKS FACED BY INSTITUTIONAL INVESTORS

- b. discuss environmental and social risks associated with the portfolio strategy of an institutional investor**

### 3.1. Universal Ownership, Externalities, and Responsible Investing

In this section, we define universal owners as large institutional investors that effectively own a slice of the whole economy and hence are generally managing their total market exposure, instead of focusing on a subset of issuers. Institutional investors such as sovereign wealth funds and public pension funds usually have large portfolios that are highly diversified and built with a long-term focus. Such portfolios are representative of global capital markets, thereby making such investors “universal owners.”

Investing long term in widely diversified holdings inevitably exposes such portfolios to increasing costs related to negative environmental and social externalities. An externality is an impact that an individual’s or a corporation’s activities have on a third party. If everyone acts in their own self-interest, it could lead to an overall negative outcome for society. Examples of negative environmental externalities include plastic pollution in the ocean, poor air quality due to industrial and vehicular emissions, and water toxicity due to improper effluent management.

Universal owners find it challenging to effectively diversify risks arising from negative environmental and social externalities. Costs that are externalized by one portfolio company can negatively affect the profitability of another portfolio company, thereby adversely

affecting the overall portfolio return. For example, a sovereign wealth fund invests in a plastic manufacturer that is saving waste treatment and disposal costs by directly releasing waste pellets and other chemical residues into a nearby river. Water toxicity arising as a result of these actions causes reduced productivity in the agriculture operations downstream, which the asset owner is also invested in. In addition, strengthening regulations related to environmental protection, for example, may lead to monetary fines and penalties, thereby leading to financial risks for a company causing such negative externalities.

According to the UN-backed Principles for Responsible Investment (PRI), environmental costs for universal owners are reflected in portfolio impacts via insurance premiums, taxes, inflated input prices, and the physical costs associated with weather-related disasters (PRI Association 2017). Also, the cost of remediating environmental damage is often significantly higher than the cost of preventing it. Given these facts, it is imperative for large institutional investors to internalize the price of such negative externalities by considering the impact of their investments on society and future generations.

Exhibit 7 provides a non-exhaustive list of environmental and social issues that we have introduced in Level I of the CFA Program curriculum.

Exhibit 7. Examples of Environmental and Social Factors	
Environmental Issues	Social Issues
Climate change and carbon emissions	Customer satisfaction and product responsibility
Air and water pollution	Data security and privacy
Biodiversity	Gender and diversity
Deforestation	Occupational health and safety
Energy efficiency	Community relations and charitable activities
Waste management	Human rights
Water scarcity	Labor standards

In the next section, we share examples of how some of these environmental and social issues could impact the portfolio strategy for large institutional investors that have a long-term focus toward their investments.

Systemic risks have the potential to destabilize capital markets and lead to serious negative



consequences for financial institutions and the broader economy. The unpredictable nature of such megatrends as climate change and their related impacts, both environmental and socioeconomic, pose clear systemic risks to global financial markets. A study carried out by researchers at the [Grantham Research Institute on Climate Change and the Environment \(2016\)](#) at the London School of Economics and Political Science and Vivid Economics projected that climate change could reduce the value of global financial assets by as much as \$24 trillion—resulting in permanent damage that would far eclipse that from the 2007–09 financial crisis.

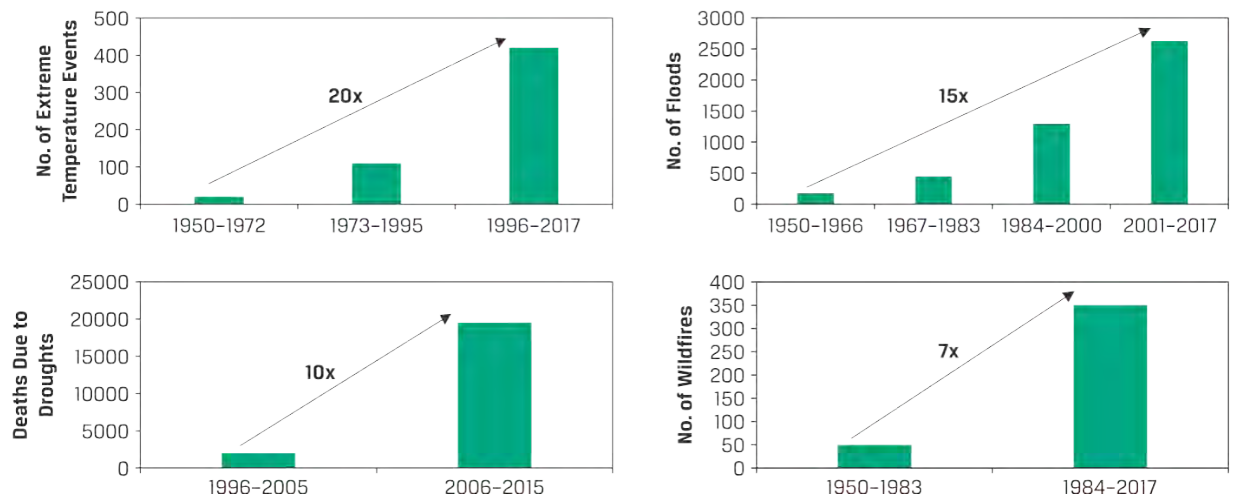
## 3.2. Material Environmental Issues for an Institutional Investor

For an institutional investor, such as a sovereign wealth fund, such megatrends as climate change and their related risks—both physical and transition risks—have the potential to cause significant harm to a portfolio’s value over the medium to long term, particularly for investments in real assets (real estate, infrastructure) and private equity, neither of which are easily divestible. Next, we will discuss the impact of climate-related risks on an institutional investor’s portfolio from the perspective of private equity and real asset investments.

### 3.2.1. *Physical climate risks*

As we have observed since the beginning of the current century, climate change has profoundly affected the physical world we live in. Annual average temperatures across the globe are continuously rising, and 19 of the 20 warmest years have occurred since 2001 ([NASA 2019](#)). Erratic weather patterns, such as heavy precipitation, droughts, and hurricanes, are both more frequent and of higher magnitude. Similarly, wildfires are causing more and more devastation every year. In addition, the chronic issue of sea-level rise is causing coastal flooding. As shown in [Exhibit 8](#), an increase in extreme weather events has occurred.

#### Exhibit 8. Extreme Weather Events on the Rise



Source: Emergency Events Database ([www.emdat.be](http://www.emdat.be)).

With continued climate change, all these physical climate risks could become more severe in the future and, to a certain extent, become the new normal for the world. Depending on global responses to climate change in the coming decade, the degree of their impact on our economies and investments may be alleviated.

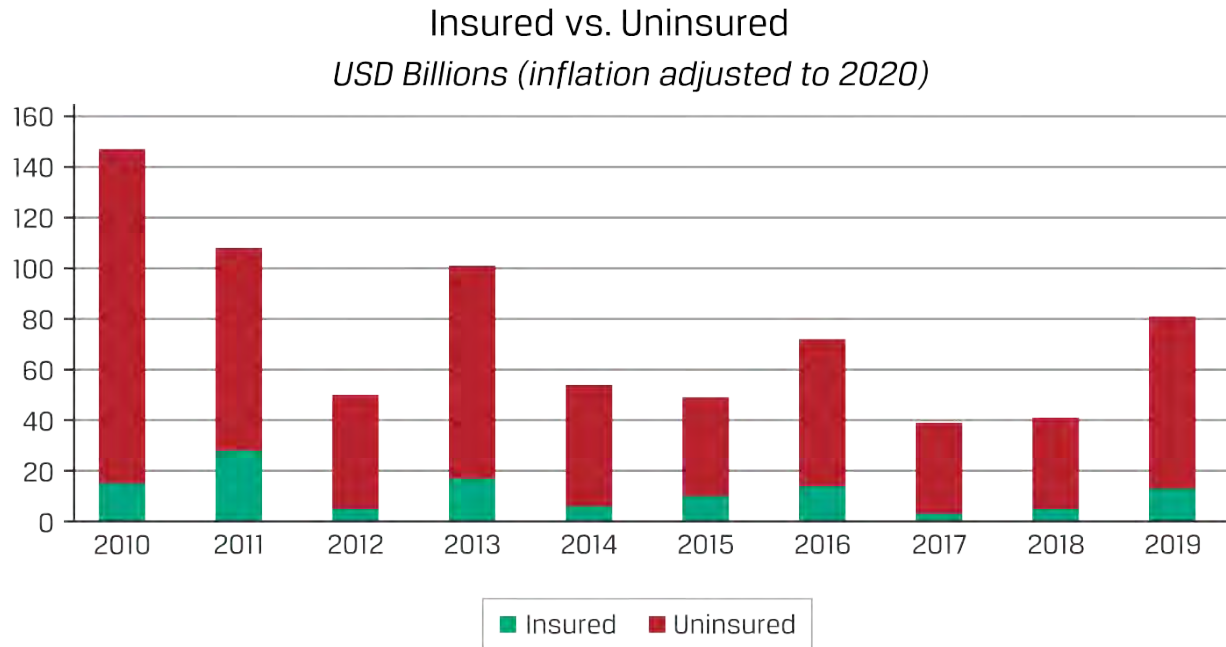
So, what does this mean for the portfolio strategy of large institutional investors with private equity and real asset investments?

### 3.2.2. Impact on real assets

Should these trends continue, the physical risks that we have discussed could create increased levels of stress on such assets as residential and commercial real estate and infrastructure, such as roads and railways. Rising sea levels that lead to flooding would impact both rents and property valuation for hitherto prime coastal properties. Prolonged exposure to extreme heat would negatively affect the useful life of roads and train tracks, which would lead to accelerated depreciation of such assets and, therefore, more frequent replacement costs for companies and governments (CFA Institute 2020).

Similarly, physical damage caused by frequent, large-scale weather-related events, such as hurricanes or even wildfires—once considered too irregular to insure against—could not only lead to large-scale drawdowns in the portfolio’s asset value but also make it difficult or expensive to insure such assets. Most of the flooding-related losses around the world are uninsured, thereby causing additional stress on a country’s economy and its people (see [Exhibit 9](#)).

## Exhibit 9. Global Flood Losses and Insurance Levels



Source: Aon.

Because these physical climate-related risks continue to play out in a much larger and more frequent manner than previously anticipated, they will continue to bring down prices and rental yields of prime real estate, leading to permanent impairments of asset valuations. For a large institutional investor that is looking to preserve capital and provide growth benefits to multiple generations, it is imperative that these risks be factored into the portfolio construction strategies.

### 3.2.3. Climate transition risks

In line with the 2015 Paris Climate Agreement, countries and companies around the world are already making efforts to dramatically reduce or eliminate their CO<sub>2</sub> emissions in order to limit the global temperature increase in this century to 2 degrees Celsius above preindustrial levels. To keep global warming less than 2°C, scientists project that energy-related CO<sub>2</sub> emissions need to fall 25% by 2030 and reach “net zero” by 2070 ([Intergovernmental Panel on Climate Change 2018](#); [IEA 2020](#)).

One of the most ambitious efforts to incentivize decarbonization is the European Union’s sustainable finance taxonomy, which helps investors understand whether an economic activity is environmentally sustainable. As of October 2020, looking at the scientific evidence about the current and potential impacts of climate change, it has become clear that

the world needs to move toward a low-carbon future if we are to cap global warming at less than 2°C and prevent the negative effects that not doing so would bring to our climate, our ecosystems, and human life. What is currently unclear is the pace at which this decarbonization will happen.

Rapid decarbonization will lead to restrictions on carbon emissions, implementation of some form of carbon pricing, introduction of new technologies, and changes in the consumer behavior. All these effects can create massive disruptions in certain sectors, such as electricity generation (with the increasing cost competitiveness of renewable energy sources as compared with coal) and automobiles (with the impending widespread switch from internal combustion engines to electric vehicles. The International Energy Agency has forecast that in order to reach carbon neutrality by 2050, half of all cars in the world should be electric by 2030 (Lo 2020).

The PRI’s Inevitable Policy Response (IPR) project aims to prepare financial markets for climate-related policy risks that are likely to emerge in the short to medium term. The IPR forecast a response by 2025 that will be forceful, abrupt, and disorderly because of the delayed action (see Exhibit 10). The PRI argues that markets have inefficiently priced climate transition risks, but its policy forecast is that a forceful policy response to climate change in the near term is a highly likely outcome, leaving portfolios of institutional investors exposed to significant risks that need to be mitigated.

**Exhibit 10. IPR Key Policy Forecasts**

Coal phase-outs	Sales ban on Internal Combustion Engines (ICE)	Carbon Pricing (Emission Allowances)	Zero carbon power
Early coal phase-out for first mover countries by 2030	Early sales ban for first mover countries by 2035	US\$40-80/tCO <sub>2</sub> prices by 2030 for first movers	Significant ramp-up of renewable energy globally
Steady retirement of coal-fired power generation after 2030 in lagging countries	Other countries follow suit as automotive industry reaches tipping point	Global convergence accelerated by Border Carbon Adjustment (BCA) to >=\$100/tCO <sub>2</sub> by 2050	Policy support of nuclear capacity increase in a small set of countries, nuclear phased out elsewhere

<b>Carbon Capture and Storage (CCS) &amp; industry decarbonisation</b>	<b>Energy efficiency</b>	<b>Green House Gas (GHG) removal (Land use-based)</b>	<b>Agriculture</b>
Limited CCS support in power,	Increase in coverage and stringency of performance standards	Improved forestry and nature-based solutions	Technical support to improve agricultural yields
Policy incentives primarily for industrial and bioenergy CCS	Utility obligation programs	Stronger enforcement of zero deforestation	Increasing public investment in irrigation and AgTech
Public support for demonstration, and then deployment of hydrogen clusters	Financial and behavioral incentives	Controlled expansion of bioenergy crops	Incremental behavioural incentives away from beef

Source: PRI IPR ([www.unpri.org/the-inevitable-policy-response-policy-forecasts/4849.article](http://www.unpri.org/the-inevitable-policy-response-policy-forecasts/4849.article)).

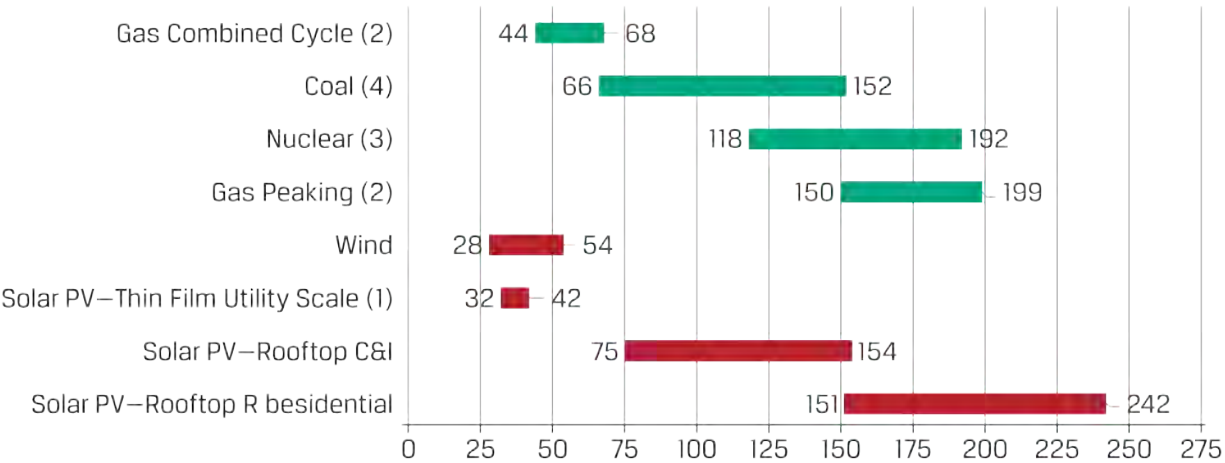
Given the uncertainty around the precise timing and magnitude of the impact of climate change, organizations are increasingly using climate-related scenario analysis to better understand how their businesses might perform under a variety of global warming scenarios—for example, in a world that is 2°C, 3°C, or 4°C warmer. The Task force on Climate-Related Financial Disclosures (TCFD) recommends organizations, including banks, asset managers, and asset owners, use scenario analysis to estimate the implications of such risks and opportunities for their businesses over time and also to inform their strategic thinking. The International Energy Agency and the Intergovernmental Panel on Climate Change both publicly offer a set of climate-related scenarios that are widely used. To learn more about climate-related scenario analysis, refer to the technical supplement issued by the TCFD.

### **3.2.4. Climate opportunities**

Although most of the investor focus in dealing with climate change has been on managing physical and transition risks, exciting investment opportunities are arising in companies focused on climate change mitigation and adaptation. These opportunities exist in secondary markets and, in some cases, investments in real assets and infrastructure projects, such as wind and solar farms and smart grids.

Because the levelized cost of energy for renewable energy generation technologies has considerably decreased since 2010, these have become cost competitive with some conventional generation technologies, such as coal-based power generation, as shown in [Exhibit 11](#).

**Exhibit 11. 2019 Levelized Cost of Energy, Unsubsidized**



*Note:* Levelized cost of energy is a measure of the average net present cost of electricity generation for a power plant over its lifetime.

- (1) Unless otherwise indicated herein, the low end represents a single-axis tracking system and the high end represents a fixed-tilt system.
- (2) The fuel cost assumption for Lazard’s global, unsubsidized analysis for gas-fired generation resources is \$3.45/MMBTU.
- (3) Unless otherwise indicated, the analysis herein does not reflect decommissioning costs, ongoing maintenance-related capital expenditures or the potential economic impacts of federal loan guarantees or other subsidies.
- (4) High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.

*Sources:* Data is from Lazard ([www.lazard.com/perspective/lcoe2019](http://www.lazard.com/perspective/lcoe2019)).

This cost competitiveness, coupled with the urgency to decarbonize our economies to avoid the potentially catastrophic physical impacts of climate change, has created secular growth

opportunity for such businesses and assets, thereby attracting increasingly large investor attention.

A summary of the business segments where such opportunities may lie follows.

Climate mitigation

This category includes companies that are positioned to benefit, directly or indirectly, from efforts to curb or mitigate the long-term effects of global climate change, to address the environmental challenges presented by global climate change, or to improve the efficiency of resource consumption.

Exhibit 12. Climate Mitigation Opportunity Examples

Business Segment	Description
Clean energy	Companies in this segment are involved in the generation of clean energy from such sources as wind, solar, and small hydro. This segment also includes manufacturers of such equipment as windmills and solar panels, as well as related service providers.
Energy efficiency	This segment comprises businesses that provide products and services to improve the efficiency of energy consumption in a variety of processes. Examples include energy efficient transportation and building solution providers and recycling technology.
Batteries and storage	This segment includes companies that help improve battery storage capacity and efficiency. These improvements are critical, for instance, to sustainable growth and wider penetration of some of the previously mentioned technologies, such as clean energy generation and distribution and electric vehicles.
Smart grids	Smart grids are digitally enhanced versions of the conventional electricity grid, with a layer of communication network overlaying the traditional grid. They are a key enabler for energy security and reliability and integration of clean energy resources.
Materials	Such materials as copper and battery-grade lithium are key ingredients in the clean energy value chain because they are required in clean energy power generation, storage solutions, and electric vehicles, resulting in a projected demand rise as the world transitions toward a low-carbon future.

## Climate adaptation

This category includes companies that would help better adjust to actual or expected future change in climate with an aim to reduce vulnerability to the harmful effects of climate change, such as food insecurity, sea-level rise, and frequent extreme weather events.

### Exhibit 13. Climate Adaptation Opportunity Examples

Business Segment	Description
Sustainable agriculture	Companies in this segment are involved in providing products that improve agriculture productivity and reduce the resource consumption in the entire process. Sustainable fish farming and timber production are other activities included here.
Water	This This segment consists of businesses that provide products and services to improve the efficiency of water consumption in a variety of processes, including wastewater treatment and reuse.

Many institutional investors are increasing allocations to such sectors as part of their real-asset allocation or as a potential equity alpha opportunity with the expectation that companies in these sectors will outperform the broad equity market over a long period of time as the world transitions to a low carbon future. Evaluating and sufficiently managing both physical and transition climate risks in the portfolio and capturing some of the aforementioned secular growth opportunities could position large institutional investor portfolios to outperform and grow in value in the long term.

## 3.3. Material Social Issues for an Institutional Investor

Environmental issues, such as climate change and air pollution, are reasonably mature and quite well understood, making them easier to accommodate in discounted cash flow models. Social issues, such as community relation, occupational health and safety, privacy and data security, modern slavery and other human right violations in the supply chain, and inequality,



however, are relatively challenging to quantify and integrate into financial models. Most social issues have largely qualitative data reported by companies, such as health and safety policies and initiatives, lists of product quality certifications, and human capital management policies, rather than metrics on which long-term performance can be judged. Nevertheless, these issues have the potential to cause reputational and financial damage to a company and its investors if not managed sufficiently well.

### ***3.3.1. Managing community relations and the social license to operate***

For large institutional investors, such as sovereign wealth funds and public pension funds, their investments may have positive social impacts, such as improving essential public infrastructure and services or providing better access to medicine and technology, or negative social impacts, via poor labor standards or forceful relocation and improper rehabilitation of communities by their portfolio companies. Good corporate behavior is usually well received by the community relations, leading to a sustainable and mutually beneficial long-term relationship. In many ways, these aspects are essential to keeping a company's social license to operate.

Let's take a hypothetical example of a sovereign wealth fund (SWF) that has invested in a dam-based hydroelectric power plant in an economically less developed part of its country. Although there will be a positive environmental impact of the project because it will generate electricity from a renewable source, the social impacts of the project could be mixed. On the positive side, rural electrification arising from this project will lead to economic development in the region, thereby improving the standard of living. Dam-based hydroelectric power plants require large-scale land acquisition, often leading to relocation and rehabilitation of indigenous communities. Some locals protest that they have not been sufficiently consulted by the government before issuing consent to establish this project. Moreover, there are allegations of acquisition of land for the project at unfair/poor valuations. In some instances, protesting locals were forcefully removed and relocated by local government authorities, leading to unrest. Eventually, the SWF decides to cease the project implementation owing to this wide variety of instances of pushback from the society.

This example highlights the importance of considering social risks when investing. Despite having the positive intent of supporting development of renewable power generation in a less economically developed part of the country, the SWF faced pushback and reputational damage for not holistically considering the interests of all the stakeholders involved, especially local communities that were the most affected by the project. Some of the best practices in community relation management include extensive stakeholder consultation meetings to better understand their needs and address their concerns, providing alternative employment opportunities to those affected, and ensuring fair land acquisition, rehabilitation, and resettlement practices.

### **3.3.2. Labor issues in the supply chain**

Another increasingly important social topic is the one related to poor labor practices, especially in the supply chain. Driven by globalization, a consumption boom across developed and emerging markets, and the availability of cheap labor in certain parts of the world, a large portion of the manufacturing and assembling activities across such key sectors as technology and garments has been outsourced to developing and frontier markets, such as India, Vietnam, and Malaysia. Although access to cheap, semi-skilled labor has led to better bottom lines for multinational companies, it has also come at the cost of exploitation of workers in such supply chains. Labor rights are being compromised in the form of heavy reliance on temporary workers, excessive or forced overtime, and low wages. Moreover, lax regulations in many countries allow legal prevention of unionization or any form of collective bargaining, thereby making such workers more vulnerable.

Large brands in the apparel industry, such as Nike and Gap, and in the technology space, such as Apple and Samsung, have all been accused of various levels of lapses in their supply chain related to the aforementioned labor management issues. Apart from suffering significant damage to their brands and reputations, which could lead to consumer boycotts, such companies may also face additional costs and/or fines related to product recalls and ad hoc shifting of supply chains.

For SWFs with equity exposure to some of the largest apparel brands and branded tech hardware companies, considering such issues while making investments is of paramount importance because lack of transparency in the supply chain and lapses in labor management may weigh heavily on the resilience of such supply chains amid global-scale disruptions, such as that caused by the COVID-19 pandemic. In addition to the financial risks, reputational risks may also arise because of a view that the SWF implicitly supports such improper and unethical business practices.

### **3.3.3. The “just” transition**

Sustainable development involves meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. Sustainable development includes economic, social, and environmental dimensions, all of which are interrelated. In the transition to environmentally sustainable economies and societies, several challenges may arise—for example, displacement of workers and job losses in certain industries, such as coal mining, fossil fuel extraction/production, and fossil fuel-based power generation. Similarly, increased energy costs due to carbon taxes and higher costs of commodities partly resulting from sustainable production practices may have adverse effects on the incomes of poor households. Therefore, a “just” transition is necessary to ensure that there are limited negative social impacts in our pursuit of positive environmental impacts via avoiding fossil fuels and implementing sustainable agriculture and business practices.

Although there is no fixed set of guidelines, the just transition encourages a dialogue between workers, industry, and governments influenced by geographical, political, cultural, and social contexts in order to tackle some of the aforementioned challenges.

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## CASE STUDY

- c. analyze and evaluate the financial and non-financial risk exposures in the portfolio strategy of an institutional investor**
- d. discuss various methods to manage the risks that arise on long-term direct investments of an institutional investor**
- e. evaluate strengths and weaknesses of an enterprise risk management system and recommend improvements**

### 1. Case Study: Introduction

You are working as a Risk Analyst at a small sovereign wealth fund (SWF) and reporting to the Head of Risk. The SWF is considering making some new investments in direct private equity and direct infrastructure. You have been asked to review risk aspects of these investment opportunities, which will be discussed in an upcoming investment committee meeting. Assuming the investments will be made, you will also have the responsibility to monitor the risk of the investments as well as make recommended improvements to the SWF's risk management system. You are excited about these opportunities and look forward to putting your knowledge and skills learned from the CFA Program to work!

### 2. Case Study: Background

- Over 20 years ago, the “Republic of Ruritania” discovered an extremely large deposit of crucial rare earth metals that are key elements in the manufacturing of high-speed computers used in science and finance. The entire deposit was sold to various entities allowing Ruritania to secure its financial future. At the same time, the government of Ruritania “dollarized” the economy, moving from the domestic RRR currency to the USD.

- The government of Ruritania (R) decided to form a sovereign wealth fund, R-SWF, in order to grow the capital for future generations. This type of SWF is a “savings fund,” intended to share wealth across generations by transforming non-renewable assets into diversified financial assets.
- R-SWF has built up a diversified portfolio of equities, fixed income, and alternative investments.
- In equities and fixed income, the SWF invests in developed markets, emerging markets, and frontier markets through both fund investing and direct investing.
- In alternatives, the SWF invests in private equity (PE), infrastructure, and real estate. Investment methods used include direct investing, making co-investments, and fund investing.
- The case study begins in Section 3 at an investment committee meeting to discuss two potential investments. The next scene, in Section 4, is set three years later, when the performance of the investments are discussed at another investment committee meeting. The final scene, in Section 5, is set five years later and provides additional information on investment performance.

### 3. R-SWF’S Investments: 1.0

#### *Initial Case Facts (1.0)*

Today, the investment committee of R-SWF is considering several new investments, including direct private equity and direct infrastructure investments. The investment committee will be discussing risk aspects of the investments, led by the Head of Risk and supported by *you*, a Risk Analyst.

- The investment committee meeting will open with an overview of asset allocation and a few basic discussions on the two proposed investments. However, the focus of the meeting is on the potential risks of the new investment proposals, not details on the investments themselves. (An in-depth investment committee meeting on the new investments was held last month.)
- The meeting will then move on to a discussion of the potential risks of the two specific direct investments being considered.

#### 1. Direct infrastructure investment in an airport

## 2. Direct PE investment in a beverage manufacturer

- The investment committee meeting will discuss key risks that R-SWF should consider as it decides whether to make new direct investments in PE and infrastructure.
- All investment committee participants (and CFA Program Level III candidates) are provided with a background memo with the following information:

Memo A: Background on R-SWF's asset allocation and performance

Memo B: Details on the proposed direct infrastructure investment

Memo C: Details on the proposed direct private equity investment

### INVESTMENT COMMITTEE MEETING MEMO 1.0

To: R-SWF Investment Committee Members

From: R-SWF Chief Investment Officer

Re: Investment Committee Meeting Agenda

Distribution: Head of Risk, Head of PE, Head of Infrastructure, Head of Equities, and Level III Candidates in the CFA Program

An agenda for today's meeting is as follows:

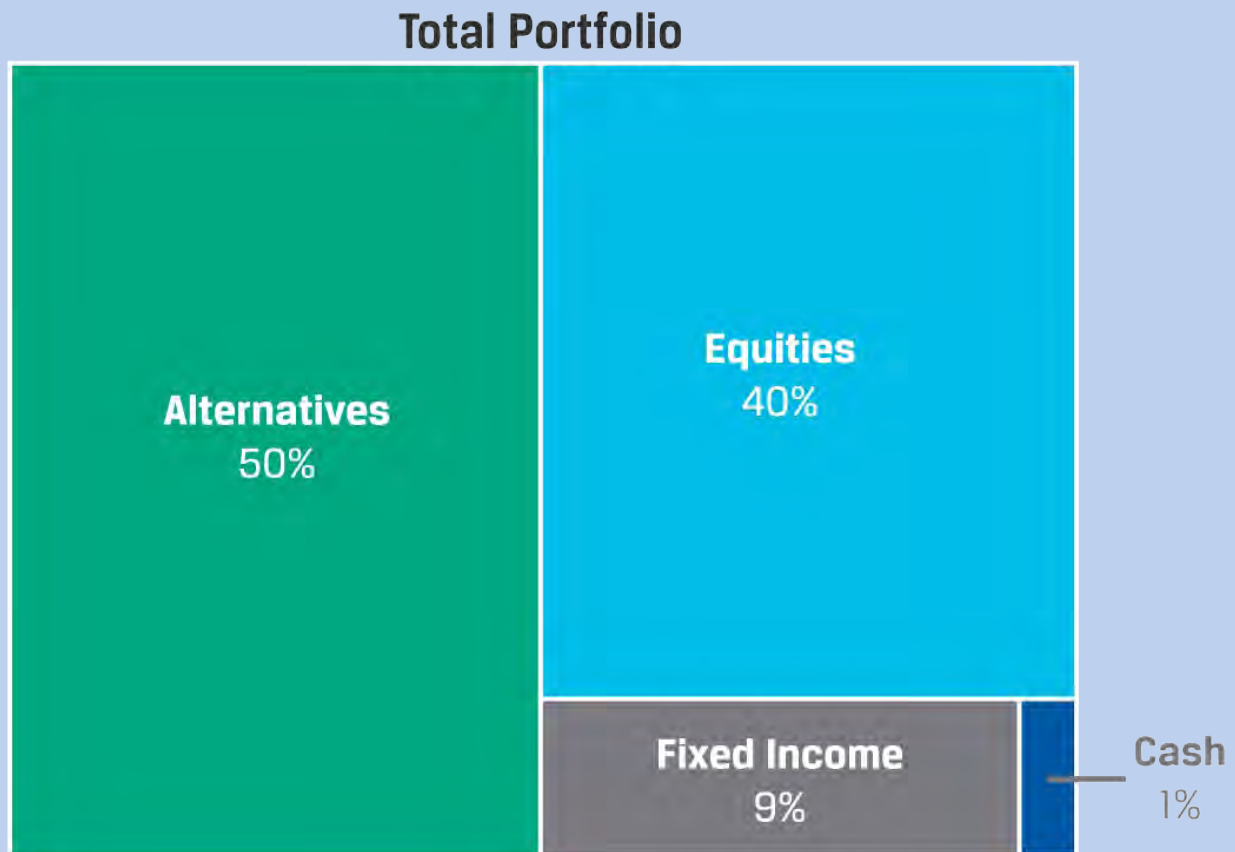
#### Agenda

- Opening Remarks and Review of Asset Allocation: Chief Investment Officer
- Review of Infrastructure Investment Opportunity: Head of Infrastructure
- Review of Private Equity Investment Opportunity: Head of PE
- Discussion of Risk—Infrastructure Investment: Head of Risk + Everyone
- Discussion of Risk—PE Investment: Head of Risk + Everyone
- Closing Remarks: Chief Investment Officer

The investment committee meeting will discuss key risks that R-SWF should consider as it determines whether to make new direct investments in PE and infrastructure.

# Memo 1A: Asset Allocation and Performance

- Since its inception, over a 25+ year period, R-SWF has built a diversified portfolio of investments. As of last month, the fund had AUM of \$50 billion USD, with the fund outperforming its overall benchmark by 150 bps net of fees since inception. Of course, there have been short-term periods of underperformance as the fund pursued its long-term strategy.
- Asset allocation as of last month for the overall fund was as follows:



- As of last month, R-SWF had approximately 50% of assets invested in alternative investments, consistent with its long-term objectives.
- In today's investment committee meeting, R-SWF is considering two new investments in alternative investments—specifically, in direct private equity and direct infrastructure investments. *(Note: Funding for these two investments will come from a combination of cash, dividends, receivables, and fixed income. The mix will be determined by the Asset/Liability Committee, or ALCO).*
- Because today's investment committee meeting will focus on alternative investments, we will break the allocation of alternatives down further, as follows:

# Alternative Investments

**Real Estate**

15%

**Private Capital**

10%

**Infrastructure**

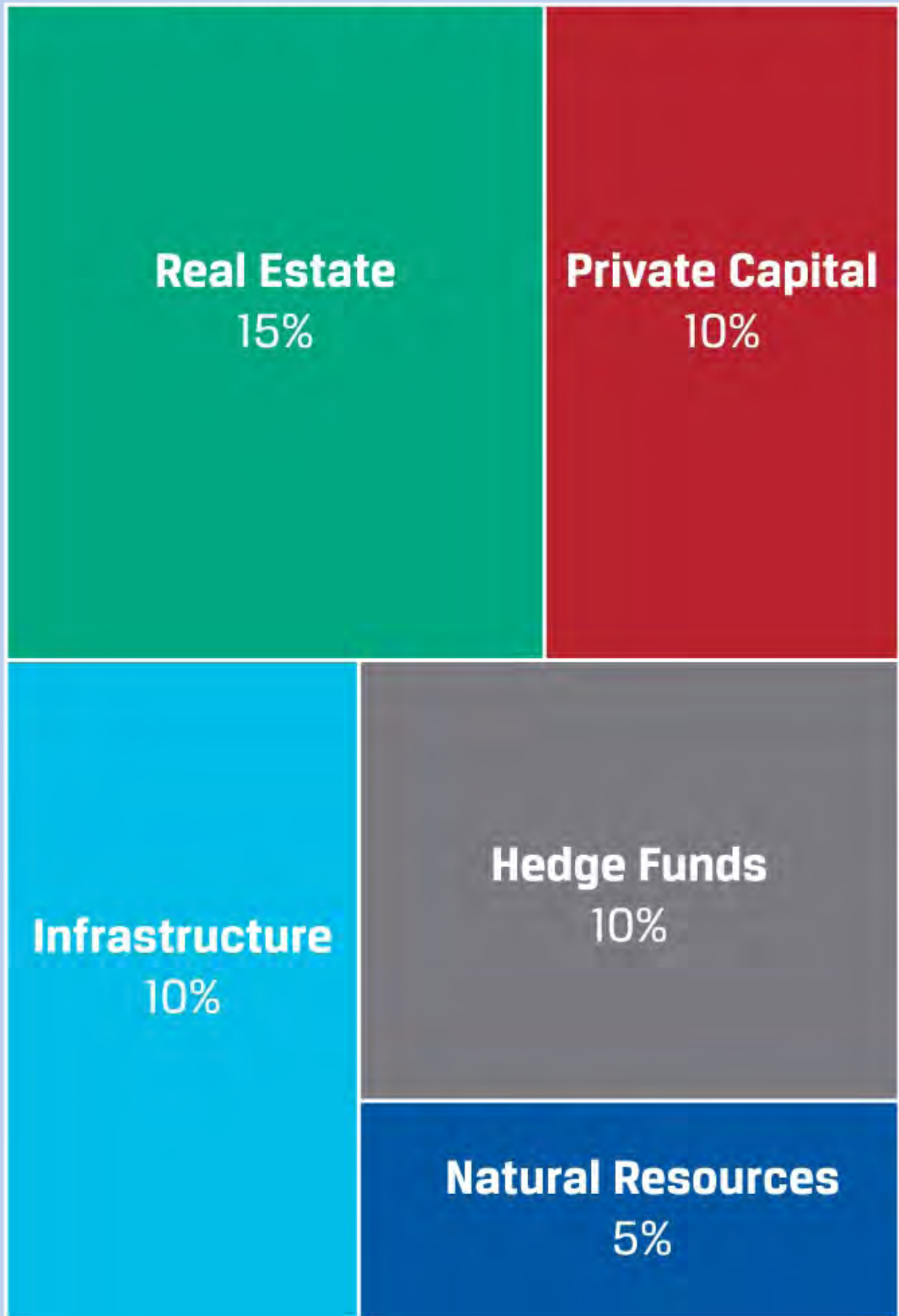
10%

**Hedge Funds**

10%

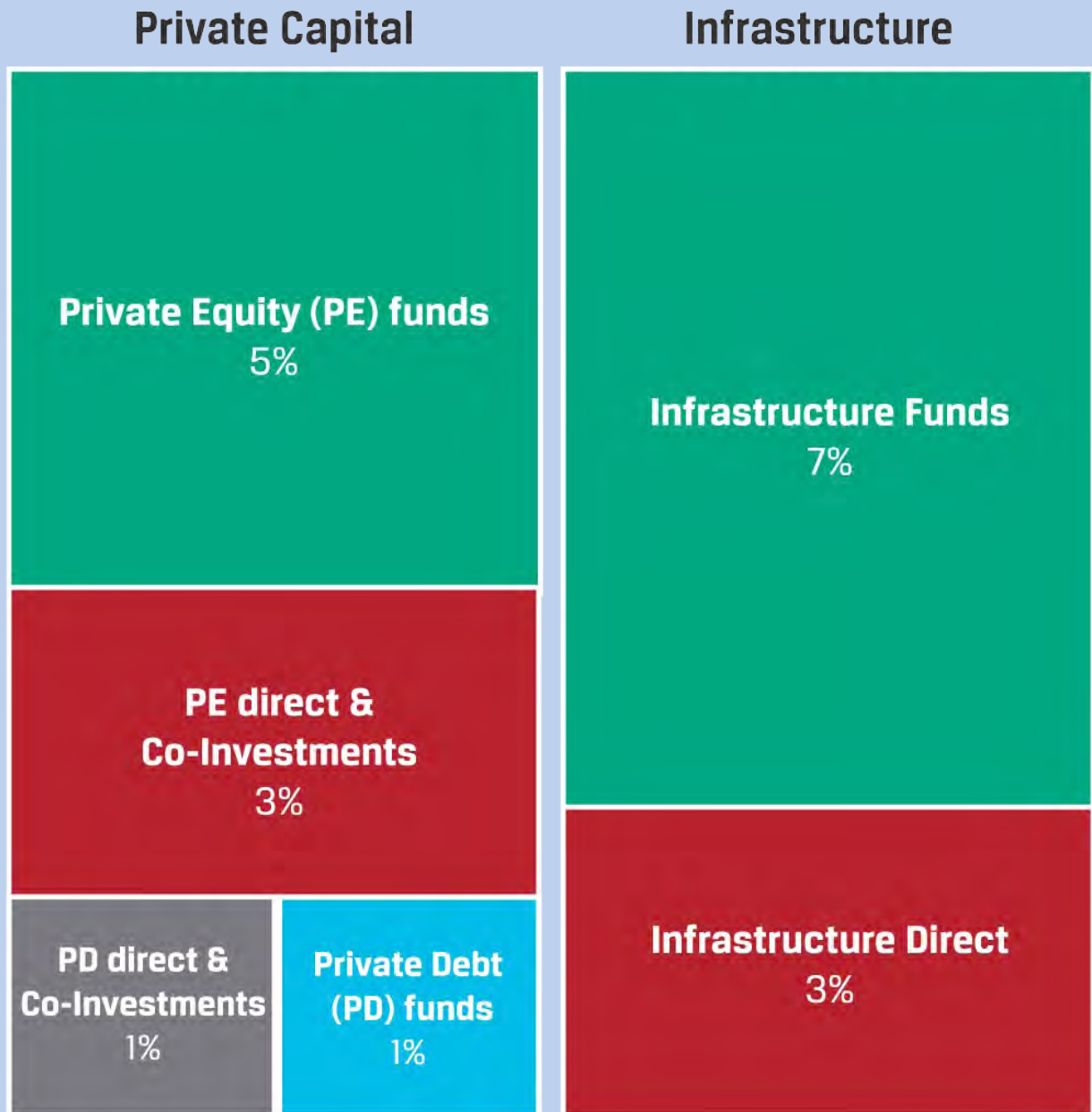
**Natural Resources**

5%





- As of last month, R-SWF had approximately 10% of assets invested in private capital and 10% of assets invested in Infrastructure.
- Next, we provide a breakdown of private capital and infrastructure:



- As of last month, R-SWF had approximately 3% of assets invested in private equity direct and co-investment and 3% of assets invested in direct Infrastructure.
- The investment committee will be discussing risk aspects of the cases, led by the Head of Risk and supported by the Risk Analyst.
- Details on the proposed infrastructure investment are found in Memo 1B.
- Details on the proposed private equity investment are found in Memo 1C.



# Memo 1B: Proposed Direct Infrastructure Investment

- The infrastructure direct investment opportunity is an investment in helping modernize an airport in the frontier market island nation of “Sunnyland.”
- Sunnyland has beautiful beaches and several hotels, ranging from 3–star to 5–star. However, the Sunnyland Airport has only one small runway that can support airplanes of only up to 10 passengers.
- The Sunnyland government is keen on expanding the airport with a new terminal and new runway. Doing so will allow much larger aircraft to land (up to 150 passengers) and be a major boost to tourism.
- The airport is located about 2 km from the sea, providing scenic views on takeoff and landing. The new runway will be built 1 km from the sea, providing even nicer views.
- R-SWF has been approached by the Sunnyland Airport Authority (SAA) to consider a \$100 million investment in a public–private partnership (PPP) on a build–operate–transfer (BOT) basis.
- For R-SWF (with assets of \$50 billion), this is a small investment (0.2% of total assets). The investment will be about 2% of total infrastructure assets—\$100 million/(\$100 million + \$5,000 million)—which includes investments in funds and direct investments.
- Other facts about this infrastructure investment that are important for the investment committee to understand: (*Note: The focus of the case and investment committee discussion is risks.*)
  - Total project cost of \$500 million for new 5 million passenger per annum (pax) terminal
  - \$33 million investment to be provided by Airport Operating Group (AOG), which will operate the airport under a management agreement (with fixed fee plus/minus performance incentive)
  - \$300 million funding to be provided through non-recourse project finance debt (i.e., approx. 70/30 debt/equity) with 15–year tenor following 3-year grace period
  - 2–year construction period, with fixed price construction contract awarded

under tender

- 25-year concession (including 2-year construction period), with investor consortium entitled to collect all regulated airport charges (e.g., passenger departure charge, landing charges) and commercial revenue (duty free, retail, F&B, car parking), subject to payment of quarterly concession fee of 35% of all revenue to SAA
- Airport charges (70% of all revenue) are regulated by concession contract—that is, schedule of charges set and then subject to stated formula for future changes (e.g., CPI)
- Concession agreement includes quality and performance standards to be met for design/construction/development (including timely delivery of new terminal) and operations, respectively
- Expected IRR for full investment term of 25 years of 15%

## **Risk Discussion: Infrastructure Investment**

The Head of Infrastructure believes the potential return on this project far outweighs the potential risk(s). However, she is happy to discuss potential risks with the investment committee.

## **Memo 1C: Proposed Direct Private Equity Investment**

- The private equity direct investment opportunity is an investment in a local beverage company (Atsui Beverage Company Limited (ABC)) that manufactures and sells carbonated beverages. The investment will be used to modernize the plant.
- ABC is an unlisted beverage company located in the tropical, land-locked nation of “Atsui.” Atsui has a developing economy and can be considered a frontier market.
- ABC is the only local manufacturer of carbonated beverages in Atsui. All other beverages are imported.
- ABC’s factory is located near a river that allows for transport to the port. Also, the river is known for its unique biodiversity.
- R-SWF’s Head of Private Equity has been on several vacations to Atsui and saw an investment opportunity.

- ABC is keen on modernizing its plant, but the founder is worried about giving up control. Thus, the founder is willing to sell only a minority stake of 35% in exchange for \$25 million.
- For R-SWF (with assets of \$50 billion), this is a small investment (0.05% of total assets). The investment will be about 0.4% of total PE assets—\$25 million/(\$25 million + \$6,000 million)—which includes investments in funds, co-investments, and direct investments.
- Other facts about this direct PE investment that are important for the investment committee to understand: (*Note: The focus of the case and investment committee discussion is risks.*)
  - R-SWF has been investing in PE for many years in funds. Over the years, R-SWF has developed direct investing capabilities through its co-investments and is now expanding its direct investing program.
  - Because of the increased direct investing capabilities of R-SWF and recent outperformance in returns, R-SWF is looking to increase its private equity allocation to direct investments over the next five years.
  - The government of Atsui has implemented tariffs on all soft drink imports. There is an upcoming election that could change this stance.
  - The cost to modernize the ABC plant is estimated to be \$20 million.
  - Over the last 12 months, ABC had a revenue of \$50 million. Revenue is expected to increase significantly over the next 10 years—with a modernized plant.
  - Over the last 12 months, ABC had an EBITDA of \$7 million. This is an EBITDA margin of 14% and a 10× EBITDA multiple. The Head of PE feels that there is significant room for improvement.
  - With the new technology from the plant modernization, ABC will be able to expand into non-carbonated drinks, such as sports drinks and juices.
  - Once the plant is modernized, productivity will improve significantly, allowing ABC to reduce factory staff headcount by 40%, from 500 employees to 300 employees, which will drive a higher EBITDA margin in the future.
  - With a significant minority, R-SWF will be allowed to have two seats on the board of ABC. So, the board will expand from five members to seven members. R-SWF is planning to have the Head of PE join the board of ABC

but hasn't decided on the other board seat.

## Risk Discussion: Private Equity Investment

The Head of PE believes the potential return on this project far outweighs the potential risk(s). However, he is happy to discuss potential risks with the Investment Committee.

### IN-TEXT QUESTION:

Please respond to the following question based on **Investment Committee Memo 1.0**.

As R-SWF's Risk Analyst, do you anticipate liquidity risk will likely be highlighted as a significant financial risk in the upcoming risk discussions for either investment? Explain your thinking.

### Guideline Answer:

No. I do not anticipate the Head of Infrastructure or the Head of PE to highlight liquidity risk as a significant risk for either investment. Although liquidity risk is the main risk that long-term institutional investors face, particularly during a significant market decline, each of these investments represents a small portion of R-SWF's total assets. R-SWF does not have cash flow pressure, unlike many institutional investors that face pressure from the regular payment of liabilities. In addition, R-SWF has been growing over time and is making a concerted effort to expand its direct investment program.

Direct investments typically help mitigate some of the liquidity issues commonly experienced when investing in a fund because direct investment provides a greater amount of control and discretion over when to exit investments. Furthermore, as the direct investment program grows and the proportion of direct investments as part R-SWF's total assets increases, R-SWF's ability to manage capital should improve. I believe there are other financial risks that are more likely to be highlighted as a significant risk for each investment.

## Investment Committee Meeting 1.0

## Participants

Chief Investment Officer (CIO)

Head of Infrastructure

Head of PE

Head of Risk

Head of Equities

Analysts [no speaking role]

### Chief Investment Officer:

Good morning, everyone. Welcome to today's investment committee meeting of the sovereign wealth fund of the Republic of Ruritania. After running this money on behalf of our citizens and future generations since its inception, the fund has outperformed our benchmark by 150 basis points, net of fees, and we've grown AUM to \$50 billion over 25 years. We are very blessed.

At last month's investment committee meeting, our **Head of Infrastructure** and our **Head of PE** got together to discuss the financials and particulars of two investment opportunities. As they both deserve our attention, today we are joined by our **Head of Risk**, along with our **Head of Equities**, to review them through the lens of risk. Our esteemed junior analysts are in the room with us to observe and provide additional analysis as required.

For now, as we consider our opportunities, I'm mostly here as a facilitator, to pave the way for a robust discussion of investment risk.

Memo A shows us our asset allocation as of mid-June, and we've got 50% in alternatives. We believe in alternatives because our liabilities are negligible and we take a long-term view of things. About 40% of our allocation is in listed equities, with a large portion of that in emerging markets, which we're also big believers in. If we do fund one or both of the two investments on the table, we'll do it with a mix of cash, dividends receivable, and fixed income, but that's not for this committee to decide; the ALCO will go over that at a later date.

In any event, our focus here is private capital, the private equity side. We've got about 3% of our investments in direct private equity and co-investments and about 3% in direct infrastructure.

Again, this meeting is primarily about risk. Let's go to Memo B and ask our **Head of**

**Infrastructure** to talk us through the first investment. It's usually the depth of her infrastructure experience that gives R-SWF the comfort to proceed in the face of risk.

## ***Infrastructure Investment Discussion***

### **Head of Infrastructure:**

Thank you for the kind words, **CIO**. I'm glad everyone's here so we can apply the full breadth of the investment committee's expertise.

This is an airport BOT project, a PPP in the frontier island nation of Sunnyland, whose primary industry is tourism. The members of our hard-working analyst team who are new to infrastructure have been briefed on the build-operate-transfer models that private developers often adopt under private-public partnerships so they can operate the facilities they have designed and built for a number of years before handing them over to government agencies.

[**Head of Infrastructure** looks around the room to see a few polite nods from the assembled analysts.]

Funds are needed for an airport upgrade: A new terminal and a new, bigger runway will accommodate larger planes. Sunnyland needs to get rid of the passenger bottleneck to allow for an all-important boost in tourism. We're thinking \$500 million and two years of construction time should be enough.

Ruritania is prepared to contribute \$100 million, and we're insisting on bringing in AOG, a properly experienced airport operator, which will also be investing private equity—about \$33 million. The rest of the capital will be no-recourse debt, about \$300 million, and an equity injection from the government and other infrastructure investors for the remainder. The debt will be 15-year with a 3-year grace period.

With the BOT arrangements, of course, we take over the airport from the beginning under a 25-year concession agreement for all the cash flows from the terminal. So that's airport charges, like aircraft landing and passenger departure fees, as well as the commercial revenue from duty-free concessions, retail, and so forth, and we remit 35% of what we collect to the Sunnyland Airport Authority on a quarterly basis. If we want to charge more, any increases—say, for CPI adjustments—are worked out according to fixed formulas.

**CIO** has set the stage for this discussion of risk, and in that spirit, everyone should note the standards and conditions of our agreement with the government. You already know we've got a two-year development program—that's two years to see the revamped airport up and running—so if there are delays or shortfalls in quality, the concession agreement sets out the consequences.

Finally, our expected return for the full 25-year term given our fund's \$100 million investment is a 15% IRR.

**Chief Investment Officer:**

Thank you, **Head of Infrastructure**. That's a sufficient return, to be sure, but let's also understand that our involvement can help our friends down in Sunnyland. If we execute this project carefully, it means a boost to the wealth of all Sunnylanders.

You've been there recently, right?

**Head of Infrastructure:**

I have. All indications are that it's an attractive tourist destination. Tourism is key to them now; they lack natural and other resources to diversify the economy. That's what they're depending on to build the economy.

Things are constrained because of the airport. The runway allows only for short, smaller aircraft, so just by increasing runway size and the associated facilities, you're paving a path for the whole nation to grow.

**Chief Investment Officer:**

I ask the assembled team to consider for a minute the responsibilities we have to ourselves, to Ruritania; we all feel partly responsible for its success. When we invest in another sovereign country, such as Sunnyland, we may carry over a similar sense of responsibility, and we take that seriously. While our proposed \$100 million investment is just 0.2% of our AUM, this single investment in transportation infrastructure will have an outsized impact on our investees.

With that in mind, let's move to the other proposal on the table. Our **Head of PE** has recently returned from Atsui, the site of the proposed private equity investment outlined in Memo C. Over to you, **Head of PE**.

## ***Private Equity Investment Discussion***

**Head of PE:**

Yeah, I just got back. The company is called Atsui Beverage Company or ABC for short, and it was kind of "love at first sight"—or sip. I was on the beach, and a waiter brought me a drink and said it was called the "Mango Special." I thanked him but I was barely listening.

You know how it is; my mind was elsewhere. But after the third : attention to my leisure and more attention to just how good this c perfectly sweet, and unlike anything I'd tasted before. You know investments, ladies and gents, and I began to think I'd stumbled c

I've been back to Atsui three times, and I introduced R-SWF to t that makes the Mango Special. I explained how sovereign wealth the long term, and I built some trust while learning about their bu this is compared to the rest of our portfolio, but I'm still obsessed out that we can invest \$25 million for 35% of the business. They revenue and \$7 million in EBITDA. For those on the team who c can, that's a 14% EBITDA margin. And we're looking at a comp 10× EBITDA.

So, wait: Is this a good deal or not?

Well, let's think about it. ABC markets the only locally sourced c Atsui, *and* tariffs are imposed on foreign competitors. That alone they'd use \$20 million of our \$25 million to modernize the plant. product way faster while also gearing up to make non-carbonated and juices. We'd drive efficiency enough to cut headcount from 5 better for the EBITDA margin: new equipment, big changes.

I've got the most knowledge on the ground, so I could take a boa else from our team. We've gotten pretty comfortable with co-inv and developing our skills, and since we're expanding our direct i seems like a good fit. It's just \$25 million out of our \$50 billion p learn, even if some of us think it's risky.

And, you know, sun, mango drinks, and the beach—I bet everyon

**Chief Investment Officer:**

So, the plant modernization allows for both a meaningful expans significant cost savings. But you said that a cut of 200 people un

**Head of PE:**

Yeah.

**Chief Investment Officer:**

OK. Any further questions for **Head of PE?**





















































































# GLOSSARY

## A

### **Absolute return benchmark**

A minimum target return that an investment manager is expected to beat.

### **Accounting defeasance**

Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

### **Accumulation phase**

Phase where the government predominantly contributes to a sovereign wealth pension reserve fund.

### **Active management**

A portfolio management approach that allows risk factor mismatches relative to a benchmark index causing potentially significant return differences between the active portfolio and the underlying benchmark.

### **Active return**

Portfolio return minus benchmark return.

### **Active risk**

The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

### **Active risk budgeting**

Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

## **Active share**

A measure of how similar a portfolio is to its benchmark. A manager who precisely replicates the benchmark will have an Active Share of zero; a manager with no holdings in common with the benchmark will have an Active Share of one.

## **Activist short selling**

A hedge fund strategy in which the manager takes a short position in a given security and then publicly presents his/her research backing the short thesis.

## **After-tax excess return**

Calculated as the after-tax return of the portfolio minus the after-tax return of the associated benchmark portfolio.

## **Agency trade**

A trade in which the broker is engaged to find the other side of the trade, acting as an agent. In doing so, the broker does not assume any risk for the trade.

## **Alpha decay**

In a trading context, alpha decay is the erosion or deterioration in short term alpha after the investment decision has been made.

## **Alternative trading systems**

(ATS) Non-exchange trading venues that bring together buyers and sellers to find transaction counterparties. Also called *multilateral trading facilities (MTF)*.

## **Anchoring and adjustment**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anchoring and adjustment bias**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anomalies**

Apparent deviations from market efficiency.

## **Arithmetic attribution**

An attribution approach which explains the arithmetic difference between the portfolio return and its benchmark return. The single-period attribution effects sum to the excess return, however, when combining multiple periods, the sub-period attribution effects will not sum to the excess return.

## **Arrival price**

In a trading context, the arrival price is the security price at the time the order was released to the market for execution.

## **Asset location**

The type of account an asset is held within, e.g., taxable or tax deferred.

## **Asset-only**

With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

## **Asset swap spread (ASW)**

The spread over MRR on an interest rate swap for the remaining life of the bond that is equivalent to the bond's fixed coupon.

## **Asset swaps**

Convert a bond's fixed coupon to MRR plus (or minus) a spread.

## **Authorized participants**

Institutional investors who create and redeem ETF shares using an OTC primary market with an ETF sponsor.

## **Availability bias**

An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

# **B**

## **Back-fill bias**



The distortion in index or peer group data which results when returns are reported to a database only after they are known to be good returns.

## **Barbell**

A fixed-income investment strategy combining short- and long-term bond positions.

## **Base**

With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in “one unit of a currency.”

## **Base-rate neglect**

A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

## **Basis risk**

The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

## **Bear flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in short-term bond yields-to-maturity.

## **Bear spread**

An option strategy that becomes more valuable when the price of the underlying asset declines, so requires buying one option and writing another with a *lower* exercise price. A put bear spread involves buying a put with a higher exercise price and selling a put with a lower exercise price. A bear spread can also be executed with calls.

## **Bear steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in long-term bond yields-to-maturity.

## **Behavioral finance macro**

A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

## **Behavioral finance micro**

A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

## **Bequest**

The transferring, or bequeathing, of assets in some other way upon a person's death. Also referred to as a testamentary bequest or testamentary gratuitous transfer.

## **Best-in-class**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *positive screening*.

## **Bid price**

In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

## **Breadth**

The number of truly independent decisions made each year.

## **Buffering**

Establishing ranges around breakpoints that define whether a stock belongs in one index or another.

## **Bull flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in long-term bond yields-to-maturity.

## **Bull spread**

An option strategy that becomes more valuable when the price of the underlying asset rises, so requires buying one option and writing another with a *higher* exercise price. A call bull spread involves buying a call with a lower exercise price and selling a call with a higher exercise price. A bull spread can also be executed with puts.

## **Bull steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in short-term bond yields-to-maturity.

## **Bullet**

A fixed-income investment strategy that focuses on the intermediate term (or “belly”) of the yield curve.

## **Business cycle**

Fluctuations in GDP in relation to long-term trend growth, usually lasting 9-11 years.

## **Butterfly spread**

A measure of yield curve shape or curvature equal to double the intermediate yield-to-maturity less the sum of short- and long-term yields-to-maturity.

## **Butterfly strategy**

A common yield curve shape strategy that combines a long or short bullet position with a barbell portfolio in the opposite direction to capitalize on expected yield curve shape changes.

# **C**

## **Calendar rebalancing**

Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

## **Calendar spread**

A strategy in which one sells an option and buys the same type of option but with different expiration dates, on the same underlying asset and with the same strike. When the investor buys the more distant (near-term) call and sells the near-term (more distant) call, it is a long (short) calendar spread.

## **Canada model**

Characterized by a high allocation to alternatives. Unlike the endowment model, however, the Canada model relies more on internally managed assets. The innovative features of the Canada model are the: a) reference portfolio, b) total portfolio approach, and c) active management.

## **Capital gain or loss**

For tax purposes equals the selling price (net of commissions and other trading costs) of the asset less its tax basis.

## **Capital market expectations**

(CME) Expectations concerning the risk and return prospects of asset classes.

## **Capital needs analysis**

See *capital sufficiency analysis*.

## **Capital sufficiency analysis**

The process by which a wealth manager determines whether a client has, or is likely to accumulate, sufficient financial resources to meet his or her objectives; also known as *capital needs analysis*.

## **Capture ratio**

A measure of the manager's gain or loss relative to the gain or loss of the benchmark.

## **Carhart model**

A four factor model used in performance attribution. The four factors are: market (RMRF), size (SMB), value (HML), and momentum (WML).

## **Carry trade**

A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

## **Carry trade across currencies**

A strategy seeking to benefit from a positive interest rate differential across currencies by combining a short position (or borrowing) in a low-yielding currency and a long position (or lending) in a high-yielding currency.

## **Cash drag**

Tracking error caused by temporarily uninvested cash.

## **Cash flow matching**

Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives.

## **Cash-secured put**

An option strategy involving the writing of a put option and simultaneously depositing an amount of money equal to the exercise price into a designated account (this strategy is also called a fiduciary put).

## **CDS curve**

Plot of CDS spreads across maturities for a single reference entity or group of reference entities in an index.

## **Cell approach**

See *stratified sampling*.

## **Charitable gratuitous transfers**

Asset transfers to not-for-profit or charitable organizations. In most jurisdictions charitable donations are not subject to a gift tax and most jurisdictions permit income tax deductions for charitable donations.

## **Charitable remainder trust**

A trust setup to provide income for the life of named-beneficiaries. When the last named-beneficiary dies any remaining assets in this trust are distributed to the charity named in the trust, hence the term *charitable remainder* trust.

## **Closet indexer**

A fund that advertises itself as being actively managed but is substantially similar to an index fund in its exposures.

## **Cognitive cost**

The effort involved in processing new information and updating beliefs.

## **Cognitive dissonance**

The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

## **Cognitive errors**

Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

## **Collar**

An option position in which the investor is long shares of stock and then buys a put with an exercise price below the current stock price and writes a call with an exercise price above the current stock price. Collars allow a shareholder to acquire downside protection through a protective put but reduce the cash outlay by writing a covered call.

## **Completion overlay**

A type of overlay that addresses an indexed portfolio that has diverged from its proper exposure.

## **Completion portfolio**

Is an index-based portfolio that when added to a given concentrated asset position creates an overall portfolio with exposures similar to the investor's benchmark.

## **Conditional value at risk**

(CVaR) Also known as expected loss The average portfolio loss over a specific time period conditional on that loss exceeding the value at risk (VaR) threshold.

## **Confirmation bias**

A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

## **Conjunction fallacy**

An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

## **Conservatism bias**

A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

## **Contingent immunization**

Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

## **Controlled foreign corporation (CFC)**

A company located outside a taxpayer's home country in which the taxpayer has a controlling interest as defined under the home country law.

## **Covered call**

An option strategy in which a long position in an asset is combined with a short position in a call on that asset.

## **Covered interest rate parity**

The relationship among the spot exchange rate, the forward exchange rate, and the interest rate in two currencies that ensures that the return on a hedged (i.e., covered) foreign risk-free investment is the same as the return on a domestic risk-free investment. Also called *interest rate parity*.

## **Credit cycle**

The expansion and contraction of credit over the business cycle, which translates into asset price changes based on default and recovery expectations across maturities and rating categories.

## **Credit default swap (CDS) basis**

Yield spread on a bond, as compared to CDS spread of same tenor.

## **Credit loss rate**

The realized percentage of par value lost to default for a group of bonds equal to the bonds' default rate multiplied by the loss severity.

## **Credit migration**

The change in a bond's credit rating over a certain period.

## **Credit valuation adjustment (CVA)**

The present value of credit risk for a loan, bond, or derivative obligation.

## **Cross-currency basis swap**

An interest rate swap involving the periodic exchange of floating payments in one currency for another based upon respective market reference rates with an initial and final exchange of notional principal.

## **Cross hedge**

A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

## **Cross-sectional consistency**

A feature of expectations setting which means that estimates for all classes reflect the same underlying assumptions and are generated with methodologies that reflect or preserve important relationships among the asset classes, such as strong correlations. It is the internal consistency across asset classes.

## **Cross-sectional momentum**

A managed futures trend following strategy implemented with a cross-section of assets (within an asset class) by going long those that are rising in price the most and by shorting those that are falling the most. This approach generally results in holding a net zero (market-neutral) position and works well when a market's out- or underperformance is a reliable predictor of its future performance.

## **Currency overlay**

A type of overlay that helps hedge the returns of securities held in foreign currency back to the home country's currency.

## **Currency overlay programs**

A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

## **Custom security-based benchmark**

Benchmark that is custom built to accurately reflect the investment discipline of a particular investment manager. Also called a *strategy benchmark* because it reflects a manager's particular strategy.

## **D**

## **Decision price**



In a trading context, the decision price is the security price at the time the investment decision was made.

### **Decision-reversal risk**

The risk of reversing a chosen course of action at the point of maximum loss.

### **Decumulation phase**

Phase where the government predominantly withdraws from a sovereign wealth pension reserve fund.

### **Dedicated short-selling**

A hedge fund strategy in which the manager takes short-only positions in equities deemed to be expensively priced versus their deteriorating fundamental situations. Short exposures may vary only in terms of portfolio sizing by, at times, holding higher levels of cash.

### **Default intensity**

POD over a specified time period in a reduced form credit model.

### **Default risk**

Likelihood that a borrower will default or fail to meet its obligation to make full and timely payments of principal and interest according to the terms of a debt obligation.

### **Deferred annuity**

An annuity that enables an individual to purchase an income stream that will begin at a later date.

### **Defined benefit**

A retirement plan in which a plan sponsor commits to paying a specified retirement benefit.

### **Defined contribution**

A retirement plan in which contributions are defined but the ultimate retirement benefit is not specified or guaranteed by the plan sponsor.

### **Delay cost**

The (trading related) cost associated with not submitting the order to the market in a timely manner.

## **Delta**

The change in an option's price in response to a change in price of the underlying, all else equal.

## **Delta hedging**

Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

## **Demand deposits**

Accounts that can be drawn upon regularly and without notice. This category includes checking accounts and certain savings accounts that are often accessible through online banks or automated teller machines (ATMs).

## **Diffusion index**

An index that measures how many indicators are pointing up and how many are pointing down.

## **Direct market access**

(DMA) Access in which market participants can transact orders directly with the order book of an exchange using a broker's exchange connectivity.

## **Disability income insurance**

A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

## **Discount margin**

The discount (or required) margin is the yield spread versus the MRR such that the FRN is priced at par on a rate reset date.

## **Discretionary portfolio management**

An arrangement in which a wealth manager has a client's pre-approval to execute investment decisions.

## **Discretionary trust**

A trust that enables the trustee to determine whether and how much to distribute based on a beneficiary's general welfare.

## **Disposition effect**

As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

## **Dividend capture**

A trading strategy whereby an equity portfolio manager purchases stocks just before their ex-dividend dates, holds these stocks through the ex-dividend date to earn the right to receive the dividend, and subsequently sells the shares.

## **Domestic asset**

An asset that trades in the investor's domestic currency (or home currency).

## **Domestic currency**

The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

## **Domestic-currency return**

A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

## **Double taxation**

A term used to describe situations in which income is taxed twice. For example, when corporate earnings are taxed at the company level and then that portion of earnings paid as dividends is taxed again at the investor level.

## **Drawdown**

A decline in value (represented by a series of negative returns only) following a peak fund valuation.

## **Drawdown duration**

The total time from the start of the drawdown until the cumulative drawdown recovers to zero.

## **Due diligence**

Investigation and analysis in support of an investment action, decision, or recommendation.

## **Duration matching**

Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

## **Duration times spread**

Weighting of spread duration by credit spread in order to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage, rather than absolute, basis.

## **Duration Times Spread (DTS)**

Weighting of spread duration by credit spread to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage rather than absolute basis.

## **Dynamic asset allocation**

A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

## **Dynamic hedge**

A hedge requiring adjustment as the price of the hedged asset changes.

# **E**

## **Earnings risk**

The risk associated with the earning potential of an individual.

## **Econometrics**

The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

## **Economic balance sheet**

A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet*.

## **Economic indicators**

Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

## **Economic net worth**

The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

## **Effective federal funds (FFE) rate**

The fed funds rate actually transacted between depository institutions, not the Fed's target federal funds rate.

## **Emotional biases**

Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

## **Empirical duration**

Estimation of the price-yield relationship using historical bond market data in statistical models.

## **Endowment bias**

An emotional bias in which people value an asset more when they hold rights to it than when they do not.

## **Endowment model**

Characterized by a high allocation to alternative investments (private investments and hedge funds), significant active management, and externally managed assets.

## **Enhanced indexing approach**

Maintains a close link to the benchmark but attempts to generate a modest amount of outperformance relative to the benchmark.

## **Enhanced indexing strategy**

Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

## **Equity monetization**

A group of strategies that allow investors to receive cash for their concentrated stock positions without an outright sale. These transactions are structured to avoid triggering the capital gains tax.

## **Estate**

Consists of all of the property a person owns or controls, which may consist of financial assets (e.g., bank accounts, stocks, bonds, business interests), tangible personal assets (e.g., artwork, collectibles, vehicles), immovable property (e.g., residential real estate, timber rights), and intellectual property (e.g., royalties).

## **Estate planning**

The process of preparing for the disposition of one's estate upon death and during one's lifetime.

## **Estate tax**

Levied on the total value of a deceased person's assets and paid out of the estate before any distributions to beneficiaries.

## **Evaluated pricing**

*See matrix pricing.*

## **Excess return**

Used in various senses appropriate to context: 1) The difference between the portfolio return and the benchmark return; 2) The return in excess of the risk-free rate.

## **Excess spread**

Credit spread return measure that incorporates both changes in spread and expected credit losses for a given period.

## **Exchange fund**

A partnership in which each of the partners have each contributed low cost-basis stock to the fund. Used in the United States as a mechanism to achieve a tax-free exchange of a concentrated asset position.

## **Execution cost**

The difference between the (trading related) cost of the real portfolio and the paper portfolio, based on shares and prices transacted.

## **Exhaustive**

An index construction strategy that selects every constituent of a universe.

## **Expected shortfall**

The average loss conditional on exceeding the VaR cutoff; sometimes referred to as *conditional VaR* or *expected tail loss*.

## **Expected tail loss**

See *expected shortfall*.

## **Extended portfolio assets and liabilities**

Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

# **F**

## **Factor-model-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

## **Family constitution**

Typically a non-binding document that sets forth an agreed-upon set of rights, values, and responsibilities of the family members and other stakeholders. Used by many wealth- and business-owning families as the starting point of conflict resolution

procedures.

## **Family governance**

The process for a family's collective communication and decision making designed to serve current and future generations based on the common values of the family.

## **Financial capital**

The tangible and intangible assets (excluding human capital) owned by an individual or household.

## **Fixed trust**

Distributions to beneficiaries of a fixed trust are specified in the trust document to occur at certain times or in certain amounts.

## **Forced heirship**

Is the requirement that a certain proportion of assets must pass to specified family members, such as a spouse and children.

## **Foreign assets**

Assets denominated in currencies other than the investor's home currency.

## **Foreign currency**

Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

## **Foreign-currency return**

The return of the foreign asset measured in foreign-currency terms.

## **Forward rate bias**

An empirically observed divergence from interest rate parity conditions that active investors seek to benefit from by borrowing in a lower-yield currency and investing in a higher-yield currency.

## **Foundation**

A legal entity available in certain jurisdictions. Foundations are typically set up to hold assets for a specific charitable purpose, such as to promote education or for



philanthropy. When set up and funded by an individual or family and managed by its own directors, it is called a *private foundation*. The term *family foundation* usually refers to a private foundation where donors or members of the donors' family are actively involved.

## **Framing**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Framing bias**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Fulcrum securities**

Partially-in-the-money claims (not expected to be repaid in full) whose holders end up owning the reorganized company in a corporate reorganization situation.

## **Full replication approach**

When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

## **Fund-of-funds**

A fund of hedge funds in which the fund-of-funds manager allocates capital to separate, underlying hedge funds (e.g., single manager and/or multi-manager funds) that themselves run a range of different strategies.

## **Funding currencies**

The low-yield currencies in which borrowing occurs in a carry trade.

# **G**

## **G-spread**

Yield spread for a fixed-rate bond over a government benchmark.

## **Gamblers' fallacy**

A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

## **Gamma**

The change in an option's delta for a change in price of the underlying, all else equal.

## **General account**

Account holding assets to fund future liabilities from traditional life insurance and fixed annuities, the products in which the insurer bears all the risks—particularly mortality risk and longevity risk.

## **Generation-skipping tax**

Taxes levied in some jurisdictions on asset transfers (gifts) that skip one generation such as when a grandparent transfers assets to their grandchildren. (see related Gift Tax).

## **Gift tax**

Depending on the tax laws of the country, assets gifted by one person to another during the giftor's lifetime may be subject to a gift tax.

## **Goals-based**

With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

## **Goals-based investing**

An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

## **Green bonds**

Fixed-income instruments issued by private or public sector borrowers that directly fund ESG initiatives.

## **Grinold–Kroner model**

An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

# H

## **Halo effect**

An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

## **Hard-catalyst event-driven approach**

An event-driven approach in which investments are made in reaction to an already announced corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) in which security prices related to the event have yet to fully converge.

## **Hazard rate**

The conditional POD, or the likelihood that default will occur given that it has not already occurred in a prior period.

## **Health insurance**

A type of insurance used to cover health care and medical costs.

## **Health risk**

The risk associated with illness or injury.

## **Hedge ratio**

The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

## **Herding**

When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

## **High-water mark**

A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

## **Hindsight bias**

A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

### **Holdings-based attribution**

A “buy and hold” attribution approach which calculates the return of portfolio and benchmark components based upon the price and foreign exchange rate changes applied to daily snapshots of portfolio holdings.

### **Holdings-based style analysis**

A bottom-up style analysis that estimates the risk exposures from the actual securities held in the portfolio at a point in time.

### **Holistic balance sheet**

*See economic balance sheet.*

### **Home bias**

A preference for securities listed on the exchanges of one’s home country.

### **Home-country bias**

The favoring of domestic over non-domestic investments relative to global market value weights.

### **Home currency**

*See domestic currency.*

### **Human capital**

An implied asset; the net present value of an investor’s future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital*.

## **I**

### **I-spread (interpolated spread)**

Yield spread measure using swaps or constant maturity Treasury YTM as a benchmark.

## **Illusion of control**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Illusion of control bias**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Immediate annuity**

An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

## **Immunization**

An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

## **Impact investing**

Investment approach that seeks to achieve targeted social or environmental objectives along with measurable financial returns through engagement with a company or by direct investment in projects or companies.

## **Implementation shortfall**

(IS) The difference between the return for a notional or paper portfolio, where all transactions are assumed to take place at the manager's decision price, and the portfolio's actual return, which reflects realized transactions, including all fees and costs.

## **Implied volatility**

The outlook for the future volatility of the underlying asset's price. It is the value (i.e., standard deviation of underlying's returns) that equates the model (e.g., Black–Scholes–Merton model) price of an option to its market price.

## **Implied volatility surface**

A three-dimensional plot, for put and call options on the same underlying asset, of days to expiration ( $x$ -axis), option strike prices ( $y$ -axis), and implied volatilities ( $z$ -axis). It

simultaneously shows the volatility skew (or smile) and the term structure of implied volatility.

### **Incremental VaR (or partial VaR)**

The change in the minimum portfolio loss expected to occur over a given time period at a specific confidence level resulting from increasing or decreasing a portfolio position.

### **Information coefficient**

Formally defined as the correlation between forecast return and actual return. In essence, it measures the effectiveness of investment insight.

### **Inheritance tax**

Paid by each individual beneficiary of a deceased person's estate on the value of the benefit the individual received from the estate.

### **Input uncertainty**

Uncertainty concerning whether the inputs are correct.

### **Interaction effect**

The attribution effect resulting from the interaction of the allocation and selection decisions.

### **Intertemporal consistency**

A feature of expectations setting which means that estimates for an asset class over different horizons reflect the same assumptions with respect to the potential paths of returns over time. It is the internal consistency over various time horizons.

### **Intestate**

A person who dies without a valid will or with a will that does not dispose of their property are considered to have died intestate.

### **Intrinsic value**

The difference between the spot exchange rate and the strike price of a currency option.

### **Investment currencies**

The high-yielding currencies in a carry trade.

## **Investment policy statement**

A written planning document that describes a client's investment objectives and risk tolerance over a relevant time horizon, along with the constraints that apply to the client's portfolio.

## **Investment style**

A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

## **Irrevocable trust**

The person whose assets are used to create the trust gives up the right to rescind the trust relationship and regain title to the trust assets.

# **K**

## **Key person risk**

The risk that results from over-reliance on an individual or individuals whose departure would negatively affect an investment manager.

## **Key rate duration**

A method of measuring interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

## **Knock-in/knock-out**

Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

# **L**

## **Leading economic indicators**

A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

## **Liability-based mandates**

Mandates managed to match or cover expected liability payments (future cash outflows) with future projected cash inflows.

## **Liability-driven investing**

An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

## **Liability driven investing (LDI) model**

In the LDI model, the primary investment objective is to generate returns sufficient to cover liabilities, with a focus on maximizing expected surplus return (excess return of assets over liabilities) and managing surplus volatility.

## **Liability glide path**

A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

## **Liability insurance**

A type of insurance used to manage liability risk.

## **Liability-relative**

With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

## **Liability risk**

The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

## **Life-cycle finance**

A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

## **Life insurance**

A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.



## **Life settlement**

The sale of a life insurance contract to a third party. The valuation of a life settlement typically requires detailed biometric analysis of the individual policyholder and an understanding of actuarial analysis.

## **Limited-life foundations**

A type of foundation where founders seek to maintain control of spending while they (or their immediate heirs) are still alive.

## **Liquidity budget**

The portfolio allocations (or weightings) considered acceptable for the liquidity categories in the liquidity classification schedule (or time-to-cash table).

## **Liquidity classification schedule**

A liquidity management classification (or table) that defines portfolio liquidity “buckets” or categories based on the estimated time it would take to convert assets in that particular category into cash.

## **Longevity risk**

The risk of outliving one’s financial resources.

## **Loss-aversion bias**

A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

## **Loss severity**

Also known as loss given default (LGD). The amount of loss if a default occurs, usually expressed as a percentage in annual terms.

# **M**

## **Macro attribution**

Attribution at the sponsor level.

## **Manager peer group**

See *manager universe*.

## **Manager universe**

A broad group of managers with similar investment disciplines. Also called *manager peer group*.

## **Matrix pricing**

An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

## **Matrix pricing (or evaluated pricing)**

Methodology for pricing infrequently traded bonds using bonds from similar issuers and actively traded government benchmarks to establish a bond's fair value.

## **Mental accounting bias**

An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

## **Micro attribution**

Attribution at the portfolio manager level.

## **Minimum-variance hedge ratio**

A mathematical approach to determining the optimal cross hedging ratio.

## **Mission-related investing**

Aims to direct a significant portion of assets in excess of annual grants into projects promoting a foundation's mission.

## **Model uncertainty**

Uncertainty as to whether a selected model is correct.

## **Mortality table**

A table that indicates individual life expectancies at specified ages.

## **Multi-class trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and involves buying and selling different classes of shares of the same company, such as voting and non-voting shares.

### **Multi-manager fund**

Can be of two types—one is a multi-strategy fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund; the second type is a fund of hedge funds (or fund-of-funds) in which the manager allocates capital to separate, underlying hedge funds that themselves run a range of different strategies.

### **Multi-strategy fund**

A fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund.

### **Multilateral trading facilities**

(MTF) See *Alternative trading systems (ATS)*.

## **N**

### **Negative butterfly**

An increase in the butterfly spread due to lower short- and long-term yields-to-maturity and a higher intermediate yield-to-maturity.

### **Negative screening**

An ESG implementation approach that excludes certain sectors or companies that deviate from an investor's accepted standards.

### **Non-deliverable forwards**

Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

### **Nonstationarity**

A characteristic of series of data whose properties, such as mean and variance, are not constant through time. When analyzing historical data it means that different parts of a

data series reflect different underlying statistical properties.

## **Norway model**

Characterized by an almost exclusive reliance on public equities and fixed income (the traditional 60/40 equity/bond model falls under the Norway model), with largely passively managed assets and with very little to no allocation to alternative investments.

## **O**

### **OAS duration**

The change in bond price for a given change in OAS.

### **Offer price**

The price at which a counterparty is willing to sell one unit of the base currency.

### **Opportunity cost**

The (trading related) cost associated with not being able to transact the entire order at the decision price.

### **Option-adjusted spread (OAS)**

A generalization of the Z-spread yield spread calculation that incorporates bond option pricing based on assumed interest rate volatility.

### **Optional stock dividends**

A type of dividend in which shareholders may elect to receive either cash or new shares.

### **Options on bond futures contracts**

Instruments that involve the right, but not the obligation, to enter into a bond futures contract at a pre-determined strike (bond price) on a future date in exchange for an up-front premium.

### **Overbought**

When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

## **Overconfidence bias**

A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

## **Overlay**

A derivative position (or positions) used to adjust a pre-existing portfolio closer to its objectives.

## **Oversold**

The opposite of overbought; see *overbought*.

# **P**

## **Packeting**

Splitting stock positions into multiple parts.

## **Pairs trading**

An equity market-neutral strategy that capitalizes on the misalignment in prices of pairs of similar under- and overvalued equities. The expectation is the differential valuations or trading relationships will revert to their long-term mean values or their fundamentally-correct trading relationships, with the long position rising and the short position declining in value.

## **Parameter uncertainty**

Uncertainty arising because a quantitative model's parameters are estimated with error.

## **Participant/cohort option**

Pools the DC plan member with a cohort that has a similar target retirement date.

## **Participant-switching life-cycle options**

Automatically switch DC plan members into a more conservative asset mix as their age increases. There may be several automatic de-risking switches at different age targets.

## **Passive investment**

In the fixed-income context, it is investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

## **Passive management**

A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

## **Percent-range rebalancing**

An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

## **Performance attribution**

Attribution, including return attribution and risk attribution; often used as a synonym for return attribution.

## **Permanent life insurance**

A type of life insurance that provides lifetime coverage.

## **Portfolio overlay**

An array of derivative positions managed separately from the securities portfolio to achieve overall intended portfolio characteristics.

## **Position delta**

The overall or portfolio delta. For example, the position delta of a covered call, consisting of long 100 shares and short one at-the-money call, is +50 (= +100 for the shares and -50 for the short ATM call).

## **Positive butterfly**

A decrease in the butterfly spread due to higher short- and long-term yields-to-maturity and a lower intermediate yield-to-maturity.

## **Positive screening**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *best-in-class*.

## **Post-liquidation return**

Calculates the return assuming that all portfolio holdings are sold as of the end date of the analysis and that the resulting capital gains tax that would be due is deducted from the ending portfolio value.

## **Potential capital gain exposure (PCGE)**

Is an estimate of the percentage of a fund's assets that represents gains and measures how much the fund's assets have appreciated. It can be an indicator of possible future capital gain distributions.

## **Premature death risk**

The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

## **Present value of distribution of cash flows methodology**

Method used to address a portfolio's sensitivity to rate changes along the yield curve. This approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

## **Principal trade**

A trade in which the market maker or dealer becomes a disclosed counterparty and assumes risk for the trade by transacting the security for their own account. Also called *broker risk trades*.

## **Probability of default**

The likelihood that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest.

## **Probate**

The legal process to confirm the validity of the will so that executors, heirs, and other interested parties can rely on its authenticity.

## **Program trading**

A strategy of buying or selling many stocks simultaneously.

## **Progressive tax rate schedule**

A tax regime in which the tax rate increases as the amount of income or wealth being taxed increases.

## **Property insurance**

A type of insurance used by individuals to manage property risk.

## **Property risk**

The possibility that a person's property may be damaged, destroyed, stolen, or lost.

## **Protective put**

An option strategy in which a long position in an asset is combined with a long position in a put on that asset.

## **Pure indexing**

Attempts to replicate a bond index as closely as possible, targeting zero active return and zero active risk.

## **Put spread**

A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

# **Q**

## **Qualified dividends**

Generally dividends from shares in domestic corporations and certain qualified foreign corporations which have been held for at least a specified minimum period of time.

## **Quantitative market-neutral**

An approach to building market-neutral portfolios in which large numbers of securities are traded and positions are adjusted on a daily or even an hourly basis using algorithm-based models.

## **Quoted margin**

The yield spread over the MRR established upon issuance of an FRN to compensate investors for assuming an issuer's credit risk.



# R

## Re-base

With reference to index construction, to change the time period used as the base of the index.

## Realized volatility

Historical volatility, the square root of the realized variance of returns, which is a measure of the range of past price outcomes for the underlying asset.

## Rebalancing

In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

## Rebalancing overlay

A type of overlay that addresses a portfolio's need to sell certain constituent securities and buy others.

## Rebalancing range

A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

## Rebate rate

The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

## Reduced form credit models

Credit models that solve for default probability over a specific time period using observable company-specific variables such as financial ratios and macroeconomic variables.

## Reduced-form models

Models that use economic theory and other factors such as prior research output to describe hypothesized relationships. Can be described as more compact representations of underlying structural models. Evaluate endogenous variables in terms of observable

exogenous variables.

## **Regime**

The governing set of relationships (between variables) that stem from technological, political, legal, and regulatory environments. Changes in such environments or policy stances can be described as changes in regime.

## **Regret**

The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

## **Regret-aversion bias**

An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

## **Relative value**

A concept that describes the selection of the most attractive individual securities to populate the portfolio with, using ranking and comparing.

## **Relative value volatility arbitrage**

A volatility trading strategy that aims to source and buy cheap volatility and sell more expensive volatility while netting out the time decay aspects normally associated with options portfolios.

## **Relative VaR**

The minimum portfolio loss expected to occur over a given time period at a specific confidence level based on a portfolio containing active positions minus benchmark holdings.

## **Repo rate**

The interest rate on a repurchase agreement.

## **Representativeness bias**

A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

## **Repurchase agreements**

In repurchase agreements, or *repos*, a security owner agrees to sell a security for a specific cash amount while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

## **Request for quote**

(RFQ) A non-binding quote provided by a market maker or dealer to a potential buyer or seller upon request. Commonly used in fixed income markets these quotes are only valid at the time they are provided.

## **Reserve portfolio**

The component of an insurer's general account that is subject to specific regulatory requirements and is intended to ensure the company's ability to meet its policy liabilities. The assets in the reserve portfolio are managed conservatively and must be highly liquid and low risk.

## **Resistance levels**

Price points on dealers' order boards where one would expect to see a clustering of offers.

## **Return attribution**

A set of techniques used to identify the sources of the excess return of a portfolio against its benchmark.

## **Returns-based attribution**

An attribution approach that uses only the total portfolio returns over a period to identify the components of the investment process that have generated the returns. The Brinson–Hood–Beebower approach is a returns-based attribution approach.

## **Returns-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

## **Returns-based style analysis**

A top-down style analysis that involves estimating the sensitivities of a portfolio to security market indexes.

## **Reverse repos**

Repurchase agreements from the standpoint of the lender.

## **Revocable trust**

The person whose assets are used to create the trust retains the right to rescind the trust relationship and regain title to the trust assets.

## **Risk attribution**

The analysis of the sources of risk.

## **Risk aversion**

The degree of an investor's unwillingness to take risk; the inverse of risk tolerance.

## **Risk budgeting**

The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

## **Risk capacity**

The ability to accept financial risk.

## **Risk perception**

The subjective assessment of the risk involved in the outcome of an investment decision.

## **Risk premium**

An extra return expected by investors for bearing some specified risk.

## **Risk reversal**

A strategy used to profit from the existence of an implied volatility skew and from changes in its shape over time. A combination of long (short) calls and short (long) puts on the same underlying with the same expiration is a long (short) risk reversal.

## **Risk tolerance**

The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

# S

## **Sample-size neglect**

A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or “real” data).

## **Scenario analysis**

What-if analysis that involves changing multiple assumptions at the same time in order to evaluate the change in an investment’s value.

## **Seagull spread**

An extension of the risk reversal foreign exchange option strategy that limits downside risk.

## **Securities lending**

A form of collateralized lending that may be used to generate income for portfolios.

## **Selective**

An index construction methodology that targets only those securities with certain characteristics.

## **Self-attribution bias**

A bias in which people take personal credit for successes and attribute failures to external factors outside the individual’s control.

## **Self-control bias**

A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

## **Separate accounts**

Accounts holding assets to fund future liabilities from variable life insurance and variable annuities, the products in which customers make investment decisions from a menu of options and themselves bear investment risk.

## **Sharpe ratio**

The average return in excess of the risk-free rate divided by the standard deviation of return; a measure of the average excess return earned per unit of standard deviation of return. Also known as the *reward-to-variability ratio*.

## **Short-biased**

A hedge fund strategy in which the manager uses a less extreme version of dedicated short-selling. It involves searching for opportunities to sell expensively priced equities, but short exposure may be balanced with some modest value-oriented, or index-oriented, long exposure.

## **Shortfall probability**

The probability of failing to meet a specific liability or goal.

## **Shrinkage estimation**

Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

## **Single-manager fund**

A fund in which one portfolio manager or team of portfolio managers invests in one strategy or style.

## **Smart beta**

Involves the use of transparent, rules-based strategies as a basis for investment decisions.

## **Smart order routers**

(SOR) Smart systems used to electronically route small orders to the best markets for execution based on order type and prevailing market conditions.

## **Social proof**

A bias in which individuals tend to follow the beliefs of a group.

## **Soft-catalyst event-driven approach**

An event-driven approach in which investments are made proactively in anticipation of a corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) that has yet to occur.

## Special dividends

A dividend paid by a company that does not pay dividends on a regular schedule, or a dividend that supplements regular cash dividends with an extra payment.

## Spread duration

The change in bond price for a given change in yield spread. Also referred to as *OAS duration* when the option-adjusted spread (OAS) is the yield measure used.

## Staged diversification strategy

The simplest approach to managing the risk of a concentrated position involves selling the concentrated position over some period of time, paying associated tax, and reinvesting the proceeds in a diversified portfolio.

## Static hedge

A hedge that is not sensitive to changes in the price of the asset hedged.

## Status quo bias

An emotional bias in which people do nothing (i.e., maintain the “status quo”) instead of making a change.

## Stock lending

Securities lending involving the transfer of equities.

## Stop-losses

A trading order that sets a selling price below the current market price with a goal of protecting profits or preventing further losses.

## Stops

Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

## Straddle

An option combination in which one buys *both* puts and calls, with the same exercise price and same expiration date, on the same underlying asset. In contrast to this long straddle, if someone *writes* both options, it is a short straddle.

## **Strangle**

A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

## **Stratified sampling**

A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

## **Structural credit models**

Credit models that apply market-based variables to estimate the value of an issuer's assets and the volatility of asset value.

## **Structural models**

Models that specify functional relationships among variables based on economic theory. The functional form and parameters of these models are derived from the underlying theory. They may include unobservable parameters.

## **Structural risk**

Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

## **Stub trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and entails buying and selling stock of a parent company and its subsidiaries, typically weighted by the percentage ownership of the parent company in the subsidiaries.

## **Support levels**

Price points on dealers' order boards where one would expect to see a clustering of bids.

## **Surplus**

The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

## **Surplus portfolio**



The component of an insurer's general account that is intended to earn higher expected returns than the reserve portfolio and so can assume more risk. Surplus portfolio assets are often managed aggressively with high-risk assets.

## **Survivorship bias**

Bias that arises in a data series when managers with poor track records are dropped from the database whereas managers with good track records remain. A data series of a given date reflects only entities that have survived to that date.

## **Swaption**

This instrument grants a party the right, but not the obligation, to enter into a rate swap at a pre-determined strike (fixed swap rate) on a future date, for a fixed up-front premium.

## **Synthetic long forward position**

The combination of a long call and a short put with identical strike prices, both traded at the same time on the same underlying.

## **Synthetic short forward position**

The combination of a short call and a long put at the same strike price, both traded at the same time on the same underlying.

# **T**

## **Tactical asset allocation**

Asset allocation that involves making short-term adjustments to the portfolio based on short-term predictions of relative performance among asset classes.

## **Tax alpha**

Calculated by subtracting the pre-tax excess return from the total return. Tax alpha isolates the benefit of tax management of the portfolio.

## **Tax avoidance**

The legal activity of understanding the tax laws and finding ways to minimize tax liability.

















# ETHICAL AND PROFESSIONAL STANDARDS

CFA® Program Curriculum  
**2022 • LEVEL III • VOLUME 6**

**WILEY**

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Example 2 (Notification of Outside Compensation):

Example 3 (Prior Approval for Outside Compensation):

Standard IV(C): Duties to Employers - Responsibilities of Supervisors

Guidance

System for Supervision

Supervision Includes Detection

Standard IV(C): Recommended Procedures

Codes of Ethics or Compliance Procedures

Adequate Compliance Procedures

Implementation of Compliance Education and Training

Establish an Appropriate Incentive Structure

Standard IV(C): Application of the Standard

Example 1 (Supervising Research Activities):

Example 2 (Supervising Research Activities):

Example 3 (Supervising Trading Activities):

Example 4 (Supervising Trading Activities and Record Keeping):

Example 5 (Accepting Responsibility):

Example 6 (Inadequate Procedures):

Example 7 (Inadequate Supervision):

Example 8 (Supervising Research Activities):

Example 9 (Supervising Research Activities):

Standard V(A): Investment Analysis, Recommendations, and Actions - Diligence and Reasonable Basis

Standard V(A) Diligence and Reasonable Basis

Guidance

Defining Diligence and Reasonable Basis

Using Secondary or Third-Party Research

Using Quantitatively Oriented Research

Developing Quantitatively Oriented Techniques

Selecting External Advisers and Subadvisers

Group Research and Decision Making

Standard V(A): Recommended Procedures

## Standard V(A): Application of the Standard

Example 1 (Sufficient Due Diligence):

Example 2 (Sufficient Scenario Testing):

Example 3 (Developing a Reasonable Basis):

Example 4 (Timely Client Updates):

Example 5 (Group Research Opinions):

Example 6 (Reliance on Third-Party Research):

Example 7 (Due Diligence in Submanager Selection):

Example 8 (Sufficient Due Diligence):

Example 9 (Sufficient Due Diligence):

Example 10 (Sufficient Due Diligence):

Example 11 (Use of Quantitatively Oriented Models):

Example 12 (Successful Due Diligence/Failed Investment):

Example 13 (Quantitative Model Diligence):

Example 14 (Selecting a Service Provider):

Example 15 (Subadviser Selection):

Example 16 (Manager Selection):

Example 17 (Technical Model Requirements):

## Standard V(B): Investment Analysis, Recommendations, and Actions - Communication with Clients and Prospective Clients

### Guidance

Informing Clients of the Investment Process

Different Forms of Communication

Identifying Risks and Limitations

Report Presentation

Distinction between Facts and Opinions in Reports

## Standard V(B): Recommended Procedures

## Standard V(B): Application of the Standard

Example 1 (Sufficient Disclosure of Investment System):

Example 2 (Providing Opinions as Facts):

Example 3 (Proper Description of a Security):

Example 4 (Notification of Fund Mandate Change):

Example 5 (Notification of Fund Mandate Change):

Example 6 (Notification of Changes to the Investment Process):

Example 7 (Notification of Changes to the Investment Process):

Example 8 (Notification of Changes to the Investment Process):

Example 9 (Sufficient Disclosure of Investment System):

Example 10 (Notification of Changes to the Investment Process):

Example 11 (Notification of Errors):

Example 12 (Notification of Risks and Limitations):

Example 13 (Notification of Risks and Limitations):

Example 14 (Notification of Risks and Limitations):

Standard V(C): Investment Analysis, Recommendations, and Actions -  
Record Retention

Guidance

New Media Records

Records Are Property of the Firm

Local Requirements

Standard V(C): Recommended Procedures

Standard V(C): Application of the Standard

Example 1 (Record Retention and IPS Objectives and  
Recommendations):

Example 2 (Record Retention and Research Process):

Example 3 (Records as Firm, Not Employee, Property):

Standard VI(A): Conflicts of Interest - Disclosure of Conflicts

Standard VI(A) Disclosure of Conflicts

Guidance

Disclosure of Conflicts to Employers

Disclosure to Clients

Cross-Departmental Conflicts

Conflicts with Stock Ownership

Conflicts as a Director

Standard VI(A): Recommended Procedures

Standard VI(A): Application of the Standard

Example 1 (Conflict of Interest and Business Relationships):

Example 2 (Conflict of Interest and Business Stock Ownership):

Example 3 (Conflict of Interest and Personal Stock Ownership):

Example 4 (Conflict of Interest and Personal Stock Ownership):

Example 5 (Conflict of Interest and Compensation Arrangements):

Example 6 (Conflict of Interest, Options, and Compensation  
Arrangements):

Example 7 (Conflict of Interest and Compensation Arrangements):

Example 8 (Conflict of Interest and Directorship):

Example 9 (Conflict of Interest and Personal Trading):

Example 10 (Conflict of Interest and Requested Favors):

Example 11 (Conflict of Interest and Business Relationships):

Example 12 (Disclosure of Conflicts to Employers):

Standard VI(B): Conflicts of Interest - Priority of Transactions

Guidance

Avoiding Potential Conflicts

Personal Trading Secondary to Trading for Clients

Standards for Nonpublic Information

## Impact on All Accounts with Beneficial Ownership

Standard VI(B): Recommended Procedures

Standard VI(B): Application of the Standard

Example 1 (Personal Trading):

Example 2 (Trading for Family Member Account):

Example 3 (Family Accounts as Equals):

Example 4 (Personal Trading and Disclosure):

Example 5 (Trading Prior to Report Dissemination):

Standard VI(C): Conflicts of Interest - Referral Fees

Guidance

Standard VI(C): Recommended Procedures

Standard VI(C): Application of the Standard

Example 1 (Disclosure of Referral Arrangements and Outside Parties):

Example 2 (Disclosure of Interdepartmental Referral Arrangements):

Example 3 (Disclosure of Referral Arrangements and Informing Firm):

Example 4 (Disclosure of Referral Arrangements and Outside Organizations):

Example 5 (Disclosure of Referral Arrangements and Outside Parties):

Standard VII(A): Responsibilities as a CFA Institute Member or CFA Candidate - Conduct as Participants in CFA Institute Programs

Standard VII(A) Conduct as Participants in CFA Institute Programs  
Guidance

Confidential Program Information

Additional CFA Program Restrictions

Expressing an Opinion

Standard VII(A): Application of the Standard

Example 1 (Sharing Exam Questions):

Example 2 (Bringing Written Material into Exam Room):

Example 3 (Writing after Exam Period End):

Example 4 (Sharing Exam Content):

Example 5 (Sharing Exam Content):

Example 6 (Sharing Exam Content):

Example 7 (Discussion of Exam Grading Guidelines and Results):

Example 8 (Compromising CFA Institute Integrity as a Volunteer):

Example 9 (Compromising CFA Institute Integrity as a Volunteer):

Standard VII(B): Responsibilities as a CFA Institute Member or CFA Candidate - Reference to CFA Institute, the CFA Designation, and the

## CFA Program

### Guidance

CFA Institute Membership

Using the CFA Designation

Referring to Candidacy in the CFA Program

Standard VII(B): Recommended Procedures

Standard VII(B): Application of the Standard

Example 1 (Passing Exams in Consecutive Years):

Example 2 (Right to Use CFA Designation):

Example 3 ("Retired" CFA Institute Membership Status):

Example 4 (Stating Facts about CFA Designation and Program):

Example 5 (Order of Professional and Academic Designations):

Example 6 (Use of Fictitious Name):

Practice Problems

Solutions

## Reading 33. Application of the Code and Standards: Level III

### Learning Outcomes

#### 1. Introduction

#### 2. Sovereign Investment Corporation

Anthony Corrales, CFA, Partner, Hedge Fund Investors

Ani Mehrotra, CFA, Junior Analyst, National Investments

Marcia Lopez

David Hockett and Team

The Kochanskis

#### 3. Castle Biotechnology Case: David Plume, PhD, CFA

David Plume, PhD, CFA

#### 4. Castle Biotechnology Case: Sandra Benning, CFA and Claris Deacon

Claris Deacon

#### 5. Lionsgate Limited & Bank of Australia Case: Tony Hill and Team

Tony Hill and Team

#### 6. Lionsgate Limited & Bank of Australia Case: Rob Portman, CFA; Kirk Graeme, CFA; The Delaney's; David Milgram

Kirk Graeme, CFA

The Delaneys

David Milgram

#### 7. Gabby Sim

Practice Problems

Solutions

## Study Session 16. Ethical and Professional Standards (2)

### Reading Assignments



## Reading 34. Asset Manager Code of Professional Conduct

### Learning Outcomes

1. Introduction, Adopting the Code and Claiming Compliance
  - Adopting the Code and Claiming Compliance
  - Acknowledgement of Claim of Compliance to CFA Institute

2. General Principles of Conduct and Asset Manager Code of Professional Conduct

#### Asset Manager Code of Professional Conduct

##### A. Loyalty to Clients

Managers must:

##### B. Investment Process and Actions

Managers must:

##### C. Trading

Managers must:

##### D. Risk Management, Compliance, and Support

Managers must:

##### E. Performance and Valuation

Managers must:

##### F. Disclosures

Managers must:

3. Appendix 6: A. Loyalty to Clients

#### Appendix 6—Recommendations and Guidance

##### A. Loyalty to Clients

Managers must:

4. Appendix 6: B. Investment Process and Actions

Managers must:

5. Appendix 6: C. Trading

Managers must:

6. Appendix 6: D. Risk Management, Compliance and Support

Managers must:

7. Appendix 6: E. Performance and Evaluation

Managers must:

8. Appendix 6: F. Disclosures

Managers must:

### Practice Problems

### Solutions

## Reading 35. Overview of the Global Investment Performance Standards

### Learning Outcomes

1. Objective and Scope of the GIPS Standards
  - 1.1. Objective and Scope of the GIPS Standards
    - 1.1.1. The Need for Global Investment Performance

- Standards
  - 1.1.2. The Scope of the GIPS Standards for Firms
  - 1.1.3. Overview of the GIPS Standards
- 2. Fundamentals of Compliance
  - 2.1. Definition of the Firm
  - 2.2. Definition of Discretion
  - 2.3. Other Fundamentals of Compliance
- 3. Time-Weighted Return
  - 3.1. Time-Weighted Return
- 4. Miscellaneous Return Calculation Topics
  - 4.1. Annualizing Returns
  - 4.2. Treatment of Cash Equivalents
  - 4.3. Treatment of Expenses and Fees
  - 4.4. Valuation Requirements
- 5. Composite Time-Weighted Return Calculations
  - 5.1. Composite Time-Weighted Return Calculations
- 6. Composites—Qualifying Portfolios and Defining Investment Strategies
  - 6.1. Composites—Defining Investment Strategies
- 7. Composites—Including and Excluding Portfolios
- 8. Presentation and Reporting Requirements for Composites
  - 8.1. Minimum Years of Performance
  - 8.2. Required Elements of a GIPS Composite Report
    - 8.2.1. Dispersion Measures
  - 8.3. Portability
  - 8.4. Sample Reports
- 9. Verification
  - 9.1. Scope of Verification
  - 9.2. Verification Process
- Summary
- Practice Problems
- Solutions

## Glossary

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# How to Use the CFA Program Curriculum

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Congratulations on your decision to enter the Chartered Financial Analyst (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities (competencies) it develops. Your commitment should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. CFA Program enrollment represents the first step toward a career-long commitment to professional education.

The CFA exam measures your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major CFA Program topic areas ([www.cfainstitute.org/programs/cfa/curriculum/cbok](http://www.cfainstitute.org/programs/cfa/curriculum/cbok));
- Topic area weights that indicate the relative exam weightings of the top-level topic areas ([www.cfainstitute.org/programs/cfa/curriculum](http://www.cfainstitute.org/programs/cfa/curriculum));
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- CFA Program curriculum that candidates receive upon exam registration.

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, features of the curriculum, and tips for designing an effective personal study program.

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# BACKGROUND ON THE CBOK

CFA Program is grounded in the practice of the investment profession. CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the competencies that are relevant to the profession, beginning with the Global Body of Investment Knowledge (GBIK®). Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback about the GBIK. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

The CFA Institute staff—in conjunction with the Education Advisory Committee and Curriculum Level Advisors, who consist of practicing CFA charterholders—designs the CFA Program curriculum in order to deliver the CBOK to candidates. The exams, also written by CFA charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into six topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected. It is then divided into one or more study sessions. These study sessions should form the basic structure of your reading and preparation. Each study session includes a statement of its structure and objective and is further divided into assigned readings. An outline illustrating the organization of these study sessions can be found at the front of each volume of the curriculum.

The readings are commissioned by CFA Institute and written by content experts, including investment professionals and university professors. Each reading includes LOS and the core material to be studied, often a combination of text, exhibits, and in-text examples and questions. End of Reading Questions (EORQs) followed by solutions help you understand and master the material. The LOS indicate what you should be able to accomplish after

studying the material. The LOS, the core material, and the EORQs are dependent on each other, with the core material and EORQs providing context for understanding the scope of the LOS and enabling you to apply a principle or concept in a variety of scenarios.

*The entire readings, including the EORQs, are the basis for all exam questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK.*

You should use the LOS to guide and focus your study because each exam question is based on one or more LOS and the core material and practice problems associated with the LOS. As a candidate, you are responsible for the entirety of the required material in a study session.

We encourage you to review the information about the LOS on our website ([www.cfainstitute.org/programs/cfa/curriculum/study-sessions](http://www.cfainstitute.org/programs/cfa/curriculum/study-sessions)), including the descriptions of LOS “command words” on the candidate resources page at [www.cfainstitute.org](http://www.cfainstitute.org).

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## FEATURES OF THE CURRICULUM

### End of Reading Questions/Solutions

*All End of Reading Questions (EORQs) as well as their solutions are part of the curriculum and are required material for the exam.* In addition to the in-text examples and questions, these EORQs help demonstrate practical applications and reinforce your understanding of the concepts presented. Some of these EORQs are adapted from past CFA exams and/or may serve as a basis for exam questions.

### Glossary

For your convenience, each volume includes a comprehensive Glossary. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the Glossary.

Note that the digital curriculum that is included in your exam registration fee is searchable for key words, including Glossary terms.

### LOS Self-Check

We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

## Source Material

The CFA Institute curriculum cites textbooks, journal articles, and other publications that provide additional context or information about topics covered in the readings. As a candidate, you are not responsible for familiarity with the original source materials cited in the curriculum.

Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written or updated but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*<sup>®</sup>, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and several Nobel laureates have contributed articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this, and other, CFA Institute practice-oriented publications through the Research & Analysis webpage ([www.cfainstitute.org/en/research](http://www.cfainstitute.org/en/research)).

## Errata

The curriculum development process is rigorous and includes multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, there are times when we must make corrections. Curriculum errata are periodically updated and posted

by exam level and test date online ([www.cfainstitute.org/en/programs/submit-errata](http://www.cfainstitute.org/en/programs/submit-errata)). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

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## DESIGNING YOUR PERSONAL STUDY PROGRAM

### Create a Schedule

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all assigned readings and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skills, and abilities described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will probably spend more time on some study sessions than on others.

You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

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## CFA INSTITUTE LEARNING ECOSYSTEM (LES)

As you prepare for your exam, we will email you important exam updates, testing policies, and study tips. Be sure to read these carefully.

Your exam registration fee includes access to the CFA Program Learning Ecosystem (LES). This digital learning platform provides access, even offline, to all of the readings and End of Reading Questions found in the print curriculum organized as a series of shorter online

lessons with associated EORQs. This tool is your one-stop location for all study materials, including practice questions and mock exams.

The LES provides the following supplemental study tools:

## **Structured and Adaptive Study Plans**

The LES offers two ways to plan your study through the curriculum. The first is a structured plan that allows you to move through the material in the way that you feel best suits your learning. The second is an adaptive study plan based on the results of an assessment test that uses actual practice questions.

Regardless of your chosen study path, the LES tracks your level of proficiency in each topic area and presents you with a dashboard of where you stand in terms of proficiency so that you can allocate your study time efficiently.

## **Flashcards and Game Center**

The LES offers all the Glossary terms as Flashcards and tracks correct and incorrect answers. Flashcards can be filtered both by curriculum topic area and by action taken—for example, answered correctly, unanswered, and so on. These Flashcards provide a flexible way to study Glossary item definitions.

The Game Center provides several engaging ways to interact with the Flashcards in a game context. Each game tests your knowledge of the Glossary terms a in different way. Your results are scored and presented, along with a summary of candidates with high scores on the game, on your Dashboard.

## **Discussion Board**

The Discussion Board within the LES provides a way for you to interact with other candidates as you pursue your study plan. Discussions can happen at the level of individual lessons to raise questions about material in those lessons that you or other candidates can clarify or comment on. Discussions can also be posted at the level of topics or in the initial Welcome section to connect with other candidates in your area.

## **Practice Question Bank**

The LES offers access to a question bank of hundreds of practice questions that are in addition to the End of Reading Questions. These practice questions, only available on the LES, are intended to help you assess your mastery of individual topic areas as you progress through your studies. After each practice question, you will receive immediate feedback

noting the correct response and indicating the relevant assigned reading so you can identify areas of weakness for further study.

## Mock Exams

The LES also includes access to three-hour Mock Exams that simulate the morning and afternoon sessions of the actual CFA exam. These Mock Exams are intended to be taken after you complete your study of the full curriculum and take practice questions so you can test your understanding of the curriculum and your readiness for the exam. If you take these Mock Exams within the LES, you will receive feedback afterward that notes the correct responses and indicates the relevant assigned readings so you can assess areas of weakness for further study. We recommend that you take Mock Exams during the final stages of your preparation for the actual CFA exam. For more information on the Mock Exams, please visit [www.cfainstitute.org](http://www.cfainstitute.org).

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## PREP PROVIDERS

You may choose to seek study support outside CFA Institute in the form of exam prep providers. After your CFA Program enrollment, you may receive numerous solicitations for exam prep courses and review materials. When considering a prep course, make sure the provider is committed to following the CFA Institute guidelines and high standards in its offerings.

Remember, however, that there are no shortcuts to success on the CFA exams; reading and studying the CFA Program curriculum *is* the key to success on the exam. The CFA Program exams reference only the CFA Institute assigned curriculum; no prep course or review course materials are consulted or referenced.

### SUMMARY

Every question on the CFA exam is based on the content contained in the required readings and on one or more LOS. Frequently, an exam question is based on a specific example highlighted within a reading or on a specific practice problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the exam.



2. All questions, problems, and their solutions are part of the curriculum and are required study material for the exam. These questions are found at the end of the readings in the print versions of the curriculum. In the LES, these questions appear directly after the lesson with which they are associated. The LES provides immediate feedback on your answers and tracks your performance on these questions throughout your study.
3. We strongly encourage you to use the CFA Program Learning Ecosystem. In addition to providing access to all the curriculum material, including EORQs, in the form of shorter, focused lessons, the LES offers structured and adaptive study planning, a Discussion Board to communicate with other candidates, Flashcards, a Game Center for study activities, a test bank of practice questions, and online Mock Exams. Other supplemental study tools, such as eBook and PDF versions of the print curriculum, and additional candidate resources are available at [www.cfainstitute.org](http://www.cfainstitute.org).
4. Using the study planner, create a schedule and commit sufficient study time to cover the study sessions. You should also plan to review the materials, answer practice questions, and take Mock Exams.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

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## FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and investment professional comments and feedback as we work to improve the curriculum, supplemental study tools, and candidate resources.

Please send any comments or feedback to [info@cfainstitute.org](mailto:info@cfainstitute.org). You can be assured that we will review your suggestions carefully. Ongoing improvements in the curriculum will help you prepare for success on the upcoming exams and for a lifetime of learning as a serious investment professional.



# Ethical and Professional Standards

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## STUDY SESSIONS

**Study Session 15** Ethical and Professional Standards (1)

**Study Session 16** Ethical and Professional Standards (2)

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## TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct, including the rules and sanctions relating to disciplinary proceedings.

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# Study Session 15

## Ethical and Professional Standards (1)

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CFA Institute members<sup>1</sup> and CFA Program candidates continually face situations requiring professional and ethical judgement. By acting in a manner consistent with the CFA Institute Code of Ethics and Standards of Professional Conduct (Code and Standards), members and candidates help build greater levels of trust in the investment profession.

This study session provides a framework for ethical conduct in the investment profession. The principles and guidance presented in the CFA Institute *Standards of Practice Handbook* (*Handbook*) form the basis for the CFA Institute self-regulatory program to maintain the highest professional standards among investment practitioners. A clear understanding of the CFA Institute Code and Standards (both found in the *Handbook*) should allow practitioners to identify and appropriately resolve ethical conflicts, leading to a reputation for integrity that benefits both the individual and the profession. Material under “Guidance” in the *Handbook* addresses the practical application of the Code and Standards. The guidance for each standard reviews its purpose and scope, presents recommended procedures for compliance, and provides examples of the standard in practice.

The study session concludes with case studies that demonstrate the practical application of the CFA Institute Code of Ethics and Standards of Professional Conduct (Code and Standards) in everyday situations.

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## READING ASSIGNMENTS

**Reading 31** Code of Ethics and Standards of Professional Conduct  
*Standards of Practice Handbook*, Eleventh Edition

**Reading 32** Guidance for Standards I–VII

**Reading 33** Application of the Code and Standards: Level III

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## NOTES

<sup>1</sup>Eligibility and requirements for becoming a member of CFA Institute vary by jurisdiction. Please consult [www.cfainstitute.org](http://www.cfainstitute.org) for further details.

# Reading 31

## Code of Ethics and Standards of Professional Conduct

This reading is a verbatim reprint of *Standards of Practice Handbook*, Eleventh Edition, updated March 2018, p. i to 12 included ([www.cfainstitute.org/en/ethics/codes/standards-practice-handbook](http://www.cfainstitute.org/en/ethics/codes/standards-practice-handbook)).

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## LEARNING OUTCOMES

The candidate should be able to:

- a. describe the structure of the CFA Institute Professional Conduct Program and the disciplinary review process for the enforcement of the CFA Institute Code of Ethics and Standards of Professional Conduct;
- b. explain the ethical responsibilities required by the Code and Standards, including the sub-sections of each standard.

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## PREFACE

The *Standards of Practice Handbook* (*Handbook*) provides guidance to the people who grapple with real ethical dilemmas in the investment profession on a daily basis; the *Handbook* addresses the professional intersection where theory meets practice and where the concept of ethical behavior crosses from the abstract to the concrete. The *Handbook* is intended for a diverse and global audience: CFA Institute members navigating ambiguous ethical situations; supervisors and direct/indirect reports determining the nature of their responsibilities to each other, to existing and potential clients, and to the broader financial markets; and candidates preparing for the Chartered Financial Analyst (CFA) examinations.

Recent events in the global financial markets have tested the ethical mettle of financial

market participants, including CFA Institute members. The standards taught in the CFA Program and by which CFA Institute members and candidates must abide represent timeless ethical principles and professional conduct for all market conditions. Through adherence to these standards, which continue to serve as the model for ethical behavior in the investment professional globally, each market participant does his or her part to improve the integrity and efficient operations of the financial markets.

The *Handbook* provides guidance in understanding the interconnectedness of the aspirational and practical principles and provisions of the Code of Ethics and Standards of Professional Conduct (Code and Standards). The Code contains high-level aspirational ethical principles that drive members and candidates to create a positive and reputable investment profession. The Standards contain practical ethical principles of conduct that members and candidates must follow to achieve the broader industry expectations. However, applying the principles individually may not capture the complexity of ethical requirements related to the investment industry. The Code and Standards should be viewed and interpreted as an interwoven tapestry of ethical requirements. Through members' and candidates' adherence to these principles as a whole, the integrity of and trust in the capital markets are improved.

## **Evolution of the CFA Institute Code of Ethics and Standards of Professional Conduct**

Generally, changes to the Code and Standards over the years have been minor. CFA Institute has revised the language of the Code and Standards and occasionally added a new standard to address a prominent issue of the day. For instance, in 1992, CFA Institute added the standard addressing performance presentation to the existing list of standards.

Major changes came in 2005 with the ninth edition of the *Handbook*. CFA Institute adopted new standards, revised some existing standards, and reorganized the standards. The revisions were intended to clarify the requirements of the Code and Standards and effectively convey to its global membership what constitutes “best practice” in a number of areas relating to the investment profession.

The Code and Standards must be regularly reviewed and updated if they are to remain effective and continue to represent the highest ethical standards in the global investment industry. CFA Institute strongly believes that revisions of the Code and Standards are not undertaken for cosmetic purposes but to add value by addressing legitimate concerns and improving comprehension.

Changes to the Code and Standards have far-reaching implications for the CFA Institute membership, the CFA Program, and the investment industry as a whole. CFA Institute members and candidates are *required* to adhere to the Code and Standards. In addition, the

Code and Standards are increasingly being adopted, in whole or in part, by firms and regulatory authorities. Their relevance goes well beyond CFA Institute members and candidates.

## ***Standards of Practice Handbook***

The periodic revisions of the Code and Standards have come in conjunction with updates of the *Standards of Practice Handbook*. The *Handbook* is the fundamental element of the ethics education effort of CFA Institute and the primary resource for guidance in interpreting and implementing the Code and Standards. The *Handbook* seeks to educate members and candidates on how to apply the Code and Standards to their professional lives and thereby benefit their clients, employers, and the investing public in general. The *Handbook* explains the purpose of the Code and Standards and how they apply in a variety of situations. The sections discuss and amplify each standard and suggest procedures to prevent violations.

Examples in the “Application of the Standard” sections are meant to illustrate how the standard applies to hypothetical but factual situations. The names contained in the examples are fictional and are not meant to refer to any actual person or entity. Unless otherwise stated (e.g., one or more people specifically identified), individuals in each example are CFA Institute members and holders of the CFA designation. Because factual circumstances vary so widely and often involve gray areas, the explanatory material and examples are not intended to be all inclusive. Many examples set forth in the application sections involve standards that have legal counterparts; ***members are strongly urged to discuss with their supervisors and legal and compliance departments the content of the Code and Standards and the members’ general obligations under the Code and Standards.***

CFA Institute recognizes that the presence of any set of ethical standards may create a false sense of security unless the documents are fully understood, enforced, and made a meaningful part of everyday professional activities. The *Handbook* is intended to provide a useful frame of reference that suggests ethical professional behavior in the investment decision-making process. This book cannot cover every contingency or circumstance, however, and it does not attempt to do so. The development and interpretation of the Code and Standards are evolving processes; the Code and Standards will be subject to continuing refinement.

## **Summary of Changes in the Eleventh Edition**

The comprehensive review of the Code and Standards in 2005 resulted in principle requirements that remain applicable today. The review carried out for the eleventh edition



focused on market practices that have evolved since the tenth edition. Along with updates to the guidance and examples within the *Handbook*, the eleventh edition includes an update to the Code of Ethics that embraces the members' role of maintaining the social contract between the industry and investors. Additionally, there are three changes to the Standards of Professional Conduct, which recognize the importance of proper supervision, clear communications with clients, and the expanding educational programs of CFA Institute.

## ***Inclusion of Updated CFA Institute Mission***

The CFA Institute Board of Governors approved an updated mission for the organization that is included in the Preamble to the Code and Standards. The new mission conveys the organization's conviction in the investment industry's role in the betterment of society at large.

### ***Mission:***

To lead the investment profession globally by promoting the highest standards of ethics, education, and professional excellence for the ultimate benefit of society.

## ***Updated Code of Ethics Principle***

One of the bullets in the Code of Ethics was updated to reflect the role that the capital markets have in the greater society. As members work to promote and maintain the integrity of the markets, their actions should also help maintain the social contract with investors.

### ***Old:***

Promote the integrity of and uphold the rules governing capital markets.

### ***New:***

Promote the integrity and viability of the global capital markets for the ultimate benefit of society.

## ***New Standard Regarding Responsibilities of Supervisors [IV(C)]***

The standard for members and candidates with supervision or authority over others within their firms was updated to bring about improvements in preventing illegal and unethical actions from occurring. The prior version of Standard IV(C) focused on the detection and prevention of violations. The updated version stresses broader compliance expectations, which include the detection and prevention aspects of the original version.

***Old:***

Members and Candidates must make reasonable efforts to detect and prevent violations of applicable laws, rules, regulations, and the Code and Standards by anyone subject to their supervision or authority.

***New:***

Members and Candidates must make reasonable efforts to ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards.

***Additional Requirement under the Standard for Communication with Clients and Prospective Clients [V(B)]***

Given the constant development of new and exotic financial instruments and strategies, the standard regarding communicating with clients now includes an implicit requirement to discuss the risks and limitations of recommendations being made to clients. The new principle and related guidance take into account the fact that levels of disclosure will differ between products and services. Members and candidates, along with their firms, must determine the specific disclosures their clients should receive while ensuring appropriate transparency of the individual firms' investment processes.

***Addition:***

Disclose to clients and prospective clients significant limitations and risks associated with the investment process.

***Modification to Standard VII(A)***

Since this standard was developed, CFA Institute has launched additional educational

programs. The updated standard not only maintains the integrity of the CFA Program but also expands the same ethical considerations when members or candidates participate in such programs as the CIPM Program and the CFA Institute Investment Foundations certificate program. Whether participating as a member assisting with the curriculum or an examination or as a sitting candidate within a program, we expect them to engage in these programs as they would participate in the CFA Program.

### ***Old:***

#### Conduct as Members and Candidates in the CFA Program

Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of the CFA examinations.

### ***New:***

#### Conduct as Participants in CFA Institute Programs

Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of CFA Institute programs.

## ***General Guidance and Example Revision***

The guidance and examples were updated to reflect practices and scenarios applicable to today's investment industry. Two concepts that appear frequently in the updates in this edition relate to the increased use of social media for business communications and the use of and reliance on the output of quantitative models. The use of social media platforms has increased significantly since the publication of the tenth edition. And although financial modeling is not new to the industry, this update reflects upon actions that are viewed as possible contributing factors to the financial crises of the past decade.

## **CFA Institute Professional Conduct Program**

All CFA Institute members and candidates enrolled in the CFA Program are required to comply with the Code and Standards. The CFA Institute Board of Governors maintains oversight and responsibility for the Professional Conduct Program (PCP), which, in

conjunction with the Disciplinary Review Committee (DRC), is responsible for enforcement of the Code and Standards. The DRC is a volunteer committee of CFA charterholders who serve on panels to review conduct and partner with Professional Conduct staff to establish and review professional conduct policies. The CFA Institute Bylaws and Rules of Procedure for Professional Conduct (Rules of Procedure) form the basic structure for enforcing the Code and Standards. The Professional Conduct division is also responsible for enforcing testing policies of other CFA Institute education programs as well as the professional conduct of Certificate in Investment Performance Measurement (CIPM) certificants.

Professional Conduct inquiries come from a number of sources. First, members and candidates must self-disclose on the annual Professional Conduct Statement all matters that question their professional conduct, such as involvement in civil litigation or a criminal investigation or being the subject of a written complaint. Second, written complaints received by Professional Conduct staff can bring about an investigation. Third, CFA Institute staff may become aware of questionable conduct by a member or candidate through the media, regulatory notices, or another public source. Fourth, candidate conduct is monitored by proctors who complete reports on candidates suspected to have violated testing rules on exam day. Lastly, CFA Institute may also conduct analyses of scores and exam materials after the exam, as well as monitor online and social media to detect disclosure of confidential exam information.

When an inquiry is initiated, the Professional Conduct staff conducts an investigation that may include requesting a written explanation from the member or candidate; interviewing the member or candidate, complaining parties, and third parties; and collecting documents and records relevant to the investigation. Upon reviewing the material obtained during the investigation, the Professional Conduct staff may conclude the inquiry with no disciplinary sanction, issue a cautionary letter, or continue proceedings to discipline the member or candidate. If the Professional Conduct staff believes a violation of the Code and Standards or testing policies has occurred, the member or candidate has the opportunity to reject or accept any charges and the proposed sanctions.

If the member or candidate does not accept the charges and proposed sanction, the matter is referred to a panel composed of DRC members. Panels review materials and presentations from Professional Conduct staff and from the member or candidate. The panel's task is to determine whether a violation of the Code and Standards or testing policies occurred and, if so, what sanction should be imposed.

Sanctions imposed by CFA Institute may have significant consequences; they include public censure, suspension of membership and use of the CFA designation, and revocation of the CFA charter. Candidates enrolled in the CFA Program who have violated the Code and Standards or testing policies may be suspended or prohibited from further participation in the CFA Program.

# Adoption of the Code and Standards

The Code and Standards apply to individual members of CFA Institute and candidates in the CFA Program. CFA Institute does encourage firms to adopt the Code and Standards, however, as part of their code of ethics. Those who claim compliance should fully understand the requirements of each of the principles of the Code and Standards.

Once a party—nonmember or firm—ensures its code of ethics meets the principles of the Code and Standards, that party should make the following statement whenever claiming compliance:

“[Insert name of party] claims compliance with the CFA Institute Code of Ethics and Standards of Professional Conduct. This claim has not been verified by CFA Institute.”

CFA Institute welcomes public acknowledgement, when appropriate, that firms are complying with the CFA Institute Code of Ethics and Standards of Professional Conduct and encourages firms to notify us of the adoption plans. For firms that would like to distribute the Code and Standards to clients and potential clients, attractive one-page copies of the Code and Standards, including translations, are available on the CFA Institute website ([www.cfainstitute.org](http://www.cfainstitute.org)).

CFA Institute has also published the Asset Manager Code of Professional Conduct, which is designed, in part, to help asset managers comply with the regulations mandating codes of ethics for investment advisers. Whereas the Code and Standards are aimed at individual investment professionals who are members of CFA Institute or candidates in the CFA Program, the Asset Manager Code was drafted specifically for firms. The Asset Manager Code provides specific, practical guidelines for asset managers in six areas: loyalty to clients, the investment process, trading, compliance, performance evaluation, and disclosure. The Asset Manager Code and the appropriate steps to acknowledge adoption or compliance can be found on the CFA Institute website ([www.cfainstitute.org](http://www.cfainstitute.org)).

## Acknowledgments

CFA Institute is a not-for-profit organization that is heavily dependent on the expertise and intellectual contributions of member volunteers. Members devote their time because they share a mutual interest in the organization’s mission to promote and achieve ethical practice in the investment profession. CFA Institute owes much to the volunteers’ abundant generosity and energy in extending ethical integrity.

The CFA Institute Standards of Practice Council (SPC), a group consisting of CFA charterholder volunteers from many different countries, is charged with maintaining and

interpreting the Code and Standards and ensuring that they are effective. The SPC draws its membership from a broad spectrum of organizations in the securities field, including brokers, investment advisers, banks, and insurance companies. In most instances, the SPC members have important supervisory responsibilities within their firms.

The SPC continually evaluates the Code and Standards, as well as the guidance in the *Handbook*, to ensure that they are

- representative of high standards of professional conduct,
- relevant to the changing nature of the investment profession,
- globally applicable,
- sufficiently comprehensive, practical, and specific,
- enforceable, and
- testable for the CFA Program.

The SPC has spent countless hours reviewing and discussing revisions to the Code and Standards and updates to the guidance that make up the eleventh edition of the *Handbook*. Following is a list of the current and former members of the SPC who generously donated their time and energy to this effort.

James E. Hollis III, CFA, Chair	Christopher C. Loop, CFA,
Rik Albrecht, CFA	James M. Meeth, CFA
Terence E. Burns, CFA	Guy G. Rutherford, Jr., CFA
Laura Dagan, CFA	Edouard Senechal, CFA
Samuel B. Jones, Jr., CFA	Wenliang (Richard) Wang, CFA
Ulrike Kaiser-Boeing, CFA	Peng Lian Wee, CFA
Jinliang (Jack) Li, CFA	

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## ETHICS AND THE INVESTMENT INDUSTRY

Society ultimately benefits from efficient markets where capital can freely flow to the most

productive or innovative destination. Well-functioning capital markets efficiently match those needing capital with those seeking to invest their assets in revenue-generating ventures. In order for capital markets to be efficient, investors must be able to trust that the markets are fair and transparent and offer them the opportunity to be rewarded for the risk they choose to take. Laws, regulations, and enforcement play a vital role but are insufficient alone to guarantee fair and transparent markets. The markets depend on an ethical foundation to guide participants' judgment and behavior. CFA Institute maintains and promotes the Code of Ethics and Standards of Professional Conduct in order to create a culture of ethics for the ultimate benefit of society.

## **Why Ethics Matters**

Ethics can be defined as a set of moral principles or rules of conduct that provide guidance for our behavior when it affects others. Widely acknowledged fundamental ethical principles include honesty, fairness, diligence, and care and respect for others. Ethical conduct follows those principles and balances self-interest with both the direct and the indirect consequences of that behavior for other people.

Not only does unethical behavior by individuals have serious personal consequences—ranging from job loss and reputational damage to fines and even jail—but unethical conduct from market participants, investment professionals, and those who service investors can damage investor trust and thereby impair the sustainability of the global capital markets as a whole. Unfortunately, there seems to be an unending parade of stories bringing to light accounting frauds and manipulations, Ponzi schemes, insider-trading scandals, and other misdeeds. Not surprisingly, this has led to erosion in public confidence in investment professionals. Empirical evidence from numerous surveys documents the low standing in the eyes of the investing public of banks and financial services firms—the very institutions that are entrusted with the economic well-being and retirement security of society.

Governments and regulators have historically tried to combat misconduct in the industry through regulatory reform, with various levels of success. Global capital markets are highly regulated to protect investors and other market participants. However, compliance with regulation alone is insufficient to fully earn investor trust. Individuals and firms must develop a “culture of integrity” that permeates all levels of operations and promotes the ethical principles of stewardship of investor assets and working in the best interests of clients, above and beyond strict compliance with the law. A strong ethical culture that helps honest, ethical people engage in ethical behavior will foster the trust of investors, lead to robust global capital markets, and ultimately benefit society. That is why ethics matters.

## ***Ethics, Society, and the Capital Markets***

CFA Institute recently added the concept “for the ultimate benefit of society” to its mission. The premise is that we want to live in a socially, politically, and financially stable society that fosters individual well-being and welfare of the public. A key ingredient for this goal is global capital markets that facilitate the efficient allocation of resources so that the available capital finds its way to places where it most benefits that society. These investments are then used to produce goods and services, to fund innovation and jobs, and to promote improvements in standards of living. Indeed, such a function serves the interests of the society. Efficient capital markets, in turn, provide a host of benefits to those providing the investment capital. Investors are provided the opportunity to transfer and transform risk because the capital markets serve as an information exchange, create investment products, provide liquidity, and limit transaction costs.

However, a well-functioning and efficient capital market system is dependent on trust of the participants. If investors believe that capital market participants—investment professionals and firms—cannot be trusted with their financial assets or that the capital markets are unfair such that only insiders can be successful, they will be unlikely to invest or, at the very least, will require a higher risk premium. Decreased investment capital can reduce innovation and job creation and hurt the economy and society as a whole. Reduced trust in capital markets can also result in a less vibrant, if not smaller, investment industry.

Ethics for a global investment industry should be universal and ultimately support trust and integrity above acceptable local or regional customs and culture. Universal ethics for a global industry strongly supports the efficiency, values, and mission of the industry as a whole. Different countries may be at different stages of development in establishing standards of practice, but the end goal must be to achieve rules, regulations, and standards that support and promote fundamental ethical principles on a global basis.

## ***Capital Market Sustainability and the Actions of One***

Individuals and firms also have to look at the indirect impacts of their actions on the broader investment community. The increasingly interconnected nature of global finance brings to the fore an added consideration of market sustainability that was, perhaps, less appreciated in years past. In addition to committing to the highest levels of ethical behavior, today’s investment professionals and their employers should consider the long-term health of the market as a whole.

As recent events have demonstrated, apparently isolated and unrelated decisions, however innocuous when considered on an individual basis, in aggregate can precipitate a market crisis. In an interconnected global economy and marketplace, each participant should strive to be aware of how his or her actions or the products he or she distributes may have an impact on capital market participants in other regions or countries.



Investment professionals should consider how their investment decision-making processes affect the global financial markets in the broader context of how they apply their ethical and professional obligations. Those in positions of authority have a special responsibility to consider the broader context of market sustainability in their development and approval of corporate policies, particularly those involving risk management and product development. In addition, corporate compensation strategies should not encourage otherwise ethically sound individuals to engage in unethical or questionable conduct for financial gain. Ethics, sustainability, and properly functioning capital markets are components of the same concept of protecting the best interests of all. To always place the interests of clients ahead of both investment professionals' own interests and those of their employer remains a key ethos.

## ***The Relationship between Ethics and Regulations***

Some equate ethical behavior with legal behavior: If you are following the law, you must be acting appropriately. Ethical principles, like laws and regulations, prescribe appropriate constraints on our natural tendency to pursue self-interest that could harm the interests of others. Laws and regulations often attempt to guide people toward ethical behavior, but they do not cover all unethical behavior. Ethical behavior is often distinguished from legal conduct by describing legal behavior as what is required and ethical behavior as conduct that is morally correct. Ethical principles go beyond that which is legally sufficient and encompass what is the right thing to do.

Given many regulators' lack of sufficient resources to enforce well-conceived rules and regulations, relying on a regulatory framework to lead the charge in establishing ethical behavior has its challenges. Therefore, reliance on compliance with laws and regulation alone is insufficient to ensure ethical behavior of investment professionals or to create a truly ethical culture in the industry.

The recent past has shown us that some individuals will succeed at circumventing the regulatory rules for their personal gain. Only the application of strong ethical principles, at both the individual level and the firm level, will limit abuses. Knowing the rules or regulations to apply in a particular situation, although important, may not be sufficient to ensure ethical conduct. Individuals must be able both to recognize areas that are prone to ethical pitfalls and to identify and process those circumstances and influences that can impair ethical judgment.

## ***Applying an Ethical Framework***

Laws, regulations, professional standards, and codes of ethics can guide ethical behavior, but individual judgment is a critical ingredient in making principled choices and engaging in appropriate conduct. When faced with an ethical dilemma, individuals must have a well-

developed set of principles; otherwise, their thought processes can lead to, at best, equivocation and indecision and, at worst, fraudulent conduct and destruction of the public trust. Establishing an ethical framework for an internal thought process prior to deciding to act is a crucial step in engaging in ethical conduct.

Most investment professionals are used to making decisions from a business (profit/loss) outlook. But given the importance of ethical behavior in carrying out professional responsibilities, it is critical to also analyze decisions and potential conduct from an ethical perspective. Utilizing a framework for ethical decision making will help investment professionals effectively examine their conduct in the context of conflicting interests common to their professional obligations (e.g., researching and gathering information, developing investment recommendations, and managing money for others). Such a framework will allow investment professionals to analyze their conduct in a way that meets high standards of ethical behavior.

An ethical decision-making framework can come in many forms but should provide investment professionals with a tool for following the principles of the firm's code of ethics. Through analyzing the particular circumstances of each decision, investment professionals are able to determine the best course of action to fulfill their responsibilities in an ethical manner.

## ***Commitment to Ethics by Firms***

A firm's code of ethics risks becoming a largely ignored, dusty compilation if it is not truly integrated into the fabric of the business. The ability to relate an ethical decision-making framework to a firm's code of ethics allows investment professionals to bring the aspirations and principles of the code of ethics to life—transforming it from a compliance exercise to something that is at the heart of a firm's culture.

An investment professional's natural desire to "do the right thing" must be reinforced by building a culture of integrity in the workplace. Development, maintenance, and demonstration of a strong culture of integrity within the firm by senior management may be the single most important factor in promoting ethical behavior among the firm's employees. Adopting a code that clearly lays out the ethical principles that guide the thought processes and conduct the firm expects from its employees is a critical first step. But a code of ethics, while necessary, is insufficient.

Simply nurturing an inclination to do right is no match for the multitude of daily decisions that investment managers make. We need to exercise ethical decision-making skills to develop the muscle memory necessary for fundamentally ethical people to make good decisions despite the reality of agent conflicts. Just as coaching and practice transform our natural ability to run across a field into the technique and endurance required to run a race,

teaching, reinforcing, and practicing ethical decision-making skills prepare us to confront the hard issues effectively. It is good for business, individuals, firms, the industry, and the markets, as well as society as a whole, to engage in the investment management profession in a highly ethical manner.

## ***Ethical Commitment of CFA Institute***

An important goal of CFA Institute is to ensure that the organization and its members and candidates develop, promote, and follow the highest ethical standards in the investment industry. The CFA Institute Code of Ethics (Code) and Standards of Professional Conduct (Standards) are the foundation supporting the organization's quest to uphold the industry's highest standards of individual and corporate practice and to help serve the greater good. The Code is a set of principles that define the overarching conduct CFA Institute expects from its members and CFA Program candidates. The Code works in tandem with the Standards, which outline professional conduct that constitutes fair and ethical business practices.

For more than 50 years, CFA Institute members and candidates have been required to abide by the organization's Code and Standards. Periodically, CFA Institute has revised and updated its Code and Standards to ensure that they remain relevant to the changing nature of the investment profession and representative of the highest standard of professional conduct. Within this *Handbook*, CFA Institute addresses ethical principles for the profession, including individual professionalism; responsibilities to capital markets, clients, and employers; ethics involved in investment analysis, recommendations, and actions; and possible conflicts of interest. Although the investment world has become a far more complex place since the first publication of the *Standard of Practice Handbook*, distinguishing right from wrong remains the paramount principle of the Code and Standards.

New challenges will continually arise for members and candidates in applying the Code and Standards because many decisions are not unambiguously right or wrong. The dilemma exists because the choice between right and wrong is not always clear. Even well-intentioned investment professionals can find themselves in circumstances that may tempt them to cut corners. Situational influences can overpower the best of intentions.

CFA Institute has made a significant commitment to providing members and candidates with the resources to extend and deepen their understanding of how to appropriately apply the principles of the Code and Standards. The product offerings from CFA Institute offer a wealth of material. Through publications, conferences, webcasts, and podcasts, the ethical challenges of investment professionals are brought to light. Archived issues of these items are available on the CFA Institute website ([www.cfainstitute.org](http://www.cfainstitute.org)).

By reviewing these resources and discussing with their peers, market participants can further enhance their abilities to apply an effective ethical decision-making framework. In time, this

should help restore some of the trust recently lost by investors.

Markets function to an important extent on trust. Recent events have shown the fragility of this foundation and the devastating consequences that can ensue when it is fundamentally questioned. Investment professionals should remain mindful of the long-term health of financial markets and incorporate this concern for the market's sustainability in their investment decision making. CFA Institute and the Standards of Practice Council hope this edition of the *Handbook* will assist and guide investment professionals in meeting the ethical demands of the highly interconnected global capital markets for the ultimate benefit of society.

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# CFA INSTITUTE CODE OF ETHICS AND STANDARDS OF PROFESSIONAL CONDUCT

## Preamble

The CFA Institute Code of Ethics and Standards of Professional Conduct are fundamental to the values of CFA Institute and essential to achieving its mission to lead the investment profession globally by promoting the highest standards of ethics, education, and professional excellence for the ultimate benefit of society. High ethical standards are critical to maintaining the public's trust in financial markets and in the investment profession. Since their creation in the 1960s, the Code and Standards have promoted the integrity of CFA Institute members and served as a model for measuring the ethics of investment professionals globally, regardless of job function, cultural differences, or local laws and regulations. All CFA Institute members (including holders of the Chartered Financial Analyst [CFA] designation) and CFA candidates have the personal responsibility to embrace and uphold the provisions of the Code and Standards and are encouraged to notify their employer of this responsibility. Violations may result in disciplinary sanctions by CFA Institute. Sanctions can include revocation of membership, revocation of candidacy in the CFA Program, and revocation of the right to use the CFA designation.

## The Code of Ethics

Members of CFA Institute (including CFA charterholders) and candidates for the CFA

designation (“Members and Candidates”) must:

- Act with integrity, competence, diligence, and respect and in an ethical manner with the public, clients, prospective clients, employers, employees, colleagues in the investment profession, and other participants in the global capital markets.
- Place the integrity of the investment profession and the interests of clients above their own personal interests.
- Use reasonable care and exercise independent professional judgment when conducting investment analysis, making investment recommendations, taking investment actions, and engaging in other professional activities.
- Practice and encourage others to practice in a professional and ethical manner that will reflect credit on themselves and the profession.
- Promote the integrity and viability of the global capital markets for the ultimate benefit of society.
- Maintain and improve their professional competence and strive to maintain and improve the competence of other investment professionals.

## **Standards of Professional Conduct**

### **I. PROFESSIONALISM**

#### **A. Knowledge of the Law**

Members and Candidates must understand and comply with all applicable laws, rules, and regulations (including the CFA Institute Code of Ethics and Standards of Professional Conduct) of any government, regulatory organization, licensing agency, or professional association governing their professional activities. In the event of conflict, Members and Candidates must comply with the more strict law, rule, or regulation. Members and Candidates must not knowingly participate or assist in and must dissociate from any violation of such laws, rules, or regulations.

#### **B. Independence and Objectivity**

Members and Candidates must use reasonable care and judgment to achieve and maintain independence and objectivity in their professional activities. Members and Candidates must not offer, solicit, or accept any gift, benefit, compensation, or consideration that reasonably could be expected to compromise their own or

another's independence and objectivity.

**C. Misrepresentation**

Members and Candidates must not knowingly make any misrepresentations relating to investment analysis, recommendations, actions, or other professional activities.

**D. Misconduct**

Members and Candidates must not engage in any professional conduct involving dishonesty, fraud, or deceit or commit any act that reflects adversely on their professional reputation, integrity, or competence.

**II. INTEGRITY OF CAPITAL MARKETS**

**A. Material Nonpublic Information**

Members and Candidates who possess material nonpublic information that could affect the value of an investment must not act or cause others to act on the information.

**B. Market Manipulation**

Members and Candidates must not engage in practices that distort prices or artificially inflate trading volume with the intent to mislead market participants.

**III. DUTIES TO CLIENTS**

**A. Loyalty, Prudence, and Care**

Members and Candidates have a duty of loyalty to their clients and must act with reasonable care and exercise prudent judgment. Members and Candidates must act for the benefit of their clients and place their clients' interests before their employer's or their own interests.

**B. Fair Dealing**

Members and Candidates must deal fairly and objectively with all clients when providing investment analysis, making investment recommendations, taking investment action, or engaging in other professional activities.

**C. Suitability**

1. When Members and Candidates are in an advisory relationship with a client,

they must:

- a.** Make a reasonable inquiry into a client's or prospective client's investment experience, risk and return objectives, and financial constraints prior to making any investment recommendation or taking investment action and must reassess and update this information regularly.
  - b.** Determine that an investment is suitable to the client's financial situation and consistent with the client's written objectives, mandates, and constraints before making an investment recommendation or taking investment action.
  - c.** Judge the suitability of investments in the context of the client's total portfolio.
- 2.** When Members and Candidates are responsible for managing a portfolio to a specific mandate, strategy, or style, they must make only investment recommendations or take only investment actions that are consistent with the stated objectives and constraints of the portfolio.

#### **D. Performance Presentation**

When communicating investment performance information, Members and Candidates must make reasonable efforts to ensure that it is fair, accurate, and complete.

#### **E. Preservation of Confidentiality**

Members and Candidates must keep information about current, former, and prospective clients confidential unless:

- 1.** The information concerns illegal activities on the part of the client or prospective client,
- 2.** Disclosure is required by law, or
- 3.** The client or prospective client permits disclosure of the information.

### **IV. DUTIES TO EMPLOYERS**

#### **A. Loyalty**

In matters related to their employment, Members and Candidates must act for the benefit of their employer and not deprive their employer of the advantage of their

skills and abilities, divulge confidential information, or otherwise cause harm to their employer.

#### **B. Additional Compensation Arrangements**

Members and Candidates must not accept gifts, benefits, compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer's interest unless they obtain written consent from all parties involved.

#### **C. Responsibilities of Supervisors**

Members and Candidates must make reasonable efforts to ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards.

### **V. INVESTMENT ANALYSIS, RECOMMENDATIONS, AND ACTIONS**

#### **A. Diligence and Reasonable Basis**

Members and Candidates must:

1. Exercise diligence, independence, and thoroughness in analyzing investments, making investment recommendations, and taking investment actions.
2. Have a reasonable and adequate basis, supported by appropriate research and investigation, for any investment analysis, recommendation, or action.

#### **B. Communication with Clients and Prospective Clients**

Members and Candidates must:

1. Disclose to clients and prospective clients the basic format and general principles of the investment processes they use to analyze investments, select securities, and construct portfolios and must promptly disclose any changes that might materially affect those processes.
2. Disclose to clients and prospective clients significant limitations and risks associated with the investment process.
3. Use reasonable judgment in identifying which factors are important to their investment analyses, recommendations, or actions and include those factors in communications with clients and prospective clients.
4. Distinguish between fact and opinion in the presentation of investment



analysis and recommendations.

**C. Record Retention**

Members and Candidates must develop and maintain appropriate records to support their investment analyses, recommendations, actions, and other investment-related communications with clients and prospective clients.

**VI. CONFLICTS OF INTEREST**

**A. Disclosure of Conflicts**

Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively.

**B. Priority of Transactions**

Investment transactions for clients and employers must have priority over investment transactions in which a Member or Candidate is the beneficial owner.

**C. Referral Fees**

Members and Candidates must disclose to their employer, clients, and prospective clients, as appropriate, any compensation, consideration, or benefit received from or paid to others for the recommendation of products or services.

**VII. RESPONSIBILITIES AS A CFA INSTITUTE MEMBER OR CFA CANDIDATE**

**A. Conduct as Participants in CFA Institute Programs**

Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of CFA Institute programs.

**B. Reference to CFA Institute, the CFA Designation, and the CFA Program**

When referring to CFA Institute, CFA Institute membership, the CFA designation, or candidacy in the CFA Program, Members and Candidates must not misrepresent or exaggerate the meaning or implications of membership in CFA Institute, holding the CFA designation, or candidacy in the CFA Program.

# Reading 32

## Guidance for Standards I–VII

This reading is a verbatim reprint of *Standards of Practice Handbook*, Eleventh Edition, updated March 2018, p. 13 to 174 included ([www.cfainstitute.org/en/ethics/codes/standards-practice-handbook](http://www.cfainstitute.org/en/ethics/codes/standards-practice-handbook)).

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## LEARNING OUTCOMES

The candidate should be able to:

- a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity;
- b. recommend practices and procedures designed to prevent violations of the Code and Standards.

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## STANDARD I(A): PROFESSIONALISM - KNOWLEDGE OF THE LAW

- a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity;

### Standard I(A) Knowledge of the Law

Members and Candidates must understand and comply with all applicable laws, rules, and regulations (including the CFA Institute Code of Ethics and Standards of Professional Conduct) of any government, regulatory organization, licensing agency, or professional association governing their professional activities. In the event of conflict, Members and Candidates must comply with the more strict law, rule, or regulation. Members and Candidates must not knowingly participate or assist in and must dissociate from any violation of such laws, rules, or regulations.

## Guidance

### Highlights:

- *Relationship between the Code and Standards and Applicable Law*
- *Participation in or Association with Violations by Others*
- *Investment Products and Applicable Laws*

Members and candidates must understand the applicable laws and regulations of the countries and jurisdictions where they engage in professional activities. These activities may include, but are not limited to, trading of securities or other financial instruments, providing investment advice, conducting research, or performing other investment services. On the basis of their reasonable and good faith understanding, members and candidates must comply with the laws and regulations that directly govern their professional activities and resulting outcomes and that protect the interests of the clients.

When questions arise, members and candidates should know their firm's policies and procedures for accessing compliance guidance. This standard does not require members and candidates to become experts, however, in compliance. Additionally, members and candidates are not required to have detailed knowledge of or be experts on all the laws that could potentially govern their activities.

During times of changing regulations, members and candidates must remain vigilant in maintaining their knowledge of the requirements for their professional activities. New financial products and processes, along with uncovered ethical missteps, create an environment for recurring and potentially wide-ranging regulatory changes. Members and candidates are also continually provided improved and enhanced methods of communicating

with both clients and potential clients, such as mobile applications and web-based social networking platforms. As new local, regional, and global requirements are updated to address these and other changes, members, candidates, and their firms must adjust their procedures and practices to remain in compliance.

## ***Relationship between the Code and Standards and Applicable Law***

Some members or candidates may live, work, or provide investment services to clients living in a country that has no law or regulation governing a particular action or that has laws or regulations that differ from the requirements of the Code and Standards. When applicable law and the Code and Standards require different conduct, members and candidates must follow the more strict of the applicable law or the Code and Standards.

“Applicable law” is the law that governs the member’s or candidate’s conduct. Which law applies will depend on the particular facts and circumstances of each case. The “more strict” law or regulation is the law or regulation that imposes greater restrictions on the action of the member or candidate or calls for the member or candidate to exert a greater degree of action that protects the interests of investors. For example, applicable law or regulation may not require members and candidates to disclose referral fees received from or paid to others for the recommendation of investment products or services. Because the Code and Standards impose this obligation, however, members and candidates must disclose the existence of such fees.

Members and candidates must adhere to the following principles:

- Members and candidates must comply with applicable laws or regulations related to their professional activities.
- Members and candidates must not engage in conduct that constitutes a violation of the Code and Standards, even though it may otherwise be legal.
- In the absence of any applicable law or regulation or when the Code and Standards impose a higher degree of responsibility than applicable laws and regulations, members and candidates must adhere to the Code and Standards. Applications of these principles are outlined in [Exhibit 1](#).

The applicable laws governing the responsibilities of a member or candidate should be viewed as the minimal threshold of acceptable actions. When members and candidates take actions that exceed the minimal requirements, they further support the conduct required of Standard I(A).

CFA Institute members are obligated to abide by the CFA Institute Articles of Incorporation, Bylaws, Code of Ethics, Standards of Professional Conduct, Rules of Procedure,

Membership Agreement, and other applicable rules promulgated by CFA Institute, all as amended periodically. CFA candidates who are not members must also abide by these documents (except for the Membership Agreement) as well as rules and regulations related to the administration of the CFA examination, the Candidate Responsibility Statement, and the Candidate Pledge.

## ***Participation in or Association with Violations by Others***

Members and candidates are responsible for violations in which they *knowingly* participate or assist. Although members and candidates are presumed to have knowledge of all applicable laws, rules, and regulations, CFA Institute acknowledges that members may not recognize violations if they are not aware of all the facts giving rise to the violations. Standard I(A) applies when members and candidates know or should know that their conduct may contribute to a violation of applicable laws, rules, or regulations or the Code and Standards.

If a member or candidate has reasonable grounds to believe that imminent or ongoing client or employer activities are illegal or unethical, the member or candidate must dissociate, or separate, from the activity. In extreme cases, dissociation may require a member or candidate to leave his or her employment. Members and candidates may take the following intermediate steps to dissociate from ethical violations of others when direct discussions with the person or persons committing the violation are unsuccessful. The first step should be to attempt to stop the behavior by bringing it to the attention of the employer through a supervisor or the firm's compliance department. If this attempt is unsuccessful, then members and candidates have a responsibility to step away and dissociate from the activity.

Dissociation practices will differ on the basis of the member's or candidate's role in the investment industry. It may include removing one's name from written reports or recommendations, asking for a different assignment, or refusing to accept a new client or continue to advise a current client. Inaction combined with continuing association with those involved in illegal or unethical conduct may be construed as participation or assistance in the illegal or unethical conduct.

CFA Institute strongly encourages members and candidates to report potential violations of the Code and Standards committed by fellow members and candidates. Although a failure to report is less likely to be construed as a violation than a failure to dissociate from unethical conduct, the impact of inactivity on the integrity of capital markets can be significant. Although the Code and Standards do not compel members and candidates to report violations to their governmental or regulatory organizations unless such disclosure is mandatory under applicable law (voluntary reporting is often referred to as whistleblowing), such disclosure may be prudent under certain circumstances. Members and candidates should consult their legal and compliance advisers for guidance.

Additionally, CFA Institute encourages members, nonmembers, clients, and the investing

public to report violations of the Code and Standards by CFA Institute members or CFA candidates by submitting a complaint in writing to the CFA Institute Professional Conduct Program via e-mail ([pcprogram@cfainstitute.org](mailto:pcprogram@cfainstitute.org)) or the CFA Institute website ([www.cfainstitute.org](http://www.cfainstitute.org)).

## ***Investment Products and Applicable Laws***

Members and candidates involved in creating or maintaining investment services or investment products or packages of securities and/or derivatives should be mindful of where these products or packages will be sold as well as their places of origination. The applicable laws and regulations of the countries or regions of origination and expected sale should be understood by those responsible for the supervision of the services or creation and maintenance of the products or packages. Members or candidates should make reasonable efforts to review whether associated firms that are distributing products or services developed by their employing firm also abide by the laws and regulations of the countries and regions of distribution. Members and candidates should undertake the necessary due diligence when transacting cross-border business to understand the multiple applicable laws and regulations in order to protect the reputation of their firm and themselves.

Given the complexity that can arise with business transactions in today's market, there may be some uncertainty surrounding which laws or regulations are considered applicable when activities are being conducted in multiple jurisdictions. Members and candidates should seek the appropriate guidance, potentially including the firm's compliance or legal departments and legal counsel outside the organization, to gain a reasonable understanding of their responsibilities and how to implement them appropriately.

### **Exhibit 1. Global Application of the Code and Standards**

Members and candidates who practice in multiple jurisdictions may be subject to varied securities laws and regulations. If applicable law is stricter than the requirements of the Code and Standards, members and candidates must adhere to applicable law; otherwise, they must adhere to the Code and Standards. The following chart provides illustrations involving a member who may be subject to the securities laws and regulations of three different types of countries:

- NS: country with no securities laws or regulations
- LS: country with **less** strict securities laws and regulations than the Code and Standards
- MS: country with **more** strict securities laws and regulations than the Code and Standards

## Standards

<b>Applicable Law</b>	<b>Duties</b>	<b>Explanation</b>
Member resides in NS country, does business in LS country; LS law applies.	Member must adhere to the Code and Standards.	Because applicable law is less strict than the Code and Standards, the member must adhere to the Code and Standards.
Member resides in NS country, does business in MS country; MS law applies.	Member must adhere to the law of MS country.	Because applicable law is stricter than the Code and Standards, member must adhere to the more strict applicable law.
Member resides in LS country, does business in NS country; LS law applies.	Member must adhere to the Code and Standards.	Because applicable law is less strict than the Code and Standards, member must adhere to the Code and Standards.
Member resides in LS country, does business in MS country; MS law applies.	Member must adhere to the law of MS country.	Because applicable law is stricter than the Code and Standards, member must adhere to the more strict applicable law.
Member resides in LS country, does business in NS country; LS law applies, but it states that law of locality where business is conducted governs.	Member must adhere to the Code and Standards.	Because applicable law states that the law of the locality where the business is conducted governs and there is no local law, the member must adhere to the Code and Standards.
Member resides in LS country, does business in MS country; LS law applies, but it states that law of locality where business is conducted governs.	Member must adhere to the law of MS country.	Because applicable law of the locality where the business is conducted governs and local law is stricter than the Code and Standards, member must adhere to the more strict applicable law.

Member resides in MS country, does business in LS country; MS law applies.	Member must adhere to the law of MS country.	Because applicable law is stricter than the Code and Standards, member must adhere to the more strict applicable law.
Member resides in MS country, does business in LS country; MS law applies, but it states that law of locality where business is conducted governs.	Member must adhere to the Code and Standards.	Because applicable law states that the law of the locality where the business is conducted governs and local law is less strict than the Code and Standards, member must adhere to the Code and Standards.
Member resides in MS country, does business in LS country with a client who is a citizen of LS country; MS law applies, but it states that the law of the client's home country governs.	Member must adhere to the Code and Standards.	Because applicable law states that the law of the client's home country governs (which is less strict than the Code and Standards), member must adhere to the Code and Standards.
Member resides in MS country, does business in LS country with a client who is a citizen of MS country; MS law applies, but it states that the law of the client's home country governs.	Member must adhere to the law of MS country.	Because applicable law states that the law of the client's home country governs and the law of the client's home country is stricter than the Code and Standards, the member must adhere to the more strict applicable law.

## STANDARD I(A): RECOMMENDED PROCEDURES

- b. recommend practices and procedures designed to prevent violations of the Code and Standards.



# Members and Candidates

Suggested methods by which members and candidates can acquire and maintain understanding of applicable laws, rules, and regulations include the following:

- *Stay informed:* Members and candidates should establish or encourage their employers to establish a procedure by which employees are regularly informed about changes in applicable laws, rules, regulations, and case law. In many instances, the employer's compliance department or legal counsel can provide such information in the form of memorandums distributed to employees in the organization. Also, participation in an internal or external continuing education program is a practical method of staying current.
- *Review procedures:* Members and candidates should review, or encourage their employers to review, the firm's written compliance procedures on a regular basis to ensure that the procedures reflect current law and provide adequate guidance to employees about what is permissible conduct under the law and/or the Code and Standards. Recommended compliance procedures for specific items of the Code and Standards are discussed in this *Handbook* in the "Guidance" sections associated with each standard.
- *Maintain current files:* Members and candidates should maintain or encourage their employers to maintain readily accessible current reference copies of applicable statutes, rules, regulations, and important cases.

## Distribution Area Laws

Members and candidates should make reasonable efforts to understand the applicable laws—both country and regional—for the countries and regions where their investment products are developed and are most likely to be distributed to clients.

## Legal Counsel

When in doubt about the appropriate action to undertake, it is recommended that a member or candidate seek the advice of compliance personnel or legal counsel concerning legal requirements. If a potential violation is being committed by a fellow employee, it may also be prudent for the member or candidate to seek the advice of the firm's compliance department or legal counsel.

## Dissociation

When dissociating from an activity that violates the Code and Standards, members and candidates should document the violation and urge their firms to attempt to persuade the perpetrator(s) to cease such conduct. To dissociate from the conduct, a member or candidate may have to resign his or her employment.

## Firms

The formality and complexity of compliance procedures for firms depend on the nature and size of the organization and the nature of its investment operations. Members and candidates should encourage their firms to consider the following policies and procedures to support the principles of Standard I(A):

- *Develop and/or adopt a code of ethics:* The ethical culture of an organization starts at the top. Members and candidates should encourage their supervisors or managers to adopt a code of ethics. Adhering to a code of ethics facilitates solutions when people face ethical dilemmas and can prevent the need for employees to resort to a “whistleblowing” solution publicly alleging concealed misconduct. CFA Institute has published the *Asset Manager Code of Professional Conduct*, which firms may adopt or use as the basis for their codes (visit [www.cfainstitute.org](http://www.cfainstitute.org)).
- *Provide information on applicable laws:* Pertinent information that highlights applicable laws and regulations might be distributed to employees or made available in a central location. Information sources might include primary information developed by the relevant government, governmental agencies, regulatory organizations, licensing agencies, and professional associations (e.g., from their websites); law firm memorandums or newsletters; and association memorandums or publications (e.g., *CFA Institute Magazine*).
- *Establish procedures for reporting violations:* Firms might provide written protocols for reporting suspected violations of laws, regulations, or company policies.

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## STANDARD I(A): APPLICATION OF THE STANDARD

- a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity;**

## **Example 1 (Notification of Known Violations):**

Michael Allen works for a brokerage firm and is responsible for an underwriting of securities. A company official gives Allen information indicating that the financial statements Allen filed with the regulator overstate the issuer's earnings. Allen seeks the advice of the brokerage firm's general counsel, who states that it would be difficult for the regulator to prove that Allen has been involved in any wrongdoing.

*Comment:* Although it is recommended that members and candidates seek the advice of legal counsel, the reliance on such advice does not absolve a member or candidate from the requirement to comply with the law or regulation. Allen should report this situation to his supervisor, seek an independent legal opinion, and determine whether the regulator should be notified of the error.

## **Example 2 (Dissociating from a Violation):**

Lawrence Brown's employer, an investment banking firm, is the principal underwriter for an issue of convertible debentures by the Courtney Company. Brown discovers that the Courtney Company has concealed severe third-quarter losses in its foreign operations. The preliminary prospectus has already been distributed.

*Comment:* Knowing that the preliminary prospectus is misleading, Brown should report his findings to the appropriate supervisory persons in his firm. If the matter is not remedied and Brown's employer does not dissociate from the underwriting, Brown should sever all his connections with the underwriting. Brown should also seek legal advice to determine whether additional reporting or other action should be taken.

## **Example 3 (Dissociating from a Violation):**

Kamisha Washington's firm advertises its past performance record by showing the 10-year return of a composite of its client accounts. Washington discovers, however, that the composite omits the performance of accounts that have left the firm during the 10-year period, whereas the description of the composite indicates the inclusion of all firm accounts.

This omission has led to an inflated performance figure. Washington is asked to use promotional material that includes the erroneous performance number when soliciting business for the firm.

*Comment:* Misrepresenting performance is a violation of the Code and Standards. Although she did not calculate the performance herself, Washington would be assisting in violating Standard I(A) if she were to use the inflated performance number when soliciting clients. She must dissociate herself from the activity. If discussing the misleading number with the person responsible is not an option for correcting the problem, she can bring the situation to the attention of her supervisor or the compliance department at her firm. If her firm is unwilling to recalculate performance, she must refrain from using the misleading promotional material and should notify the firm of her reasons. If the firm insists that she use the material, she should consider whether her obligation to dissociate from the activity requires her to seek other employment.

## **Example 4 (Following the Highest Requirements):**

James Collins is an investment analyst for a major Wall Street brokerage firm. He works in a developing country with a rapidly modernizing economy and a growing capital market. Local securities laws are minimal—in form and content—and include no punitive prohibitions against insider trading.

*Comment:* Collins must abide by the requirements of the Code and Standards, which might be more strict than the rules of the developing country. He should be aware of the risks that a small market and the absence of a fairly regulated flow of information to the market represent to his ability to obtain information and make timely judgments. He should include this factor in formulating his advice to clients. In handling material nonpublic information that accidentally comes into his possession, he must follow Standard II(A)—Material Nonpublic Information.

## **Example 5 (Following the Highest Requirements):**

Laura Jameson works for a multinational investment adviser based in the United States. Jameson lives and works as a registered investment adviser in the tiny, but wealthy, island nation of Karramba. Karramba's securities laws state that no investment adviser registered and working in that country can participate in initial public offerings (IPOs) for the adviser's personal account. Jameson, believing that, as a US citizen working for a US-based company, she should comply only with US law, has ignored this Karrambian law. In addition, Jameson believes that as a charterholder, as long as she adheres to the Code and Standards requirement

that she disclose her participation in any IPO to her employer and clients when such ownership creates a conflict of interest, she is meeting the highest ethical requirements.

*Comment:* Jameson is in violation of Standard I(A). As a registered investment adviser in Karramba, Jameson is prevented by Karrambian securities law from participating in IPOs regardless of the law of her home country. In addition, because the law of the country where she is working is stricter than the Code and Standards, she must follow the stricter requirements of the local law rather than the requirements of the Code and Standards.

## **Example 6 (Laws and Regulations Based on Religious Tenets):**

Amanda Janney is employed as a fixed-income portfolio manager for a large international firm. She is on a team within her firm that is responsible for creating and managing a fixed-income hedge fund to be sold throughout the firm's distribution centers to high-net-worth clients. Her firm receives expressions of interest from potential clients from the Middle East who are seeking investments that comply with Islamic law. The marketing and promotional materials for the fixed-income hedge fund do not specify whether or not the fund is a suitable investment for an investor seeking compliance with Islamic law. Because the fund is being distributed globally, Janney is concerned about the reputation of the fund and the firm and believes disclosure of whether or not the fund complies with Islamic law could help minimize potential mistakes with placing this investment.

*Comment:* As the financial market continues to become globalized, members and candidates will need to be aware of the differences between cultural and religious laws and requirements as well as the different governmental laws and regulations. Janney and the firm could be proactive in their efforts to acknowledge areas where the new fund may not be suitable for clients.

## **Example 7 (Reporting Potential Unethical Actions):**

Krista Blume is a junior portfolio manager for high-net-worth portfolios at a large global investment manager. She observes a number of new portfolios and relationships coming from a country in Europe where the firm did not have previous business and is told that a broker in that country is responsible for this new business. At a meeting on allocation of research resources to third-party research firms, Blume notes that this broker has been added to the list and is allocated payments for research. However, she knows the portfolios do not invest in securities in the broker's country, and she has not seen any research come from this broker.

Blume asks her supervisor about the name being on the list and is told that someone in marketing is receiving the research and that the name being on the list is OK. She believes that what may be going on is that the broker is being paid for new business through the inappropriate research payments, and she wishes to dissociate from the misconduct.

*Comment:* Blume should follow the firm's policies and procedures for reporting potential unethical activity, which may include discussions with her supervisor or someone in a designated compliance department. She should communicate her concerns appropriately while advocating for disclosure between the new broker relationship and the research payments.

## **Example 8 (Failure to Maintain Knowledge of the Law):**

Colleen White is excited to use new technology to communicate with clients and potential clients. She recently began posting investment information, including performance reports and investment opinions and recommendations, to her Facebook page. In addition, she sends out brief announcements, opinions, and thoughts via her Twitter account (for example, "Prospects for future growth of XYZ company look good! #makingmoney4U"). Prior to White's use of these social media platforms, the local regulator had issued new requirements and guidance governing online electronic communication. White's communications appear to conflict with the recent regulatory announcements.

*Comment:* White is in violation of Standard I(A) because her communications do not comply with the existing guidance and regulation governing use of social media. White must be aware of the evolving legal requirements pertaining to new and dynamic areas of the financial services industry that are applicable to her. She should seek guidance from appropriate, knowledgeable, and reliable sources, such as her firm's compliance department, external service providers, or outside counsel, unless she diligently follows legal and regulatory trends affecting her professional responsibilities.

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## **STANDARD I(B): PROFESSIONALISM - INDEPENDENCE AND OBJECTIVITY**

- a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity;**

Members and Candidates must use reasonable care and judgment to achieve and maintain independence and objectivity in their professional activities. Members and Candidates must not offer, solicit, or accept any gift, benefit, compensation, or consideration that reasonably could be expected to compromise their own or another's independence and objectivity.

## Guidance

### Highlights:

- *Buy-Side Clients*
- *Fund Manager and Custodial Relationships*
- *Investment Banking Relationships*
- *Performance Measurement and Attribution*
- *Public Companies*
- *Credit Rating Agency Opinions*
- *Influence during the Manager Selection/Procurement Process*
- *Issuer-Paid Research*
- *Travel Funding*

Standard I(B) states the responsibility of CFA Institute members and candidates in the CFA Program to maintain independence and objectivity so that their clients will have the benefit of their work and opinions unaffected by any potential conflict of interest or other circumstance adversely affecting their judgment. Every member and candidate should endeavor to avoid situations that could cause or be perceived to cause a loss of independence or objectivity in recommending investments or taking investment action.

External sources may try to influence the investment process by offering analysts and portfolio managers a variety of benefits. Corporations may seek expanded research coverage,

issuers and underwriters may wish to promote new securities offerings, brokers may want to increase commission business, and independent rating agencies may be influenced by the company requesting the rating. Benefits may include gifts, invitations to lavish functions, tickets, favors, or job referrals. One type of benefit is the allocation of shares in oversubscribed IPOs to investment managers for their personal accounts. This practice affords managers the opportunity to make quick profits that may not be available to their clients. Such a practice is prohibited under Standard I(B). Modest gifts and entertainment are acceptable, but special care must be taken by members and candidates to resist subtle and not-so-subtle pressures to act in conflict with the interests of their clients. Best practice dictates that members and candidates reject any offer of gift or entertainment that could be expected to threaten their independence and objectivity.

Receiving a gift, benefit, or consideration from a *client* can be distinguished from gifts given by entities seeking to influence a member or candidate to the detriment of other clients. In a client relationship, the client has already entered some type of compensation arrangement with the member, candidate, or his or her firm. A gift from a client could be considered supplementary compensation. The potential for obtaining influence to the detriment of other clients, although present, is not as great as in situations where no compensation arrangement exists. When possible, prior to accepting “bonuses” or gifts from clients, members and candidates should disclose to their employers such benefits offered by clients. If notification is not possible prior to acceptance, members and candidates must disclose to their employer benefits previously accepted from clients. Disclosure allows the employer of a member or candidate to make an independent determination about the extent to which the gift may affect the member’s or candidate’s independence and objectivity.

Members and candidates may also come under pressure from their own firms to, for example, issue favorable research reports or recommendations for certain companies with potential or continuing business relationships with the firm. The situation may be aggravated if an executive of the company sits on the bank or investment firm’s board and attempts to interfere in investment decision making. Members and candidates acting in a sales or marketing capacity must be especially mindful of their objectivity in promoting appropriate investments for their clients.

Left unmanaged, pressures that threaten independence place research analysts in a difficult position and may jeopardize their ability to act independently and objectively. One of the ways that research analysts have coped with these pressures in the past is to use subtle and ambiguous language in their recommendations or to temper the tone of their research reports. Such subtleties are lost on some investors, however, who reasonably expect research reports and recommendations to be straightforward and transparent and to communicate clearly an analyst’s views based on unbiased analysis and independent judgment.

Members and candidates are personally responsible for maintaining independence and objectivity when preparing research reports, making investment recommendations, and taking investment action on behalf of clients. Recommendations must convey the member’s



or candidate's true opinions, free of bias from internal or external pressures, and be stated in clear and unambiguous language.

Members and candidates also should be aware that some of their professional or social activities within CFA Institute or its member societies may subtly threaten their independence or objectivity. When seeking corporate financial support for conventions, seminars, or even weekly society luncheons, the members or candidates responsible for the activities should evaluate both the actual effect of such solicitations on their independence and whether their objectivity might be perceived to be compromised in the eyes of their clients.

## ***Buy-Side Clients***

One source of pressure on sell-side analysts is buy-side clients. Institutional clients are traditionally the primary users of sell-side research, either directly or with soft dollar brokerage. Portfolio managers may have significant positions in the security of a company under review. A rating downgrade may adversely affect the portfolio's performance, particularly in the short term, because the sensitivity of stock prices to ratings changes has increased in recent years. A downgrade may also affect the manager's compensation, which is usually tied to portfolio performance. Moreover, portfolio performance is subject to media and public scrutiny, which may affect the manager's professional reputation. Consequently, some portfolio managers implicitly or explicitly support sell-side ratings inflation.

Portfolio managers have a responsibility to respect and foster the intellectual honesty of sell-side research. Therefore, it is improper for portfolio managers to threaten or engage in retaliatory practices, such as reporting sell-side analysts to the covered company in order to instigate negative corporate reactions. Although most portfolio managers do not engage in such practices, the perception by the research analyst that a reprisal is possible may cause concern and make it difficult for the analyst to maintain independence and objectivity.

## ***Fund Manager and Custodial Relationships***

Research analysts are not the only people who must be concerned with maintaining their independence. Members and candidates who are responsible for hiring and retaining outside managers and third-party custodians should not accept gifts, entertainment, or travel funding that may be perceived as impairing their decisions. The use of secondary fund managers has evolved into a common practice to manage specific asset allocations. The use of third-party custodians is common practice for independent investment advisory firms and helps them with trading capabilities and reporting requirements. Primary and secondary fund managers, as well as third-party custodians, often arrange educational and marketing events to inform others about their business strategies, investment process, or custodial services. Members and candidates must review the merits of each offer individually in determining whether they

may attend yet maintain their independence.

## ***Investment Banking Relationships***

Some sell-side firms may exert pressure on their analysts to issue favorable research reports on current or prospective investment banking clients. For many of these firms, income from investment banking has become increasingly important to overall firm profitability because brokerage income has declined as a result of price competition. Consequently, firms offering investment banking services work hard to develop and maintain relationships with investment banking clients and prospects. These companies are often covered by the firm's research analysts because companies often select their investment banks on the basis of the reputation of their research analysts, the quality of their work, and their standing in the industry.

In some countries, research analysts frequently work closely with their investment banking colleagues to help evaluate prospective investment banking clients. In other countries, because of past abuses in managing the obvious conflicts of interest, regulators have established clear rules prohibiting the interaction of these groups. Although collaboration between research analysts and investment banking colleagues may benefit the firm and enhance market efficiency (e.g., by allowing firms to assess risks more accurately and make better pricing assumptions), it requires firms to carefully balance the conflicts of interest inherent in the collaboration. Having analysts work with investment bankers is appropriate only when the conflicts are adequately and effectively managed and disclosed. Firm managers have a responsibility to provide an environment in which analysts are neither coerced nor enticed into issuing research that does not reflect their true opinions. Firms should require public disclosure of actual conflicts of interest to investors.

Members, candidates, and their firms must adopt and follow perceived best practices in maintaining independence and objectivity in the corporate culture and protecting analysts from undue pressure by their investment banking colleagues. The "firewalls" traditionally built between these two functions must be managed to minimize conflicts of interest; indeed, enhanced firewall policies may go as far as prohibiting all communications between these groups. A key element of an enhanced firewall is separate reporting structures for personnel on the research side and personnel on the investment banking side. For example, investment banking personnel should not have any authority to approve, disapprove, or make changes to research reports or recommendations. Another element should be a compensation arrangement that minimizes the pressures on research analysts and rewards objectivity and accuracy. Compensation arrangements should not link analyst remuneration directly to investment banking assignments in which the analyst may participate as a team member. Firms should also regularly review their policies and procedures to determine whether analysts are adequately safeguarded and to improve the transparency of disclosures relating to conflicts of interest. The highest level of transparency is achieved when disclosures are

prominent and specific rather than marginalized and generic.

## ***Performance Measurement and Attribution***

Members and candidates working within a firm's investment performance measurement department may also be presented with situations that challenge their independence and objectivity. As performance analysts, their analyses may reveal instances where managers may appear to have strayed from their mandate. Additionally, the performance analyst may receive requests to alter the construction of composite indexes owing to negative results for a selected account or fund. The member or candidate must not allow internal or external influences to affect their independence and objectivity as they faithfully complete their performance calculation and analysis-related responsibilities.

## ***Public Companies***

Analysts may be pressured to issue favorable reports and recommendations by the companies they follow. Not every stock is a "buy," and not every research report is favorable—for many reasons, including the cyclical nature of many business activities and market fluctuations. For instance, a "good company" does not always translate into a "good stock" rating if the current stock price is fully valued. In making an investment recommendation, the analyst is responsible for anticipating, interpreting, and assessing a company's prospects and stock price performance in a factual manner. Many company managers, however, believe that their company's stock is undervalued, and these managers may find it difficult to accept critical research reports or ratings downgrades. Company managers' compensation may also be dependent on stock performance.

Due diligence in financial research and analysis involves gathering information from a wide variety of sources, including public disclosure documents (such as proxy statements, annual reports, and other regulatory filings) and also company management and investor-relations personnel, suppliers, customers, competitors, and other relevant sources. Research analysts may justifiably fear that companies will limit their ability to conduct thorough research by denying analysts who have "negative" views direct access to company managers and/or barring them from conference calls and other communication venues. Retaliatory practices include companies bringing legal action against analysts personally and/or their firms to seek monetary damages for the economic effects of negative reports and recommendations. Although few companies engage in such behavior, the perception that a reprisal is possible is a reasonable concern for analysts. This concern may make it difficult for them to conduct the comprehensive research needed to make objective recommendations. For further information and guidance, members and candidates should refer to the CFA Institute publication *Best Practice Guidelines Governing Analyst/Corporate Issuer Relations* ([www.cfainstitute.org](http://www.cfainstitute.org)).

## ***Credit Rating Agency Opinions***

Credit rating agencies provide a service by grading the fixed-income products offered by companies. Analysts face challenges related to incentives and compensation schemes that may be tied to the final rating and successful placement of the product. Members and candidates employed at rating agencies should ensure that procedures and processes at the agencies prevent undue influences from a sponsoring company during the analysis. Members and candidates should abide by their agencies' and the industry's standards of conduct regarding the analytical process and the distribution of their reports.

The work of credit rating agencies also raises concerns similar to those inherent in investment banking relationships. Analysts may face pressure to issue ratings at a specific level because of other services the agency offers companies—namely, advising on the development of structured products. The rating agencies need to develop the necessary firewalls and protections to allow the independent operations of their different business lines.

When using information provided by credit rating agencies, members and candidates should be mindful of the potential conflicts of interest. And because of the potential conflicts, members and candidates may need to independently validate the rating granted.

## ***Influence during the Manager Selection/Procurement Process***

Members and candidates may find themselves on either side of the manager selection process. An individual may be on the hiring side as a representative of a pension organization or an investment committee member of an endowment or a charitable organization. Additionally, other members may be representing their organizations in attempts to earn new investment allocation mandates. The responsibility of members and candidates to maintain their independence and objectivity extends to the hiring or firing of those who provide business services beyond investment management.

When serving in a hiring capacity, members and candidates should not solicit gifts, contributions, or other compensation that may affect their independence and objectivity. Solicitations do not have to benefit members and candidates personally to conflict with Standard I(B). Requesting contributions to a favorite charity or political organization may also be perceived as an attempt to influence the decision-making process. Additionally, members and candidates serving in a hiring capacity should refuse gifts, donations, and other offered compensation that may be perceived to influence their decision-making process.

When working to earn a new investment allocation, members and candidates should not offer gifts, contributions, or other compensation to influence the decision of the hiring representative. The offering of these items with the intent to impair the independence and objectivity of another person would not comply with Standard I(B). Such prohibited actions

may include offering donations to a charitable organization or political candidate referred by the hiring representative.

A clear example of improperly influencing hiring representatives was displayed in the “pay-to-play” scandal involving government-sponsored pension funds in the United States. Managers looking to gain lucrative allocations from the large funds made requested donations to the political campaigns of individuals directly responsible for the hiring decisions. This scandal and other similar events have led to new laws requiring additional reporting concerning political contributions and bans on hiring—or hiring delays for—managers that made campaign contributions to representatives associated with the decision-making process.

## ***Issuer-Paid Research***

In light of the recent reduction of sell-side research coverage, many companies, seeking to increase visibility both in the financial markets and with potential investors, have hired analysts to produce research reports analyzing their companies. These reports bridge the gap created by the lack of coverage and can be an effective method of communicating with investors.

Issuer-paid research conducted by independent analysts, however, is fraught with potential conflicts. Depending on how the research is written and distributed, investors may be misled into believing that the research is from an independent source when, in reality, it has been paid for by the subject company.

Members and candidates must adhere to strict standards of conduct that govern how the research is to be conducted and what disclosures must be made in the report. Analysts must engage in thorough, independent, and unbiased analysis and must fully disclose potential conflicts of interest, including the nature of their compensation. Otherwise, analysts risk misleading investors.

Investors need clear, credible, and thorough information about companies, and they need research based on independent thought. At a minimum, issuer-paid research should include a thorough analysis of the company’s financial statements based on publicly disclosed information, benchmarking within a peer group, and industry analysis. Analysts must exercise diligence, independence, and thoroughness in conducting their research in an objective manner. Analysts must distinguish between fact and opinion in their reports. Conclusions must have a reasonable and adequate basis and must be supported by appropriate research.

Independent analysts must also strictly limit the type of compensation that they accept for conducting issuer-paid research. Otherwise, the content and conclusions of the reports could reasonably be expected to be determined or affected by compensation from the sponsoring

companies. Compensation that might influence the research report could be direct, such as payment based on the conclusions of the report, or indirect, such as stock warrants or other equity instruments that could increase in value on the basis of positive coverage in the report. In such instances, the independent analyst has an incentive to avoid including negative information or making negative conclusions. Best practice is for independent analysts, prior to writing their reports, to negotiate only a flat fee for their work that is not linked to their conclusions or recommendations.

## ***Travel Funding***

The benefits related to accepting paid travel extend beyond the cost savings to the member or candidate and his firm, such as the chance to talk exclusively with the executives of a company or learning more about the investment options provided by an investment organization. Acceptance also comes with potential concerns; for example, members and candidates may be influenced by these discussions when flying on a corporate or chartered jet or attending sponsored conferences where many expenses, including airfare and lodging, are covered. To avoid the appearance of compromising their independence and objectivity, best practice dictates that members and candidates always use commercial transportation at their expense or at the expense of their firm rather than accept paid travel arrangements from an outside company. Should commercial transportation be unavailable, members and candidates may accept modestly arranged travel to participate in appropriate information-gathering events, such as a property tour.

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## **STANDARD I(B): RECOMMENDED PROCEDURES**

### **b. recommend practices and procedures designed to prevent violations of the Code and Standards.**

Members and candidates should adhere to the following practices and should encourage their firms to establish procedures to avoid violations of Standard I(B):

- *Protect the integrity of opinions:* Members, candidates, and their firms should establish policies stating that every research report concerning the securities of a corporate client should reflect the unbiased opinion of the analyst. Firms should also design compensation systems that protect the integrity of the investment decision process by maintaining the independence and objectivity of analysts.



- *Create a restricted list:* If the firm is unwilling to permit dissemination of adverse opinions about a corporate client, members and candidates should encourage the firm to remove the controversial company from the research universe and put it on a restricted list so that the firm disseminates only factual information about the company.
- *Restrict special cost arrangements:* When attending meetings at an issuer's headquarters, members and candidates should pay for commercial transportation and hotel charges. No corporate issuer should reimburse members or candidates for air transportation. Members and candidates should encourage issuers to limit the use of corporate aircraft to situations in which commercial transportation is not available or in which efficient movement could not otherwise be arranged. Members and candidates should take particular care that when frequent meetings are held between an individual issuer and an individual member or candidate, the issuer should not always host the member or candidate.
- *Limit gifts:* Members and candidates must limit the acceptance of gratuities and/or gifts to token items. Standard I(B) does not preclude customary, ordinary business-related entertainment as long as its purpose is not to influence or reward members or candidates. Firms should consider a strict value limit for acceptable gifts that is based on the local or regional customs and should address whether the limit is per gift or an aggregate annual value.
- *Restrict investments:* Members and candidates should encourage their investment firms to develop formal policies related to employee purchases of equity or equity-related IPOs. Firms should require prior approval for employee participation in IPOs, with prompt disclosure of investment actions taken following the offering. Strict limits should be imposed on investment personnel acquiring securities in private placements.
- *Review procedures:* Members and candidates should encourage their firms to implement effective supervisory and review procedures to ensure that analysts and portfolio managers comply with policies relating to their personal investment activities.
- *Independence policy:* Members, candidates, and their firms should establish a formal written policy on the independence and objectivity of research and implement reporting structures and review procedures to ensure that research analysts do not report to and are not supervised or controlled by any department of the firm that could compromise the independence of the analyst. More detailed recommendations related to a firm's policies regarding research objectivity are set forth in the CFA Institute statement *Research Objectivity Standards* ([www.cfainstitute.org](http://www.cfainstitute.org)).
- *Appointed officer:* Firms should appoint a senior officer with oversight responsibilities for compliance with the firm's code of ethics and all regulations concerning its business. Firms should provide every employee with the procedures and policies for reporting potentially unethical behavior, violations of regulations, or other activities that may

harm the firm's reputation.

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## STANDARD I(B): APPLICATION OF THE STANDARD

- a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity;**

### Example 1 (Travel Expenses):

Steven Taylor, a mining analyst with Bronson Brokers, is invited by Precision Metals to join a group of his peers in a tour of mining facilities in several western US states. The company arranges for chartered group flights from site to site and for accommodations in Spartan Motels, the only chain with accommodations near the mines, for three nights. Taylor allows Precision Metals to pick up his tab, as do the other analysts, with one exception—John Adams, an employee of a large trust company who insists on following his company's policy and paying for his hotel room himself.

*Comment:* The policy of the company where Adams works complies closely with Standard I(B) by avoiding even the appearance of a conflict of interest, but Taylor and the other analysts were not necessarily violating Standard I(B). In general, when allowing companies to pay for travel and/or accommodations in these circumstances, members and candidates must use their judgment. They must be on guard that such arrangements not impinge on a member's or candidate's independence and objectivity. In this example, the trip was strictly for business and Taylor was not accepting irrelevant or lavish hospitality. The itinerary required chartered flights, for which analysts were not expected to pay. The accommodations were modest. These arrangements are not unusual and did not violate Standard I(B) as long as Taylor's independence and objectivity were not compromised. In the final analysis, members and candidates should consider both whether they can remain objective and whether their integrity might be perceived by their clients to have been compromised.

### Example 2 (Research Independence):



Susan Dillon, an analyst in the corporate finance department of an investment services firm, is making a presentation to a potential new business client that includes the promise that her firm will provide full research coverage of the potential client.

*Comment:* Dillon may agree to provide research coverage, but she must not commit her firm's research department to providing a favorable recommendation. The firm's recommendation (favorable, neutral, or unfavorable) must be based on an independent and objective investigation and analysis of the company and its securities.

### **Example 3 (Research Independence and Intrafirm Pressure):**

Walter Fritz is an equity analyst with Hilton Brokerage who covers the mining industry. He has concluded that the stock of Metals & Mining is overpriced at its current level, but he is concerned that a negative research report will hurt the good relationship between Metals & Mining and the investment banking division of his firm. In fact, a senior manager of Hilton Brokerage has just sent him a copy of a proposal his firm has made to Metals & Mining to underwrite a debt offering. Fritz needs to produce a report right away and is concerned about issuing a less-than-favorable rating.

*Comment:* Fritz's analysis of Metals & Mining must be objective and based solely on consideration of company fundamentals. Any pressure from other divisions of his firm is inappropriate. This conflict could have been eliminated if, in anticipation of the offering, Hilton Brokerage had placed Metals & Mining on a restricted list for its sales force.

### **Example 4 (Research Independence and Issuer Relationship Pressure):**

As in Example 3, Walter Fritz has concluded that Metals & Mining stock is overvalued at its current level, but he is concerned that a negative research report might jeopardize a close rapport that he has nurtured over the years with Metals & Mining's CEO, chief finance officer, and investment relations officer. Fritz is concerned that a negative report might result also in management retaliation—for instance, cutting him off from participating in conference calls when a quarterly earnings release is made, denying him the ability to ask questions on such calls, and/or denying him access to top management for arranging group meetings between Hilton Brokerage clients and top Metals & Mining managers.

*Comment:* As in Example 3, Fritz's analysis must be objective and based solely on

consideration of company fundamentals. Any pressure from Metals & Mining is inappropriate. Fritz should reinforce the integrity of his conclusions by stressing that his investment recommendation is based on relative valuation, which may include qualitative issues with respect to Metals & Mining's management.

## **Example 5 (Research Independence and Sales Pressure):**

As support for the sales effort of her corporate bond department, Lindsey Warner offers credit guidance to purchasers of fixed-income securities. Her compensation is closely linked to the performance of the corporate bond department. Near the quarter's end, Warner's firm has a large inventory position in the bonds of Milton, Ltd., and has been unable to sell the bonds because of Milton's recent announcement of an operating problem. Salespeople have asked her to contact large clients to push the bonds.

*Comment:* Unethical sales practices create significant potential violations of the Code and Standards. Warner's opinion of the Milton bonds must not be affected by internal pressure or compensation. In this case, Warner must refuse to push the Milton bonds unless she is able to justify that the market price has already adjusted for the operating problem.

## **Example 6 (Research Independence and Prior Coverage):**

Jill Jorund is a securities analyst following airline stocks and a rising star at her firm. Her boss has been carrying a "buy" recommendation on International Airlines and asks Jorund to take over coverage of that airline. He tells Jorund that under no circumstances should the prevailing buy recommendation be changed.

*Comment:* Jorund must be independent and objective in her analysis of International Airlines. If she believes that her boss's instructions have compromised her, she has two options: She can tell her boss that she cannot cover the company under these constraints, or she can take over coverage of the company, reach her own independent conclusions, and if they conflict with her boss's opinion, share the conclusions with her boss or other supervisors in the firm so that they can make appropriate recommendations. Jorund must issue only recommendations that reflect her independent and objective opinion.

## Example 7 (Gifts and Entertainment from Related Party):

Edward Grant directs a large amount of his commission business to a New York–based brokerage house. In appreciation for all the business, the brokerage house gives Grant two tickets to the World Cup in South Africa, two nights at a nearby resort, several meals, and transportation via limousine to the game. Grant fails to disclose receiving this package to his supervisor.

*Comment:* Grant has violated Standard I(B) because accepting these substantial gifts may impede his independence and objectivity. Every member and candidate should endeavor to avoid situations that might cause or be perceived to cause a loss of independence or objectivity in recommending investments or taking investment action. By accepting the trip, Grant has opened himself up to the accusation that he may give the broker favored treatment in return.

## Example 8 (Gifts and Entertainment from Client):

Theresa Green manages the portfolio of Ian Knowlden, a client of Tisbury Investments. Green achieves an annual return for Knowlden that is consistently better than that of the benchmark she and the client previously agreed to. As a reward, Knowlden offers Green two tickets to Wimbledon and the use of Knowlden’s flat in London for a week. Green discloses this gift to her supervisor at Tisbury.

*Comment:* Green is in compliance with Standard I(B) because she disclosed the gift from one of her clients in accordance with the firm’s policies. Members and candidates may accept bonuses or gifts from clients as long as they disclose them to their employer because gifts in a client relationship are deemed less likely to affect a member’s or candidate’s objectivity and independence than gifts in other situations. Disclosure is required, however, so that supervisors can monitor such situations to guard against employees favoring a gift-giving client to the detriment of other fee-paying clients (such as by allocating a greater proportion of IPO stock to the gift-giving client’s portfolio).

Best practices for monitoring include comparing the transaction costs of the Knowlden account with the costs of other accounts managed by Green and other similar accounts within Tisbury. The supervisor could also compare the performance returns with the returns of other clients with the same mandate. This comparison will assist in determining whether a pattern of favoritism by Green is disadvantaging other Tisbury clients or the possibility that this favoritism could affect her future behavior.

## Example 9 (Travel Expenses from External Manager):

Tom Wayne is the investment manager of the Franklin City Employees Pension Plan. He recently completed a successful search for a firm to manage the foreign equity allocation of the plan's diversified portfolio. He followed the plan's standard procedure of seeking presentations from a number of qualified firms and recommended that his board select Penguin Advisors because of its experience, well-defined investment strategy, and performance record. The firm claims compliance with the Global Investment Performance Standards (GIPS) and has been verified. Following the selection of Penguin, a reporter from the *Franklin City Record* calls to ask if there was any connection between this action and the fact that Penguin was one of the sponsors of an "investment fact-finding trip to Asia" that Wayne made earlier in the year. The trip was one of several conducted by the Pension Investment Academy, which had arranged the itinerary of meetings with economic, government, and corporate officials in major cities in several Asian countries. The Pension Investment Academy obtains support for the cost of these trips from a number of investment managers, including Penguin Advisors; the Academy then pays the travel expenses of the various pension plan managers on the trip and provides all meals and accommodations. The president of Penguin Advisors was also one of the travelers on the trip.

*Comment:* Although Wayne can probably put to good use the knowledge he gained from the trip in selecting portfolio managers and in other areas of managing the pension plan, his recommendation of Penguin Advisors may be tainted by the possible conflict incurred when he participated in a trip partly paid for by Penguin Advisors and when he was in the daily company of the president of Penguin Advisors. To avoid violating Standard I(B), Wayne's basic expenses for travel and accommodations should have been paid by his employer or the pension plan; contact with the president of Penguin Advisors should have been limited to informational or educational events only; and the trip, the organizer, and the sponsor should have been made a matter of public record. Even if his actions were not in violation of Standard I(B), Wayne should have been sensitive to the public perception of the trip when reported in the newspaper and the extent to which the subjective elements of his decision might have been affected by the familiarity that the daily contact of such a trip would encourage. This advantage would probably not be shared by firms competing with Penguin Advisors.

## Example 10 (Research Independence and Compensation Arrangements):

Javier Herrero recently left his job as a research analyst for a large investment adviser. While looking for a new position, he was hired by an investor-relations firm to write a research report on one of its clients, a small educational software company. The investor-relations firm

hopes to generate investor interest in the technology company. The firm will pay Herrero a flat fee plus a bonus if any new investors buy stock in the company as a result of Herrero's report.

*Comment:* If Herrero accepts this payment arrangement, he will be in violation of Standard I(B) because the compensation arrangement can reasonably be expected to compromise his independence and objectivity. Herrero will receive a bonus for attracting investors, which provides an incentive to draft a positive report regardless of the facts and to ignore or play down any negative information about the company. Herrero should accept only a flat fee that is not tied to the conclusions or recommendations of the report. Issuer-paid research that is objective and unbiased can be done under the right circumstances as long as the analyst takes steps to maintain his or her objectivity and includes in the report proper disclosures regarding potential conflicts of interest.

## **Example 11 (Recommendation Objectivity and Service Fees):**

Two years ago, Bob Wade, trust manager for Central Midas Bank, was approached by Western Funds about promoting its family of funds, with special interest in the service-fee class of funds. To entice Central to promote this class, Western Funds offered to pay the bank a service fee of 0.25%. Without disclosing the fee being offered to the bank, Wade asked one of the investment managers to review Western's funds to determine whether they were suitable for clients of Central Midas Bank. The manager completed the normal due diligence review and determined that the new funds were fairly valued in the market with fee structures on a par with competitors. Wade decided to accept Western's offer and instructed the team of portfolio managers to exclusively promote these funds and the service-fee class to clients seeking to invest new funds or transfer from their current investments.

Now, two years later, the funds managed by Western begin to underperform their peers. Wade is counting on the fees to reach his profitability targets and continues to push these funds as acceptable investments for Central's clients.

*Comment:* Wade is violating Standard I(B) because the fee arrangement has affected the objectivity of his recommendations. Wade is relying on the fee as a component of the department's profitability and is unwilling to offer other products that may affect the fees received.

See also Standard VI(A)–Disclosure of Conflicts.

## Example 12 (Recommendation Objectivity):

Bob Thompson has been doing research for the portfolio manager of the fixed-income department. His assignment is to do sensitivity analysis on securitized subprime mortgages. He has discussed with the manager possible scenarios to use to calculate expected returns. A key assumption in such calculations is housing price appreciation (HPA) because it drives “prepays” (prepayments of mortgages) and losses. Thompson is concerned with the significant appreciation experienced over the previous five years as a result of the increased availability of funds from subprime mortgages. Thompson insists that the analysis should include a scenario run with –10% for Year 1, –5% for Year 2, and then (to project a worst-case scenario) 0% for Years 3 through 5. The manager replies that these assumptions are too dire because there has never been a time in their available database when HPA was negative.

Thompson conducts his research to better understand the risks inherent in these securities and evaluates these securities in the worst-case scenario, an unlikely but possible environment. Based on the results of the enhanced scenarios, Thompson does not recommend the purchase of the securitization. Against the general market trends, the manager follows Thompson’s recommendation and does not invest. The following year, the housing market collapses. In avoiding the subprime investments, the manager’s portfolio outperforms its peer group that year.

*Comment:* Thompson’s actions in running the worst-case scenario against the protests of the portfolio manager are in alignment with the principles of Standard I(B). Thompson did not allow his research to be pressured by the general trends of the market or the manager’s desire to limit the research to historical norms.

See also Standard V(A)–Diligence and Reasonable Basis.

## Example 13 (Influencing Manager Selection Decisions):

Adrian Mandel, CFA, is a senior portfolio manager for ZZYY Capital Management who oversees a team of investment professionals who manage labor union pension funds. A few years ago, ZZYY sought to win a competitive asset manager search to manage a significant allocation of the pension fund of the United Doughnut and Pretzel Bakers Union (UDPBU). UDPBU’s investment board is chaired by a recognized key decision maker and long-time leader of the union, Ernesto Gomez. To improve ZZYY’s chances of winning the competition, Mandel made significant monetary contributions to Gomez’s union reelection campaign fund. Even after ZZYY was hired as a primary manager of the pension, Mandel believed that his firm’s position was not secure. Mandel continued to contribute to Gomez’s reelection campaign chest as well as to entertain lavishly the union leader and his family at top restaurants on a regular basis. All of Mandel’s outlays were routinely handled as



marketing expenses reimbursed by ZZZY's expense accounts and were disclosed to his senior management as being instrumental in maintaining a strong close relationship with an important client.

*Comment:* Mandel not only offered but actually gave monetary gifts, benefits, and other considerations that reasonably could be expected to compromise Gomez's objectivity. Therefore, Mandel was in violation of Standard I(B).

## **Example 14 (Influencing Manager Selection Decisions):**

Adrian Mandel, CFA, had heard about the manager search competition for the UDPBU Pension Fund through a broker/dealer contact. The contact told him that a well-known retired professional golfer, Bobby "The Bear" Finlay, who had become a licensed broker/dealer serving as a pension consultant, was orchestrating the UDPBU manager search. Finlay had gained celebrity status with several labor union pension fund boards by entertaining their respective board members and regaling them with colorful stories of fellow pro golfers' antics in clubhouses around the world. Mandel decided to improve ZZZY's chances of being invited to participate in the search competition by befriending Finlay to curry his favor. Knowing Finlay's love of entertainment, Mandel wined and dined Finlay at high-profile bistros where Finlay could glow in the fan recognition lavished on him by all the other patrons. Mandel's endeavors paid off handsomely when Finlay recommended to the UDPBU board that ZZZY be entered as one of three finalist asset management firms in its search.

*Comment:* Similar to Example 13, Mandel lavished gifts, benefits, and other considerations in the form of expensive entertainment that could reasonably be expected to influence the consultant to recommend the hiring of his firm. Therefore, Mandel was in violation of Standard I(B).

## **Example 15 (Fund Manager Relationships):**

Amie Scott is a performance analyst within her firm with responsibilities for analyzing the performance of external managers. While completing her quarterly analysis, Scott notices a change in one manager's reported composite construction. The change concealed the bad performance of a particularly large account by placing that account into a new residual composite. This change allowed the manager to remain at the top of the list of manager performance. Scott knows her firm has a large allocation to this manager, and the fund's manager is a close personal friend of the CEO. She needs to deliver her final report but is concerned with pointing out the composite change.

*Comment:* Scott would be in violation of Standard I(B) if she did not disclose the

change in her final report. The analysis of managers' performance should not be influenced by personal relationships or the size of the allocation to the outside managers. By not including the change, Scott would not be providing an independent analysis of the performance metrics for her firm.

## Example 16 (Intrafirm Pressure):

Jill Stein is head of performance measurement for her firm. During the last quarter, many members of the organization's research department were removed because of the poor quality of their recommendations. The subpar research caused one larger account holder to experience significant underperformance, which resulted in the client withdrawing his money after the end of the quarter. The head of sales requests that Stein remove this account from the firm's performance composite because the performance decline can be attributed to the departed research team and not the client's adviser.

*Comment:* Pressure from other internal departments can create situations that cause a member or candidate to violate the Code and Standards. Stein must maintain her independence and objectivity and refuse to exclude specific accounts from the firm's performance composites to which they belong. As long as the client invested under a strategy similar to that of the defined composite, it cannot be excluded because of the poor stock selections that led to the underperformance and asset withdrawal.

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## STANDARD I(C): PROFESSIONALISM – MISREPRESENTATION

- a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity;**

Members and Candidates must not knowingly make any misrepresentations relating to investment analysis, recommendations, actions, or other professional activities.



# Guidance

## Highlights:

- *Impact on Investment Practice*
- *Performance Reporting*
- *Social Media*
- *Omissions*
- *Plagiarism*
- *Work Completed for Employer*

Trust is the foundation of the investment profession. Investors must be able to rely on the statements and information provided to them by those with whom the investors have trusted their financial well-being. Investment professionals who make false or misleading statements not only harm investors but also reduce the level of investor confidence in the investment profession and threaten the integrity of capital markets as a whole.

A misrepresentation is any untrue statement or omission of a fact or any statement that is otherwise false or misleading. A member or candidate must not knowingly omit or misrepresent information or give a false impression of a firm, organization, or security in the member's or candidate's oral representations, advertising (whether in the press or through brochures), electronic communications, or written materials (whether publicly disseminated or not). In this context, "knowingly" means that the member or candidate either knows or should have known that the misrepresentation was being made or that omitted information could alter the investment decision-making process.

Written materials include, but are not limited to, research reports, underwriting documents, company financial reports, market letters, newspaper columns, and books. Electronic communications include, but are not limited to, internet communications, webpages, mobile applications, and e-mails. Members and candidates who use webpages should regularly monitor materials posted on these sites to ensure that they contain current information. Members and candidates should also ensure that all reasonable precautions have been taken to protect the site's integrity and security and that the site does not misrepresent any information and does provide full disclosure.

Standard I(C) prohibits members and candidates from guaranteeing clients any specific return on volatile investments. Most investments contain some element of risk that makes their return inherently unpredictable. For such investments, guaranteeing either a particular

rate of return or a guaranteed preservation of investment capital (e.g., “I can guarantee that you will earn 8% on equities this year” or “I can guarantee that you will not lose money on this investment”) is misleading to investors. Standard I(C) does not prohibit members and candidates from providing clients with information on investment products that have guarantees built into the structure of the products themselves or for which an institution has agreed to cover any losses.

## ***Impact on Investment Practice***

Members and candidates must not misrepresent any aspect of their practice, including (but not limited to) their qualifications or credentials, the qualifications or services provided by their firm, their performance record and the record of their firm, and the characteristics of an investment. Any misrepresentation made by a member or candidate relating to the member’s or candidate’s professional activities is a breach of this standard.

Members and candidates should exercise care and diligence when incorporating third-party information. Misrepresentations resulting from the use of the credit ratings, research, testimonials, or marketing materials of outside parties become the responsibility of the investment professional when it affects that professional’s business practices.

Investing through outside managers continues to expand as an acceptable method of investing in areas outside a firm’s core competencies. Members and candidates must disclose their intended use of external managers and must not represent those managers’ investment practices as their own. Although the level of involvement of outside managers may change over time, appropriate disclosures by members and candidates are important in avoiding misrepresentations, especially if the primary activity is to invest directly with a single external manager. Standard V(B)–Communication with Clients and Prospective Clients discusses in further detail communicating the firm’s investment practices.

## ***Performance Reporting***

The performance benchmark selection process is another area where misrepresentations may occur. Members and candidates may misrepresent the success of their performance record through presenting benchmarks that are not comparable to their strategies. Further, clients can be misled if the benchmark’s results are not reported on a basis comparable to that of the fund’s or client’s results. Best practice is selecting the most appropriate available benchmark from a universe of available options. The transparent presentation of appropriate performance benchmarks is an important aspect in providing clients with information that is useful in making investment decisions.

However, Standard I(C) does not require that a benchmark always be provided in order to

comply. Some investment strategies may not lend themselves to displaying an appropriate benchmark because of the complexity or diversity of the investments included. Furthermore, some investment strategies may use reference indexes that do not reflect the opportunity set of the invested assets—for example, a hedge fund comparing its performance with a “cash plus” basis. When such a benchmark is used, members and candidates should make reasonable efforts to ensure that they disclose the reasons behind the use of this reference index to avoid misrepresentations of their performance. Members and candidates should discuss with clients on a continuous basis the appropriate benchmark to be used for performance evaluations and related fee calculations.

Reporting misrepresentations may also occur when valuations for illiquid or non-traded securities are available from more than one source. When different options are available, members and candidates may be tempted to switch providers to obtain higher security valuations. The process of shopping for values may misrepresent a security’s worth, lead to misinformed decisions to sell or hold an investment, and result in overcharging clients advisory fees.

Members and candidates should take reasonable steps to provide accurate and reliable security pricing information to clients on a consistent basis. Changing pricing providers should not be based solely on the justification that the new provider reports a higher current value of a security. Consistency in the reported information will improve the perception of the valuation process for illiquid securities. Clients will likely have additional confidence that they were able to make an informed decision about continuing to hold these securities in their portfolios.

## ***Social Media***

The advancement of online discussion forums and communication platforms, commonly referred to as “social media,” is placing additional responsibilities on members and candidates. When communicating through social media channels, members and candidates should provide only the same information they are allowed to distribute to clients and potential clients through other traditional forms of communication. The online or interactive aspects of social media do not remove the need to be open and honest about the information being distributed.

Along with understanding and following existing and newly developing rules and regulations regarding the allowed use of social media, members and candidates should also ensure that all communications in this format adhere to the requirements of the Code and Standards. The perceived anonymity granted through these platforms may entice individuals to misrepresent their qualifications or abilities or those of their employer. Actions undertaken through social media that knowingly misrepresent investment recommendations or professional activities are considered a violation of Standard I(C).

## ***Omissions***

The omission of a fact or outcome can be misleading, especially given the growing use of models and technical analysis processes. Many members and candidates rely on such models and processes to scan for new investment opportunities, to develop investment vehicles, and to produce investment recommendations and ratings. When inputs are knowingly omitted, the resulting outcomes may provide misleading information to those who rely on it for making investment decisions. Additionally, the outcomes from models shall not be presented as fact because they represent the expected results based on the inputs and analysis process incorporated.

Omissions in the performance measurement and attribution process can also misrepresent a manager's performance and skill. Members and candidates should encourage their firms to develop strict policies for composite development to prevent cherry picking—situations in which selected accounts are presented as representative of the firm's abilities. The omission of any accounts appropriate for the defined composite may misrepresent to clients the success of the manager's implementation of its strategy.

## ***Plagiarism***

Standard I(C) also prohibits plagiarism in the preparation of material for distribution to employers, associates, clients, prospects, or the general public. Plagiarism is defined as copying or using in substantially the same form materials prepared by others without acknowledging the source of the material or identifying the author and publisher of such material. Members and candidates must not copy (or represent as their own) original ideas or material without permission and must acknowledge and identify the source of ideas or material that is not their own.

The investment profession uses a myriad of financial, economic, and statistical data in the investment decision-making process. Through various publications and presentations, the investment professional is constantly exposed to the work of others and to the temptation to use that work without proper acknowledgment.

Misrepresentation through plagiarism in investment management can take various forms. The simplest and most flagrant example is to take a research report or study done by another firm or person, change the names, and release the material as one's own original analysis. This action is a clear violation of Standard I(C). Other practices include (1) using excerpts from articles or reports prepared by others either verbatim or with only slight changes in wording without acknowledgment, (2) citing specific quotations as attributable to "leading analysts" and "investment experts" without naming the specific references, (3) presenting statistical estimates of forecasts prepared by others and identifying the sources but without including the qualifying statements or caveats that may have been used, (4) using charts and graphs

without stating their sources, and (5) copying proprietary computerized spreadsheets or algorithms without seeking the cooperation or authorization of their creators.

In the case of distributing third-party, outsourced research, members and candidates may use and distribute such reports as long as they do not represent themselves as the report's authors. Indeed, the member or candidate may add value for the client by sifting through research and repackaging it for clients. In such cases, clients should be fully informed that they are paying for the ability of the member or candidate to find the best research from a wide variety of sources. Members and candidates must not misrepresent their abilities, the extent of their expertise, or the extent of their work in a way that would mislead their clients or prospective clients. Members and candidates should disclose whether the research being presented to clients comes from another source—from either within or outside the member's or candidate's firm. This allows clients to understand who has the expertise behind the report or whether the work is being done by the analyst, other members of the firm, or an outside party.

Standard I(C) also applies to plagiarism in oral communications, such as through group meetings; visits with associates, clients, and customers; use of audio/video media (which is rapidly increasing); and telecommunications, including electronic data transfer and the outright copying of electronic media.

One of the most egregious practices in violation of this standard is the preparation of research reports based on multiple sources of information without acknowledging the sources. Examples of information from such sources include ideas, statistical compilations, and forecasts combined to give the appearance of original work. Although there is no monopoly on ideas, members and candidates must give credit where it is clearly due. Analysts should not use undocumented forecasts, earnings projections, asset values, and so on. Sources must be revealed to bring the responsibility directly back to the author of the report or the firm involved.

## ***Work Completed for Employer***

The preceding paragraphs address actions that would constitute a violation of Standard I(C). In some situations, however, members or candidates may use research conducted or models developed by others within the same firm without committing a violation. The most common example relates to the situation in which one (or more) of the original analysts is no longer with the firm. Research and models developed while employed by a firm are the property of the firm. The firm retains the right to continue using the work completed after a member or candidate has left the organization. The firm may issue future reports without providing attribution to the prior analysts. A member or candidate cannot, however, reissue a previously released report solely under his or her name.

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# STANDARD I(C): RECOMMENDED PROCEDURES

- b. recommend practices and procedures designed to prevent violations of the Code and Standards.**

## Factual Presentations

Members and candidates can prevent unintentional misrepresentations of their qualifications or the services they or their firms provide if each member and candidate understands the limit of the firm's or individual's capabilities and the need to be accurate and complete in presentations. Firms can provide guidance for employees who make written or oral presentations to clients or potential clients by providing a written list of the firm's available services and a description of the firm's qualifications. This list should suggest ways of describing the firm's services, qualifications, and compensation that are both accurate and suitable for client or customer presentations. Firms can also help prevent misrepresentation by specifically designating which employees are authorized to speak on behalf of the firm. Regardless of whether the firm provides guidance, members and candidates should make certain that they understand the services the firm can perform and its qualifications.

## Qualification Summary

In addition, to ensure accurate presentations to clients, each member and candidate should prepare a summary of his or her own qualifications and experience and a list of the services the member or candidate is capable of performing. Firms can assist member and candidate compliance by periodically reviewing employee correspondence and documents that contain representations of individual or firm qualifications.

## Verify Outside Information

When providing information to clients from a third party, members and candidates share a responsibility for the accuracy of the marketing and distribution materials that pertain to the third party's capabilities, services, and products. Misrepresentation by third parties can damage the member's or candidate's reputation, the reputation of the firm, and the integrity

of the capital markets. Members and candidates should encourage their employers to develop procedures for verifying information of third-party firms.

## Maintain Webpages

Members and candidates who publish a webpage should regularly monitor materials posted on the site to ensure that the site contains current information. Members and candidates should also ensure that all reasonable precautions have been taken to protect the site's integrity, confidentiality, and security and that the site does not misrepresent any information and provides full disclosure.

## Plagiarism Policy

To avoid plagiarism in preparing research reports or conclusions of analysis, members and candidates should take the following steps:

- *Maintain copies:* Keep copies of all research reports, articles containing research ideas, material with new statistical methodologies, and other materials that were relied on in preparing the research report.
- *Attribute quotations:* Attribute to their sources any direct quotations, including projections, tables, statistics, model/product ideas, and new methodologies prepared by persons other than recognized financial and statistical reporting services or similar sources.
- *Attribute summaries:* Attribute to their sources any paraphrases or summaries of material prepared by others. For example, to support his analysis of Brown Company's competitive position, the author of a research report on Brown might summarize another analyst's report on Brown's chief competitor, but the author of the Brown report must acknowledge in his own report the reliance on the other analyst's report.

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## STANDARD I(C): APPLICATION OF THE STANDARD



- a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity;**

## **Example 1 (Disclosure of Issuer-Paid Research):**

Anthony McGuire is an issuer-paid analyst hired by publicly traded companies to electronically promote their stocks. McGuire creates a website that promotes his research efforts as a seemingly independent analyst. McGuire posts a profile and a strong buy recommendation for each company on the website indicating that the stock is expected to increase in value. He does not disclose the contractual relationships with the companies he covers on his website, in the research reports he issues, or in the statements he makes about the companies in internet chat rooms.

*Comment:* McGuire has violated Standard I(C) because the website is misleading to potential investors. Even if the recommendations are valid and supported with thorough research, his omissions regarding the true relationship between himself and the companies he covers constitute a misrepresentation. McGuire has also violated Standard VI(A)—Disclosure of Conflicts by not disclosing the existence of an arrangement with the companies through which he receives compensation in exchange for his services.

## **Example 2 (Correction of Unintentional Errors):**

Hijian Yao is responsible for the creation and distribution of the marketing materials for his firm, which claims compliance with the GIPS standards. Yao creates and distributes a presentation of performance by the firm's Asian equity composite that states the composite has ¥350 billion in assets. In fact, the composite has only ¥35 billion in assets, and the higher figure on the presentation is a result of a typographical error. Nevertheless, the erroneous material is distributed to a number of clients before Yao catches the mistake.

*Comment:* Once the error is discovered, Yao must take steps to cease distribution of the incorrect material and correct the error by informing those who have received the erroneous information. Because Yao did not knowingly make the misrepresentation, however, he did not violate Standard I(C). Because his firm claims compliance with the GIPS standards, it must also comply with the GIPS Guidance Statement on Error Correction in relation to the error.

## **Example 3 (Noncorrection of Known Errors):**



Syed Muhammad is the president of an investment management firm. The promotional material for the firm, created by the firm's marketing department, incorrectly claims that Muhammad has an advanced degree in finance from a prestigious business school in addition to the CFA designation. Although Muhammad attended the school for a short period of time, he did not receive a degree. Over the years, Muhammad and others in the firm have distributed this material to numerous prospective clients and consultants.

*Comment:* Even though Muhammad may not have been directly responsible for the misrepresentation of his credentials in the firm's promotional material, he used this material numerous times over an extended period and should have known of the misrepresentation. Thus, Muhammad has violated Standard I(C).

## **Example 4 (Plagiarism):**

Cindy Grant, a research analyst for a Canadian brokerage firm, has specialized in the Canadian mining industry for the past 10 years. She recently read an extensive research report on Jefferson Mining, Ltd., by Jeremy Barton, another analyst. Barton provided extensive statistics on the mineral reserves, production capacity, selling rates, and marketing factors affecting Jefferson's operations. He also noted that initial drilling results on a new ore body, which had not been made public, might show the existence of mineral zones that could increase the life of Jefferson's main mines, but Barton cited no specific data as to the initial drilling results. Grant called an officer of Jefferson, who gave her the initial drilling results over the telephone. The data indicated that the expected life of the main mines would be tripled. Grant added these statistics to Barton's report and circulated it within her firm as her own report.

*Comment:* Grant plagiarized Barton's report by reproducing large parts of it in her own report without acknowledgment.

## **Example 5 (Misrepresentation of Information):**

When Ricki Marks sells mortgage-backed derivatives called "interest-only strips" (IOs) to public pension plan clients, she describes them as "guaranteed by the US government." Purchasers of the IOs are entitled only to the interest stream generated by the mortgages, however, not the notional principal itself. One particular municipality's investment policies and local law require that securities purchased by its public pension plans be guaranteed by the US government. Although the underlying mortgages are guaranteed, neither the investor's investment nor the interest stream on the IOs is guaranteed. When interest rates

decline, causing an increase in prepayment of mortgages, interest payments to the IOs' investors decline, and these investors lose a portion of their investment.

*Comment:* Marks violated Standard I(C) by misrepresenting the terms and character of the investment.

## **Example 6 (Potential Information Misrepresentation):**

Khalouck Abdrabbo manages the investments of several high-net-worth individuals in the United States who are approaching retirement. Abdrabbo advises these individuals that a portion of their investments be moved from equity to bank-sponsored certificates of deposit and money market accounts so that the principal will be “guaranteed” up to a certain amount. The interest is not guaranteed.

*Comment:* Although there is risk that the institution offering the certificates of deposits and money market accounts could go bankrupt, in the United States, these accounts are insured by the US government through the Federal Deposit Insurance Corporation. Therefore, using the term “guaranteed” in this context is not inappropriate as long as the amount is within the government-insured limit. Abdrabbo should explain these facts to the clients.

## **Example 7 (Plagiarism):**

Steve Swanson is a senior analyst in the investment research department of Ballard and Company. Apex Corporation has asked Ballard to assist in acquiring the majority ownership of stock in the Campbell Company, a financial consulting firm, and to prepare a report recommending that stockholders of Campbell agree to the acquisition. Another investment firm, Davis and Company, had already prepared a report for Apex analyzing both Apex and Campbell and recommending an exchange ratio. Apex has given the Davis report to Ballard officers, who have passed it on to Swanson. Swanson reviews the Davis report and other available material on Apex and Campbell. From his analysis, he concludes that the common stocks of Campbell and Apex represent good value at their current prices; he believes, however, that the Davis report does not consider all the factors a Campbell stockholder would need to know to make a decision. Swanson reports his conclusions to the partner in charge, who tells him to “use the Davis report, change a few words, sign your name, and get it out.”

*Comment:* If Swanson does as requested, he will violate Standard I(C). He could refer to those portions of the Davis report that he agrees with if he identifies Davis as the source; he could then add his own analysis and conclusions to the report before signing and

distributing it.

## Example 8 (Plagiarism):

Claude Browning, a quantitative analyst for Double Alpha, Inc., returns from a seminar in great excitement. At that seminar, Jack Jorrely, a well-known quantitative analyst at a national brokerage firm, discussed one of his new models in great detail, and Browning is intrigued by the new concepts. He proceeds to test the model, making some minor mechanical changes but retaining the concepts, until he produces some very positive results. Browning quickly announces to his supervisors at Double Alpha that he has discovered a new model and that clients and prospective clients should be informed of this positive finding as ongoing proof of Double Alpha's continuing innovation and ability to add value.

*Comment:* Although Browning tested Jorrely's model on his own and even slightly modified it, he must still acknowledge the original source of the idea. Browning can certainly take credit for the final, practical results; he can also support his conclusions with his own test. The credit for the innovative thinking, however, must be awarded to Jorrely.

## Example 9 (Plagiarism):

Fernando Zubia would like to include in his firm's marketing materials some "plain-language" descriptions of various concepts, such as the price-to-earnings (P/E) multiple and why standard deviation is used as a measure of risk. The descriptions come from other sources, but Zubia wishes to use them without reference to the original authors. Would this use of material be a violation of Standard I(C)?

*Comment:* Copying verbatim any material without acknowledgement, including plain-language descriptions of the P/E multiple and standard deviation, violates Standard I(C). Even though these concepts are general, best practice would be for Zubia to describe them in his own words or cite the sources from which the descriptions are quoted. Members and candidates would be violating Standard I(C) if they either were responsible for creating marketing materials without attribution or knowingly use plagiarized materials.

## Example 10 (Plagiarism):

Through a mainstream media outlet, Erika Schneider learns about a study that she would like to cite in her research. Should she cite both the mainstream intermediary source as well as the author of the study itself when using that information?

*Comment:* In all instances, a member or candidate must cite the actual source of the information. Best practice for Schneider would be to obtain the information directly from the author and review it before citing it in a report. In that case, Schneider would not need to report how she found out about the information. For example, suppose Schneider read in the *Financial Times* about a study issued by CFA Institute; best practice for Schneider would be to obtain a copy of the study from CFA Institute, review it, and then cite it in her report. If she does not use any interpretation of the report from the *Financial Times* and the newspaper does not add value to the report itself, the newspaper is merely a conduit of the original information and does not need to be cited. If she does not obtain the report and review the information, Schneider runs the risk of relying on second-hand information that may misstate facts. If, for example, the *Financial Times* erroneously reported some information from the original CFA Institute study and Schneider copied that erroneous information without acknowledging CFA Institute, she could be the object of complaints. Best practice would be either to obtain the complete study from its original author and cite only that author or to use the information provided by the intermediary and cite both sources.

## **Example 11 (Misrepresentation of Information):**

Paul Ostrowski runs a two-person investment management firm. Ostrowski's firm subscribes to a service from a large investment research firm that provides research reports that can be repackaged by smaller firms for those firms' clients. Ostrowski's firm distributes these reports to clients as its own work.

*Comment:* Ostrowski can rely on third-party research that has a reasonable and adequate basis, but he cannot imply that he is the author of such research. If he does, Ostrowski is misrepresenting the extent of his work in a way that misleads the firm's clients or prospective clients.

## **Example 12 (Misrepresentation of Information):**

Tom Stafford is part of a team within Appleton Investment Management responsible for managing a pool of assets for Open Air Bank, which distributes structured securities to offshore clients. He becomes aware that Open Air is promoting the structured securities as a much less risky investment than the investment management policy followed by him and the

team to manage the original pool of assets. Also, Open Air has prepared a prospectus rating for the pool that significantly overstates the quality of the investments. Stafford communicates his concerns to his supervisor, who responds that the rating is correct and is responsible for all marketing and distribution. Stafford's supervisor also states that the product is outside of the US regulatory regime that Appleton is subject to. The fact that the product are disclosed at the bottom of page 184 of the prospectus.

*Comment:* As a member of the investment team, Stafford is qualified to assess the degree of accuracy of the materials that characterize the portfolio. He is concerned about Appleton's responsibility for a misrepresentation. He should continue to pursue the issue of Open Air's inaccurate prospectus rating according to the firm's policies and procedures.

The Code and Standards stress protecting the reputation of the firm and the sustainability and integrity of the capital markets. Misrepresentation associated with the investment pool may lead to negative consequences for the firm beyond the direct investors.

## Example 13 (Avoiding a Misrepresentation)

Trina Smith is a fixed-income portfolio manager at a pension fund. The market for highly structured mortgages is the focus of salespeople's efforts. The products represent a significant number of trading opportunities. When Smith discusses this topic with her team, Smith learns that calculating yields on changing interest rates for this deal structure requires very specialized vendor software. After meeting with the vendor, she realizes that each deal is unique and that deals can have more than a dozen different cash flow priorities. Smith comes to the conclusion that, because of the complexity of the securities, the team cannot effectively distinguish between potential investment options. To avoid misrepresenting their understanding of the highly structured mortgage segment of the securitized market she decides to limit the core of the fund's portfolio; they will allow some of the less complex securities to remain in the core.

*Comment:* Smith is in compliance with Standard I(C) by not investing in securities that she and her team cannot effectively understand. Because she is aware of the risk and return profile of the securities to the pension fund beneficiaries, she appropriately limits the fund's exposure to this sector.

## Example 14 (Misrepresenting Composition)







































































































































































































































































































































































































































































# Reading 33

## Application of the Code and Standards: Level III

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### LEARNING OUTCOMES

The candidate should be able to:

- a. evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct;
- b. explain how the practices, policies, or conduct does or does not violate the CFA Institute Code of Ethics and Standards of Professional Conduct.

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### 1. INTRODUCTION

The purpose of this reading is to provide examples of how the CFA Institute Code of Ethics and Standards of Professional Conduct (Code and Standards) can be applied in situations requiring professional and ethical judgment. [Exhibit 1](#) presents a useful framework to help navigate the ethical decision-making process and apply the Code and Standards. The framework's components do not need to be addressed in the sequence shown, but a review of the outcome should conclude the process. This review provides insights for improved decision making in the future.

#### Exhibit 1. A Framework for Ethical Decision Making

- Identify: Relevant facts, stakeholders and duties owed, ethical principles, conflicts of interest
- Consider: Situational influences, additional guidance, alternative actions



- Decide and act
  - Reflect: Was the outcome as anticipated? Why or why not?
- 

These cases involve individuals in private wealth and institutional asset management settings and discussion as to whether actions, taken or not taken, are in violation of the Code and Standards. As you work through these cases, think about how applying the ethical decision-making framework might have changed the decisions and actions of those in the scenarios. Referencing the Code and Standards will help in identifying applicable ethical principles upon which sound decisions and appropriate behavior can be based. The reading concludes with practice problems in item-set format.

**Note: The quoted material that follows is from the most recent edition of the *Standards of Practice Handbook, 11th edition (2014)*, which includes the Standards themselves as well as the Guidance to them.**

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## 2. SOVEREIGN INVESTMENT CORPORATION

- evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct;
- explain how the practices, policies, or conduct does or does not violate the CFA Institute Code of Ethics and Standards of Professional Conduct.

Anthony Corrales and Victoria Adebayo worked together at a UK hedge fund (HFI) that specializes in making alternative investments in developing markets.<sup>1</sup> Recently, Adebayo decided to return to her home country and accept a position as chief financial officer and chief investment officer at her country's Sovereign Investment Corporation (SIC). SIC's mandate is to benefit the country's developing economy by financing local projects that generate positive investment returns and attract global partners to co-invest with SIC. A secondary goal for SIC is to develop the country's capital markets by promoting more activity and growth in the local stock market. To achieve these objectives, SIC has an investment company called National Investments (NI). In exchange for investment proceeds, investors are issued shares in NI that are listed on the country's sole national exchange. By bringing in outside investors, the capital invested by NI has a leverage effect on the local economy and society. Adebayo is excited about the opportunity to work for SIC and lead NI's investing activities. She makes appropriate arrangements for the move home.

Soon after Adebayo starts in her new role, one of the country's regional governors, who also leads the country's opposing political party, strenuously advocates for SIC to make a sizable investment in a complex mining project in an underpopulated, remote area of the nation. The project is expected to bring economic benefits to the governor's region but requires a major capital commitment. The country's Minister of Finance, who hired Adebayo, has different priorities. He wants SIC to fund a moderately sized urban infrastructure project. Although less capital intensive than the mining project, this project is expected to create hundreds of jobs for supporters of the political party currently in power.

Adebayo knows that although both projects are potentially important to the country, investing in both simultaneously would strain the team's resources. She quickly decides that NI should invest in the urban infrastructure project before investing in the mining project. Adebayo thinks this sequencing of investment by NI offers the benefit of supporting the current political party in power while postponing investment in the mining project until a time when the opposition party gains control of the government in a future election. She also believes the urban infrastructure project may be more profitable in the short term, thus helping to attract new investment partners. With more capital from outside investors and the extra time, Adebayo believes NI would then have sufficient funding and expertise to invest in the second, more capital intensive and complex project.

1. Did Adebayo's decision to invest in the urban infrastructure project rather than the mining project most likely violate the CFA Institute Code and Standards?
  - A. No
  - B. Yes, with regard to diligence and reasonable basis
  - C. Yes, with regard to suitability

B is correct. Standard V(A): Diligence and Reasonable Basis requires members to exercise diligence, independence, and thoroughness, as well as to have a reasonable and adequate basis to support investment action. Adebayo's decision to invest "quickly" without apparent analysis is made based on political, not investment or financial, considerations. Adebayo is facing political pressures from senior governmental supporters of each project. She must thoroughly and independently investigate each potential investment and be resolute in maintaining her independence and objectivity to act in the best interests of NI and its investors. In addition, Adebayo must not be swayed or influenced by conflicts of interest resulting from outside situational influences or pressures.

A is incorrect because Adebayo's decision to invest "quickly" without apparent analysis is made based on political, not investment, considerations and violates her

responsibilities to exercise diligence, independence, and thoroughness in analyzing investments and taking investment action. She does not have a reasonable and adequate basis, supported by appropriate research and investigation, for any investment analysis, recommendation, or action.

C is incorrect. Both investments are suitable in meeting the goals of NI and may be justified on their merit in having a positive socioeconomic impact for the country. The mining project is likely to increase the country's wealth through increased economic activity and at the same time deliver a potentially attractive ROI. The infrastructure project will similarly enhance the local economy by providing long-term employment for hundreds of workers.

2. Which of the following would most likely mitigate any political bias influencing Adebayo's decisions regarding how to invest NI assets?
- A. Requiring all investments be approved by a higher governmental authority
  - B. Developing a rigorous governance framework for investment decisions
  - C. Requiring Adebayo to disclose conflicts of interest

B is correct. NI should have a robust and rigorous governance framework for making investment decisions that supports an appropriate level of due diligence undertaken and facilitates Adebayo's duty to make independent and objective investment decisions free of bias, as required by Standard I(B): Independence and Objectivity. NI's development orientation does not justify taking a less-than-rigorous investment approach. If NI is to originate deals locally and bring in co-investors, it must demonstrate that it is acting in investors' best interests and not subject to political pressures or other situational influences.

A is incorrect because deferring the decision to a higher governmental authority would not mitigate, and may in fact enhance, political influence on the investment decision rather than ensure each project is objectively considered for its individual investment merit.

C is incorrect because disclosing outside negative situational influences or conflicts of interest does not replace the need to act with independent and objective judgement when analyzing and selecting investment opportunities.

## Anthony Corrales, CFA, Partner, Hedge Fund Investors

Anthony Corrales, CFA, Adebayo's former colleague and partner at the hedge fund HFI, contacts Adebayo and expresses interest in making a significant investment in NI. Corrales asks Adebayo for detailed information regarding NI's current financial condition, future projections, and projects. She gives him the standard investor disclosure package. After closely examining the material, Corrales decides it is an excellent investment for the hedge fund. He is confident Adebayo will deliver a strong ROI for NI, which in turn will generate strong performance for HFI.

To demonstrate his conviction and convince his hedge fund partners of the opportunity, Corrales immediately invests 25% of his personal portfolio into NI in return for shares. After several days of deliberation, the hedge fund partners decide to invest HFI assets in NI but seek assurances that NI will maintain its aggressive investment strategy and commitment to high returns. Adebayo assures Corrales and the other hedge fund partners that NI is committed to providing its investors with high rates of return. Corrales asks Adebayo to provide him directly with regular updates on NI's investment performance, financial health, future funding plans, and project status. After the hedge fund's investment with SIC is made public, shares in NI trade higher on the exchange.

Corrales is also interested in making private market investments directly for HFI. To help in this endeavor, the hedge fund uses local sub-advisers to identify promising investment opportunities and navigate local laws and regulations. For their role, the sub-advisers are paid from assets of the hedge fund, and although they have minimal or no experience as financial consultants or advisers, all sub-advisers have close connections with local high-ranking government officials. Payments are made by the sub-advisers on behalf of the hedge fund to cover substantial "deal fees" and other expenses to facilitate governmental support for each investment. Corrales does not require the local business partners to provide details of their activities or to identify what specific expenses the fees cover. Corrales views these expenditures as necessary to the fund's investment success and reports them as operating expenses to the fund's investors.

**3. Which of Adebayo's interactions with Corrales most likely violates the CFA Institute Code and Standards?**

- A.** Sharing information about NI's current investments and financial condition
- B.** Promising to provide updates directly to Corrales and the hedge fund partners

**C. Committing that she will maximize return on investment for NI's investors**

C is correct. Standard III(C): Suitability requires CFA Institute members responsible for managing assets to a specific mandates, strategy, or style to take only investment actions that are consistent with that mandate. In the case of NI, Adebayo has a dual mandate to invest in projects that have both a beneficial socioeconomic impact and a positive expected investment return. This dual mandate is in contrast to traditional investment mandates that focus only on ROI regardless of outside or other impact. NI's investors are informed up front that investment return is not the single determining factor for NI's investment decisions. Any assurances by Adebayo to the hedge fund or other investors that promise a set rate or return or prioritize return maximization would be contrary to NI's mandate.

A is incorrect. Transparency is a fundamental principle in the Code and Standards. It would be appropriate and reasonable for Adebayo to provide detailed information about NI to potential investors, such as her former hedge fund partners, so they can conduct appropriate due diligence on NI. Although Adebayo must be careful to avoid improperly disclosing confidential information or material nonpublic information to potential investors, the facts make clear that Adebayo shares the information she is regularly disclosing to other potential investors. Adebayo can develop trust with the investment community, for NI's benefit, by providing ongoing transparency and accountability regarding her investment actions.

B is incorrect. Although Adebayo must be careful that she treats NI investors fairly, it may be acceptable in some circumstances to regularly communicate directly with a particular investor. This holds true as long as all investors of NI are treated fairly and receive the same disclosures about the financial prospects and other information about NI, with no preference for those investors with whom Adebayo has a close relationship. There is no indication from the facts that Adebayo is not also providing this same "hands on" service to other NI investors.

**4. Did Corrales's investment for his own portfolio most likely violate the CFA Institute Code and Standards?**

- A. No**
- B. Yes, with regard to conflicts of interest**
- C. Yes, with regard to priority of transactions**

C is correct. In this instance, Corrales has engaged in the unethical and often illegal practice of front-running, or trading in advance for one's personal account prior to trading for client accounts for economic advantage. Standard VI(B): Priority of Transactions states that investment transactions for clients must have priority over investment transactions for personal benefit. After the hedge fund invests in NI, the value of NI shares increases, benefiting Corrales through an increase in the value of his personal investment. This practice is unethical and violates Standard VI(B) even if his personal investment does not disadvantage the hedge fund in any way. Corrales should have waited to invest in NI until after the hedge fund had completed its investment in NI.

A is incorrect because Corrales is violating Standard VI(B): Priority of Transactions.

B is incorrect. Purchasing the same investments as your employer or investing in the same assets as your clients does not necessarily create a conflict of interest, although best practice recommends that such "co-investing" be disclosed.

5. By hiring sub-advisers in a developing country to source investment opportunities, Corrales is most likely violating the CFA Standard of Professional Conduct relating to:

- A. misrepresentation.
- B. diligence and reasonable basis.
- C. independence and objectivity.

A is correct. By reporting sub-advisory payments as legitimate hedge fund "operating expenses," Corrales is misrepresenting the nature of the payments to hide illegal activity and is in violation of Standard I(C): Misrepresentation. Although it is acceptable to hire sub-advisers to assist in sourcing investment opportunities, Corrales is not hiring a sub-adviser to assist in the investment decision-making process but is essentially engaged in bribery and facilitating local corruption.

Such conduct would violate multiple standards. To ensure inside access to investment opportunities for the hedge fund, Corrales pays locally connected individuals with minimal to no financial experience to influence government officials and secure access to investment deals. The "deal fees" are corrupt transactions and not supported by any documentation that details legitimate investment expenses. Corrales very likely violates Standard I(A): Knowledge of the Law because his conduct would most likely violate

applicable anti-bribery laws.

B is incorrect. To better serve clients, investment professionals may choose to delegate to third parties work that requires specialization, knowledge, or expertise. For example, an investment adviser may hire sub-advisers to handle a particular strategy or investment style outside the scope of the adviser's ability or experience. An adviser can hire a sub-adviser to manage an asset allocation invested in a particular market, and the payments to the sub-adviser would be legitimate investment expenses that could properly be passed on to investors in the hedge fund. Under Standard V(A): Diligence and Reasonable Basis, an investment adviser that has hired sub-advisers must ensure they have the necessary knowledge or expertise to meet the need for diligence and thoroughness in using sub-advisers in the investment decision-making process.

C is incorrect. Investment professionals may rely on the recommendations of sub-advisers who have a particular specialization, knowledge or expertise, when selecting investment opportunities without having separate or objective reasons for choosing those investments independent from the sub-adviser's recommendation.

## Ani Mehrotra, CFA, Junior Analyst, National Investments

Back at NI, Adebayo hires Ani Mehrotra, a young analyst and recent CFA charterholder who serves on the board of the CFA Institute local society. Mehrotra's responsibilities include promoting NI globally to potential investors. He is excited about his new role and is looking forward to working with Adebayo. Mehrotra asks Adebayo why she has not been participating in events held by the local society, given how active she was with the CFA Society of the UK. Adebayo tells him that since taking her new role, she has not paid her CFA Institute membership dues or had the time to engage actively with the society. Mehrotra notices that Adebayo continues to use the CFA designation on her business card and on all marketing materials. When Mehrotra asks Adebayo about her use of the designation, she tells him that because she passed the exams and earned the charter, the credential is like a degree from university that cannot be taken away.

During a sales presentation by Mehrotra and Adebayo, the potential client notes that their firm considers only investment opportunities that have CFA charterholders in senior investment positions. He asks Adebayo if all of NI's senior investment professionals are CFA charterholders. Adebayo responds, "Yes, that is correct." Mehrotra defers to Adebayo, his supervisor, and says nothing.



In serving as a board member in the CFA Institute local society, Mehrotra seeks to “give back” to the CFA Program by mentoring local candidates. He volunteers to lead the exam preparation course given by his local society for candidates in the CFA Program. After the exam, the society hosts a celebration for the students. During the celebration, a number of Mehrotra’s students describe their experiences sitting for the exam. Most give their opinion on the relative difficulty of the exam, and some describe their surprise about areas of the curriculum that were not tested. Mehrotra asks the students their opinion on the most difficult exam questions. He hopes to use this information to help ensure his future students are better prepared.

**6.** With regard to communicating information to a potential investor about the qualifications of NI’s investment team, who violated the CFA Institute Code and Standards?

- A.** Only Adebayo
- B.** Both Adebayo and Mehrotra
- C.** Neither Adebayo or Mehrotra

B is correct. Standard VII(B): Reference to CFA Institute, the CFA Designation, and the CFA Program states that when referring to the CFA designation, CFA Institute members and candidates “must not misrepresent ... holding the designation.” The CFA designation is not like a degree from a university in that once granted the right to use the designation, individuals must also satisfy CFA Institute membership requirements (including paying dues and submitting a Professional Conduct Statement annually) to maintain the right to refer to themselves as CFA charterholders. Although Adebayo earned her charter, her membership is considered lapsed because she has not been paying her CFA Institute dues. Until her membership is reactivated, she must not use the CFA designation or present herself as a charterholder to potential investors, although she may state she was previously a CFA Institute member.

Mehrotra hears Adebayo refer to herself as a charterholder, but he knows that because Adebayo has not paid her dues, her CFA Institute membership has lapsed. Standard I(A): Knowledge of the Law prohibits members from knowingly participating or assisting in the violations of others and requires members to dissociate from any unethical or illegal conduct. Mehrotra’s acquiescence and silence during Adebayo’s misrepresentation to the client, at minimum, assists Adebayo’s violation of the standard. By keeping silent about false information given to a potential investor, when doing so is potentially harmful to that investor, Mehrotra’s behavior constitutes assisting in the violations of those who provide that false information even if there is no active conduct by Mehrotra. Best practice, although difficult, would be for Mehrotra to address



Adebayo directly about her conduct and ask her to reinstate her membership or correct the statement made to the potential investor. If Adebayo refuses to take corrective action, Mehrotra could bring this conduct to the attention of the SIC's compliance department for them to address. Mehrotra should dissociate from the activity by not participating in any future sales meetings with Adebayo.

A is incorrect because Mehrotra violated Standard I(A): Knowledge of the Law, as outlined earlier.

C is incorrect because Adebayo violated Standard VII(B): Reference to CFA Institute, the CFA Designation, and the CFA Program and Mehrotra violated Standard I(A): Knowledge of the Law, as outlined earlier.

7. Which of Mehrotra's actions with respect to the society CFA preparatory course least likely violates the CFA Institute Code and Standards?
- A. Soliciting information about the exam questions from students in an effort to improve the course for future preparatory classes
  - B. Relating information about the exam to candidates in future preparatory classes to help prepare them for the exam
  - C. Sharing his students' opinions about the difficulty of the exam to candidates in future preparatory classes to emphasize the need to thoroughly prepare

C is correct. CFA Institute Standard VII(A): Conduct as Participants in CFA Institute Programs states that candidates must not engage in any conduct that compromises the integrity, validity, or security of CFA Institute Programs. This Standard is designed to protect the integrity and security of future exams. The Standard includes giving or receiving assistance on any CFA exams and providing confidential program or exam information to candidates or the public. Candidates may generally disclose whether they believed to the CFA Exam to be difficult relative to their expectations. It is acceptable for Mehrotra to advise future preparatory classes that his previous students found the CFA exam to be more difficult than expected, so students should study the curriculum and prepare as much as possible.

A is incorrect. Candidates cannot provide specific information about the exam regarding the questions or the subjects tested within a topic area. Mehrotra violates Standard VII(A) by soliciting information about specific exam questions.

B is incorrect. Candidates can discuss their exam experience in general terms. However, they cannot provide specific information about the exam questions or curriculum subjects that are or are not tested on the exam. Mehrotra cannot pass such information to future candidates without violating Standard VII(A). For example, although CFA Institute makes known to candidates that ethics is one of 10 topic areas tested on the exam, there may not be an exam question on the subject of material non-public information. A candidate saying ethics was difficult on the exam is not in violation of Standard VII(A), but a candidate saying there were no exam questions on insider information would violate Standard VII(A).

## Marcia Lopez

June 2017 was a life-changing month for Marcia Lopez.<sup>2</sup> She earned a master's degree in finance from a top national university, sat for the Level I CFA Program exam, and accepted a job offer in her hometown as an associate in the wealth management division of BankGlobal, a multinational financial services firm.

In August, Lopez finds out that she passed Level I and begins working for BankGlobal. On her first day at BankGlobal, Lopez meets with her supervisor, David Hockett, CFA. Hockett has worked in the wealth management industry for almost 25 years and has been with BankGlobal for the past 10 years. He is eager to share his expertise with Lopez, which will enable her to assume greater client management responsibilities under his supervision. During their meeting, Hockett reviews BankGlobal's Code of Ethics, the specific policies and procedures needed to ensure compliance with their Code, the CFA Institute Code and Standards, and all applicable securities laws and regulations. At the end of the meeting, Lopez asks him to approve her Business Card Request form, on which she describes herself as a "CFA, Level I." Hockett tells her that she should also put on her business card the year she expects to receive her CFA designation so clients can track her success in the program.

8. Does Lopez violate the Code and Standards in her description of herself on the Business Card Request form?
  - A. Yes
  - B. No, because she found out in August that she passed Level I
  - C. No, because she knows the year that she expects to receive her CFA

## designation

A is correct. Putting on her business card “CFA, Level I” and the year in which she expects to receive the CFA designation is a violation of Standard VII(B):

Responsibilities as a CFA Institute Member or CFA Candidate, Reference to CFA Institute, the CFA Designation, and the CFA Program. “Candidates in the CFA Program may refer to their participation in the CFA Program, but such references must clearly state that an individual is a *candidate* in the CFA Program and must not imply that the candidate has achieved any type of partial designation.” Moreover, CFA candidates must never “cite an expected completion date of any level of the CFA Program.”

B is incorrect. The fact that she found out she passed Level I is irrelevant to the standard. By putting “CFA, Level I” and the year she expects to receive her designation, Lopez is violating Standard VII(B): Reference to CFA Institute, the CFA Designation, and the CFA Program.

C is incorrect. Lopez cannot know the year she expects to receive the designation because she needs to pass Levels II and III as well as gain sufficient relevant work experience—all of which involve future uncertainty. Even if knowing the date was possible, putting the year she expects to receive her designation violates Standard VII(B): Reference to CFA Institute, the CFA Designation, and the CFA Program.

## David Hockett and Team

Later that day, Hockett introduces Lopez to the four other members of his wealth management team. The team manages \$900 million in assets for 150 high-net-worth clients. Almost 80% of the team’s assets are managed in discretionary accounts, with the balance managed in non-discretionary accounts. For the past two years, the portfolios managed by Hockett’s team have outperformed their benchmarks and most other wealth management teams at BankGlobal. This is partly due to the close relationships that the team has developed with the securities analysts in BankGlobal’s research department. Because of bottlenecks in BankGlobal’s information technology (IT) department, it generally takes about 45 minutes for changes in the analysts’ recommendations to be published on the firm’s website and emailed to clients. As a result, the analysts often call Hockett’s team about changes in their recommendations before IT has published the information on BankGlobal’s website. After receiving these calls, the team immediately acts upon any analyst changes for their discretionary accounts to prevent their clients’ portfolios from being adversely impacted when the recommendations are posted or to take advantage of better than expected reports.

**9.** By acting upon the analysts' recommendations for their discretionary accounts, are members of Hockett's team violating the Code and Standards?

**A.** No

**B.** Yes, because they are not dealing fairly with all clients

**C.** Yes, because they are acting on material nonpublic information

B is correct. By acting on the analysts' recommendation changes for their discretionary accounts before the changes are publicly disseminated, the team is violating Standard III(B): Duties to Clients, Fair Dealing. Standard III(B) requires members and candidates to "deal fairly and objectively with all clients when providing investment analysis, making investment recommendations, taking investment action, or engaging in other professional activities." Guidance to Standard III(B) states: "Members and candidates must make every effort to treat all individual and institutional clients in a fair and impartial manner. A member or candidate may have multiple relationships with an institution; for example, the member or candidate may be a corporate trustee, pension fund manager, manager of funds for individuals employed by the customer, loan originator, or creditor. A member or candidate must exercise care to treat all clients fairly."

A is incorrect. By acting on the analysts' recommendation changes for only some clients before the investment recommendations are publicly disseminated to all clients, Hockett's team is not treating all BankGlobal clients in a fair and impartial manner. Hockett is giving preferential treatment to his discretionary accounts at the expense of other clients, such as the non-discretionary accounts managed by Hockett's team and clients of other BankGlobal wealth teams.

C is incorrect. The research team develops their recommendations for management of all BankGlobal's client accounts. These clients pay BankGlobal for its research. If other investors would like to access BankGlobal research, they can do so by becoming clients of the bank. The Guidance to Standard II(A) Material Nonpublic Information states: "information is material if it would significantly alter the total mix of information currently available about a security." To be considered material there would need to be a clear indication that the general investing public relies on the information of BankGlobal. There is no indication in the material that BankGlobal recommendations are distributed to, or highly valued by, the general investing public.

## The Kochanskis

After several months of learning about the wealth management division's operations and products, Hockett believes Lopez is ready to meet with prospective clients. Next week, Hockett is meeting with Marty and Mary Kochanski for the first time. The Kochanskis were referred to Hockett by Gary White, their business banker at BankGlobal. The Kochanskis are both 61 years of age, and they recently retired after Mary sold her medical insurance consulting business for \$7.4 million. Hockett invites Lopez to participate in the meeting with the older couple and asks her to prepare a presentation on BankGlobal's wealth management capabilities. Hockett also asks her to create a model "balanced portfolio" that he intends to recommend to the Kochanskis at the meeting.

Lopez is excited and immediately begins work on the presentation. To develop the Kochanski's "balanced portfolio," Lopez prepares a list of fixed-income funds, equity mutual funds, and exchange-traded funds (ETFs). The list includes mutual funds and ETFs from BankGlobal's proprietary offerings as well as those from other firms. Lopez then selects the top two performing equity and fixed-income funds with the highest five-year returns. To create a balanced portfolio, she gives an equal weight to each fund. Unsure how to present the model portfolio's past performance, Lopez uses an average of the four funds' five-year annualized rates of return and labels it "Total Portfolio Return." For comparison purposes, Lopez shows the annual rates of return realized over a five-year period for a "composite portfolio" consisting of the team's discretionary accounts of similar size to the Kochanski's that also have a balanced objective. To simplify the presentation, she excludes terminated accounts.

The day before they are to meet with the Kochanskis, Hockett reviews Lopez's presentation. Although he is impressed with the quality of her work, he asks her why she did not use only BankGlobal's proprietary mutual funds to create the Kochanski's balanced portfolio. Hockett tells Lopez that, whenever possible, she should always use BankGlobal's products since they are "as good as any other firm's" and that the team receives a higher fee by using them. In addition, he states that "as employees and shareholders of BankGlobal, we have a fiduciary duty to maximize our shareholders' wealth." Before leaving to go home that evening, Lopez changes the funds in the Kochanski's model portfolio to include only BankGlobal's proprietary funds and then updates the presentation.

The next morning, Hockett and Lopez meet with the Kochanskis. At the time White had referred them to Hockett, White had told Hockett only how much the Kochanskis wanted to invest, their ages, and their employment status. At the face-to-face meeting, the Kochanskis share that while they have a solid understanding of the health care and medical insurance businesses, they don't know enough about financial markets and securities to manage their own investments. Instead, they would prefer to have an investment professional manage their money, allowing them more time to travel and enjoy their grandchildren. During the 30-minute meeting with the Kochanskis, Hockett and Lopez go through Lopez's presentation

and explain why a balanced portfolio is most suited for them.

**10.** Did Hockett/Lopez violate the Code and Standards in their recommendation of a balanced portfolio to the Kochanskis?

- A.** Yes
- B.** No, because they know the Kochanski's investment objectives and risk tolerance
- C.** No, because the balanced portfolio is most suitable for the Kochanskis given their age and wealth

A is correct. Hockett/Lopez violated the Code and Standards. By developing/recommending a balanced portfolio for the Kochanskis without knowing their clients' investment objectives, risk tolerance, horizon, etc., Hockett/Lopez violated Standard III(C): Duties to Clients, Suitability: "When Members and Candidates are in an advisory relationship with a client, they must:

- Make a reasonable inquiry into a client's or prospective client's investment experience, risk and return objectives, and financial constraints prior to making any investment recommendation or taking investment action and must reassess and update this information regularly.
- Determine that an investment is suitable to the client's financial situation and consistent with the client's written objectives, mandates, and constraints before making an investment recommendation or taking investment action.
- Judge the suitability of investments in the context of the client's total portfolio."

Hockett/Lopez should have developed an investment policy statement for the Kochanskis *before* they recommended any investments.

B is incorrect. Hockett/Lopez violated Standard III(C): Suitability because they did not know their clients' investment objectives, risk tolerance, horizon, etc., when they developed/recommended the balanced portfolio. Hockett/Lopez should have developed an investment policy statement for the Kochanskis before they recommended any investments.

C is incorrect. Without knowing the Kochanski's investment objectives, risk tolerance, horizon, etc., it is simply not possible to know that the balanced portfolio as constructed is most suitable for the Kochanskis. Thus, the actions of Hockett and Lopez are in

- 11.** Which one of the following caused Lopez to violate the Code and Standards in her presentation of past performance information?
- A.** Exclusion of terminated accounts.
  - B.** Using an average return for the model portfolio's performance.
  - C.** Using discretionary accounts of similar size to the Kochanski's account.

A is correct. Lopez violated Standard III(D): Duties to Clients, Performance Presentation in her use and presentation of the composite portfolio's performance because she did not include the performance of terminated accounts. In addition, she included only the team's discretionary accounts of similar size to the Kochanski's. Lopez should have included terminated and current discretionary accounts that were similar in her composite portfolio's performance. There is no need to include non-discretionary accounts as clients make their own investment decisions for such accounts.

B is incorrect. Using an average of the four fund's performance to present the model portfolio's performance is acceptable since the Kochanski's knowledge of investments is unknown to Lopez. This easy to understand approach is appropriate for sharing information with novice investors. This is supported through the guidance: Members and candidates can also meet their obligations under Standard III(D) by

- considering the knowledge and sophistication of the audience to whom a performance presentation is addressed

C is incorrect. Lopez presented a composite based upon accounts similar in nature to the one being recommended. This is supported through the guidance: Members and candidates can also meet their obligations under Standard III(D) by

- presenting the performance of the weighted composite of similar portfolios rather than using a single representative account

The Kochanskis are impressed with Lopez's presentation and BankGlobal's broad array of products and services, its commitment to clients, and its long-term view of the markets. As a result, they decide to open an account and invest their \$7.4 million into the balanced



portfolio.

Following the meeting with the Kochanskis, Hockett calls White to thank him for the referral. White replies, “Glad to do it, David. The new incentive referral program implemented in the corporate banking division in January of this year has been very rewarding for me. I receive a \$250 gift certificate each time I refer one of my banking clients to the wealth management division. Because our referral program is internal and uses gift certificates, I do not have to disclose this to clients.” Hockett replies, “In January of this year, the wealth management division also established a new incentive program in order to motivate and retain key people, like myself and my team. All portfolio managers are now paid a quarterly bonus based on the performance of client accounts relative to certain benchmark indexes. Although 90% of our client accounts are conservative with long-term investment objectives, we have been able to generate short-term ‘alpha’ in these accounts by investing 15%–20% of their portfolios in high beta stocks that appear to have low risk. As a result, we have not had to change client investment objectives or their investment policy statements. Our returns have been great, and clients are pleased with our performance. Until that changes, I don’t see the need to mention the incentive program to clients.”

After work, Lopez tweets the following to her old high school friends: “Just opened an account for Mr. Kochanski and his wife, Mary.”

**12.** Is Hockett violating the Code and Standards by generating “alpha” for conservative client accounts?

- A.** Yes
- B.** No, because the stocks are high beta, low risk securities
- C.** No, because client investment objectives and investment policy statements are unchanged

A is correct. Hockett is violating Standard III(C): Duties to Clients, Suitability by investing in high beta stocks for client accounts with long-term objectives in order to achieve his short-term quarterly performance bonus. “When Members and Candidates are responsible for managing a portfolio to a specific mandate, strategy, or style, they must make only investment recommendations or take only investment actions that are consistent with the stated objectives and constraints of the portfolio.” High beta stocks by their very nature have risk.

Hockett is also violating Standard III(C) by investing 15%–20% of his clients’ portfolios in high beta stocks that “appear low risk.” These high beta stocks are contrary to the



long-term risk profile established in the clients' IPS. Hockett has changed the investment strategy for his clients in an attempt to gain short-term rewards offered by his firm's new compensation arrangement and not in response to changes in their investment needs and corresponding investment policy statements.

B is incorrect. High beta stocks are not low risk. Hockett's statement is incorrect, and he is violating Standard III(C) by investing 15%–20% of clients' portfolios in high beta stocks that are contrary to the long-term risk profile established in the clients' IPS. Hockett has changed the investment strategy of his clients in an attempt to reap short-term rewards offered by his firm's new compensation arrangement.

C is incorrect. The fact that client investment objectives and investment policy statements are unchanged is irrelevant. Hockett violated Standard III(C) by investing 15%–20% of clients' portfolios in high beta stocks that are contrary to the long-term risk profile established in the clients' IPS. Hockett has changed the investment strategy of his clients in an attempt to reap short-term rewards offered by his firm's new compensation arrangement.

**13. Did Lopez violate the Code and Standards in her use of social media?**

- A. Yes**
- B. No, because Lopez did not provide any specific information on the investments or dollar amounts**
- C. No, because Lopez only tweeted to her old high school friends, not to people in the industry**

A is correct. Lopez violated Standard III(E): Duties to Clients, Preservation of Confidentiality by tweeting about the Kochanski's opening of an account. "Members and Candidates must keep information about current, former, and prospective clients confidential unless: 1. The information concerns illegal activities on the part of the client or prospective client, 2. Disclosure is required by law, or 3. The client or prospective client permits disclosure of the information." Standard III(E) requires that even the presence of a client account be kept confidentially within the firm unless the client has been informed and has consented to the disclosure of the information.

B is incorrect. Standard III(E) requires all information about current, former, or prospective clients be kept confidential, not just information about their investments or dollar amounts. Tweeting the name of the Kochanskis as new clients violated the

required confidentiality.

C is incorrect. Standard III(E) requires all information about current, former, or prospective clients be kept confidential. This confidentiality extends beyond the investment industry to the population as a whole. By tweeting the name of the Kochanskis as new clients to her high school friends, Lopez violated the confidentiality required under Standard III(E).

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### 3. CASTLE BIOTECHNOLOGY CASE: DAVID PLUME, PHD, CFA

- a. evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct;
- b. explain how the practices, policies, or conduct does or does not violate the CFA Institute Code of Ethics and Standards of Professional Conduct.

Castle Biotechnology (CB) is a biopharmaceutical company dedicated to acquiring, developing, and commercializing pharmaceutical and biotechnology products.<sup>3</sup> These products are developed within CB and through the nine biopharmaceutical companies it controls. Fifteen months ago, CB purchased a controlling interest in Global Capital Management (Global), a full-service investment banking and asset management firm that provides a range of services that include underwriting, institutional sales, trading, equity research, and retail brokerage.

Shakira Chung, CFA, is CB's president, and Yusef Anders, CFA, is CB's chief executive. This morning they are meeting to discuss the latest financial results of CB and its subsidiaries.

Anders: "Shakira, your idea to purchase Global was brilliant. Global gives CB an in-house underwriter and a private sales force of 700 brokers to raise money to finance the research and development activities of the nine companies in our portfolio. Since acquiring Global, its brokers and research analysts have raised more than \$75 million from investors around the world. Currently, Global has deals in progress to raise an additional \$45 million."

Chung: "Yusef, we have built a unique model that inherently aligns CB's business objectives

with the financial interests of Global's clients. We should be proud of the deals we have completed and the large amount of capital we have raised for our subsidiaries since we acquired Global."

Two of the biopharmaceutical companies in CB's portfolio that Global has recently taken public are Street Pharmaceuticals (STRX) and Appaloosa Biotech (APBX). Even though each company issued 75% of its shares to the public, CB stills retains voting control of each company. CB also has the right to receive a significant grant of each company's common stock each year.

## **David Plume, PhD, CFA**

David Plume, PhD, CFA, follows the biopharmaceutical industry for Global. Prior to joining Global, Plume worked as a biochemist at CB for 15 years. During that time, he developed close professional and personal relationships with Chung and Anders. As a result, they encouraged him to become an equity analyst at Global after CB acquired it. Chung and Anders felt Plume's extensive, in-depth knowledge of the biotechnology and pharmaceutical industries would be a great help to Global. He would not only be able to write "perceptive" research reports on the companies in CB's portfolio, but he also would be able to help Global's corporate finance department identify which of its companies should be taken public. As part of his compensation package at Global, Plume receives an annual bonus equal to 0.10% of the gross proceeds raised for each initial public offering (IPO) he works on.

Prior to STRX and APBX going public with their IPOs, Plume spent a good deal of time with Global's investment bankers explaining the products each company was developing, their market potential, and the regulatory process required before their drugs could be approved for patient use by government regulators. On their first day of trading, the stock prices of STRX and APBX increased by 70% and 65%, respectively. Since then, however, their stock prices have declined 36% and 54%, respectively.

Shortly after STRX and APBX went public with their IPOs, Plume published positive research reports for both companies. In a note published on Global's website, Plume wrote that "STRX and APBX are the biopharmaceutical companies of the future. Although both are small and have no revenues to date, each company is developing a 'life changing drug' currently undergoing clinical trials. As a result, I rate their stocks a 'buy' and predict their share prices will more than double in 9 to 12 months."

In his research reports, Plume does not mention that Global is owned by Castle, the same company that controls STRX and APBX, because this information is disclosed in each company's offering prospectus. He does state, however, that "One or more directors, officers, and/or employees of Global Capital and its affiliated companies, or independent contractors affiliated with Global, may be a director of the issuer of the securities mentioned herein."

Plume also does not disclose that he owns Class A preferred shares of CB and options on CB's common stock, which were given/granted to him while he was a CB employee.

Three months after issuing his research report with a "buy" rating on APBX, Plume sells APBX short in his personal portfolio. He does not disclose the sale because he was never a beneficial owner of APBX's stock.

1. Did Plume violate the Code and Standards by not disclosing in his research report that Global is owned by Castle?
  - A. Yes
  - B. No, because this does not affect his duty to Global or his duty to clients
  - C. No, because this information is disclosed in each company's offering prospectus

A is correct. By not disclosing that Global is owned by Castle in his research report, Plume is in violation of Standard VI(A): Conflicts of Interest, Disclosure of Conflicts, which states that "Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively."

By not disclosing in his research reports the relationships between Castle, its nine subsidiaries, and Global, Plume is in violation of Standard VI(A). CB's ownership of Global as well as Plume's close relationships with CB's management raise questions about Plume's ability to remain independent and objective.

B is incorrect. Plume's holdings of preferred shares and options on CB's common stock require his disclosure that Global is owned by Castle (plus his beneficial ownership) to his clients. Thus, the non-disclosure means he has failed in his duty of full and fair disclosure of any potential conflicts of interest that may affect his clients.

C is incorrect. The fact that the relationships between Plume, CB and subsidiaries, and Global are disclosed in the offering prospectus is necessary but not sufficient to meet Standard VI(A).

**2. Did Plume violate the Code and Standards by not disclosing his ownership of CB's Class A preferred shares and common stock options in his research report?**

**A. Yes**

**B. No, because he does not own shares of STRX and APBX**

**C. No, because he does not have a beneficial interest in STRX and APBX**

A is correct. By not disclosing his ownership of CB's preferred shares and stock options in his research report, Plume is in violation of Standard VI(A): Conflicts of Interest, Disclosure of Conflicts. Because of his ownership in CB, Plume has a material beneficial ownership interest in the securities of STRX and APBX, which are both recommended "buys" by him. The most obvious conflict that should always be disclosed involves relationships between an issuer and the member, the candidate, or his or her firm. For the purposes of Standard VI(A), members and candidates beneficially own securities or other investments if they have a direct or indirect pecuniary interest in the securities or have the power to dispose of or direct the disposition of the security or investment.

B is incorrect. Plume does not need to own shares in STRX and APBX directly to have a material beneficial interest in the two companies. His ownership of CB's preferred shares and its common stock options, along with CB's voting control of each company, gives him a material beneficial ownership interest in STRX and APBX. This creates a conflict of interest that requires disclosure.

C is incorrect. Plume's ownership of CB's preferred shares and its common stock options give him a material beneficial ownership interest in STRX and APBX. This material beneficial interest leads to the conflict of interest that requires disclosure of his holding of CB's Class A preferred shares and options on CB common stock.

**3. Did Plume violate the Code and Standards by not disclosing in his research report his annual bonus based on his IPO work?**

**A. Yes**

**B. No, because it does not represent an additional compensation arrangement**

**C. No, because it does not affect his duty of loyalty, prudence, and care to clients**

A is correct. By not disclosing his annual bonus in his research report, Plume is in violation of Standard I(B): Professionalism, Independence and Objectivity, which states “Members and Candidates must use reasonable care and judgment to achieve and maintain independence and objectivity in their professional activities. Members and Candidates must not offer, solicit, or accept any gift, benefit, compensation, or consideration that reasonably could be expected to compromise their own or another’s independence and objectivity.”

Plume’s annual bonus is equal to 0.10% of the gross proceeds for each IPO he works on with the corporate finance department. Can a member or candidate remain objective, if, on behalf of the firm, the member or candidate obtains or assists in obtaining fees for service? As a sell-side analyst, Plume may be encouraged by Global or CB to write potentially biased research reports about particular companies (i.e., the ones in CB’s portfolio) to the exclusion of covering other companies that may be more suitable for Global’s clients. Guidance to Standard I(B) states, “Compensation arrangements should not link analyst remuneration directly to investment banking assignments in which the analysts may participate as a team member.” The Guidance also states, “Having analysts work with investment bankers is appropriate only when the conflicts are adequately and effectively managed and disclosed. Firm managers have a responsibility to provide an environment in which analysts are neither coerced nor enticed into issuing research that does not reflect their true opinions. Firms should require public disclosure of actual conflicts of interest to investors.”

B is incorrect. Plume’s bonus is based on the gross proceeds of each IPO he works on, and so it does constitute an additional compensation arrangement. The compensation arrangement is also likely to create a conflict of interest that must be disclosed.

C is incorrect. Because Plume’s bonus is based on the gross proceeds of each IPO he works on, he could reasonably be expected to compromise his independence and objectivity. As a result, this arrangement links his compensation directly to his participation in his investment banking assignments and thus creates a conflict of interest between the member/candidate and his employer. In this case, the bonus is being paid by his employer.

**4.** Did Plume violate the Code and Standards by selling APBX short in his personal portfolio?

**A.** Yes

**B.** No, because he was not a beneficial owner of APBX

**C.** No, because he sold the shares short after issuing his research report

A is correct. By selling APBX short in his personal portfolio, Plume is in violation of Standard VI(A): Conflicts of Interest, Disclosure of Conflicts, which states that “Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively.” Selling APBX short in his personal portfolio while having a “buy” recommendation on the stock is a conflict of interest that Plume needs to disclose.

B is incorrect. The fact that Plume was not a beneficial owner of APBX shares is irrelevant given his financial interest in the short sale of its shares. Selling APBX short after he issues a “buy” recommendation creates a conflict of interest that Plume must disclose to clients.

C is incorrect. Selling APBX short after he issues a “buy” recommendation creates a conflict of interest that Plume must disclose to clients.

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## 4. CASTLE BIOTECHNOLOGY CASE: SANDRA BENNING, CFA AND CLARIS DEACON

- a.** evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct;
- b.** explain how the practices, policies, or conduct does or does not violate the CFA Institute Code of Ethics and Standards of Professional Conduct.

Sandra Benning, CFA, is an investment adviser (broker) at Global and a rising star because of her exceptional skill in brokering stocks and developing relationships. Her clients include corporations and their senior executives, pension plans, and high-net worth individuals. Benning recently joined Global after working as an investment adviser at Kodiak Securities. While at Kodiak, she used her personal social media platforms, such as LinkedIn, Twitter,



and Facebook, as well as “old fashioned” email to communicate with her clients. After she resigned from Kodiak, she immediately used her social media and personal email to inform her clients of her departure and solicited them to follow her to Global. Global paid her a signing bonus of \$250,000 based on the percentage of her Kodiak clients who moved their accounts to Global. One of the reasons Benning joined Global was to give her clients greater access to Global’s initial public offerings (IPOs). Global pays its investment advisers an annual year-end bonus based on the level of their clients’ IPO participation. Benning does not disclose either bonus to clients.

**1. Did Benning violate the Code and Standards in her use of social media and email to solicit former clients?**

**A. No**

**B. Yes, because Benning has a duty of loyalty to Kodiak**

**C. Yes, because Benning is not preserving her clients’ confidentiality**

A is correct. Benning’s solicitation of former clients via social media and email does not violate the Code and Standards. Standard IV(A): Duties to Employers, Loyalty states “The Code and Standards also do not prohibit former employees from contacting clients of their previous firm, in the absence of a noncompete agreement.” In the absence of a noncompete agreement, as long as Benning maintains her duty of loyalty to Kodiak before joining Global, does not take steps to solicit clients until she has left Kodiak, and does not use material from Kodiak without the firm’s permission after she has left the firm, she is not in violation of the Code and Standards.

B is incorrect. In this case, Benning did not solicit clients until after she resigned from Kodiak. Benning used her personal social media platforms to connect with her clients, and she did not contact them until after she resigned from Kodiak. She did not use material from Kodiak without the firm’s permission.

C is incorrect. Benning did not reveal confidential client information in her use of social media and email to solicit former clients.

**2. Did Benning violate the Code and Standards by not disclosing to clients the signing**



bonus received from Global to bring clients over from Kodiak?

- A. Yes
- B. No, because the bonus is not a referral fee
- C. No, because the bonus represents additional compensation

A is correct. By not disclosing to her Kodiak clients the signing bonus she received from Global, Benning is in violation of Standard VI(A): Conflicts of Interest, Disclosure of Conflicts. Benning's decision to solicit her Kodiak clients to move to Global could have been influenced by the fact that her signing bonus from Global was based on the percentage of her Kodiak clients who moved their accounts to Global. This creates an actual or potential conflict of interest that she must disclose to her former Kodiak clients.

According to Standard VI(A): Conflicts of Interest, Disclosure of Conflicts, "Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer." Standard VI(A) protects investors and employers by requiring members and candidates to fully disclose to clients, potential clients, and employers all actual and potential conflicts of interest.

B is incorrect. It is true that the bonus paid by Global represents compensation paid by the employer to the employee for services provided and is not a referral fee. It is also true, however, that the signing bonus could reasonably be expected to impair Benning's independence and objectivity or interfere with her respective duties to her clients, prospective clients, and her employer, which is in violation of Standard VI(A). If such a potential conflict of interest exists, Benning should have fully and fairly disclosed it. Referral fees are defined in Standard VI(C): Conflicts of Interest, Referral Fees as "any compensation, consideration, or benefit received from or paid to others for the recommendation of products or services." Members and candidates must disclose referral fees to their employers, clients, and prospective clients, as appropriate.

C is incorrect. Additional compensation is defined in Standard IV(B): Duties to Employers, Additional Compensation Arrangements as "gifts, benefits, compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer's interest unless they obtain written consent from all parties involved." Additional compensation arrangements generally refer to conflicts of interest the member or candidate has with their employer, not clients and prospects. The bonus does not represent additional compensation. It does, however, create an actual/potential conflict of interest.

3. Does Benning's non-disclosure of her year-end bonus that is based on the level of her clients' IPO participation place her in violation of the Code and Standards?
- A. No
  - B. Yes, because the bonus represents a conflict of interest
  - C. Yes, because the bonus represents additional compensation

B is correct. Benning's year-end bonus is based on the level of her clients' participation in IPOs. This creates a conflict of interest between Benning and her clients. Is she recommending IPOs to clients based on their best interest or hers? Benning is in violation of Standard VI(A): Conflicts of Interest, Disclosure of Conflicts, which states that "Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively."

A is incorrect. Benning's year-end bonus is based on the level of her clients' participation in IPOs, which creates a conflict of interest between Benning and her clients that must be disclosed under Standard VI(A).

C is incorrect. The bonus is not additional compensation, which is defined in Standard IV(B) as "gifts, benefits, compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer's interest...." In this case, the bonus is between the employer and employee and does not create a conflict of interest between Global and Benning. The year-end bonus does, however, create a conflict of interest between Benning and her clients that must be disclosed under Standard VI(A).

Currently, Global is planning a highly anticipated initial public offering for Frontier Therapeutics (FTSX), a company in CB's portfolio. To determine interest in this IPO, Benning contacts her clients via social media and email and invites them to submit an application to participate in the FTSX public offering. In the invitation, she cautions her clients that "confirming your indication of interest does not guarantee an allocation of shares in the offering." She also warns that "depending on client demand, clients requesting IPO shares might receive all, some, or none of the shares they requested." On highly anticipated (oversubscribed) IPOs, Global's policy is to allocate the IPO shares to institutional clients

who plan on purchasing additional shares on the first day of trading. Following Global's policy, Benning calls her institutional clients who expressed an interest in FTSX to ask if they plan on purchasing additional shares of FTSX on its first day of trading. For clients who indicate they plan on buying additional shares, Benning will allocate shares of FTSX to them in the IPO.

Once all client indications of interest have been submitted, Global then uses this information to determine an offering price for FTSX and the "basis of allotment" (i.e., the number of shares to be allocated) to each adviser/broker for their clients.

Global uses the following criteria to make its IPO allocation decisions:

- The level of business a client has done with the firm
- The long- or short-term interest of a client in the issuer
- The size of a client's anticipated long-term investment
- The client's track record of investment in similar issues
- The client's apparent interest in the issuer, as evidenced by attendance at road shows
- The size of the client's account
- The existing or potential business relationships between the client and Global

The day before FTSX's first day of trading (public listing), Benning emails her high-net-worth individual clients who were allocated shares of FTSX and warns them not to flip (sell) their shares when FTSX begins trading or else they will be excluded from future IPO allocations. She then phones her corporate clients (those with an existing investment banking relationship with Global) and tells them they are free to sell their shares of FTSX at the end of its first trading day. The following day, at the end of trading, FTSX's stock price closes down, at 65% of its initial offering price.

**4.** Does Benning violate the Code and Standards by allocating FTSX shares to institutional clients who plan on purchasing additional shares when it begins trading?

**A.** Yes

**B.** No, because Benning is following her employer's policy

**C. No, because Benning is treating all her clients fairly**

A is correct. This is an example of a tie-in agreement, where the underwriter requires the investor to buy more shares of a new issue in the secondary market as a condition of buying shares in the IPO. It is intended to artificially increase demand and support a higher share price. Tie-in agreements are a violation of Standard II(B): Integrity of Capital Markets, Market Manipulation. “Members and Candidates must not engage in practices that distort prices or artificially inflate trading volume with the intent to mislead market participants.” By allocating shares of FTSX to institutional clients who agree to purchase additional shares on the first day of trading, Global and Benning may be distorting security prices or trading volume on the first day of trading by deceiving investors that rely on information in the market. Guidance to Standard II(B) states, “Transaction-based manipulation involves instances where a member or candidate knew or should have known that his or her actions could affect the pricing of a security.” It appears that Benning and Global are artificially creating demand for FTSX shares (and increasing its price on the first day of trading) by only allocating IPO shares to clients who plan to purchase additional shares on the first day of trading.

This practice also violates Standard III(B): Duties to Clients, Fair Dealing. “Members and Candidates must deal fairly and objectively with all clients when providing investment analysis, making investment recommendations, taking investment action, or engaging in other professional activities.” In this case, Benning is not treating all her institutional clients fairly because she is only allocating IPO shares to those clients who agree to purchase additional shares after FTSX begins trading on the first day. The overall criteria and policy used by Global to determine client allocations also are in violation of Standard III(B).

B is incorrect. Irrespective of whether she has followed her employer’s policy, Benning’s actions are in violation of Standard II(B): Integrity of Capital Markets, Market Manipulation and Standard III(B): Duties to Clients, Fair Dealing.

C is incorrect. In this case, Benning is not treating all her institutional clients fairly because she is only allocating IPO shares to those clients who agree to purchase additional shares after FTSX begins trading on the first day. Benning’s allocation to institutional investors violates Standard III(B): Duties to Clients, Fair Dealing. “Members and Candidates must deal fairly and objectively with all clients when providing investment analysis, making investment recommendations, taking investment action, or engaging in other professional activities.”

## Clariss Deacon

Benning's newest client is Clariss Deacon, a long-time family friend. To date, Deacon has made three visits to Benning's office to set up her investment account and portfolio. During her first visit, she completed and signed a New Account Agreement and a Limited Trade Authorization form, giving Benning discretion to transact securities in Deacon's account. During Deacon's second visit, she opened a cash management account that linked her brokerage account to an in-house checking (transaction) account. In her third visit, Deacon completed and signed an Option Account Application and Agreement, authorizing Benning to transact equity options in her account. After the third visit, Benning changed some of the language in the Option Account Application and Agreement pertaining to Deacon's suitability for the options she would be recommending. To save Deacon from having to make yet another trip to her office to initial the changes on the form, Benning initials the form on Deacon's behalf.

While traveling with her husband a week later, Deacon calls Benning because she is unable to transfer money from her brokerage account to her checking account. Upon further investigation, Benning discovers that the link between the accounts had not been activated. Proud of the superior customer service she provides to her clients, Benning immediately calls her client and obtains Deacon's authorization to sign the Account Linking form on Deacon's behalf. Within 24 hours, Deacon has access to her account.

A month later, Benning receives a phone call from Deacon's husband, Steve, who informs her that his wife is having serious health issues. He asks Benning to redeem \$15,000 worth of mutual fund shares and send the proceeds as soon as possible. Over the next few weeks, Benning completes several redemptions and withdrawals from Deacon's account at Steve's request. Benning makes a note on the trade form each time a redemption is processed, indicating she has spoken with Steve, who is acting on Deacon's behalf.

5. In opening and servicing Deacon's account, does Benning violate the Code and Standards?

- A. Yes
- B. No, because Benning was acting in Deacon's best interest
- C. No, because Benning was exercising prudent judgment, loyalty, and reasonable care

A is correct. By changing the language on the Option Account Application and Agreement and initialing the form on behalf of Deacon, Benning is in violation of

Standard I(D): Professionalism, Misconduct. Signing the Account Linking form on behalf of Deacon is also a violation of Standard I(D). According to Standard I(D): Professionalism, Misconduct, “Members and Candidates must not engage in any professional conduct involving dishonesty, fraud, or deceit or commit any act that reflects adversely on their professional reputation, integrity, or competence.” The approval Benning received over the telephone to sign the Account Linking form is insufficient. Benning needs Deacon to personally sign the authorization.

By redeeming shares and transacting (withdrawals) in Deacon’s account at her husband’s request, Benning is in violation of Standard III(A): Duties to Clients, Loyalty, Prudence, and Care. Benning has no authority or authorization from Deacon, the account holder, allowing Deacon’s husband, Steve, to redeem shares and approve withdrawals from her account. To transact in the account, Steve would need to be a co-signer on all the account documents or have a “power of attorney” written authorization signed by Deacon granting him the right to act on Deacon’s behalf. According to Standard III(A), “Members and Candidates have a duty of loyalty to their clients and must act with reasonable care and exercise prudent judgment.” Members and candidates must also be aware of whether they have ‘custody’ or effective control of client assets. If so, a heightened level of responsibility arises.

B is incorrect. Even if Benning was acting in Deacon’s best interests by making and initialing the changes on the Option Account Application and Agreement form and signing the Account Linking form, these changes cannot be effected without Deacon’s own written approval and thus are in violation of the Standards. In addition, she should not have transacted in Deacon’s account at her husband’s request without Deacon’s authorization.

C is incorrect. Benning is *not* showing loyalty, prudence, or care by taking actions that violate Standard III(A): Duties to Clients, Loyalty, Prudence, and Care. These actions include making and initialing the changes on the Option Account Application and Agreement form and signing the Account Linking form. These changes cannot be effected without Deacon’s own written approval and are in violation of the Standards. In addition, Benning should not have transacted in Deacon’s account at her husband’s request without Deacon’s authorization.

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## 5. LIONSGATE LIMITED & BANK OF AUSTRALIA CASE: TONY HILL AND TEAM



- a. evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct;
- b. explain how the practices, policies, or conduct does or does not violate the CFA Institute Code of Ethics and Standards of Professional Conduct.

Lionsgate Limited (LL) is a publicly listed Australian fund manager.<sup>4</sup> The firm has benefited greatly from the “Superannuation Guarantee” program that was created in 1992. This program requires all the country’s employees ages 18 to 70 to contribute a percentage of their earnings to a tax-advantaged retirement account or superannuation fund. In addition, legislation enacted in 2005 gives all employees the right to select a superannuation fund administered by a retail financial services company, such as LL. LL offers a range of mutual funds.

## Tony Hill and Team

LL’s flagship fund is the Lionsgate Victory Capital Fund (VCF), an equity mutual fund that is managed by Tony Hill and his team of 16 analysts. In LL’s marketing material, Hill states, “For the period ending 31 December 2018, the Victory Capital Fund is the best-performing fund in Australian equities over the 10-year period. The VCF has delivered returns of 28.7%, gross of fees over the 1-year period, and 13.2% annually since inception in 2005. During this time, assets under management (AUM) in Australian dollars increased from \$18 million to \$14 billion.”

Hill has become the main media engagement person for the VCF and LL. He has a half-hour show on “Sky News Business Channel,” writes a weekly financial column for *Australian Financial Review*, and regularly appears on daytime and evening talk shows, where he talks about the VCF and its holdings. Like the other guests on these shows, Hill does not receive financial compensation for his appearances. Instead, the shows’ sponsors provide him with “thank you gift bags,” containing wine, retail gift cards, restaurant gift certificates, and travel discounts on hotels and airfare. Hill does not disclose the receipt of these gift bags to LL.

In 2006, Nicole Martin, CFA, was hired as an intern at LL to cover the paper, chemical, and publishing industries. After graduating at the top of her class from a prestigious university, Nicole accepted a full-time position on Hill’s team, covering the metals, mining, and energy industries. As Hill’s outside activities increased, Martin assumed more responsibility for security selection and investment decision making for the VCF. For the past three years, the performance of the VCF has been directly attributable to her and the other analysts, although both she and Hill still state publicly that he is in charge of all investment decision making for the VCF.

As the VCF's "star stock picker," Hill is often invited to provide a fund update at LL's quarterly board meetings. Hill uses the most recent board meeting to announce his resignation and to notify the board he is starting his own fund management firm. Recognizing Hill's departure could have a negative impact on LL's stock price as well as cash flows into the VCF, the board asks Hill to keep his plans to resign confidential until the end of LL's fiscal year (in two weeks) to give them time to find his replacement. Hill agrees. After the board meeting, Hill has a "closed door" meeting with his team and announces his plan to resign and start his own firm. He then asks the team if they want to join him. Ten of the analysts agree to resign with him and work in his new firm. Martin and the five remaining analysts tell him they will remain at LL and leave the meeting. Hill tells the analysts who will join him: "Team, we have a lot of work to do over the next two weeks. We'll need to use time after work and on weekends to lease office space and to individually register with the government authorities in the name of our new firm. Since we have not signed a noncompete agreement with LL, we can begin soliciting former clients the day we open our new firm."

1. Do Hill's statements in the Lionsgate Limited (LL) marketing materials violate the Code and Standards?
  - A. No
  - B. Yes, because he stated the Victory Capital Fund's returns gross of fees
  - C. Yes, because he is not distinguishing between fact and opinion in discussing the fund's performance

A is correct. There is no evidence to suggest Hill's statements are false or opinion-based. In speaking about the fund's performance, Hill is stating facts. In addition, Hill states the performance is gross of fees or "pre-fees." According to Standard III(D): Duties to Clients, Performance Presentation, "When communicating investment performance information, Members and Candidates must make reasonable efforts to ensure that it is fair, accurate, and complete." Guidance to Standard III(D) states, "Members and candidates can also meet their obligations under Standard III(D) by including disclosures that fully explain the performance results being reported (for example, stating, when appropriate, that results are simulated when model results are used, clearly indicating when the performance record is that of a prior entity, or disclosing whether the performance is gross of fees, net of fees, or after tax)."

B is incorrect. Hill states the performance is gross of fees or "pre-fees." Guidance to Standard III(D) states, "Members ... can also meet their obligations under Standard III(D) by including disclosures that fully explain the performance results being reported (for example, ... disclosing whether the performance is gross of fees, net of fees, or after



tax).”

C is incorrect. It is clear in this case that in speaking about the fund’s performance, Hill is stating facts, not opinions.

2. Does Hill violate the Code and Standards by accepting “thank you gift bags” from the talk show sponsors?

A. No

B. Yes, because he does not disclose this to his employer

C. Yes, because his independence and objectivity are being compromised

A is correct. According to Standard IV(B): Duties to Employers, Additional Compensation Arrangements, “Members and Candidates must not accept gifts, benefits, compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer’s interest unless they obtain written consent from all parties involved.” Hill’s appearance on these shows does not create a conflict of interest with the interests of LL or the VCF.

B is incorrect. No conflict of interest is created in this situation. By not disclosing his receipt of the “thank you gift bags,” Hill is not in violation of the Code and Standards.

C is incorrect. Hill’s acceptance of the “thank you gift bags” does not create a conflict of interest between Hill and his employer or between Hill and his clients. Therefore, Hill’s independence and objectivity are not compromised. Hill is not in violation of Standard I(B): Professionalism, Independence and Objectivity.

3. Has Martin or Hill violated the Code and Standards by publicly stating that Hill is in charge of investment decision making for the VCF?

A. Yes

B. No, because Hill still works for the VCF

- C.** No, because Martin and Hill both publicly state that Hill is in charge of investment decision making

A is correct. Martin and Hill have failed to disclose to clients and prospective clients that Martin has assumed more responsibility for security selection and investment decision making at the fund and that she and the other analysts—not Hill—are primarily responsible for the fund’s performance. Martin and Hill have both violated Standard V(B)1: Investment Analysis, Recommendations, and Actions, Communication with Clients and Prospective Clients. “Members and Candidates must: 1. Disclose to clients and prospective clients the basic format and general principles of the investment processes they use to analyze investments, select securities, and construct portfolios and must promptly disclose any changes that might materially affect those processes.”

B is incorrect. Although Hill still works for the VCF, Martin has assumed more responsibility for security selection and investment decision making at the VCF such that she and the other analysts are primarily responsible for the fund’s performance.

C is incorrect. While Martin and Hill both publicly state Hill is in charge, it is not true. Martin—not Hill—is now primarily responsible for security selection and investment decision making at the VCF.

- 4.** Did Hill violate the Code and Standards with respect to announcing his resignation in the “closed door” meeting with his team?

- A.** No
- B.** Yes, he should not have announced his plan to resign to his team
- C.** Yes, he should have publicly announced his resignation immediately after the board meeting

B is correct. Hill violated the Code and Standards by telling his team about his planned resignation after the board’s request that he keep this information strictly confidential until fiscal year end (in two weeks). Despite the board’s request, Hill informed his team the same day. Hill’s conduct violates Standard IV(A): Duties to Employers, Loyalty. While the board’s request may be considered as an outward-facing directive, it can also be considered an internally-facing directive. By telling his team about his resignation after the board’s request that he keep this information confidential until fiscal year end,

Hill is not honoring the board's request and is being disloyal to his employer. Hill would have been free to discuss his resignation with his team prior to his informing the board of his plans and prior to the board's request for confidentiality.

A is incorrect. Hill did violate Standard IV(A): Loyalty. By telling his team about his resignation after the board's request that he keep this information confidential until fiscal year end, Hill is not honoring the board's request and is being disloyal to his employer.

C is incorrect. There is no duty under the Code and Standards for Hill to announce his resignation immediately after the board meeting.

5. Did Hill violate the Code and Standards by asking his team to join him at his new firm?

**A.** No

**B.** Yes, because Hill was the supervisor of the team

**C.** Yes, because Hill owed a duty of loyalty to his current employer

A is correct. It is not a violation for Hill to ask his team to join him at his new firm. The Guidance to Standard IV(A): Duties to Employers, Loyalty states, "A departing employee is generally free to make arrangements or preparations to go into a competitive business before terminating the relationship with his or her employer as long as such preparations do not breach the employee's duty of loyalty." Asking his team to join him at his new firm does not breach the duty of loyalty. However, any planning and activity on behalf of the new firm (such as the leasing of office space and individual registration) must be done by Hill and the individuals joining him on their own time.

B is incorrect. The fact that Hill was the supervisor of the team does not change his responsibility to his employer under Standard IV(A). Thus, he was not in violation of this Standard for the reasons given in the answer to A.

C is incorrect. Hill does owe a duty to his employer under Standard IV(A); however, asking his team to join him at his new firm does not breach the duty of loyalty under the criteria of this standard. Thus, Hill is not in violation of the Code and Standards.

6. Did Hill and his team violate the Code and Standards by leasing office space for the new firm and registering with the government authorities before resigning from Lionsgate?
- A. No
  - B. Yes, because Hill and his team owe a duty of loyalty to Lionsgate
  - C. Yes, because Hill and his team owe a duty of loyalty to Lionsgate's clients

A is correct. It is not a violation for Hill and the team to lease office space and register with the government authorities before resigning from Lionsgate. According to Standard IV(A): Duties to Employers, Loyalty, "In matters related to their employment, Members and Candidates must act for the benefit of their employer and not ... cause harm to their employer." Moreover, Guidance to Standard IV(A) states, "A departing employee is generally free to make arrangements or preparations to go into a competitive business before terminating the relationship with his or her employer as long as such preparations do not breach the employee's duty of loyalty." Hill and the team are making preparations outside of work and on weekends; their actions to start a new business do not occur during hours when their employer would expect them to be at work. Thus, they are not in violation of the standard. Hill and the team are also not violating Standard III(A): Duties to Clients, Loyalty, Prudence, and Care because their actions are taking place during non-work hours, not when they should be working for the benefit of their clients.

B is incorrect. Hill and the individuals joining him at the new firm are using their time outside of work and on weekends to lease office space and to individually register with government authorities. Because they are not using work time, they are not breaching their duty of loyalty to Lionsgate, as defined in Standard IV(A): Duties to Employers, Loyalty.

C is incorrect. In using their time outside of work and on weekends to plan for the new firm, Hill and his team are not placing their own interests ahead of their clients' interests. They are not in violation of Standard III(A): Duties to Clients, Loyalty, Prudence, and Care.

7. Did Hill violate the Code and Standards by telling his team to begin soliciting former clients the day they open the new firm?
- A. No
  - B. Yes, because Hill owes a duty of loyalty to Lionsgate
  - C. Yes, because Hill has a responsibility as their supervisor

A is correct. Hill is not in violation of the Code and Standards. The Guidance to Standard IV(A): Duties to Employers, Loyalty states, “When members and candidates are planning to leave their current employer, they must continue to act in the employer’s best interest. They must not engage in any activities that would conflict with this duty until their resignation becomes effective.” The Guidance also states, “A member or candidate who is contemplating seeking other employment must not contact existing clients or potential clients prior to leaving his or her employer for purposes of soliciting their business for the new employer.” By telling his team to begin solicitation on the new firm’s opening day—not prior to its opening—there is no conflict of interest or violation of loyalty.

B is incorrect. The Guidance to Standard IV(A): Duties to Employers, Loyalty states, “When members and candidates are planning to leave their current employer, they must continue to act in the employer’s best interest. They must not engage in any activities that would conflict with this duty until their resignation becomes effective.” The Guidance also states, “A member or candidate who is contemplating seeking other employment must not contact existing clients or potential clients prior to leaving his or her employer for purposes of soliciting their business for the new employer.” Hill tells his team to begin client solicitation on the new firm’s opening day, not prior to its opening. At that time, Hill and his team will no longer work for Lionsgate.

C is incorrect. Hill is not violating Standard IV(C): Duties to Employers, Responsibilities of Supervisors. According to this standard, “Members and Candidates must make reasonable efforts to ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards.” Hill did not ask anyone under his supervision to violate any of the Standards.

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## 6. LIONSGATE LIMITED & BANK OF

# AUSTRALIA CASE: ROB PORTMAN, CFA; KIRK GRAEME, CFA; THE DELANEY'S; DAVID MILGRAM

- a. evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct;
- b. explain how the practices, policies, or conduct does or does not violate the CFA Institute Code of Ethics and Standards of Professional Conduct.

Rob Portman, CFA, is a salesperson at LL who oversees the sales of the VCF to institutions and high-net-worth individuals. For each of the past five years, Portman has achieved his annual sales goal and has received a sizable bonus as a result. Portman is hoping this year will be no different. With two weeks remaining in LL's fiscal year, Portman is planning a big event next week for prospective clients that he hopes will enable him to achieve his sales goal.

Portman knows how much "prestige" institutional clients and high-net-worth individuals place on having Hill manage their money. To make the fund more attractive to prospective and current clients, Portman always discusses Hill's stock-picking acumen and Hill's success as the key investment decision maker for the VCF. In addition, he always invites Hill to meetings with important clients. However, when clients have investment-related questions about the fund's purchases and sales, he always refers them to Martin, who he refers to as Hill's "assistant."

Tonight is Portman's big event. Since LL's board meeting, Portman has heard rumors about Hill and members of his team leaving the firm. To clarify Hill's situation, Portman meets with LL's chief investment officer (CIO), who attended the recent board meeting. The CIO tells Portman to ignore the rumors about Hill and proceed with his planned event. Later that day, Portman learns from "Sky News Business Channel" that the CIO and two board members have sold shares in LL and the VCF. As a result, Portman sells his shares in LL and the VCF.

1. Has Portman violated the Code and Standards by inviting Hill to important client meetings and discussing Hill's stock-picking acumen?

**A.** No

- B.** Yes, because Portman is misrepresenting Hill's role in the investment process to clients
- C.** Yes, because Portman is misrepresenting the VCF investment strategy and its limitations and risks

B is correct. By inviting Hill to client meetings and referring to Martin as Hill's "assistant," Portman is giving clients the impression that Hill is responsible for stock selection and investment decision making at the fund. Portman is in violation of Standard I(C): Professionalism, Misrepresentation. "Members and Candidates must not knowingly make any misrepresentations relating to investment analysis, recommendations, actions, or other professional activities."

A is incorrect. Portman is in violation of Standard I(C): Professionalism, Misrepresentation. By inviting Hill to client meetings and referring to Martin as Hill's "assistant," Portman is giving clients the impression that Hill is responsible for stock selection and investment decision making at the fund.

C is incorrect. Although Portman is misrepresenting Hill's role in executing the VCF's investment strategy, he is not misrepresenting the investment strategy itself.

2. Did Lionsgate's CIO and two board members violate the Code and Standards by selling their shares in LL and the VCF?

- A.** No
- B.** Yes, because they owe a duty of loyalty to Lionsgate
- C.** Yes, because they acted on material nonpublic information

C is correct. By selling their shares before Hill's resignation is announced, they are acting on material nonpublic information. Under Standard II(A): Integrity of Capital Markets, Material Nonpublic Information, "Members and Candidates who possess material nonpublic information that could affect the value of an investment must not act or cause others to act on the information." Information is 'material' if its disclosure would probably have an impact on the price of a security or if reasonable investors would want to know the information before making an investment decision.

A is incorrect. They are clearly in violation of Standard II(A): Integrity of Capital

Markets, Material Nonpublic Information.

B is incorrect. Although the CIO and two board members do owe a duty of loyalty to Lionsgate, they are not in violation of Standard IV(A): Duties to Employers, Loyalty by selling their shares in LL and the VCF. Instead, they are in violation of Standard II(A): Material Nonpublic Information.

3. Did Portman violate the Code and Standards by selling his shares in LL and the VCF?

- A. No
- B. Yes, because he owes a duty of loyalty to Lionsgate
- C. Yes, because he is acting on material nonpublic information

A is correct. In this case, Portman does not know definitively whether Hill is resigning. In addition to the rumors he has heard, Portman's sell decision is based on learning from "Sky News Business Channel" that the CIO and two board members have sold their shares. Portman's decision to sell is not based on material nonpublic information as this information was publicly reported. He is not in violation of Standard II(A): Integrity of Capital Markets, Material Nonpublic Information.

B is incorrect. Although Portman does owe a duty to his employer, Lionsgate, he is not in violation of Standard IV(A): Duties to Employers, Loyalty by selling his shares in LL and the VCF.

C is incorrect. In selling his shares in LL and the VCF, Portman is not acting on material nonpublic information and therefore is not in violation of Standard II(A): Integrity of Capital Markets, Material Nonpublic Information.

## Kirk Graeme, CFA

Lionsgate Limited (LL) is partially owned by the Bank of Australia Financial Group (BOA). BOA consists of a retail bank, a capital markets division (investment and corporate banking),



and a wealth management division. Kirk Graeme, CFA, is a financial adviser in BOA's wealth management division. He is regarded as a subject matter expert within the firm because of the well-supported research he does on new issues and his experience in buying and selling them.

Although all accounts that Graeme manages are fee-based, he does receive additional commissions (paid by the issuer) for new issue purchases.

BOA (through its capital markets group) is a member of the syndicate for new issues purchased by Graeme. As a syndicate member, BOA also shares in fees and commissions paid by the issuer. BOA's policy does not require commission disclosure on new issues since clients receive prospectuses for new issue purchases that disclose commissions paid to the syndicate member. Graeme, however, does disclose his new issue commissions to clients who ask for this information.

In 2016 and 2017, Graeme earned a total of \$477,000 in commissions from new issues, while BOA earned fees and commissions of \$1,908,900 on the same transactions. From 2016 to 2017, Graeme's assets under management remained relatively unchanged; however, Graeme more than doubled the dollar value of new issue purchases relative to his AUM.

Unfortunately, many of these new issues performed poorly. By the end of 2017, Graeme had sold—often significantly below purchase price—many of the issues he had purchased in 2016. Despite the underperformance, Graeme continues to research and recommend new issues following the same process he has always used.

- 4. Did Graeme violate the Code and Standards with respect to his disclosure of new issue commissions earned on sales?**
- A.** No, he does not need to disclose the commissions because BOA's policy does not require it.
  - B.** No, he does not need to disclose the commissions because clients receive this disclosure in the prospectuses for the new issues.
  - C.** Yes, he does need to disclose the commissions because they are material.

C is correct. Graeme is in violation of Standard VI(A): Conflicts of Interest, Disclosure of Conflicts, which states that "Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively."

Graeme needs to inform all clients, not just those who ask, of the commissions he receives on new issues so that his clients have the information necessary to evaluate the objectivity of the investment advice or action taken by him on their behalf.

A is incorrect. There is a violation here because the size of the commissions could reasonably be expected to impair Graeme's objectivity. Standard VI(A) requires Graeme to disclose these commissions to all his clients regardless of BOA's policy in this regard.

B is incorrect. There is a violation here because the size of the commissions could reasonably be expected to impair Graeme's objectivity. Standard VI(A) requires Graeme to disclose these commissions to all his clients regardless of what appears in the prospectuses of the new issues.

## The Delaneys

In January 2017, Graeme opened a \$250,000 joint account for Melissa and Rodney Delaney. During their initial conversation, the Delaneys stated that the account represented the majority of their investable assets, that their investment time horizon was 15 to 20 years, and that they had a low tolerance for risk. After this conversation, approximately half of Graeme's recommended purchases to the Delaneys were new issues; new issues comprised approximately three quarters of the dollar value of all purchases in their account. Between January and October 2017, five months was the longest period of time that a new issue was held in their account. Since opening the Delaney's account, the majority of purchases were new issues. During this period, Graeme also made new issue purchases for the majority of his other client accounts.

At the end of 2017, Graeme met with his supervisor, Jane Balmer. During the meeting, Balmer raised concerns about the turnover in Graeme's accounts and his use of new issues. Balmer also escalated her concerns by reporting them to BOA's director of compliance. After his meeting with Balmer, Graeme significantly reduced his new issue purchases and turnover in his "book of business."

5. Did Graeme violate the Code and Standards in managing the Delaney's account?

A. No

B. Yes, because their risk tolerance is low

**C.** Yes, because their time horizon is 15–20 years

B is correct. The Delaneys stated their risk tolerance is low, were unwilling to accept high levels of volatility in their portfolio. Even if Graeme had sold the new issues in their account and holding them for less than five months, Graeme's actions would have been unsuitable for the Delaney's risk tolerance. As stated, the majority of the new issues that Graeme made for the Delaneys were new issue purchases. Graeme violated Standard III(C)1: Duties to Clients, Suitability: "When Members and Candidates are in an advisory relationship with a client, they must b. Determine that the investment is suitable to the client's financial situation and consistent with the client's investment objectives, mandates, and constraints before making an investment recommendation or investment action." In addition, members and candidates must consider the suitability of investments in the context of the client's total portfolio."

A is incorrect. Graeme violated Standard III(C)1 by purchasing new issues for the Delaney's account that were unsuitable for the Delaney's risk tolerance.

C is incorrect. It is the Delaney's low risk tolerance—not their time horizon—that makes the purchase of new issues unsuitable. Graeme violated

**6.** Did Balmer meet the Code and Standards in addressing her concerns about Graeme's use of new issues?

**A.** No

**B.** Yes, because she escalated her concerns to the direct

**C.** Yes, because she raised her concerns with Graeme, and followed up accordingly

A is correct. Balmer violated Standard IV(C): Duties to Employers, Supervisors, which states that "Members and Candidates must ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards." Moreover, Standard IV(C) states, "Once a supervisor learns that an employee has violated the law or the Code and Standards, the supervisor must conduct an investigation and assessment to determine the extent of the wrongdoing. Relying on the employee's statements about the extent of the violation or assurances that it will not reoccur is not enough." Balmer should have initiated an investigation











































































































# Study Session 16

## Ethical and Professional Standards (2)

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The Asset Manager Code of Professional Conduct uses the basic tenets of the Code and Standards to establish ethical and professional standards for firms managing client assets. The Asset Manager Code of Professional Conduct also extends the Code and Standards to address investment management firm practices regarding trading, compliance, risk management, security pricing, and disclosure.

The Global Investment Performance Standards (GIPS®) contain ethical and professional standards for presenting investment performance to prospective clients. These guidelines provide for standardized performance calculation and presentation among investment managers, enabling investors to objectively compare manager return histories and evaluate performance. Coverage provides a grounding in the requirements and recommendations of GIPS.

## READING ASSIGNMENTS

- Reading 34** Asset Manager Code of Professional Conduct  
by Kurt N. Schacht, JD, CFA, Jonathan J. Stokes, JD, and Glenn Doggett, CFA
- Reading 35** Overview of the Global Investment Performance Standards  
by Philip Lawton, PhD, CFA, CIPM

# Reading 34

## Asset Manager Code of Professional Conduct

by Kurt N. Schacht, JD, CFA, Jonathan J. Stokes, JD, and Glenn Doggett, CFA

*Kurt N. Schacht, JD, CFA, is at CFA Institute (USA). Jonathan J. Stokes, JD, is at CFA Institute (USA). Glenn Doggett, CFA, is at CFA Institute (USA).*

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## LEARNING OUTCOMES

The candidate should be able to:

- a. explain the purpose of the Asset Manager Code and the benefits that may accrue to a firm that adopts the Code;
- b. explain the ethical and professional responsibilities required by the six General Principles of Conduct of the Asset Manager Code;
- c. determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code;
- d. recommend practices and procedures designed to prevent violations of the Asset Manager Code.

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## 1. INTRODUCTION, ADOPTING THE CODE AND CLAIMING COMPLIANCE

- a. explain the purpose of the Asset Manager Code and the benefits that may accrue to a firm that adopts the Code;

Asset managers hold a unique place of trust in the lives of millions of investors. Investment professionals and firms that undertake and perform their responsibilities with honesty and integrity are critical to maintaining investors' trust and confidence and to upholding the client covenant of trust, loyalty, prudence, and care. CFA Institute and its members are committed to reinforcing those principles. The CFA Institute mission is to lead the investment profession globally by setting the highest standards of ethics, education, and professional excellence. To foster this culture of ethics and professionalism, CFA Institute offers this voluntary code of conduct. It is designed to be broadly adopted within the industry as a template and guidepost for investors seeking managers who adhere to sound ethical practice.

The Asset Manager Code of Professional Conduct outlines the ethical and professional responsibilities of firms that manage assets on behalf of clients. Whereas the CFA Institute Code of Ethics and Standards of Professional Conduct address individual conduct, this Code is meant to apply, on a global basis, to firms that manage client assets as separate accounts or pooled funds (including collective investment schemes, mutual funds, and fund of funds organizations); we refer to such firms as "Managers." In part, this document responds to requests from Managers to extend the scope of the Code and Standards to the firm level. Although many institutional asset managers, particularly those in well-regulated jurisdictions, already have such a code in place, they should use this Code to evaluate their own code and ensure that all of this Code's principles have been included. This Code also has been developed for use by asset managers, including hedge fund managers, who may not already have such a code in place. This second edition of the Code includes provisions relating to risk management as well as guidance for Managers seeking to claim compliance.

Ethical leadership begins at the highest level of an organization; therefore, the Code should be adopted by the Manager's senior management, board of directors, and similar oversight bodies. Such adoption sends a strong message regarding the importance of ethical behavior at the firm. Rather than creating rules that apply only to certain people or groups, this Code is intended to cover all employees of the firm. Although not every employee is actively involved in conduct covered in the Code, a code that is broadly applied reinforces the need for all employees to understand the ethical issues involved in the asset management business. By adopting and enforcing a code of conduct for their organizations, Managers demonstrate their commitment to ethical behavior and the protection of investors' interests. In doing so, the Managers also protect and enhance the reputation of their organizations.

The Code sets forth minimum ethical standards for providing asset management services for clients. It is meant to be general in nature and allows flexibility for asset managers of various sizes and structures to develop the particular policies and procedures necessary to implement the Code. The goal of this Code is to set forth a useful framework for all asset managers to provide services in a fair and professional manner and to fully disclose key elements of those services to clients, regardless of whether individual Managers are required to register or comply with applicable securities laws or regulations. Unregistered hedge fund managers, in particular, are encouraged to adopt the Code and implement its provisions to ensure fair

dealing and integrity and to promote self-regulation in this dynamic sector.

We recognize that in the highly regulated and complex business of investment management, the adoption of a code of ethics by itself is not sufficient to ensure ethical conduct. To be implemented effectively, the principles and standards embodied in the Code must be supported by appropriate compliance procedures. The specific procedures that translate principle into practice will depend on a variety of factors, including the business of the Manager, the type of clients, the size of the Manager (based on assets under management and on number of employees), the regulatory régime with which the Manager must comply, and other factors.

Managers must adhere to all applicable laws and regulations governing their activities. Thus, the provisions of this Code may need to be supplemented with additional provisions to meet the requirements of applicable security regulation in markets around the world. Inevitably, in some markets, the Code will closely reflect or be aligned with existing regulation or accepted best practice and in other markets, the Code will expand on the existing work of regulatory authorities or may even break new ground. Furthermore, Managers operate in different types of market structures, which may affect the manner in which the Code can be applied. Despite these differences, the Code provides a universal set of principles and standards relevant to all asset managers.

Clients have a responsibility to be aware of, understand, and monitor how their assets are invested. Yet, to fulfill this responsibility, clients must be able to count on full and fair disclosure from their Managers. Providing clients with a code of ethics that sets a framework for how the Manager conducts business is an important step toward developing the trust and confidence necessary for a successful investment management relationship.

## **Adopting the Code and Claiming Compliance**

Adoption of or compliance with the Asset Manager Code of Professional Conduct requires firms to adhere to all the principles of conduct and provisions set forth in the Code. Many asset management firms already have codes of ethics and other policies and procedures that address or go beyond the principles and provisions of the Code. Adoption of or compliance with the Code does not require a firm to amend its existing code of ethics or other policies and procedures as long as they are at least consistent with the principles and provisions set forth in the Code. Managers are strongly encouraged to review and consider the material in the Appendix when developing and reviewing their codes and other policies and procedures, although because of the many variables in size and complexity among asset management firms, compliance with the Code does not require strict adherence to this guidance.

If the Manager has not complied with each of the principles of conduct and provisions of the Code, the Manager cannot represent that it is in compliance with the Code. Statements

referring to partial or incomplete compliance (e.g., “the firm complies with the Asset Manager Code *except for* . . .” or “the firm complies with parts A, B, and C of the Asset Manager Code”) are prohibited.

Once a Manager has met each of the required elements of the Code, the firm must make the following statement whenever the firm claims compliance with the Code:

“[Insert name of Firm] claims compliance with the CFA Institute Asset Manager Code of Professional Conduct. This claim has not been verified by CFA Institute.”

## Acknowledgement of Claim of Compliance to CFA Institute

Managers also must notify CFA Institute of their claim of compliance with the Asset Manager Code of Professional Conduct through the CFA Institute online notification process at [www.cfainstitute.org/assetcode](http://www.cfainstitute.org/assetcode). This acknowledgement form is for communication and information-gathering purposes only and does not represent that CFA Institute engages in enforcement or quality control of an organization’s claim of compliance. CFA Institute does not verify either the Manager’s claim of compliance or actual compliance with the Code.

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## 2. GENERAL PRINCIPLES OF CONDUCT AND ASSET MANAGER CODE OF PROFESSIONAL CONDUCT

- b. explain the ethical and professional responsibilities required by the six General Principles of Conduct of the Asset Manager Code;

Managers have the following responsibilities to their clients. Managers must:

1. Act in a professional and ethical manner at all times.
2. Act for the benefit of clients.
3. Act with independence and objectivity.
4. Act with skill, competence, and diligence.

5. Communicate with clients in a timely and accurate manner.
6. Uphold the applicable rules governing capital markets.

## **Asset Manager Code of Professional Conduct**

### ***A. Loyalty to Clients***

#### **Managers must:**

1. Place client interests before their own.
2. Preserve the confidentiality of information communicated by clients within the scope of the Manager–client relationship.
3. Refuse to participate in any business relationship or accept any gift that could reasonably be expected to affect their independence, objectivity, or loyalty to clients.

### ***B. Investment Process and Actions***

#### **Managers must:**

1. Use reasonable care and prudent judgment when managing client assets.
2. Not engage in practices designed to distort prices or artificially inflate trading volume with the intent to mislead market participants.
3. Deal fairly and objectively with all clients when providing investment information, making investment recommendations, or taking investment action.
4. Have a reasonable and adequate basis for investment decisions.
5. When managing a portfolio or pooled fund according to a specific mandate, strategy, or style:
  - a. Take only investment actions that are consistent with the stated objectives and constraints of that portfolio or fund.
  - b. Provide adequate disclosures and information so investors can consider whether



any proposed changes in the investment style or strategy meet their investment needs.

6. When managing separate accounts and before providing investment advice or taking investment action on behalf of the client:
  - a. Evaluate and understand the client's investment objectives, tolerance for risk, time horizon, liquidity needs, financial constraints, any unique circumstances (including tax considerations, legal or regulatory constraints, etc.) and any other relevant information that would affect investment policy.
  - b. Determine that an investment is suitable to a client's financial situation.

## ***C. Trading***

### **Managers must:**

1. Not act or cause others to act on material nonpublic information that could affect the value of a publicly traded investment.
2. Give priority to investments made on behalf of the client over those that benefit the Managers' own interests.
3. Use commissions generated from client trades to pay for only investment-related products or services that directly assist the Manager in its investment decision making process, and not in the management of the firm.
4. Maximize client portfolio value by seeking best execution for all client transactions.
5. Establish policies to ensure fair and equitable trade allocation among client accounts.

## ***D. Risk Management, Compliance, and Support***

### **Managers must:**

1. Develop and maintain policies and procedures to ensure that their activities comply with the provisions of this Code and all applicable legal and regulatory requirements.
2. Appoint a compliance officer responsible for administering the policies and procedures and for investigating complaints regarding the conduct of the Manager or its personnel.

3. Ensure that portfolio information provided to clients by the Manager is accurate and complete and arrange for independent third-party confirmation or review of such information.
4. Maintain records for an appropriate period of time in an easily accessible format.
5. Employ qualified staff and sufficient human and technological resources to thoroughly investigate, analyze, implement, and monitor investment decisions and actions.
6. Establish a business-continuity plan to address disaster recovery or periodic disruptions of the financial markets.
7. Establish a firmwide risk management process that identifies, measures, and manages the risk position of the Manager and its investments, including the sources, nature, and degree of risk exposure.

## ***E. Performance and Valuation***

### **Managers must:**

1. Present performance information that is fair, accurate, relevant, timely, and complete. Managers must not misrepresent the performance of individual portfolios or of their firm.
2. Use fair-market prices to value client holdings and apply, in good faith, methods to determine the fair value of any securities for which no independent, third-party market quotation is readily available.

## ***F. Disclosures***

### **Managers must:**

1. Communicate with clients on an ongoing and timely basis.
2. Ensure that disclosures are truthful, accurate, complete, and understandable and are presented in a format that communicates the information effectively.
3. Include any material facts when making disclosures or providing information to clients regarding themselves, their personnel, investments, or the investment process.
4. Disclose the following:

- a. Conflicts of interests generated by any relationships with brokers or other entities, other client accounts, fee structures, or other matters.
- b. Regulatory or disciplinary action taken against the Manager or its personnel related to professional conduct.
- c. The investment process, including information regarding lock-up periods, strategies, risk factors, and use of derivatives and leverage.
- d. Management fees and other investment costs charged to investors, including what costs are included in the fees and the methodologies for determining fees and costs.
- e. The amount of any soft or bundled commissions, the goods and/or services received in return, and how those goods and/or services benefit the client.
- f. The performance of clients' investments on a regular and timely basis.
- g. Valuation methods used to make investment decisions and value client holdings.
- h. Shareholder voting policies.
- i. Trade allocation policies.
- j. Results of the review or audit of the fund or account.
- k. Significant personnel or organizational changes that have occurred at the Manager.
- l. Risk management processes.

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### 3. APPENDIX 6: A. LOYALTY TO CLIENTS

- c. determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code;
- d. recommend practices and procedures designed to prevent violations of the Asset Manager Code.

## Appendix 6—Recommendations and Guidance

Adoption of the Code is insufficient by itself for a Manager to meet its ethical and regulatory responsibilities. Managers must adopt detailed policies and procedures to effectively implement the Code. This section provides guidance explaining the Code and includes recommendations and illustrative examples to assist Managers that are seeking to implement the Code. These examples are not meant to be exhaustive, and the policies and procedures needed to support the Code will depend on the particular circumstances of each organization and the legal and regulatory environment in which the Manager operates.

The following guidance highlights particular issues that Managers should consider when developing their internal policies and procedures that accompany the Code. The guidance is not intended to cover all issues or aspects of a Manager's operations that would have to be included in such policies and procedures to fully implement and support the Code.

## **A. Loyalty to Clients**

### ***Managers must:***

#### **1. Place client interests before their own.**

Client interests are paramount. Managers should institute policies and procedures to ensure that client interests supersede Manager interests in all aspects of the Manager–client relationship, including (but not limited to) investment selection, transactions, monitoring, and custody. Managers should take reasonable steps to avoid situations in which the Manager's interests and client interests conflict and should institute operational safeguards to protect client interests. Managers should implement compensation arrangements that align the financial interests of clients and Managers and avoid incentives that could result in Managers taking action in conflict with client interests.

#### **2. Preserve the confidentiality of information communicated by clients within the scope of the Manager–client relationship.**

As part of their ethical duties, Managers must hold information communicated to them by clients or other sources within the context of the Manager–client relationship strictly confidential and must take all reasonable measures to preserve that confidentiality. This duty applies when Managers obtain information on the basis of their confidential relationship with the client or their special ability to conduct a portion of the client's business or personal affairs. Managers should create a privacy policy that addresses how confidential client information will be collected, stored, protected, and used.

The duty to maintain confidentiality does not supersede a duty (and in some cases the

legal requirement) to report suspected illegal activities involving client accounts to the appropriate authorities. Where appropriate, Managers should consider creating and implementing a written anti-money-laundering policy to prevent their organizations from being used for money laundering or the financing of any illegal activities.

**3. Refuse to participate in any business relationship or accept any gift that could reasonably be expected to affect their independence, objectivity, or loyalty to clients.**

As part of holding clients' interests paramount, Managers must establish policies for accepting gifts or entertainment in a variety of contexts. To avoid the appearance of a conflict, Managers must refuse to accept gifts or entertainment from service providers, potential investment targets, or other business partners of more than a minimal value. Managers should define what the minimum value is and should confer with local regulations which may also establish limits.

Managers should establish a written policy limiting the acceptance of gifts and entertainment to items of minimal value. Managers should consider creating specific limits for accepting gifts (e.g., amount per time period per vendor) and prohibit the acceptance of any cash gifts. Employees should be required to document and disclose to the Manager, through their supervisor, the firm's compliance office, or senior management, the acceptance of any gift or entertainment.

This provision is not meant to preclude Managers from maintaining multiple business relationships with a client as long as potential conflicts of interest are managed and disclosed.

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## **4. APPENDIX 6: B. INVESTMENT PROCESS AND ACTIONS**

- c. determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code;
- d. recommend practices and procedures designed to prevent violations of the Asset Manager Code.

**Managers must:**

**1. Use reasonable care and prudent judgment when managing client assets.**

Managers must exhibit the care and prudence necessary to meet their obligations to clients. Prudence requires caution and discretion. The exercise of prudence requires acting with the care, skill, and diligence that a person acting in a like capacity and familiar with such matters would use under the same circumstances. In the context of managing a client's portfolio, prudence requires following the investment parameters set forth by the client and balancing risk and return. Acting with care requires Managers to act in a prudent and judicious manner in avoiding harm to clients.

**2. Not engage in practices designed to distort prices or artificially inflate trading volume with the intent to mislead market participants.**

Market manipulation is illegal in most jurisdictions and damages the interests of all investors by disrupting the efficient functioning of financial markets and causing deterioration in investor confidence.

Market manipulation includes practices that distort security prices or values or artificially inflate trading volumes with the intent to deceive persons or entities that rely on information in the market. Such practices may involve, for example, transactions that deceive market participants by distorting the price-setting mechanism of financial instruments and the dissemination of false or misleading information. Transaction-based manipulation includes, but is not limited to, transactions that artificially distort prices or volume to give the impression of activity or price movement in a financial instrument (e.g., trading in illiquid stocks at the end of a measurement period to drive up the price and improve Manager performance) and securing a large position with the intent to exploit and manipulate the price of an asset and/or a related derivative. Information-based manipulation includes, but is not limited to, spreading knowingly false rumors to induce trading by others and pressuring sell-side analysts to rate or recommend a security in such a way that benefits the Manager or the Manager's clients.

**3. Deal fairly and objectively with all clients when providing investment information, making investment recommendations, or taking investment action.**

To maintain the trust that clients place in them, Managers must deal with all clients in a fair and objective manner. Managers must not give preferential treatment to favored clients to the detriment of other clients. In some cases, clients may pay for a higher level of service or certain services and certain products may only be made available to certain qualifying clients (e.g., certain funds may be open only to clients with assets above a certain level). These practices are permitted as long as they are disclosed and made available to all clients.

This provision is not intended to prevent Managers from engaging in secondary investment opportunities—referred to in some jurisdictions as “side-letter,” “sidecar,” or

“tag-along” arrangements—with certain clients as long as such opportunities are fairly allocated among similarly situated clients for whom the opportunity is suitable.

#### **4. Have a reasonable and adequate basis for investment decisions.**

Managers must act with prudence and make sure their decisions have a reasonable and adequate basis. Prior to taking action on behalf of their clients, Managers must analyze the investment opportunities in question and should act only after undertaking due diligence to ensure there is sufficient knowledge about specific investments or strategies. Such analysis will depend on the style and strategy being used. For example, a Manager implementing a passive strategy will have a very different basis for investment actions from that of a Manager that uses an active strategy.

Managers can rely on external third-party research as long as Managers have made reasonable and diligent efforts to determine that such research has a reasonable basis. When evaluating investment research, Managers should consider the assumptions used, the thoroughness of the analysis performed, the timeliness of the information, and the objectivity and independence of the source.

Managers should have a thorough understanding of the securities in which they invest and the strategies they use on behalf of clients. Managers should understand the structure and function of the securities, how they are traded, their liquidity, and any other risks (including counterparty risk).

Managers who implement complex and sophisticated investment strategies should understand the structure and potential vulnerabilities of such strategies and communicate these in an understandable manner to their clients. For example, when implementing complex derivative strategies, Managers should understand the various risks and conduct statistical analysis (i.e., stress testing) to determine how the strategy will perform under different conditions. By undertaking adequate due diligence, Managers can better judge the suitability of investments for their clients.

#### **5. When managing a portfolio or pooled fund according to a specific mandate, strategy, or style:**

- a. Take only investment actions that are consistent with the stated objectives and constraints of that portfolio or fund.**

When Managers are given a specific mandate by clients or offer a product, such as a pooled fund for which the Managers do not know the specific financial situation of each client, the Managers must manage the funds or portfolios within the stated mandates or strategies. Clients need to be able to evaluate the suitability of the investment funds or strategies for themselves. Subsequently, they must be able to trust that Managers will not diverge from the stated or agreed-on mandates or

strategies. When market events or opportunities change to such a degree that Managers wish to have flexibility to take advantage of those occurrences, such flexibility is not improper but should be expressly understood and agreed to by Managers and clients. Best practice is for Managers to disclose such events to clients when they occur or, at the very least, in the course of normal client reporting.

**b. Provide adequate disclosures and information so investors can consider whether any proposed changes in the investment style or strategy meet their investment needs.**

To give clients an opportunity to evaluate the suitability of investments, Managers need to provide adequate information to them about any proposed material changes to their investment strategies or styles. They must provide this information well in advance of such changes. Clients should be given enough time to consider the proposed changes and take any actions that may be necessary. If the Manager decides to make a material change in the investment strategy or style, clients should be permitted to redeem their investment, if desired, without incurring any undue penalties.

**6. When managing separate accounts and before providing investment advice or taking investment action on behalf of the client:**

**a. Evaluate and understand the client's investment objectives, tolerance for risk, time horizon, liquidity needs, financial constraints, any unique circumstances (including tax considerations, legal or regulatory constraints, etc.) and any other relevant information that would affect investment policy.**

Prior to taking any investment actions for clients, Managers must take the necessary steps to understand and evaluate the client's financial situation, constraints, and other relevant factors. Without understanding the client's situation, the Manager cannot select and implement an appropriate investment strategy. Ideally, each client will have an investment policy statement (IPS) that includes a discussion of risk tolerances (both the ability and willingness of the client to bear risk), return objectives, time horizon, liquidity requirements, liabilities, tax considerations, and any legal, regulatory, or other unique circumstances.

The purpose of the IPS is to provide Managers with written strategic plans to direct investment decisions for each client. The Manager should take an opportunity to review the IPS for each client, offer any suggestions on clarifying the IPS, and discuss with the client the various techniques and strategies to be used to meet the client's investment goals. Managers should review each client's IPS with the client at least annually and whenever circumstances suggest changes may be needed.



The information contained in an IPS allows Managers to assess whether a particular strategy or security is suitable for a client (in the context of the rest of the client's portfolio), and the IPS serves as the basis for establishing the client's strategic asset allocation. (Note: In some cases, the client will determine the strategic asset allocation; in other cases, that duty will be delegated to the Manager). The IPS should also specify the Manager's role and responsibilities in managing the client's assets and establish schedules for review and evaluation. The Manager should reach agreement with the client as to an appropriate benchmark or benchmarks by which the Manager's performance will be measured and any other details of the performance evaluation process (e.g., when performance measurement should begin).

**b. Determine that an investment is suitable to a client's financial situation.**

Managers must evaluate investment actions and strategies in light of each client's circumstances. Not all investments are suitable for every client, and Managers have a responsibility to ensure that only appropriate investments and investment strategies are included in a client's portfolio. Ideally, individual investments should be evaluated in the context of clients' total assets and liabilities, which may include assets held outside of the Manager's account, to the extent that such information is made available to the Manager and is explicitly included in the context of the client's IPS.

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## 5. APPENDIX 6: C. TRADING

- c. determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code;
- d. recommend practices and procedures designed to prevent violations of the Asset Manager Code.

### Managers must:

1. **Not act or cause others to act on material nonpublic information that could affect the value of a publicly traded investment.**

Trading on material nonpublic information, which is illegal in most jurisdictions, erodes

confidence in capital markets, institutions, and investment professionals and promotes the perception that those with inside and special access can take unfair advantage of the general investing public. Although trading on such information may lead to short-term profitability, over time, individuals and the profession as a whole suffer if investors avoid capital markets because they perceive them to be unfair by favoring the knowledgeable insider.

Different jurisdictions and regulatory regimes may define materiality differently, but in general, information is “material” if it is likely that a reasonable investor would consider it important and if it would be viewed as significantly altering the total mix of information available. Information is “nonpublic” until it has been widely disseminated to the marketplace (as opposed to a select group of investors).

Managers must adopt compliance procedures, such as establishing information barriers (e.g., fire walls), to prevent the disclosure and misuse of material nonpublic information. In many cases, pending trades or client or fund holdings may be considered material nonpublic information, and Managers must be sure to keep such information confidential. In addition, merger and acquisition information, prior to its public disclosure, is generally considered material nonpublic information. Managers should evaluate company-specific information that they may receive and determine whether it meets the definition of material nonpublic information.

This provision is not meant to prevent Managers from using the mosaic theory to draw conclusions—that is, combine pieces of material public information with pieces of nonmaterial nonpublic information to draw conclusions that are actionable.

## **2. Give priority to investments made on behalf of the client over those that benefit the Managers’ own interests.**

Managers must not execute their own trades in a security prior to client transactions in the same security. Investment activities that benefit the Manager must not adversely affect client interests. Managers must not engage in trading activities that work to the disadvantage of clients (e.g., front-running client trades).

In some investment arrangements, such as limited partnerships or pooled funds, Managers put their own capital at risk alongside that of their clients to align their interests with the interests of their clients. These arrangements are permissible only if clients are not disadvantaged.

Managers should develop policies and procedures to monitor and, where appropriate, limit the personal trading of their employees. In particular, Managers should require employees to receive approval prior to any personal investments in initial public offerings or private placements. Managers should develop policies and processes designed to ensure that client transactions take precedence over employee or firm

transactions. One method is to create a restricted list and/or watch list of securities that are owned in client accounts or may be bought or sold on behalf of clients in the near future; prior to trading securities on such a list, employees would be required to seek approval. In addition, Managers could require employees to provide the compliance officer with copies of trade confirmations each quarter and annual statements of personal holdings.

**3. Use commissions generated from client trades to pay for only investment-related products or services that directly assist the Manager in its investment decision-making process, and not in the management of the firm.**

Managers must recognize that commissions paid (and any benefits received in return for commissions paid) are the property of the client. Consequently, any benefits offered in return for commissions must benefit the Manager's clients.

To determine whether a benefit generated from client commissions is appropriate, Managers must determine whether it will directly assist in the Manager's investment decision-making process. The investment decision-making process can be considered the qualitative and quantitative process and the related tools used by the Manager in rendering investment advice to clients. The process includes financial analysis, trading and risk analysis, securities selection, broker selection, asset allocation, and suitability analysis.

Some Managers have chosen to eliminate the use of soft commissions (also known as soft dollars) to avoid any conflicts of interest that may exist. Managers should disclose their policy on how benefits are evaluated and used for the client's benefit. If Managers choose to use a soft commission or bundled brokerage arrangement, they should disclose this use to their clients. Managers should consider complying with industry best practices regarding the use and reporting of such an arrangement, which can be found in the CFA Institute Soft Dollar Standards.

**4. Maximize client portfolio value by seeking best execution for all client transactions.**

When placing client trades, Managers have a duty to seek terms that secure best execution for and maximize the value of each client's portfolio (i.e., ensure the best possible result overall). Managers must seek the most favorable terms for client trades within each trades' particular circumstances (such as transaction size, market characteristics, liquidity of security, and security type). Managers also must decide which brokers or venues provide best execution while considering, among other things, commission rates, timeliness of trade executions, and the ability to maintain anonymity, minimize incomplete trades, and minimize market impact.

When a client directs the Manager to place trades through a specific broker or through a particular type of broker, Managers should alert the client that by limiting the Manager's

ability to select the broker, the client may not be receiving best execution. The Manager should seek written acknowledgment from the client of receiving this information.

**5. Establish policies to ensure fair and equitable trade allocation among client accounts.**

When placing trades for client accounts, Managers must allocate trades fairly so that some client accounts are not routinely traded first or receive preferential treatment. Where possible, Managers should use block trades and allocate shares on a pro-rata basis by using an average price or some other method that ensures fair and equitable allocations. When allocating shares of an initial or secondary offering, Managers should strive to ensure that all clients for whom the security is suitable are given opportunities to participate. When Managers do not receive a large enough allocation to allow all eligible clients to participate fully in a particular offering, they must ensure that certain clients are not given preferential treatment and should establish a system to ensure that new issues are allocated fairly (e.g., pro rata). Manager's trade allocation policies should specifically address how initial public offerings and private placements are to be handled.

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## **6. APPENDIX 6: D. RISK MANAGEMENT, COMPLIANCE AND SUPPORT**

- c. determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code;
- d. recommend practices and procedures designed to prevent violations of the Asset Manager Code.

### **Managers must:**

- 1. Develop and maintain policies and procedures to ensure that their activities comply with the provisions of this Code and all applicable legal and regulatory requirements.**

Detailed and firmwide compliance policies and procedures are critical tools to ensure that Managers meet their legal requirements when managing client assets. In addition,

the fundamental, principle-based, ethical concepts embodied in the Code should be put into operation by the implementation of specific policies and procedures.

Documented compliance procedures assist Managers in fulfilling the responsibilities enumerated in the Code and ensure that the standards expressed in the Code are adhered to in the day-to-day operation of the firms. The appropriate compliance programs, internal controls, and self-assessment tools for each Manager will depend on such factors as the size of the firm and the nature of its investment management business.

**2. Appoint a compliance officer responsible for administering the policies and procedures and for investigating complaints regarding the conduct of the Manager or its personnel.**

Effective compliance programs require Managers to appoint a compliance officer who is competent, knowledgeable, and credible and is empowered to carry out his or her duties. Depending on the size and complexity of the Manager's operations, Managers may designate an existing employee to also serve as the compliance officer, may hire a separate individual for that role, or may establish an entire compliance department. Where possible, the compliance officer should be independent from the investment and operations personnel and should report directly to the CEO or board of directors.

The compliance officer and senior management should regularly make clear to all employees that adherence to compliance policies and procedures is crucial and that anyone who violates them will be held liable. Managers should consider requiring all employees to acknowledge that they have received a copy of the Code (as well as any subsequent material amendments), that they understand and agree to comply with it, and that they will report any suspected violations of the Code to the designated compliance officer. Compliance officers should take steps to implement appropriate employee training and conduct continuing self-evaluation of the Manager's compliance practices to assess the effectiveness of the practices.

Among other things, the compliance officer should be charged with reviewing firm and employee transactions to ensure the priority of client interests. Because personnel, regulations, business practices, and products constantly change, the role of the compliance officer (particularly the role of keeping the firm up to date on such matters) is particularly important.

The compliance officer should document and act expeditiously to address any compliance breaches and work with management to take appropriate disciplinary action.

**3. Ensure that portfolio information provided to clients by the Manager is accurate and complete and arrange for independent third-party confirmation or review of such information.**

Managers have a responsibility to ensure that the information they provide to clients is accurate and complete. By receiving an independent third-party confirmation or review of that information, clients have an additional level of confidence that the information is correct, which may enhance the Manager's credibility. Such verification is also good business practice because it may serve as a risk management tool to help the Manager identify potential problems. The confirmation of portfolio information may take the form of an audit or review, as is the case with most pooled vehicles, or may take the form of copies of account statements and trade confirmations from the custodian bank where the client assets are held.

#### **4. Maintain records for an appropriate period of time in an easily accessible format.**

Managers must retain records that substantiate their investment activities, the scope of their research, the basis for their conclusions, and the reasons for actions taken on behalf of their clients. Managers should also retain copies of other compliance-related records that support and substantiate the implementation of the Code and related policies and procedures, as well as records of any violations and resulting actions taken. Records can be maintained either in hard copy or electronic form.

Regulators often impose requirements related to record retention. In the absence of such regulation, Managers must determine the appropriate minimum time frame for keeping the organization's records. Unless otherwise required by local law or regulation Managers should keep records for at least seven years.

#### **5. Employ qualified staff and sufficient human and technological resources to thoroughly investigate, analyze, implement, and monitor investment decisions and actions.**

To safeguard the Manager–client relationship, Managers need to allocate all the resources necessary to ensure that client interests are not compromised. Clients pay significant sums to Managers for professional asset management services, and client assets should be handled with the greatest possible care.

Managers of all sizes and investment styles struggle with issues of cost and efficiency and tend to be cautious about adding staff in important operational areas. Nevertheless, adequate protection of client assets requires appropriate administrative, back-office, and compliance support. Managers should ensure that adequate internal controls are in place to prevent fraudulent behavior.

A critical consideration is employing only *qualified* staff. Managers must ensure that client assets are invested, administered, and protected by qualified and experienced staff. Employing qualified staff reflects a client-first attitude and helps ensure that Managers are applying the care and prudence necessary to meet their obligations to clients. This provision is not meant to prohibit the outsourcing of certain functions, but

the Manager retains the liability and responsibility for any outsourced work.

Managers have a responsibility to clients to deliver the actual services they claim to offer. Managers must use adequate resources to carry out the necessary research and analysis to implement their investment strategies with due diligence and care. Also, Managers must have adequate resources to monitor the portfolio holdings and investment strategies. As investment strategies and instruments become increasingly sophisticated, the need for sufficient resources to analyze and monitor them becomes ever more important.

## **6. Establish a business-continuity plan to address disaster recovery or periodic disruptions of the financial markets.**

Part of safeguarding client interests is establishing procedures for handling client accounts and inquiries in situations of national, regional, or local emergency or market disruption. Commonly referred to as business-continuity or disaster-recovery planning, such preparation is increasingly important in an industry and world highly susceptible to a wide variety of disasters and disruptions.

The level and complexity of business-continuity planning depends on the size, nature, and complexity of the organization. At a minimum, Managers should consider having the following:

- adequate backup, preferably off-site, for all account information;
- alternative plans for monitoring, analyzing, and trading investments if primary systems become unavailable;
- plans for communicating with critical vendors and suppliers;
- plans for employee communication and coverage of critical business functions in the event of a facility or communication disruption; and
- plans for contacting and communicating with clients during a period of extended disruption.

Numerous other factors may need to be considered when creating the plan. According to the needs of the organization, these factors may include establishing backup office and operational space in the event of an extended disruption and dealing with key employee deaths or departures.

As with any important business planning, Managers should ensure that employees and staff are knowledgeable about the plan and are specifically trained in areas of responsibility. Plans should be tested on a firmwide basis at intervals to promote

employee understanding and identify any needed adjustments.

**7. Establish a firmwide risk management process that identifies, measures, and manages the risk position of the Manager and its investments, including the sources, nature, and degree of risk exposure.**

Many investors, including those investing in hedge funds and alternative investments or leveraged strategies, invest specifically to increase their risk-adjusted returns. Assuming some risk is a necessary part of that process. The key to sound risk management by Managers is seeking to ensure that the risk profile desired by clients matches the risk profile of their investments. Risk management should complement rather than compete with the investment management process. Investment managers must implement risk management techniques that are consistent with their investment style and philosophy.

The types of risks faced by Managers include, but are not limited to, market risk, credit risk, liquidity risk, counterparty risk, concentration risk, and various types of operational risk. Such types of risks should be analyzed by Managers as part of a comprehensive risk management process for portfolios, investment strategies, and the firm. These examples are illustrative only and may not be applicable to all investment organizations.

Although portfolio managers consider risk issues as part of formulating an investment strategy, the firm's risk management process must be objective, independent, and insulated from influence of portfolio managers. Managers may wish to describe to clients how the risk management framework complements the portfolio management process while remaining separate from that process. Managers should consider outsourcing risk management activities if a separate risk management function is not appropriate or feasible because of the size of the organization.

An effective risk management process will identify risk factors for individual portfolios as well as for the Manager's activities as whole. It will often be appropriate for managers to perform stress tests, scenario tests, and backtests as part of developing risk models that comprehensively capture the full range of their actual and contingent risk exposures. The goal of such models is to determine how various changes in market and investment conditions could affect investments. The risk models should be continuously evaluated and challenged, and Managers should be prepared to describe the models to clients. Despite the importance of risk models, however, effective risk management ultimately depends on the experience, judgment, and ability of the Managers in analyzing their risk metrics.

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## **7. APPENDIX 6: E. PERFORMANCE AND**



# EVALUATION

- c. determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code;
- d. recommend practices and procedures designed to prevent violations of the Asset Manager Code.

## Managers must:

- 1. Present performance information that is fair, accurate, relevant, timely, and complete. Managers must not misrepresent the performance of individual portfolios or of their firm.**

Although past performance is not necessarily indicative of future performance, historical performance records are often used by prospective clients as part of the evaluation process when hiring asset managers. Managers have a duty to present performance information that is a fair representation of their record and includes all relevant factors. In particular, Managers should be certain not to misrepresent their track records by taking credit for performance that is not their own (i.e., when they were not managing a particular portfolio or product) or by selectively presenting certain time periods or investments (i.e., cherry picking). Any hypothetical or backtested performance must be clearly identified as such. Managers should provide as much additional portfolio transparency as feasibly possible. Any forward-looking information provided to clients must also be fair, accurate, and complete.

A model for fair, accurate, and complete performance reporting is embodied in the Global Investment Performance Standards (GIPS®), which are based on the principles of fair representation and full disclosure and are designed to meet the needs of a broad range of global markets. By adhering to these standards for reporting investment performance, Managers help assure investors that the performance information being provided is both complete and fairly presented. When Managers comply with the GIPS standards, both prospective and existing clients benefit because they can have a high degree of confidence in the reliability of the performance numbers the Managers are presenting. This confidence may, in turn, enhance clients' sense of trust in their Managers.

- 2. Use fair-market prices to value client holdings and apply, in good faith, methods to determine the fair value of any securities for which no independent, third-party market quotation is readily available.**

In general, fund Managers' fees are calculated as a percentage of assets under management. In some cases, an additional fee is calculated as a percentage of the annual returns earned on the assets. Consequently, a conflict of interest may arise where the portfolio Manager has the additional responsibility of determining end-of-period valuations and returns on the assets.

These conflicts may be overcome by transferring responsibility for the valuation of assets (including foreign currencies) to an independent third party. For pooled funds that have boards of directors comprising independent members, the independent members should have the responsibility of approving the asset valuation policies and procedures and reviewing the valuations. For pooled funds without independent directors, we recommend that this function be undertaken by independent third parties who are expert in providing such valuations.

Managers should use widely accepted valuation methods and techniques to appraise portfolio holdings of securities and other investments and should apply these methods on a consistent basis.

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## 8. APPENDIX 6: F. DISCLOSURES

- c. determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code;
- d. recommend practices and procedures designed to prevent violations of the Asset Manager Code.

### **Managers must:**

#### **1. Communicate with clients on an ongoing and timely basis.**

Developing and maintaining clear, frequent, and thorough communication practices is critical to providing high-quality financial services to clients. Understanding the information communicated to them allows clients to know how Managers are acting on their behalf and gives clients the opportunity to make well-informed decisions regarding their investments. Managers must determine how best to establish lines of communication that fit their circumstances and that enable clients to evaluate their financial status.

**2. Ensure that disclosures are truthful, accurate, complete, and understandable and are presented in a format that communicates the information effectively.**

Managers must not misrepresent any aspect of their services or activities, including (but not limited to) their qualifications or credentials, the services they provide, their performance records, and characteristics of the investments or strategies they use. A misrepresentation is any untrue statement or omission of fact or any statement that is otherwise false or misleading. Managers must ensure that misrepresentation does not occur in oral representations, marketing (whether through mass media or printed brochures), electronic communications, or written materials (whether publicly disseminated or not).

To be effective, disclosures must be made in plain language and in a manner designed to effectively communicate the information to clients and prospective clients. Managers must determine how often, in what manner, and under what particular circumstances disclosures must be made.

**3. Include any material facts when making disclosures or providing information to clients regarding themselves, their personnel, investments, or the investment process.**

Clients must have full and complete information to judge the abilities of Managers and their actions in investing client assets. “Material” information is information that reasonable investors would want to know relative to whether or not they would choose to use or continue to use the Manager.

**4. Disclose the following:**

**a. Conflicts of interests generated by any relationships with brokers or other entities, other client accounts, fee structures, or other matters.**

Conflicts of interests often arise in the investment management profession and can take many forms. Best practice is to avoid such conflicts if possible. When Managers cannot reasonably avoid conflicts, they must carefully manage them and disclose them to clients. Disclosure of conflicts of interests protects investors by providing them with the information they need to evaluate the objectivity of their Managers’ investment advice and actions taken on behalf of clients and by giving them the information to judge the circumstances, motives, and possible Manager bias for themselves. Examples of some of the types of activities that can constitute actual or potential conflicts of interest are the use of soft dollars or bundled commissions, referral and placement fees, trailing commissions, sales incentives, directed brokerage arrangements, allocation of investment opportunities among similar portfolios, Manager or employee holdings in the same securities as clients, whether the Manager co-invests alongside clients, and use of affiliated brokers.

**b. Regulatory or disciplinary action taken against the Manager or its personnel related to professional conduct.**

Past professional conduct records are an important factor in an investor's selection of a Manager. Such records include actions taken against a Manager by any regulator or other organization. Managers must fully disclose any significant instances in which the Manager or an employee was found to have violated standards of conduct or other standards in such a way that reflects badly on the integrity, ethics, or competence of the organization or the individual.

**c. The investment process, including information regarding lock-up periods, strategies, risk factors, and use of derivatives and leverage.**

Managers must disclose to clients and prospects the manner in which investment decisions are made and implemented. Such disclosures should address the overall investment strategy and should include a discussion of the specific risk factors inherent in such a strategy.

Understanding the basic characteristics of an investment is an important factor in judging the suitability of each investment on a stand-alone basis, but it is especially important in determining the effect each investment will have on the characteristics of the client's portfolio. Only by thoroughly understanding the nature of the investment product or service can a client determine whether changes to that product or service could materially affect his or her investment objectives.

**d. Management fees and other investment costs charged to investors, including what costs are included in the fees and the methodologies for determining fees and costs.**

Investors are entitled to full and fair disclosures of costs associated with the investment management services provided. Material that should be disclosed includes information relating to any fees to be paid to the Managers on an ongoing basis and periodic costs that are known to the Managers and that will affect investors' overall investment expenses. At a minimum, Managers should provide clients with gross- and net-of-fees returns and disclose any unusual expenses.

A general statement that certain fees and other costs will be assessed to investors may not adequately communicate the total amount of expenses that investors may incur as a result of investing. Therefore, Managers must not only use plain language in presenting this information but must clearly explain the methods for determining all fixed and contingent fees and costs that will be borne by investors and also must explain the transactions that will trigger the imposition of these expenses.

Managers should also retrospectively disclose to each client the actual fees and other costs charged to the clients, together with itemizations of such charges when requested by clients. This disclosure should include the specific management fee, any incentive fee, and the amount of commissions Managers paid on behalf of clients during the period. In addition, Managers must disclose to prospective clients the average or expected expenses or fees clients are likely to incur.

**e. The amount of any soft or bundled commissions, the goods and/or services received in return, and how those goods and/or services benefit the client.**

Commissions belong to the client and should be used in their best interests. Any soft or bundled commissions should be used only to benefit the client. Clients deserve to know how their commissions are spent, what is received in return for them, and how those goods and/or services benefit them.

**f. The performance of clients' investments on a regular and timely basis.**

Clients may reasonably expect to receive regular performance reporting about their accounts. Without such performance information, even for investment vehicles with lock-up periods, clients cannot evaluate their overall asset allocations (i.e., including assets not held or managed by the Managers) and determine whether rebalancing is necessary. Accordingly, unless otherwise specified by the client, Managers must provide regular, ongoing performance reporting. Managers should report to clients at least quarterly, and when possible, such reporting should be provided within 30 days after the end of the quarter.

**g. Valuation methods used to make investment decisions and value client holdings.**

Clients deserve to know whether the assets in their portfolios are valued on the basis of closing market values, third-party valuations, internal valuation models, or other methods. This type of disclosure allows clients to compare performance results and determine whether different valuation sources and methods may explain differences in performance results. This disclosure should be made by asset class and must be meaningful (i.e., not general or boilerplate) so that clients can understand how the securities are valued.

**h. Shareholder voting policies.**

As part of their fiduciary duties, Managers that exercise voting authority over client shares must vote them in an informed and responsible manner. This obligation includes the paramount duty to vote shares in the best interests of clients.

To fulfill their duties, Managers must adopt policies and procedures for the voting

of shares and disclose those policies and procedures to clients. These disclosures should specify, among other things, guidelines for instituting regular reviews for new or controversial issues, mechanisms for reviewing unusual proposals, guidance in deciding whether additional actions are warranted when votes are against corporate management, and systems to monitor any delegation of share-voting responsibilities to others. Managers also must disclose to clients how to obtain information on the manner in which their shares were voted.

**i. Trade allocation policies.**

By disclosing their trade allocation policies, Managers give clients a clear understanding of how trades are allocated and provide realistic expectations of what priority they will receive in the investment allocation process. Managers must disclose to clients any changes in the trade allocation policies. By establishing and disclosing trade allocation policies that treat clients fairly, Managers foster an atmosphere of openness and trust with their clients.

**j. Results of the review or audit of the fund or account.**

If a Manager submits its funds or accounts (generally pooled or mutual funds) for an annual review or audit, it must disclose the results to clients. Such disclosure enables clients to hold Managers accountable and alerts them to any potential problems.

**k. Significant personnel or organizational changes that have occurred at the Manager.**

Clients should be made aware of significant changes at the Manager in a timely manner. “Significant” changes would include personnel turnover, merger and acquisition activities of the Manager, and similar actions.

**l. Risk management processes.**

Managers must disclose their risk management processes to clients. Material changes to the risk management process also must be disclosed. Managers should further consider regularly disclosing specific risk information and specific information regarding investment strategies related to each client. Managers must provide clients information detailing what relevant risk metrics they can expect to receive at the individual product/portfolio level.

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# PRACTICE PROBLEMS

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## The following information relates to Questions 1–6

Bornelli Asset Management offers traditional long-only funds as well as a variety of hedge funds for both private and institutional clients. Bornelli is a well-managed firm of more than 100 employees. Its board of directors has voted to adopt the Asset Manager Code of Professional Conduct (the Code).

Bornelli has hired Ava Campanelli as chief compliance officer with responsibility for implementing the Code. Campanelli develops a plan to evaluate the firm's current policies and procedures for compliance with the Code. Campanelli begins by reviewing three of the firm's compliance procedures:

Portfolio review	Portfolio information provided to clients is reviewed by an independent third-party.
Record retention	The firm retains records to substantiate all investment decisions for seven years. In compliance with regulatory requirements, the firm also retains copies of all emails for the same period. The firm retains its records in a combination of both hard-copy and electronic formats.
Investigation of complaints	The chief compliance officer (CCO) is responsible for investigating and documenting all complaints. The CCO reports to the chief investment officer and works with management to take appropriate disciplinary action in cases of compliance breaches.

Campanelli then evaluates the firm's business-continuity plan. Under the current plan, the technology division backs up all of the firm's computer systems and client records twice daily. The back-ups are stored in a fireproof storage facility offsite. Bornelli outsources certain emergency plans to a disaster recovery firm. The disaster recovery firm is responsible for developing and implementing plans to communicate with employees and mission-critical vendors and suppliers in the event of a facility or communication disruption. The same firm also provides plans for contacting and communicating with clients in event of an extended disruption.

For her next project, Campanelli reviews the disclosures provided to both prospective and

current clients. The disclosures regarding management fees state:

Bornelli charges a 2% asset-based management fee. In addition to the management fee, clients may pay an incentive fee at the end of each year. The incentive fee is equal to 20% of the account's net investment income and net realized and unrealized capital gains for the year.

No incentive fee will be paid unless the Fund has offset all prior net realized capital losses and net investment losses with realized capital gains, unrealized appreciation, and net investment income from all securities held by the Fund.

Campanelli's evaluation of the management fee disclosures is interrupted by a more urgent matter involving a client. The client has requested monthly performance reporting of his investment in a long-short equity hedge fund. The fund's administrator argues "Our procedures call for us to provide clients with both gross- and net-of-fees returns within 30 days of the end of the quarter." He adds "Quarterly reporting is the industry standard."

The administrator complains "This client, Rossi, is overly demanding. He telephoned yesterday and requested an itemization of the fees and other costs charged to him for the past three years. He wants to know the specific management fee, the incentive fee, and the amount of commissions paid. The more time we spend answering his requests, the less time we have to research investments." Campanelli promises to look into the matter for the administrator.

The following week, Campanelli meets with Lee Bruno, manager of the firm's alternative assets fund. Bruno informs Campanelli, "The fund has a three-year lock-up period. We disclosed to all the prospective clients in writing before they invested that this is a long-term investment and that they should not focus on short-term performance results. During the lock-up period, we provide semiannual reporting. After the lock-up, we report quarterly."

Bruno informs Campanelli that whenever possible, the firm uses fair market prices to value client holdings. He adds "Of course, our fund invests in alternative assets—some of which are very difficult to value. They aren't like public equities with independent, third-party market quotations available, so we use an internal model to value client holdings." He continues, "We disclose the use of internal models for valuation purposes on all our reports."

Following her conversation with Bruno, Campanelli researches a complaint from a new client regarding the valuations of his fund's holdings. The client complains that another management firm reported much lower valuations on similar instruments. Campanelli researches the methodologies Bornelli uses for valuing fund holdings. She determines the following:

- All publicly traded US and foreign equities, including large-, mid-, small-, and micro-cap shares are valued at the last available closing price.



- The value of certain securities such as swaps are based on quotes collected from broker-dealers.
  - When prices are not available from either of the above sources, valuations are based on internal models.
1. Are the three compliance procedures reviewed by Campanelli consistent with both the required and recommended standards of the CFA Institute Asset Manager Code of Professional Conduct?
    - A. No, the procedures regarding record retention are inconsistent.
    - B. No, the procedures regarding portfolio review are inconsistent.
    - C. No, the procedures regarding investigation of complaints are inconsistent.
  2. Is Bornelli's disaster recovery plan consistent with both the required and recommended standards of the Asset Manager Code?
    - A. Yes.
    - B. No, because the plan lacks a backup plan for monitoring, analyzing, and trading investments.
    - C. No, because the plan only provides for contacting and communicating with clients during periods of extended disruption.
  3. Are the firm's disclosures regarding management fees consistent with the required and recommended standards of the Asset Manager Code?
    - A. Yes.
    - B. No, because they do not use plain language.
    - C. No, because they do not include the average or expected expenses or fees clients are likely to incur.
  4. Are the performance reporting procedures described by the fund's administrator consistent with the required disclosure standards of the Asset Manager Code?
    - A. Yes.
    - B. No, because the AMC requires firms to report performance to all clients on a monthly basis.

- C. No, because the AMC requires firms to provide performance on a monthly basis when requested by clients.
5. To comply with both the required and recommended standards of the Asset Manager Code, must Bornelli honor Rossi's telephone request regarding an itemization of fees?
- A. Yes.
- B. No, because the firm is not required to disclose the amount of incentive fee charged to an individual client.
- C. No, because unless the firm claims compliance with the Soft Dollar Standards, it is not required to disclose the amount of commissions paid on clients' behalf.
6. Are the policies of the alternative assets fund consistent with the required and recommended standards of the Asset Manager Code?
- A. Yes.
- B. No, the frequency of reporting is inconsistent with the AMC.
- C. No, the use of internal valuation models is inconsistent with the AMC.
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## The following information relates to Questions 7–12

Henry Schmidt, David Zane, and Andrew Ronoldo founded SZR LLC (SZR), an investment advisory firm managing portfolios for individuals. Although none of the founders holds the CFA charter, SZR has adopted the CFA Institute Asset Manager Code of Professional Conduct.

SZR's client portfolios average \$50,000 and are entirely invested in SZR's commingled fund, managed by Ronoldo. Ronoldo implements a quantitative enhanced index process in SZR's fund and has consistently added moderate performance (alpha) over the fund's mid-cap benchmark index. After five years of strong performance, Ronoldo worries that the mid-cap fund will lag broad market indexes, so he decides to broaden the fund's strategy. After doing research, he adds micro-cap, foreign, and convertible preferred stocks to the fund and doubles some holdings so that their weights are much larger than they are in the benchmark index. Since the fund achieves even stronger performance, both against the benchmark mid-cap index and major market indexes, Ronoldo plans to describe the new strategy in the company's next annual newsletter, due to be sent to clients in three months.

As a prominent member of the community, Schmidt has just joined the board of a local company, Trezeguet Baking Company, which recently went public. Trezeguet's shares are in most micro-capitalization (cap) indexes. As a board member, Schmidt receives a small annual stipend of \$2,000; however, he is granted several thousand stock options, which he can exercise after 24 months' board service. Since his stipend is insignificant and he will not exercise his options for at least 24 months, Schmidt does not disclose his Trezeguet board service to SZR clients.

One of SZR's clients is president of Sastre International. Because of SZR's success, this client hires SZR to manage \$800 million of Sastre International's corporate cash in a separate account, but asks that its hiring of SZR not be made public. Sastre's board asks Ronoldo to direct all of the Sastre account trades through a local financial advisor, to thank the advisor for selecting SZR. Ronoldo is concerned that this direction may limit SZR's ability to achieve best execution, but after Sastre acknowledges in writing that this is their preference, Ronoldo agrees to follow Sastre's direction.

As head of operations, Zane wishes to simplify trading and implements a new trade policy: first place trades for the Sastre account through the local financial advisor and then submit the commingled fund's trades through national brokerage houses and electronic networks. The local financial advisor is pleased with this arrangement, as he is able to buy securities before other clients; he informs Zane that he'll recommend SZR to additional clients.

Schmidt, SZR's sales director, sends the commingled fund's stellar performance track record to several investment consultants, who serve as "gatekeepers" for large institutional clients, but he is told that SZR is too small to be considered by their clients. After Schmidt reveals that Sastre has recently hired SZR, and offers to negotiate the same special fee discount that has been given to Sastre, one consultant agrees to consider SZR for its clients. The consultant indicates that if SZR agrees to sponsor the consulting firm's annual conference, Schmidt will meet many potential clients. Schmidt considers this conference sponsorship, but decides that it is too costly for SZR's budget, so he declines the offer.

As SZR grows, Zane hires his brother-in-law, John Karna (top salesman for a local auto parts company) as Compliance Officer. Karna is tasked with writing SZR's Code of Ethics and its Investment Policies and Procedures Manual. Karna is also put in charge of the firm's Business Continuity Plan. The plan consists of his taking home, each evening, the computer records of SZR's daily trades.

7. Does Ronoldo violate the CFA Institute Asset Manager Code of Professional Conduct with respect to his broader investment strategy?
  - A. No.
  - B. Yes, with respect to client disclosure only.

**C.** Yes, with respect to reasonable and adequate basis only.

- 8.** Does Schmidt violate the CFA Institute Asset Manager Code of Professional Conduct with respect to his current Trezeguet board service?
- A.** No.
- B.** Yes, with respect to priority of client interests only.
- C.** Yes, with respect to priority of client interests and participation in business relationships.
- 9.** By agreeing to Sastre's direction, does Ronoldo violate the CFA Institute Asset Manager Code of Professional Conduct?
- A.** No.
- B.** Yes, only with respect to best execution.
- C.** Yes, only with respect to fair and equitable trade allocation.
- 10.** Does Zane's revision of SZR's trading process violate the CFA Institute Asset Manager Code of Professional Conduct?
- A.** No.
- B.** Yes, only with respect to best execution.
- C.** Yes, with respect to best execution and fair, equitable trade allocation.
- 11.** Does Schmidt violate the CFA Institute Asset Manager Code of Professional Conduct in his interaction with consultants?
- A.** No.
- B.** Yes, only with respect to confidentiality.
- C.** Yes, only with respect to business relationships that could affect independence.
- 12.** Does Karna's role as Chief Compliance Officer, and the process of SZR's Business Continuity Plan, respectively, conform to the requirements and recommendations of the CFA Institute Asset Manager Code of Professional Conduct?
- A.** Neither Karna's role nor the Business Continuity Plan conforms.

**B.** Karna's role conforms, but the Business Continuity Plan does not conform.

**C.** Karna's role does not conform, but the Business Continuity Plan does conform.

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## SOLUTIONS

1. C is correct. According to the recommendations of Section D(2) of the Asset Manager Code, where possible, the CCO should be independent from the investment and operations personnel and should report directly to the CEO or the board of directors.
2. B is correct. According to the guidance provided in Section D(6) of the Asset Manager Code, the level and complexity of business-continuity planning depends on the size, nature, and complexity of the organization involved. Bornelli is a large firm with hedge fund investments and it should have alternative plans for monitoring, analyzing, and trading investments if primary systems become unavailable.
3. C is correct. According to the recommendations and guidance of Section F(4d) of the Asset Manager Code, managers must disclose to prospective clients the average or expected expenses or fees clients are likely to incur, and to existing clients the actual fees and other costs charged to them.
4. A is correct. The performance reporting procedures described by the administrator are consistent with the Asset Manager Code (AMC) which requires disclosing the "performance of clients' investments on a regular and timely basis." The AMC recommends that "managers should report to clients at least quarterly, and when possible, such reporting should be provided within 30 days after the end of the quarter." The AMC also states that "at a minimum, Managers should provide clients with gross-and net-of-fees returns." Because quarterly reporting is the recommended minimum, managers may choose to provide more timely performance to clients.
5. A is correct. According to the recommendations of Section F(4d) of the Asset Manager Code, managers should disclose to each client the actual fees and other costs charged to them, together with itemizations of such charges, when requested by clients. The disclosure should include the specific management fee, incentive fee, and the amount of commissions paid on clients' behalf during the period.
6. B is correct. Clients must have regular performance information to evaluate their overall asset allocations and to determine whether rebalancing is necessary. This concept applies even to investment vehicles with lock-up periods. According to the Asset

Manager Code, unless otherwise specified by the client, managers should report to clients at least quarterly, and when possible, within 30 days of the end of the period.

7. B is correct. Ronoldo should have disclosed his change in investment strategy to clients, allowing them to move their accounts if not in agreement. Until he disclosed a planned change in strategy, he should have continued to manage in the manner for which clients had hired him.
8. C is correct. Schmidt is on the board of a company whose stock is in microcap indexes. This is a conflict of interest, as Ronoldo's widened investment guidelines allow purchase of Trezeguet stock for the fund. As Schmidt is an insider for the company and received options that can be sold (after 24 months), this relationship should be terminated.
9. A is correct. The Sastre board requests directed trading for its discretionary account and acknowledges, in writing, that trading through the local financial advisor may limit best execution. As this is a discretionary (not pension) account, the client has the right to direct to a less-than-optimal trading venue.
10. C is correct. Zane should have pursued best execution for all clients in the fund (which is not accomplished by placing trades with the local financial advisor first versus with national brokers or electronic networks), and fairly traded for all clients. While Sastre is welcome to direct trades, Zane's change in procedures harms other clients.
11. B is correct. Schmidt violated Code A-2 by revealing Sastre's hiring of SZR and its special fee discount.
12. A is correct. Karna's qualification as compliance officer is inadequate (D-2, D-5), and taking tapes home each night is inadequate business continuity for a firm of \$1.5 billion (D-6).

# Reading 35

## Overview of the Global Investment Performance Standards

by Philip Lawton, PhD, CFA, CIPM

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### LEARNING OUTCOMES

The candidate should be able to:

- a. discuss the objectives and scope of the GIPS standards and their benefits to prospective clients and investors, as well as investment managers;
- b. explain the fundamentals of compliance with the GIPS standards, including the definition of the firm and the firm's definition of discretion;
- c. discuss requirements of the GIPS standards with respect to return calculation methodologies, including the treatment of external cash flows, cash and cash equivalents, and expenses and fees;
- d. explain requirements of the GIPS standards with respect to composite return calculations, including methods for asset-weighting portfolio returns;
- e. explain the meaning of "discretionary" in the context of composite construction and, given a description of the relevant facts, determine whether a portfolio is likely to be considered discretionary;
- f. explain the role of investment mandates, objectives, or strategies in the construction of composites;
- g. explain requirements of the GIPS standards with respect to composite construction, including switching portfolios among composites, the timing of the inclusion of new portfolios in composites, and the timing of the exclusion of terminated portfolios from

composites;

- h. explain requirements of the GIPS standards with respect to presentation and reporting;
- i. explain the conditions under which the performance of a past firm or affiliation may be linked to or used to represent the historical performance of a new or acquiring firm;
- j. explain the recommended valuation hierarchy of the GIPS standards;
- k. discuss the purpose, scope, and process of verification.

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## 1. OBJECTIVE AND SCOPE OF THE GIPS STANDARDS

- a. **discuss the objectives and scope of the GIPS standards and their benefits to prospective clients and investors, as well as investment managers**

This reading explains the rationale and application of certain provisions of the 2020 edition of the Global Investment Performance Standards (GIPS®) for Firms. The 2020 edition of the GIPS standards contains three chapters: the GIPS Standards for Firms, the GIPS Standards for Asset Owners, and the GIPS Standards for Verifiers, each with its own glossary.

***Candidates are responsible not only for the material contained directly in this reading but also for the sections of the GIPS Standards for Firms specifically referenced within this reading.*** The entirety of the 2020 GIPS Standards for Firms can be found here:

<https://www.cfainstitute.org/en/ethics/codes/gips-standards/firms>

The GIPS standards fulfill an essential role in investment management around the world. They meet the need for globally accepted standards for investment management firms in calculating and presenting their investment returns to **prospective clients** and **prospective investors**. (In the context of the GIPS Standards for Firms, a prospective *client* is any person or entity that has expressed interest in one of the firm's strategies and qualifies to invest in that strategy via a segregated account, irrespective of whether the person or entity currently invests with the firm through another strategy that the firm offers. A prospective *investor* is any person or entity that has expressed interest in one of the firm's pooled funds and qualifies to invest in the pooled fund, again irrespective of any other current investments with the firm. These and other terms bolded in this reading are defined in the glossary of the GIPS Standards for Firms. For purposes of this reading, the terms *client* and *investor* may be used interchangeably.)



The GIPS standards are based on the ideals of fair representation and full disclosure of an investment management firm's performance history. Firms that claim compliance with the GIPS standards must adhere to rules governing not only return calculations but also the way in which returns are displayed in a **GIPS Report**. (A GIPS Report is a specific type of performance presentation that must be provided to *prospective* clients and investors when a firm claims compliance with the GIPS standards.) They are further required to make certain disclosures and are encouraged to make others in a GIPS Report, thereby assisting the user in interpreting and evaluating the reported returns. Prospective and current clients can have a high degree of confidence that the information shown in a GIPS Report reflects the results of the firm's past investment decisions. They can also be confident that the returns are calculated and presented on a consistent basis and are objectively comparable for a given strategy with those reported by other firms claiming compliance with the GIPS standards.

## 1.1. Objective and Scope of the GIPS Standards

The GIPS standards evolved from earlier efforts to improve the reliability of investment performance information and to standardize calculation methodologies and presentation standards. In this part of the reading, we explain the objectives and scope of the GIPS standards.

### 1.1.1. *The Need for Global Investment Performance Standards*

To appreciate the value of industry-wide performance presentation standards, consider some of the many ways in which unscrupulous employees might attempt to gather and retain assets by misrepresenting a firm's historical record. In communicating with a prospective client or investor, they could

- present returns only for the best-performing portfolios as though those returns fully represented the firm's expertise in a given strategy or style;
- base portfolio values on their own unsubstantiated estimates of asset prices;
- inflate returns by annualizing partial-period results;
- select the most favorable measurement period, calculating returns from a low point to a high point;
- present simulated returns as though they had actually been earned;
- choose as a benchmark the particular index the selected portfolios have outperformed by the greatest margin during the preferred measurement period;

- portray the growth of assets in the style or strategy of interest so as to mask the difference between investment returns and client contributions; or
- use the marketing department's expertise in graphic design to underplay unfavorable performance data and direct the prospect's attention to the most persuasive elements of the sales presentation.

Some of the foregoing examples are admittedly egregious abuses. They are not, however, farfetched. The investment management industry is highly competitive, and people whose careers and livelihoods depend on winning new business want to communicate their firm's performance in the most favorable light. The GIPS standards are ethical criteria designed to ensure that the firm's performance history is fairly represented and adequately disclosed. Indeed, employees who are pressured to misrepresent their firm's investment results can and should cite the GIPS standards.

Without established, well-formulated, and widely adopted standards for investment performance measurement and presentation, the prospective client's or investor's ability to make sound decisions in selecting investment managers would be impaired. Individual clients, investors, and their advisors, as well as pension plan sponsors, foundation trustees, and other institutional investors with fiduciary responsibility for asset pools, need reliable information. The GIPS standards increase their confidence that the returns shown fairly represent an investment firm's historical record. The GIPS standards also enable them to make reasonable comparisons among different investment management firms before hiring one of them. Evaluating past returns is only one dimension of the manager selection process, but it is an important one in fulfilling the due diligence responsibilities expected of fiduciaries.

Global standards for performance presentation, including a requirement to show a strategy's returns alongside the returns of an appropriate **benchmark**, can lead to an informative discussion about the firm's investment decision-making process. A prospective client might ask, for instance, why the strategy outperformed the benchmark in some periods and not in others, inviting the firm's spokespersons to explain past returns and to describe how the investment product is positioned for the future. The firm's representatives should be able to explain the sources of past returns reasonably, credibly, and insightfully in light of the firm's investment philosophy and investment decision-making process as well as the then-prevailing capital market environment.

(It must be stressed in this context that reviewing properly calculated, fully disclosed historical results does not exempt the prospective client from a thorough investigation of the candidate firm's background, resources, and capabilities for the mandate under consideration. Due diligence in selecting an investment manager includes, among many other important elements, examining a firm's regulatory history, the experience and professional credentials of its decision makers, the soundness of its investment philosophy, the nature of its investment and operational risk controls, and the independence of its service providers.)

The benefits of the GIPS standards to prospective and current clients are clear. What, if any, are the benefits to the investment management firms incurring the expenses required to achieve and maintain compliance with the GIPS standards?

There is, first, an immeasurable benefit to the investment management industry as a whole. The development of well-founded, thoughtfully defined performance presentation standards is a great credit not only to the vision of certain professionals and organizations but, above all, to the leadership of the investment management firms that adopted the standards early on. The GIPS standards may reassure investors about compliant firms' integrity in the area of investment performance reporting, especially if they have been verified. **Verification**, discussed later in this reading, refers to an investment firm's voluntarily engaging an independent third party to test the firm's design and implementation of certain performance measurement policies and procedures. Verification brings additional credibility to the firm's claim of compliance with the GIPS standards.

The practical benefits to individual firms facing the initial and ongoing expenses of GIPS compliance have increased over time. In some markets, the GIPS standards are so well accepted by plan sponsors and consultants that non-compliance is a serious competitive impediment to a firm's winning new institutional business. Requests for proposals (RFPs) in manager searches routinely ask if the responding firm is in compliance with the GIPS standards and if the firm has been independently verified. In addition, the global recognition the GIPS standards have gained helps the compliant firm to compete in international markets because prospective clients and investors value the ability to equitably compare its investment performance to that of local GIPS-compliant firms. Compliance with the GIPS standards has appropriately been characterized as the investment management firm's passport to the international marketplace.

Because the GIPS standards reflect best practices in the calculation and presentation of investment performance, firms may also realize internal benefits. In the course of implementing the GIPS standards, they might identify opportunities to strengthen managerial controls. The discipline of reviewing portfolio guidelines and defining, documenting, and adhering to internal policies in support of compliance with the GIPS standards typically improves the firm's oversight of investment operations and provides management with additional comfort in the accuracy of the firm's performance reporting and the quality of the presentations provided to prospective clients and investors. Similarly, technological enhancements designed to provide valid calculation input data and presentation elements, such as dispersion statistics, may improve the quality of information available to the firm.

### ***1.1.2. The Scope of the GIPS Standards for Firms***

Only investment management firms and asset owners that manage assets on a discretionary basis—and compete for business—may claim compliance with the GIPS Standards for

Firms. (An asset owner that manages investments, directly and/or through the use of external managers, on behalf of participants, beneficiaries, or the organization itself—but does not compete for business—would comply with the GIPS Standards for Asset Owners.) Consultants, software houses, or third-party performance measurement providers such as custodians may not claim to be GIPS-compliant.

GIPS compliance cannot be claimed for only some of an investment firm’s products, nor for specific **composites, pooled funds, or portfolios**; compliance can be achieved only on a firm-wide basis. A firm’s claim of compliance signifies, among other things, that the firm’s performance measurement data inputs, processes, and return calculation methodology conform to the prescribed guidelines; that all of the firm’s fee-paying discretionary **segregated accounts** have been assigned to at least one composite; and that all **limited distribution pooled funds** meeting a **composite definition** are properly included in the appropriate composites.

## UNDERSTANDING KEY TERMS

Here we pause for a brief detour to define a few terms that have very specific meaning in the context of the GIPS standards:

*Composite.* A composite is an aggregation of one or more portfolios that are managed according to a similar investment mandate, objective, or strategy.

*Segregated Account.* A segregated account is a portfolio owned by a single client, sometimes referred to in practice as a separately managed account (SMA).

*Pooled Fund.* A pooled fund is also a “portfolio,” but we distinguish between a segregated account portfolio and a pooled fund portfolio in this reading because the requirements of the GIPS standards for pooled funds may differ from those that apply to segregated accounts. Pooled funds are further distinguished between limited distribution and broad distribution pooled funds. A broad distribution pooled fund is a pooled fund that is regulated under a framework that would permit the general public to purchase or hold the pooled fund’s shares and is not exclusively offered in one-on-one presentations. Mutual fund and UCITs are examples of broad distribution pooled funds. A limited distribution pooled fund is any pooled fund that is not a broad distribution pooled fund. Examples of limited distribution pooled funds include many private equity or hedge funds.

This reading is based on the 2020 edition of the GIPS standards, which are effective as of 1 January 2020. **GIPS Reports** that include performance for periods ending on or after 31 December 2020 must be prepared in accordance with the 2020 edition of the GIPS standards.

### 1.1.3. Overview of the GIPS Standards

The Introduction to the GIPS standards articulates the mission and objectives of the GIPS standards and provides an overview of key concepts important to understanding the objectives and scope of the GIPS standards.

The mission of the GIPS standards is “to promote ethics and integrity and instill trust through the use of the GIPS standards by achieving universal demand for compliance by asset owners, adoption by asset managers, and support from regulators for the ultimate benefit of the global investment community.”

The five objectives of the GIPS standards are to:

- promote investor interests and instill investor confidence;
- ensure accurate and consistent data;
- obtain worldwide acceptance of a single standard for calculating and presenting performance;
- promote fair, global competition among investment firms; and
- promote industry self-regulation on a global basis.

Key concepts of the GIPS Standards for Firms include the following:

- *Fair representation and full disclosure of investment performance is the key principle underlying the GIPS standards. As ethical standards, the GIPS standards are voluntary.*
- *Fair representation and full disclosure likely requires adherence to both the minimum requirements and the recommendations of the GIPS standards. When appropriate, firms have the responsibility to include information in the GIPS Reports that is not specifically addressed by the GIPS standards.*
- *Firms must comply with all applicable requirements of the GIPS standards, including any Guidance Statements, interpretations, and Questions & Answers (Q&As) published by CFA Institute and the GIPS standards governing bodies. The GIPS standards consist of requirements which must be followed in order for a firm to claim compliance. The GIPS standards also include recommendations, which are optional but should be followed because they represent best practice in performance presentation.*
- *The GIPS standards do not address every aspect of performance measurement and will continue to evolve over time to address additional areas of investment performance. The GIPS standards will continue to evolve as the industry tackles additional areas of*

performance measurement and recognizes the implications of new investment strategies, instruments, and technologies.

- *Composites are required for all strategies managed on behalf of or marketed to segregated account clients to prevent firms from cherry-picking the performance presented to prospective clients.* To promote fair representations of performance, the GIPS standards require firms to include *all* actual fee-paying, discretionary segregated accounts in at least one composite. Composites are defined by investment mandate, objective, or strategy. Pooled funds must also be included in any composite if the pooled fund meets the composite definition.
- *The GIPS standards rely on the integrity of input data, including the valuations of portfolio holdings and the use of certain calculation methodologies.* Because the GIPS standards are global, **prospective clients** and **prospective investors** engaged in an evaluation of competing GIPS-compliant firms' historical performance know that rates of return have been calculated in accordance with a common set of valuation principles and methodological guidelines.

The GIPS standards require that firms must meet *all* the applicable requirements set forth in the GIPS standards. There can be no exceptions. As stated in the part of the Introduction headed "Claiming Compliance and Verification," firms must take all steps necessary to ensure that they have satisfied all of the applicable requirements before claiming compliance with the GIPS standards. Moreover, firms are strongly encouraged to perform periodic internal compliance checks to confirm the validity of compliance claims. Implementing adequate internal controls during all stages of the investment performance process will instill confidence in the performance presented and in the claim of compliance. The GIPS standards recommend that firms be verified.

When the GIPS standards conflict with laws and/or regulations regarding the calculation and presentation of performance, the GIPS standards obligate firms to comply with laws and regulations and to disclose the conflict in the GIPS Report. Firms are strongly encouraged to comply with the GIPS standards in addition to applicable regulatory requirements.

In the next sections, we discuss specific requirement of the GIPS standards. The GIPS Standards for Firms are divided into eight sections:

1. Fundamentals of Compliance
2. Input Data and Calculation Methodology
3. Composite and Pooled Fund Maintenance
4. Composite Time-Weighted Return Report

5. Composite Money-Weighted Return Report
6. Pooled Fund Time-Weighted Return Report
7. Pooled Fund Money-Weighted Return Report
8. GIPS Advertising Guidelines

Sections 4, 5, 6, and 7 detail the requirements and recommendations for the various report types specified by the GIPS standards: Composite Time-Weighted Return Reports, Composite Money-Weighted Return Reports, Pooled Fund Time-Weighted Return Reports, and Pooled Fund Money-Weighted Return Reports. Section 8 focuses on the GIPS Advertising Guidelines, outlining the conditions under which a firm that claims compliance with the GIPS standards can include such a claim in its advertising. The balance of this reading focuses primarily on the remaining sections of the GIPS standards: (1) Fundamentals of Compliance, (2) Input Data and Calculation Methodology, and (3) Composite and Pooled Fund Maintenance.

**Exhibit 1** contains an excerpt from the GIPS standards introducing each of these topics.

### **Exhibit 1. Content of the Global Investment Performance Standards**

- 1. Fundamentals of Compliance:** Several core principles create the foundation for the GIPS standards, including properly defining the firm, providing GIPS Reports to all prospective clients and prospective pooled fund investors, adhering to applicable laws and regulations, and ensuring that information presented is not false or misleading. Two important issues that a firm must consider when becoming compliant with the GIPS standards are the definition of the firm and the firm's definition of discretion. The definition of the firm is the foundation for firm-wide compliance and creates defined boundaries whereby total firm assets can be determined. The firm's definition of discretion establishes criteria to judge which portfolios must be included in a composite and is based on the firm's ability to implement its investment strategies.
- 2. Input Data and Calculation Methodology:** Consistency of input data used to calculate performance is critical to effective compliance with the GIPS standards and establishes the foundation for full, fair, and comparable investment performance presentations. Achieving comparability among investment management firms' performance presentations requires uniformity in methods used to calculate returns. The GIPS standards mandate the use of certain calculation methodologies to facilitate comparability.

- 3. Composite and Pooled Fund Maintenance:** A composite is an aggregation of one or more portfolios managed according to a similar investment mandate, objective, or strategy. The composite return is the asset-weighted average of the performance of all portfolios in the composite. Creating meaningful composites is essential to the fair presentation, consistency, and comparability of performance over time and among firms. A composite must include all portfolios that meet the composite definition.
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In the next seventeen sections, we discuss select required provisions of Fundamentals of Compliance, Input Data and Calculation Methodology, and Composite and Pooled Fund Maintenance.

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## 2. FUNDAMENTALS OF COMPLIANCE

- b. explain the fundamentals of compliance with the GIPS standards, including the definition of the firm and the firm’s definition of discretion**

Section 1 of the GIPS Standards for Firms, “Fundamentals of Compliance,” contains 39 requirements and seven recommendations. For our purposes, we focus on selected *required* fundamentals of compliance, emphasizing the definition of the firm.

*Candidates should read all of Section 1.A of the GIPS Standards for Firms for a complete understanding of the required fundamentals of compliance.*

Although the concept of discretion, specifically the firm’s definition of discretion, is not technically a part of the Fundamentals of Compliance, the concept is integral to developing an understanding of the applications of the GIPS standards and thus is covered prior to delving more deeply into the standards themselves.

### 2.1. Definition of the Firm

The **firm** must be defined as an investment firm, subsidiary, or division held out to the public as a **distinct business entity**. The Glossary defines a distinct business entity as a “unit, division, department, or office that is organizationally and functionally segregated from other units, divisions, departments, or offices and that retains discretion over the assets it manages



and that should have autonomy over the investment decision-making process.” Possible criteria for identifying a distinct business entity are the organization being a legal entity, having a distinct market or client type, or using a separate and distinct investment process.

The way in which the investment management organization is held out to the public is a key factor in defining the firm. For example, if a unit of a larger company specializes in providing investment management services to private clients, and it is marketed as a specialist in meeting the investment needs of high-net-worth individuals and family offices, then that organizational unit might qualify as a “firm” for the purpose of compliance with the GIPS standards. Certainly, however, the unit’s entitlement to be considered a firm under the GIPS standards could be justified if it additionally were incorporated as a subsidiary and had its own dedicated financial analysts, portfolio managers, and traders located in a separate building or area of the company and reporting through a separate chain of command to the parent organization’s senior management.

## IMPLEMENTATION

### Defining the Firm

For small investment management boutiques, defining the firm may be a relatively easy task, but it can prove challenging for large firms.

Consider the case of a super-regional bank whose wealth management department consists of two separate and distinct divisions: the private client division and the institutional client division. The private client division, called Eastern National Bank Wealth Management Services, offers investment management to private individuals and families. The institutional client division, called Eastern Institutional Asset Advisors, serves tax-exempt non-profit organizations including pension funds and charitable foundations; it does not solicit or handle non-institutional business. Each division has its own investment management team, traders, marketing department, administrative personnel, and accounting department. After a few years of operating in this manner, the institutional investment unit decides to achieve compliance with the GIPS standards, but the private client division makes a business decision not to implement the GIPS standards. The institutional client division may nonetheless be in position to become GIPS-compliant because it holds itself out to customers as a distinct business unit, with its own autonomous investment management, research, trading, and administrative team.

Based on the information provided, the institutional client division appears to satisfy the conditions for defining itself as a firm for the purpose of compliance with the GIPS standards. Sample language might be, “The firm is defined as Eastern Institutional Asset Advisors, the institutional asset management division of Eastern National Bank.”

On the other hand, if both divisions were to use the same investment process, approved security list, style models, and so on, and they merely divided assets between personal and institutional portfolios, then neither division alone could compellingly claim compliance. If the senior investment personnel of the Private Client division had authority to dictate the Institutional Client division's investment strategy or tactical asset allocations, or to mandate the investment of institutional clients' funds in specific securities, then the Institutional Client division would likely not qualify as a distinct business unit having autonomy over the investment decision-making process and discretion over the assets it manages. If the two divisions were organizationally segregated but shared the same trading desk, the Institutional Client division would have to determine whether its decision-making autonomy is compromised by the trading arrangement. If the traders merely fill the portfolio manager's orders, then the Institutional Client division arguably remains autonomous, but if the traders actively participate in the identification of misvalued securities, a greater impediment to the autonomy argument would exist.

Defining the firm in such a situation calls for the scrupulous exercise of professional judgment, with due attention to the ethical objectives of the Global Investment Performance Standards.

In view of the complexity of modern organizational structures, it may require judgment to determine if a given unit properly meets the definition of a firm. The decision has immediate and lasting practical consequences, however. Because the GIPS standards apply firm-wide, the definition of the firm will determine the extent of the initial implementation and ongoing compliance activities. It also establishes the boundaries for determining total firm assets. The phrase **total firm assets** refers to the aggregate **fair value** of all assets (whether or not discretionary or fee-paying) for which a firm has investment management responsibility. Total firm assets include assets managed by sub-advisors that the firm has authority to select but do not include **advisory-only assets** or uncalled **committed capital**.

A firm that has been defined for the purposes of the GIPS standards may very well undergo subsequent changes in its corporate structure or organizational design. Changes in a firm's organization are not permitted to lead to alteration of historical performance, however. Indeed, we may put it down as a general rule that, apart from correcting errors, historical performance is not to be altered.

## 2.2. Definition of Discretion

The GIPS Standards for Firms require that all discretionary, fee-paying segregated accounts

must be included in at least one composite. Discretionary, fee-paying pooled funds must also be included in at least one composite if they meet a composite definition. A key term in this requirement is “discretionary,” although the GIPS standards do not define the term itself. Generally speaking, a portfolio is discretionary if the manager is able to implement the intended investment strategy. For example, the manager of a discretionary domestic mid-cap value portfolio is free to purchase any stock issued in the investor’s home country that meets the pertinent market capitalization and style criteria. The firm might define mid-cap stocks as those whose market capitalization falls within a certain range. Similarly, the firm might define value stocks in terms of their price-to-earnings multiple, price-to-book ratio, dividend yield, or other characteristics intended to distinguish them from growth stocks. In line with best practice, the firm and the client will agree in advance that the portfolio’s investment objective is to outperform a specified benchmark that is an appropriate measure of success in the domestic mid-cap market. For instance, the firm might construct a custom benchmark that is acceptable to the client, or the firm and the client might agree to use a commercially available index that mirrors the domestic mid-cap market.

Although both discretionary and non-discretionary portfolios are included in total firm assets, only discretionary portfolios are included in composites. If the client imposes restrictions on the manager’s freedom to make investment decisions to buy, hold, and sell securities so as to carry out the investment strategy and achieve the portfolio’s financial objectives, then the manager must consider whether the portfolio is in fact discretionary. In general, restrictions that impede the investment process to such an extent that the strategy cannot be implemented as intended may be presumed to render the portfolio non-discretionary, and it should not be included in a composite.

## **2.3. Other Fundamentals of Compliance**

Other requirements under Section 1, Fundamentals of Compliance, can be broadly characterized as relating to:

- the minimum number of years required in order to initially claim compliance with the GIPS standards;
- documenting policies and procedures related to compliance;
- complying with laws and regulations;
- avoiding false or misleading performance and performance-related information;
- the requirements concerning the distribution of GIPS Reports and lists of firm composites and pooled funds;

- the use of total return benchmarks reflective of the investment strategy;
  - the requirement to correct **material errors** in a GIPS Report and the redistribution of the report to the appropriate parties;
  - the maintenance of data and information necessary to support the elements of the GIPS Reports; and
  - conditions under which performance may be used or linked to that of another firm.
- 

## 3. TIME-WEIGHTED RETURN

- c. **discuss requirements of the GIPS standards with respect to return calculation methodologies, including the treatment of external cash flows, cash and cash equivalents, and expenses and fees**

Section 2.A of the GIPS Standards for Firms addresses, among other aspects, the requirements for calculating portfolio and composite returns. The GIPS standards mandate the use of a **time-weighted return (TWR)**. **Money-weighted returns (MWRs)** may be used for portfolios meeting certain conditions (described later). In the following paragraphs, we address TWR, MWR, and the treatment of cash balances and fees and expenses.

**Candidates should read Section 2.A, Provisions 2.A.1 through 2.A.39 of the GIPS Standards for Firms. Candidates are not responsible for the provisions in Section 2 related to Private Market Investments, Real Estate, Carve-Outs, Wrap Fees, and Side Pockets and Subscription Lines of Credit (Provisions 2.A.40 through 2.A.50).**

### 3.1. Time-Weighted Return

TWR is a method of calculating period-by-period returns that reflects the change in value and negates the effects of **external cash flows**. Except for private market investment portfolios, portfolios using TWR must be valued monthly, and the TWR must be calculated at least monthly as of the calendar month end or last business day of the month. If returns are not calculated daily and the portfolio receives an intra-month **large cash flow**, the portfolio must be valued and a sub-period return must be calculated at the time of the large cash flow.

Private market investment portfolios (e.g., real estate and infrastructure, private equity, and similar investments that are illiquid, not publicly traded, and not traded on an exchange) must

be valued quarterly.

What constitutes a large cash flow is defined by the firm. It is usually an external cash flow of such size that it may distort the return if the portfolio is not valued and a sub-period return is not calculated at the time of the cash flow. A large cash flow may be defined either relative to an absolute monetary threshold or as a percentage of the portfolio or composite assets.

If the portfolio is a pooled fund (a fund whose ownership interests may be held by more than one investor), and the pooled fund is not included in one of the firm's composites, the fund must be valued and returns must be calculated at least annually. Similar to the composite requirements presented above, the pooled fund must be valued at the time of any subscriptions or redemptions and a sub-period return calculated as of that date. The sub-period return is then linked with other sub-period returns.

In the simplest case, when no external cash flows (i.e., client-initiated additions to or withdrawals from invested assets) occur during the period, calculating the TWR is straightforward:

**Equation (1)**

$$r_t = \frac{V_1 - V_0}{V_0}$$

where  $r_t$  is the TWR for period  $t$ ;  $V_1$  is the ending value of the portfolio, including cash and accrued income, at the end of the period; and  $V_0$  is the portfolio's beginning value, including cash and accrued income, at the beginning of the specified period. [Equation 1](#) assumes that there are no cash inflows or cash outflows and expresses return as the ratio of the change in value during the period to the value at the start of the period. Despite its simplicity, the TWR equation produces an accurate representation of investment results in a single period with no external cash flows. As we will see, this equation is also used to calculate sub-period results under the intra-period valuation method when external cash flows occur.

Most portfolios, of course, do have external cash flows. A segregated account for an institutional investor, for example, may routinely have contributions and withdrawals based on the institution's needs. The TWR methodology removes the effect of such contributions and withdrawals from the return calculation, allowing the performance evaluator to focus on the value added by investment decisions that are controlled by the investment management firm.

If the portfolio experiences a cash flow that is not a large cash flow, the GIPS Standards for Firms do not require that the portfolio be valued as of the date of the cash flow. Instead, firms must use a method that adjusts for daily weighted cash flows, which is an approximation of a true TWR.

The most accurate way to calculate a total return while eliminating the impact of external cash flows is to value the portfolio whenever an external cash flow occurs, compute a sub-period return, and geometrically link sub-period returns expressed in relative form according to Equation 2:

### Equation (2)

$$r_{twr} = (1 + r_{t,1}) \times (1 + r_{t,2}) \times \dots \times (1 + r_{t,n}) - 1$$

where  $r_{twr}$  is the time-weighted total return for the entire period and  $r_{t,1}$  through  $r_{t,n}$  are the sub-period returns. The GIPS standards require that the periodic returns be geometrically linked.

For example, consider a portfolio with a beginning value of \$100,000 as of 31 May, a value of \$109,000 on 5 June (which includes a cash contribution of \$10,000 received that day), and an ending value of \$110,550 on 30 June. Consider that the first sub-period ends and the second sub-period begins on the cash flow date, such that the ending value for Sub-period 1 is \$99,000 (\$109,000 less the contribution of \$10,000) and the beginning value for Sub-period 2, including the \$10,000 contribution, is \$109,000. The portfolio's true time-weighted return using the intra-period valuation method is 0.41%, computed as follows:

$$\begin{aligned} r_{t,1} &= \frac{V_1 - V_0}{V_0} = \frac{(109,000 - 10,000) - 100,000}{100,000} = \frac{99,000 - 100,000}{100,000} = -0.01 \\ r_{t,2} &= \frac{V_2 - V_1}{V_1} = \frac{110,550 - 109,000}{109,000} = 0.0142 \\ r_{twr} &= (1 + r_{t,1}) \times (1 + r_{t,2}) - 1 = [1 + (-0.01)] \times (1 + 0.0142) - 1 \\ &= 1.0041 - 1 = 0.0041 = 0.41\% \end{aligned}$$

Geometric linking is used because returns are compounded and so are not additive but multiplicative.

If the portfolio experiences cash flows that are not large cash flows, and the firm does not calculate daily performance, portfolio returns must be calculated using a method that adjusts for daily weighted cash flows. Examples of acceptable approaches are the Modified Dietz method and the Modified Internal Rate of Return (Modified IRR) method, both of which weight each cash flow by the proportion of the measurement period it is held in the portfolio.

Equation 3 shows the formula for estimating the time-weighted rate of return using the Modified Dietz method:

### Equation (3)

$$r_{ModDietz} = \frac{V_1 - V_0 - CF}{V_0 + \sum_{i=1}^n (CF_i \times w_i)}$$

where  $\sum_{i=1}^n (CF_i \times w_i)$  is the sum of each cash flow multiplied by its weight and  $CF = \sum CF_i$ . The weight ( $w_i$ ) is simply the proportion of the measurement period, in days, that each cash flow has been in the portfolio, as shown in Equation 4:

**Equation (4)**

$$w_i = \frac{CD - D_i}{CD}$$

where  $CD$  is the total number of calendar days in the period and  $D_i$  is the number of calendar days from the beginning of the period to the time cash flow  $CF_i$  occurs. (Note that this formula assumes that cash flows occur at the end of the day.<sup>1</sup>) In our example, a \$10,000 contribution occurs on 5 June, so  $D_i = 5$ , and there are 30 days in June, so  $CD = 30$ . The proportion of the measurement period for which the \$10,000 is in the portfolio is thus

$$w_i = \frac{CD - D_i}{CD} = \frac{30 - 5}{30} = \frac{25}{30} = 0.83$$

Applying the Modified Dietz formula to the same example gives a return of 0.51%:

$$r_{ModDietz} = \frac{V_1 - V_0 - CF}{V_0 + \sum_{i=1}^n (CF_i \times w_i)} = \frac{110,550 - 100,000 - 10,000}{100,000 + [10,000 \times (25/30)]} = 0.0051 = 0.51\%$$

Note that this formula as given assumes that the portfolio is not valued at the time of the external cash flow.

The Modified IRR method is another estimation approach. This method determines the internal rate of return (IRR) for the period, adjusted to take into account the timing of cash flows. The Modified IRR is the value of  $r$  that satisfies Equation 5:

**Equation (5)**

$$\text{Ending Value} = V_1 = \sum_{i=1}^n [CF_i \times (1 + r)^{w_i}] + V_0(1 + r)$$

where the exponent,  $w_i$ , is as previously defined the ratio of the amount of time  $CF_i$  is in the

portfolio to the total time in the measurement period. The equation is solved iteratively by a trial-and-error procedure, settling on the value of  $r$  that makes the series of cash flows equal to the ending fair value. The Modified IRR method is computationally intensive, but programs are available for solving the equation efficiently. (Some Modified IRR programs use the Modified Dietz return as an initial estimate or seed value.) Applying the Modified IRR method to the simple example used earlier in this section gives a result of 0.51%, the same as the rate of return found with the Modified Dietz method.

## TRUE VS. ESTIMATED TIME-WEIGHTED RETURNS

In the foregoing section, different methodologies for calculating a rate of return from a single set of input data gave different answers. To recapitulate:

### Inputs:

Fair value on 31 May: \$100,000

Cash flow on 5 June: + \$10,000

Fair value on 5 June: \$109,000 (after the cash flow)

Fair value on 30 June: \$110,550

### Solutions:

True time-weighted return: 0.41%

Modified Dietz method: 0.51%

Modified IRR method: 0.51%

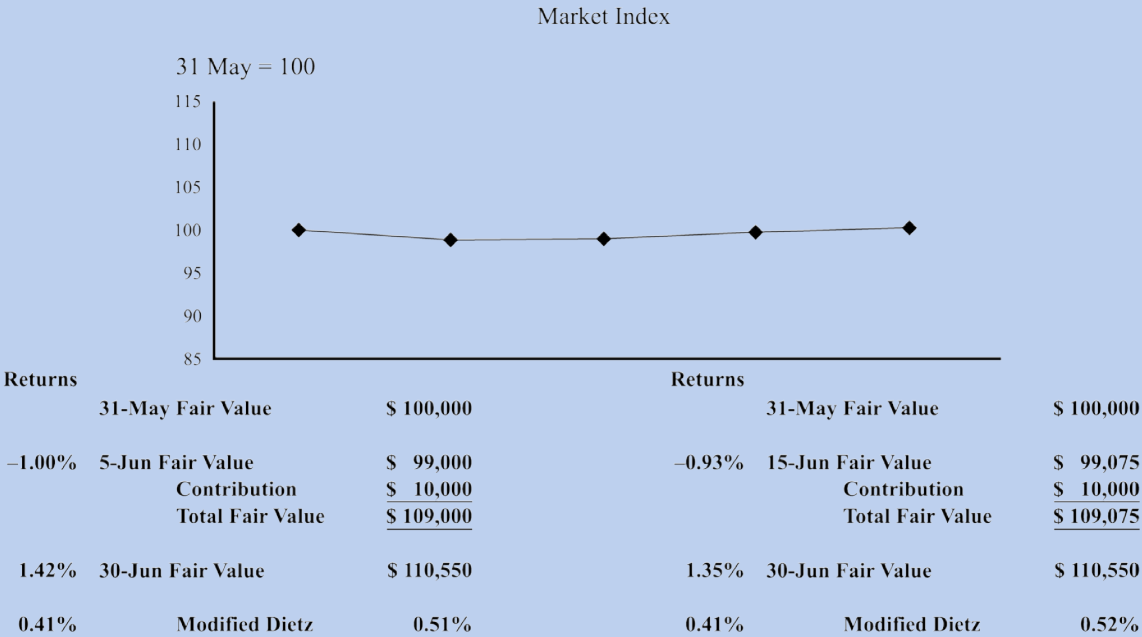
In this particular example, the external cash flow causes the day-weighted estimates (0.51%) to vary by 10 basis points from the true time-weighted return (0.41%).

To appreciate the potentially distorting effect of external cash flows on estimated time-weighted rates of return, consider [Exhibits 2 through 4](#). The exhibits depict a “market index” with a value of 100 as of 31 May, and the data following each exhibit represent portfolios with a value of \$100,000 on 31 May and contributions of \$10,000 received on 5 June (on the left-hand side) and 15 June (on the right-hand side). In flat and steadily rising or falling markets (illustrated in [Exhibit 2](#) and [Exhibit 3](#)), the timing of the cash flows has a relatively modest effect on the estimates’ accuracy. We can observe this phenomenon by comparing the true time-weighted returns with those calculated using



the Modified Dietz method. When markets are volatile, however, as illustrated in [Exhibit 4](#), large external cash flows may have a material effect on the estimated return’s accuracy. The reader should work through these examples using the formulas for the true time-weighted return and the Modified Dietz method. The calculations for the first example, on the left-hand side of [Exhibit 2](#), were shown earlier.

**Exhibit 2. Effect of Cash Flows in a Flat Market**

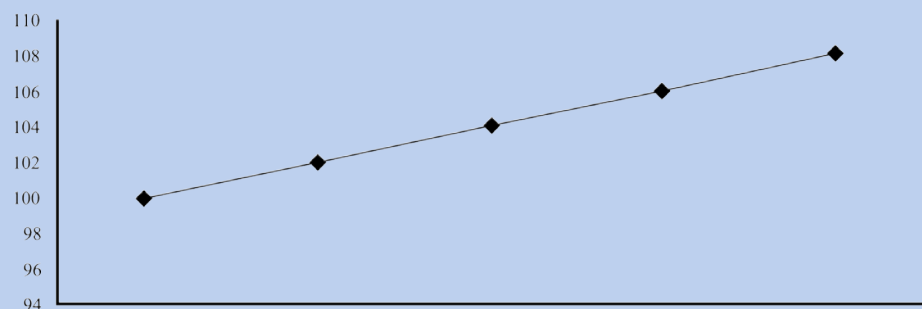


Source: Paula Gehr

**Exhibit 3. Effect of Cash Flows in a Steadily Rising Market**

Market Index

31 May = 100



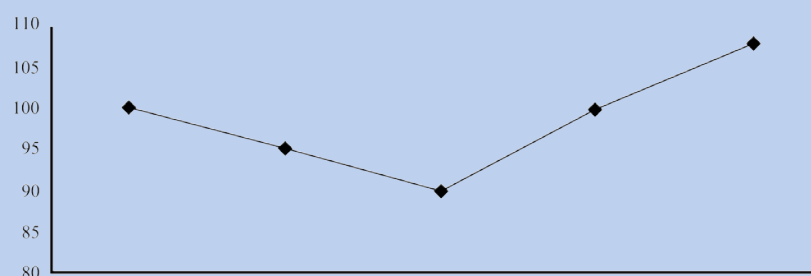
Returns	31-May Fair Value	\$ 100,000	Returns	31-May Fair Value	\$ 100,000
2.00%	5-Jun Fair Value	\$ 102,000	4.00%	15-Jun Fair Value	\$ 104,000
	Contribution	\$ 10,000		Contribution	\$ 10,000
	Total Fair Value	<u>\$ 112,000</u>		Total Fair Value	<u>\$ 114,000</u>
5.88%	30-Jun Fair Value	\$ 118,588	3.85%	30-Jun Fair Value	\$ 118,385
8.00%	Modified Dietz	7.93%	8.00%	Modified Dietz	7.99%

Source: Paula Gehr

## Exhibit 4. Effect of Cash Flows in a Volatile Market

Market Index

31 May = 100



Returns	31-May Fair Value	\$ 100,000	Returns	31-May Fair Value	\$ 100,000
-5.00%	5-Jun Fair Value	\$ 95,000	-10.00%	15-Jun Fair Value	\$ 90,000
	Contribution	\$ 10,000		Contribution	\$ 10,000
	Total Fair Value	<u>\$ 105,000</u>		Total Fair Value	<u>\$ 100,000</u>
13.68%	30-Jun Fair Value	\$ 119,364	20.00%	30-Jun Fair Value	\$ 120,000
8.00%	Modified Dietz	8.64%	8.00%	Modified Dietz	9.52%

Source: Paula Gehr

The GIPS standards require firms to formulate and document composite-specific and pooled fund-specific policies for the treatment of external cash flows and to adhere to those policies consistently. Each policy should describe the firm's methodology for computing time-weighted returns and the firm's assumptions about the timing of capital inflows and outflows. If it is the firm's rule to value portfolios on the date of all external cash flows, as the GIPS standards recommend, then the firm should also state that policy.

As we have previously remarked, the GIPS standards do not specify a quantitative definition of large external cash flows. Taking into account the liquidity of the market segments or asset classes and the nature of the investment strategy, firms must make their own determinations for each composite. For example, a relatively high percentage of portfolio value might be easily deployed in a developed equity market, whereas a lower percentage of portfolio value might be deemed the appropriate criterion for a large external cash flow in a comparatively illiquid emerging debt market.

Whatever definition a firm adopts, it must document the policy and follow it without exception. If a portfolio receives a large external cash flow, as defined for the composite in which the portfolio is included, the firm is not at liberty to omit the valuation on the grounds that the market was not especially volatile during the measurement period. Inconsistent applications of firm policies constitute a breach of the GIPS standards.

## IMPLEMENTATION

### Return Calculation Policies

Firms must calculate time-weighted rates of return that adjust for external cash flows. Both periodic and sub-period returns must be geometrically linked. External cash flows must be treated according to the firm's composite-specific policy. These portfolios must be valued on the date of all large cash flows, and firms must define what constitutes a large cash flow for each composite in order to determine when the portfolios in that composite must be valued. Here are examples of internal policy statements addressing these elements:

Portfolio return calculation methodology: "Eastern Institutional Asset Advisors calculates each portfolio's time-weighted rate of return on a monthly basis. For periods beginning on or after 1 January 2010, portfolios are valued monthly and when large cash flows occur. In the event of a large cash flow, a sub-period return will be calculated using the Modified Dietz method and sub-period returns will be geometrically linked to calculate the monthly return. Returns for longer measurement periods are computed by geometrically linking the monthly returns."

Large external cash flows: "Eastern Institutional Asset Advisors revalues portfolios that

belong to the Large-Cap Domestic Equity composite when capital equal to 10% or more of fair value as of the end of the most recent measurement period is contributed or withdrawn.”

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## 4. MISCELLANEOUS RETURN CALCULATION TOPICS

- c. **discuss requirements of the GIPS standards with respect to return calculation methodologies, including the treatment of external cash flows, cash and cash equivalents, and expenses and fees**
- j. **explain the recommended valuation hierarchy of the GIPS standards**

A firm may choose to present MWRs instead of TWRs if the firm has control over the external cash flows *and*: (1) the portfolios are **closed-end**, **fixed life**, or **fixed commitment** or (2) **illiquid investments** are a significant part of the investment strategy. Annualized, since-inception MWRs must be calculated at least annually. For periods beginning with the effective date of the 2020 GIPS Standards, daily external cash flows must be used. (External cash flows for periods prior to this date must be reflected on at least a quarterly basis.) Portfolios for which a money-weighted return is calculated must be valued at least annually and as of the period end for which performance is calculated.

### 4.1. Annualizing Returns

Returns for periods of less than one year must not be annualized. Extrapolating partial-year returns by annualizing them would amount to a prediction about investment results for the rest of the year.

### 4.2. Treatment of Cash Equivalents

Returns from cash and cash equivalents held in portfolios must be included in all total return calculations. A primary purpose of performance measurement is to enable prospective clients

and, by extension, their consultants to evaluate an investment management firm's results. Within the constraints established by a client's investment policy statement (IPS), active managers often have discretion to decide what portion of a portfolio's assets to hold in cash or cash equivalents. The portfolio return will be affected by how much cash the manager elects to hold, and thus return calculations must reflect the contribution of the cash and cash equivalents to investment results. Even if the management of cash balances is handled by another firm (as is often the case in manager-of-manager arrangements), cash and cash equivalents must be included in the total return calculation.

Consider the case of an institutional investor such as a defined benefit pension plan sponsor. The structure of the sponsor's investment program is generally based on an asset/liability study identifying the optimal mix of asset classes to meet the pension fund's financial objectives at an acceptable level of risk. The sponsor retains investment management firms to invest the fund's assets in specific markets in accordance with the study results. For example, within the domestic equity allocation, the sponsor might hire one firm to invest a certain portion of the fund's assets in small-cap growth stocks and another firm to invest a portion in large-cap value stocks. The sponsor expects the managers to remain fully invested in their mandated market sectors at all times. The sponsor's IPS may, however, allow the managers to hold some amount (e.g., up to 5% of portfolio assets) in cash and cash equivalents, if only to accommodate the frictional cash that arises in the process of buying and selling securities. (The client will usually define "cash equivalents," for example, as money market instruments and fixed-income securities with less than one year to maturity.) In this case, the manager has discretion over the size of the cash position, up to 5% of assets.

### 4.3. Treatment of Expenses and Fees

The GIPS standards require that returns be calculated after the deduction of **transaction costs** incurred during the period. Transaction costs are the costs of buying or selling investments. These costs typically take the form of brokerage commissions, exchange fees and/or taxes, or spreads from either internal or external brokers. For private market investments, transaction costs include all legal, financial, advisory, and investment banking fees related to buying, selling, restructuring, and/or recapitalizing investments but do not include costs associated with investments that were considered but did not ultimately make it into the fund. **Custody fees** should not be considered transaction costs, even when they are charged on a per-transaction basis.

Commissions are explicit costs, generally a negotiated amount per share of common stock bought or sold, intended to compensate the broker, as the investor's agent, for arranging and settling trades. Bid-offer spreads are the difference between the price at which a dealer, acting for his firm's account, is willing to buy a security from a seller and the price at which he is willing to sell the security to a buyer. From the investor's perspective, the spread is the

cost of immediacy or liquidity, and it compensates the dealer for both the cost of operations and the risk of adverse selection (the possibility that a well-informed trader has better information than the dealer has about the fundamental value of a security in the dealer's inventory). Transaction costs can be estimated for a specific portfolio only if actual transaction costs are not known.

Some portfolios may pay **bundled fees**, which can include any combination of **investment management fees**, transaction costs, custody fees, and/or **administrative fees**. **All-in fee** arrangements are common when a single company offers diverse services such as asset management, brokerage, and custody. If transaction costs cannot be identified (either actual transactions costs or estimated transactions costs based on a reasonable estimation method) and segregated from a bundle fee, composites for institutional investors must reduce the **gross-of-fees** return by the entire amount of the bundled fee or by that portion of the bundled fee that includes the transaction costs.

## 4.4. Valuation Requirements

Meaningful performance measurement presupposes the validity of beginning and ending asset values. Section 2 of the GIPS Standards for Firms also addresses asset valuation. Firms are required to apply a fair value methodology when valuing assets. The GIPS standards define **fair value** as the amount at which an investment could be sold in an orderly, arm's-length transaction between willing parties. The valuation must be determined using the objective, observable, unadjusted quoted market price for an identical investment in an active market on the measurement date, if available. Fair value must include any accrued income on fixed-income securities and all other investments that earn interest income (the firm may choose to recognize income on cash and cash equivalents on a cash basis rather than an accrual basis).

If objective, observable, unadjusted quoted market prices for identical investments in active markets on the measurement date are not available, the GIPS standards recommend the following alternatives, in declining order of preference:

1. quoted prices for similar investments in active markets. If such inputs are not available or appropriate, then investments should be valued based on:
2. quoted prices for identical or similar investments in markets that are not active (markets in which there are few transactions for the investment, the prices are not current, or price quotations vary substantially over time and/or between market makers). If such inputs are not available or appropriate, then investments should be valued based on:
3. market-based inputs, other than quoted prices, that are observable for the investment. If such inputs are not available or appropriate, then investments should be valued based

on:

4. subjective, unobservable inputs.

## IMPLEMENTATION

### Valuation Policies and Procedures

Firms may enter transactions involving a wide range of financial instruments, including derivative securities, in many different markets. It is fitting, therefore, that the GIPS standards not only require firms to document their valuation policies, procedures, methodologies, and hierarchies but also recommend that the valuation hierarchies be composite-or pooled fund-specific. Normally, for investment strategies that employ plain-vanilla securities trading in robust markets, quoted prices are readily available. Other composites, however, may represent strategies that materially make use of securities that trade infrequently in relatively illiquid markets where values must be imputed or estimated. Real estate and private equity are obvious examples, but valuing investments in swaps, options, and other derivatives that are tied to underlying securities uniquely issued by specific companies may present difficulties, especially if the firm cannot refer to recent transactions in identical or similar assets. Implementing the GIPS standards offers firms an opportunity to re-examine their valuation policies, procedures, and methodologies and to define valuation hierarchies reflecting the characteristics of the securities held in each composite or pooled fund and the markets in which the strategy is executed. For assets valued using quantitative models, it is useful to list input factors such as discount rates and risk-adjusted cash flow projections and to review the basis for estimating them. Portfolio managers, security analysts, quantitative analysts, and traders should participate in these discussions. Once established, the valuation policies must be documented, followed consistently, and made available to prospective clients upon request.

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## 5. COMPOSITE TIME-WEIGHTED RETURN CALCULATIONS

- d. explain requirements of the GIPS standards with respect to composite return calculations, including methods for asset-weighting portfolio returns

The notion of composites is central to the GIPS standards. The GIPS standards define a composite as an aggregation of one or more portfolios that are managed according to a similar investment mandate, objective, or strategy. Because composite returns convey the firm's investment results for a given investment mandate, objective, or strategy, proper composite construction is essential to achieving the ethical aims of the GIPS standards as well as the fair representation and full disclosure of the firm's performance. Provisions relating to the construction and maintenance of composites can be found in Section 3 of the GIPS standards.

***Candidates should read Section 3.A, Provisions 3.A.1 through 3.A.14 of the GIPS Standards for Firms for more complete understanding of the requirements for composite and pooled fund maintenance. Candidates are not responsible for the required provisions in Section 3 related to Wrap Fee and Carve-Outs (Provisions 3.A.14 through 3.A.19).***

To prevent firms from presenting only their best-performing portfolios to prospective clients, the GIPS standards require all actual, fee-paying, discretionary segregated accounts to be included in at least one composite. All actual, fee-paying, discretionary pooled funds must also be included in at least one composite if they meet a composite definition. Non-discretionary segregated accounts and pooled funds must not be included in composites. Non-fee-paying discretionary segregated accounts and pooled funds *may* be included in a composite, but additional disclosures may be required. (For example, in the interest of public service or community relations, a firm might waive the investment management fee on a charitable organization's portfolio, or a firm might use its own or its principals' capital to implement a new investment strategy.) If a strategy is offered as a pooled fund *and* a segregated account, the pooled fund must be included in a composite for that strategy. The firm does need not to create a composite for a strategy if it is offered only as a pooled fund.

## 5.1. Composite Time-Weighted Return Calculations

Time-weighted composite returns must be calculated in one of three ways: asset-weighting the individual portfolio returns using beginning-of-period values; using a method that reflects both beginning-of-period values and external cash flows; or using the Aggregate Return method. [Exhibit 5](#) displays the beginning asset values of four portfolios that, taken together, constitute a composite. The exhibit also shows the external cash flows experienced by each portfolio during the month of June. For completeness, the exhibit also shows each portfolio's ending fair value.

**Exhibit 5. A Composite Including Four Portfolios: Weighted External Cash Flows**

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	Cash Flow Weighting Factor	Portfolio (\$ Thousands)				
		A	B	C	D	Total
Beginning assets (31 May)		100.00	97.40	112.94	124.47	434.81
<i>External cash flows</i>						
5 June	0.83	10.00	15.00			25.00
8 June	0.73				-15.00	-15.00
17 June	0.43		-5.00			-5.00
24 June	0.20				-6.50	-6.50
29 June	0.03		-2.50		-4.00	-6.50
Ending assets (30 June)		110.55	105.20	113.30	100.50	429.55
Beginning assets + Weighted cash flows		108.30	107.63	112.94	112.10	440.97
Percentage of total beginning assets		23.00%	22.40%	25.97%	28.63%	100.00%
Percentage of total beginning assets + Weighted cash flows		24.56%	24.41%	25.61%	25.42%	100.00%

*Note:* Weighted cash flows reflect two-decimal-place precision in the weighting factors.

Determining the relative weight of each portfolio in the composite at the beginning of the measurement period is straightforward. Portfolio A had a beginning fair value of \$100,000, and all four portfolios combined had a beginning fair value of approximately \$435,000, so the weight assigned to Portfolio A is  $100/434.81 = 0.23 = 23\%$ . As we will show in a moment, under a method reflecting only beginning-of-period values, we can calculate the

composite return by multiplying the individual portfolio returns by the portfolio's beginning weight, then summing the products.

Determining a composite return when there are external cash flows is a little more complex. The cash flows must be weighted following the methodology introduced in our discussion of the Modified Dietz rate-of-return calculation. Each external cash flow is weighted in proportion to percentage of the time it is held in the portfolio during the measurement period as shown in [Equation 4](#):

$$w_i = \frac{CD - D_i}{CD}$$

where  $CD$  is the total number of calendar days in the period and  $D_i$  is the number of calendar days since the beginning of the period until the time cash flow  $CF_i$  occurs. [Exhibit 5](#) showed the weighting factor computed to two decimal places with this formula for each of the days in the measurement period (the month of June) on which external cash flows occur that affect any of the portfolios in the composite. It also showed the weighted external cash flows under the two methods discussed. For the method incorporating weighted external cash flows, the sum of beginning assets and weighted external cash flows,  $V_p$ , is calculated as shown in [Equation 6](#):

#### Equation (6)

$$V_p = V_0 + \sum_{i=1}^n (CF_i \times w_i)$$

where  $V_0$  is the portfolio's beginning value and  $\sum_{i=1}^n (CF_i \times w_i)$  is the sum of each portfolio's weighted external cash inflows and outflows. Note that the right-hand side in [Equation 6](#) is the denominator of the Modified Dietz formula (see [Equation 4](#)).

The composite return is the weighted-average return of the individual portfolios that belong to that composite. Under the "beginning assets" weighting method, the composite return calculation is shown in [Equation 7](#):

#### Equation (7)

$$r_C = \sum \left[ r_{pi} \times \frac{V_{0,pi}}{\sum_{pi=1}^n V_{0,pi}} \right]$$

where  $r_C$  is the composite return,  $r_{pi}$  is the return of an individual portfolio  $i$ ,  $V_{0,pi}$  is the beginning value of portfolio  $i$ , and  $\sum_{pi=1}^n V_{0,pi}$  is the total beginning fair value of all the individual portfolios in the composite. In other words, the composite return is the sum of the individual portfolio returns weighted in proportion to their respective percentages of aggregate beginning assets.

Under the alternate “beginning assets plus weighted cash flows” method, shown in Equation 8, the return calculation uses the individual portfolios’  $V_P$ , computed earlier, in place of  $V_{0,p}$ :

**Equation (8)**

$$r_C = \sum \left( r_{pi} \times \frac{V_{pi}}{\sum V_{pi}} \right)$$

Exhibit 6 supplies each individual portfolio’s return for the month of June and presents the composite returns resulting from these two weighting methods.

Exhibit 6. Composite Returns			
	Percentage of Beginning Assets	Percentage of Beginning Assets + Weighted Cash Flows	Return for Month of June
Portfolio A	23.00%	24.56%	0.51%
Portfolio B	22.40%	24.41%	0.28%
Portfolio C	25.97%	25.61%	0.32%
Portfolio D	28.63%	25.42%	1.36%
	100.00%	100.00%	
Composite Return:			
Based on beginning assets			0.65%
Based on beginning assets plus weighted cash flows			0.62%

Under the “beginning assets” weighting method, the composite return shown in [Exhibit 6](#) is as follows:

$$r_C = (0.0051 \times 0.23) + (0.0028 \times 0.224) + (0.0032 \times 0.2597) + (0.0136 \times 0.2863) = 0.0065 \\ = 0.65\%$$

Similarly, the composite return under the “beginning assets plus weighted cash flows” method is as follows:

$$r_C = (0.0051 \times 0.2456) + (0.0028 \times 0.2441) + (0.0032 \times 0.2561) \\ + (0.0136 \times 0.2542) = 0.0062 = 0.62\%$$

The Aggregate Return method combines all the composite assets and external cash flows to calculate returns as if the composite were one portfolio. Beginning assets and intra-period external cash flows can be summed and, treating the entire composite as though it were a single portfolio, the return can be computed directly with the Modified Dietz formula. This approach can be illustrated with data from [Exhibit 5](#), using [Equation 3](#):

$$r_{ModDietz} = \frac{V_1 - V_0 - CF}{V_0 + \sum_{i=1}^n (CF_i \times w_i)}$$
$$r_C = \frac{429.55 - 434.81 - 25 - (-15) - (-5) - (-6.5) - (-6.5)}{440.97}$$
$$= \frac{2.74}{440.97} = 0.0062 = 0.62\%$$

Composite time-weighted returns, except for private market investment composites, must be calculated at least monthly. The less frequently the asset-weighting exercise is conducted, the greater the likelihood that composite returns will inaccurately reflect the constituent portfolios’ aggregate performance.

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## 6. COMPOSITES—QUALIFYING PORTFOLIOS AND DEFINING INVESTMENT STRATEGIES

- e. explain the meaning of “discretionary” in the context of composite construction and, given a description of the relevant facts, determine whether a portfolio is

## **likely to be considered discretionary**

### **f. explain the role of investment mandates, objectives, or strategies in the construction of composites**

Investors commonly set forth investment restrictions in investment policy statements (IPSs). In addition to articulating the investor's overall financial objectives, an IPS normally expresses a number of constraints intended to limit the investment risks to which the assets are exposed. For example, the IPS may limit an individual equity portfolio's economic sector exposure to a certain percentage of portfolio assets or a certain relationship to the comparable benchmark weight: "No portfolio shall hold more than 15% of assets or 125% of the corresponding benchmark weight, whichever is greater, in any given sector, such as consumer discretionary stocks or information technology stocks." A fixed-income portfolio may be constrained to hold no securities rated below investment grade and to maintain the portfolio's weighted-average duration within a specified range, such as 75% to 125% of the benchmark duration. These restrictions are intended to preserve the portfolios from losses in value resulting from inadequate sector diversification, excessive credit quality risk, or unacceptable levels of interest rate risk.

Clearly, in addition to ensuring that the benchmark is appropriate, investors must be careful to formulate constraints that achieve their intended risk-control objectives without unduly impairing the portfolio managers' ability to act on their professional judgment regarding the relative attractiveness of sectors and securities. In other words, a well-written IPS meets the client's need for risk mitigation while respecting the portfolio manager's discretion. The manager is well advised to discuss with the client any restrictions that are incompatible with the intended investment strategy. Upon accepting the investment management assignment, however, the portfolio manager is ethically bound by the client's stated policies. Moreover, investment management agreements often incorporate the IPS, so the portfolio manager may also be legally required to comply with properly communicated client-specified constraints.

In some cases, the client's investment constraints may impinge on the portfolio manager's flexibility. Some clients may have environmental, social or governance (ESG) restrictions that prohibit investment in securities issued by companies operating in alcohol, tobacco, or gaming industries. Other clients might have restrictions that prohibit the sale of company stock. Additionally, legal restrictions may apply. For instance, a public fund might be statutorily precluded from investing in non-domestic securities. None of these constraints automatically renders a portfolio non-discretionary. Rather, in these and other cases, the portfolio manager must determine whether the client-imposed constraints are likely to materially affect her ability to execute the investment strategy. If the constraints are determined to not have a material effect, the manager could include the portfolio in a composite with portfolios that have no such restriction. If the constraint is material, the manager may include the portfolio in a composite with other, similarly constrained portfolios or classify it as non-discretionary and exclude the portfolio from all composites.

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### Defining Discretion

The GIPS standards require that all actual fee-paying discretionary segregated accounts be included in at least one composite. (If a pooled fund meets the composite definition, it must be included in the composite.) Because discretion is a key variable that determines inclusion in or exclusion from a composite, a firm implementing the GIPS standards must have a clear, written definition of discretion. The firm must consistently apply its definition of discretion.

A client could insist that the manager retain specific holdings that might or might not otherwise be held in a portfolio. For example, the client could direct that legacy holdings with a low cost basis must not be sold because of the adverse tax consequences of realizing large gains. In such cases, retaining the asset in the portfolio may skew performance, and—whether the impact is favorable or unfavorable in any given measurement period—the outcome would not reflect the results of the manager’s actual discretionary investment management. If holding the assets hinders the manager’s ability to implement the intended strategy, either the entire portfolio should be considered non-discretionary and excluded from the firm’s composites or the individual assets should be removed and the remaining assets for which the manager has full discretion should be included in the composite. Alternately, the firm might include a materiality threshold in its policy, enabling it to consider a portfolio discretionary if the non-discretionary assets consist of less than a certain percentage of portfolio assets.

Recognizing that degrees of discretion exist, the firm must consider the interactions among client-directed constraints, the portfolio’s strategy or style, and the investment process, notably including the financial instruments used. For example, a client’s investment policy might prohibit the use of derivative securities such as futures, swaps, and options. In this case, the firm must consider whether the restriction is pertinent. If a portfolio manager is managing a domestic mid-cap stock portfolio, the fact that the client prohibits the use of derivatives may be irrelevant if the manager’s typical investment approach simply buys, holds, and sells common stocks. If the use of derivative securities is central to the firm’s implementation of the investment mandate, however, then the client’s policy may render the portfolio non-discretionary.

In some cases, the pattern of external cash flows might make a portfolio non-discretionary. For example, if a client frequently makes large withdrawals, perhaps on a regular schedule, a portfolio manager might have to maintain such a high level of liquidity that he cannot truly implement the investment strategy as he does for other portfolios with a similar stated

investment mandate, objective, or strategy.

In the process of developing, testing, and refining new investment strategies, firms frequently construct model portfolios and use historical security prices to simulate hypothetical performance in past measurement periods. No model or hypothetical portfolios may be included in any composite. Firms may not link the **theoretical performance** of simulated or model portfolios with actual performance. (Model, hypothetical, backtested, or simulated returns are all considered theoretical performance. These returns can be shown as **supplemental information** but cannot be linked to actual composite or pooled fund returns.)

On the other hand, if the firm created a new strategy and managed portfolios in this strategy with its own assets—sometimes called seed money—it could include those portfolios from inception in appropriate composites (or, more likely, construct new composites reflecting the new strategies), subject to any presentation and reporting requirements related to the inclusion of non-fee-paying portfolios in composites.

To summarize the criteria for including portfolios in composites:

- All actual, fee-paying, discretionary segregated accounts must be included in at least one composite.
- Discretionary segregated accounts that are non-fee paying may be included in composites, but neither non-discretionary nor simulated or model portfolios may be included in any composite.
- Pooled funds must be included in any composite for which they meet the composite definition.
- A composite must include all portfolios that meet the composite definition.

## 6.1. Composites—Defining Investment Strategies

Defining and constructing meaningful composites constitute a vital step toward achieving the ideal of fair representation and the goal of providing prospective clients with useful comparative information. Under the GIPS standards, composites must be defined according to investment mandate, objective, or strategy; composites must include all portfolios that meet the composite definition; and the composite definition, including detailed criteria that determine the assignment of portfolios to the composite, must be documented in the firm's policies and procedures. Well-defined composites will be objectively representative of the firm's products and consistent with the firm's marketing strategy.

One possible hierarchy that may be helpful for the firm considering how to define composites

is outlined as follows.

Investment Mandate  
Asset Classes  
Style or Strategy  
Benchmarks  
Risk/Return Characteristics

A composite based on the investment mandate bears a summary product or strategy description, such as “Global Equities.” This summary description may be an entirely acceptable composite definition as long as no significant strategic differences exist among the portfolios included in the composite. It is a guiding principle of composite definition that firms are not permitted to include portfolios with different investment mandates, objectives, or strategies in the same composite.

A composite based on the constituent portfolios’ asset class, such as “equity” or “fixed income,” may also be acceptable; however, asset classes are broadly inclusive, and because generic descriptions are not very informative, asset class composites should be offered only if they are legitimately and meaningfully representative of the firm’s products.

To afford investors a better understanding of the nature of a composite, the firm may use an asset-class modifier indicating the composite’s investment style or strategy. For example, equity portfolios may be restricted to a specific economic sector, such as telecommunication services. Stocks issued by corporations competing in the same economic sector are presumably affected more or less the same way by exogenous factors such as changes in raw material prices, consumer demand, or the general level of interest rates.

Portfolios might also be classified according to a defined style. An equity style matrix that classifies portfolios by capitalization (large cap, mid-cap, and small cap) and by style (value; core, also called neutral, market oriented, or blend; and growth) might be the starting point for defining a set of composites. Fixed-income portfolios may be classified by a combination of duration and/or market segment that generally aligns with the major fixed-income indexes.

A portfolio may be assigned to one of the style categories based on the money-weighted averages of pertinent characteristics of the portfolio’s holdings. For example, a portfolio holding stocks with an average market capitalization of \$5 billion along with a relatively high price-to-earnings multiple, a relatively high price-to-book ratio, and a relatively low dividend yield, would likely be identified as a mid-cap growth portfolio. Alternately, the portfolio’s historical monthly or quarterly returns might be regressed against the returns of pertinent capital market indexes to determine which style-specific benchmarks best explain the portfolio’s performance. Evaluating the comparative merits of these approaches falls outside



the scope of this reading. Suffice it to say that, given the widespread acceptance of these categories, a firm may meaningfully and usefully define composites with reference to the capitalization range and the style in which the constituent portfolios are managed.

## IMPLEMENTATION

### Defining Composites

One of the greatest challenges in implementing the GIPS standards is devising the set of composites that will most meaningfully represent the firm's products. A firm must create composites for the firm's strategies that are managed for or offered as a segregated account. Composites must be defined according to investment mandate, objective, or strategy. What appears to be a straightforward exercise—defining composites and assigning portfolios to them—may prove rather difficult in practice.

A useful guideline is to build a set of composites that will accurately represent the firm's distinct investment strategies. With too few composites, a firm risks overlooking significant differences and grouping diverse portfolios together into a single, overly broad composite subject to a wide dispersion of portfolio returns. With too many composites, in addition to incurring unnecessary costs, the firm runs the risk of creating narrowly defined groupings that are too much alike in investment strategy, contain too few portfolios or assets to be useful, or compromise client confidentiality.

Assuming that the definitions of the “firm” and “discretion” have been agreed upon and that a master list of portfolios has been compiled, here is a common-sense strategy a firm might follow to reach agreement on composite definitions.

1. Review the firm's organizational structure and investment process to see if distinctive strategies can be readily identified. For instance, an equity advisor might have units specializing in one or more active management strategies as well as index fund construction and quantitatively driven enhanced indexing.
2. Review the firm's existing marketing materials to determine which strategies are offered as a segregated account. If possible, review marketing materials from competitors and recently received requests for proposals (RFPs) to determine how the industry defines products similar to those the firm offers.
3. Construct a provisional framework using descriptive captions to identify possible composites.
4. Taking into consideration the clients' investment policies, test how well the firm's fee-paying, discretionary portfolios would fit the provisional framework. The inevitable identification of exceptions—that is, the discovery that some segregated

accounts do not really fit any composite defined in the provisional framework—will lead to the redefinition of proposed composites or the creation of new composites. Several iterations may be needed.

5. Review the proposed set of composites to ensure that, in the aggregate, the composites are likely to satisfy the requirements of the GIPS standards.
6. Document the composite definitions in detail and circulate the definitions for final review by all affected parties within the firm.

Of course, the most effective process for defining composites may differ from one firm to another in view of variables such as organizational structure, culture, and investment strategies, among other factors. Nonetheless, composite definitions have lasting consequences, and it is highly desirable to have a plan for reaching consensus.

Firms may also define composites based on the portfolios' benchmarks, as long as the benchmarks reflect the investment strategy and the firm has no other composites with the same characteristics. This approach is particularly appropriate if the portfolios are limited to holding stocks that are held in the index.

Finally, portfolios sharing distinctive risk/return profiles may reasonably be grouped together. For example, enhanced index funds with benchmark-specific targeted excess returns and tracking error tolerances might fall into natural groups.

Fixed-income composites can likewise be meaningfully and usefully defined in many dimensions. For example, composites might conform to asset classes or market segments such as government debt, mortgage-backed securities, convertible bonds, or high-yield bonds; investment strategies such as fundamental credit analysis, sector rotation, or interest rate anticipation; or investment styles such as indexing or core-plus. However a firm chooses to define the composites representing its investment products, those composites must consist of portfolios managed in accordance with similar investment strategies or objectives.

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## 7. COMPOSITES—INCLUDING AND EXCLUDING PORTFOLIOS

- g. explain requirements of the GIPS standards with respect to composite

## **construction, including switching portfolios among composites, the timing of the inclusion of new portfolios in composites, and the timing of the exclusion of terminated portfolios from composites**

The GIPS standards governing composite construction require that composites include new portfolios on a timely and consistent basis after the portfolio comes under management. Firms are required to establish, document, and consistently apply a policy of including new portfolios in the appropriate composites on a timely basis. For many strategies, new portfolios should be included as of the beginning of the next full performance measurement period after the firm receives the funds. If composite returns are calculated monthly and a portfolio is funded on 20 May, the composite should include the new portfolio as of the beginning of June. It may take time to invest the assets of a new portfolio in accordance with the desired investment strategy, however, particularly when the portfolio is funded in kind (that is, with securities other than cash and cash equivalents) and the assets have to be redeployed, or when the securities to be purchased are relatively illiquid (e.g., in emerging markets). Accordingly, the GIPS standards give firms some discretion to determine when to add the new portfolio to a composite. In such cases, the firm must establish a policy on a composite-by-composite basis and apply it consistently to all new portfolios.

In addition to winning new business, firms routinely lose relationships. Under the GIPS standards, a firm must include a terminated portfolio in the historical performance of the appropriate composite through the last full measurement period in which the firm had the discretion to manage the portfolio to the strategy. In many cases, the firm loses its discretion over the portfolio upon being notified of a pending termination. For instance, the client may instruct the firm to stop buying securities immediately and to commence the liquidation of holdings in preparation for an outbound cash transfer on a specified date. Alternately, the client may halt trading and transfer control of the portfolio to a transition management organization to facilitate moving assets to a new firm. When the firm being terminated loses its discretion over the portfolio, it should include the portfolio in the composite through the last full measurement period prior to notification of termination. To use the same example, if a firm that calculates performance monthly is informed on 20 May that its management contract is being terminated effective 31 May and is instructed to stop trading forthwith, then the firm should include the portfolio in its composite only through 30 April. In any event, it is incumbent upon the GIPS-compliant firm to have defined and documented its policies governing the removal of terminated portfolios from composites and, of course, to apply those policies consistently.

### **IMPLEMENTATION**

## **Adding, Removing, and Switching Portfolios**

GIPS-compliant firms must have written policies setting forth when portfolios may be

added to or removed from composites. These policies should be composite-specific. For a firm that reports composite performance monthly, a policy statement could read as follows:

“All new portfolios funded with cash or securities on or before the 15th day of the month shall be added to the appropriate composite at the beginning of the following month. All new portfolios funded with cash or securities after the 15th day of the month shall be added to the appropriate composite at the beginning of the second month after funding. All terminating portfolios will be removed from the composite at the end of the last full month for which the firm has full discretion. The historical performance of terminated portfolios shall remain in the appropriate composite.”

Policies like the foregoing sample allow firms a reasonable amount of time to implement the strategy without delaying inclusion of the portfolio in the appropriate composite. Each firm must develop a policy that conforms to its own investment process while meeting the GIPS standards requirement to include portfolios in composites on a timely basis. Here is a sample statement for a policy:

“Portfolios shall not be moved from one composite to another unless the composite is redefined or documented changes in the client’s guidelines require restructuring the portfolio in such a way that another composite becomes more appropriate. The portfolio shall be removed from the original composite at the end of the last calendar month before the event causing the removal occurred and shall be added to the appropriate new composite at the beginning of the calendar month following the date on which the portfolio is substantially invested. The historical performance of the portfolio shall remain in the original composite.”

The firm’s policy for adding portfolios to or removing portfolios from a composite must also include language outlining conditions under which a portfolio may be switched from one composite to another. The GIPS standards stipulate that portfolios cannot be switched from one composite to another unless documented changes in the portfolio’s investment mandate, objective, or strategy or the redefinition of the composite make it appropriate. The historical performance of the portfolio must remain with the original composite. This is an important requirement; if the GIPS standards permitted firms to transfer portfolios from one composite to another at will, an unethical firm might identify and exploit opportunities to improve the reported performance of selected composites by re-populating them with the portfolios whose investment results were most advantageous during the measurement period.

The GIPS standards describe two conditions under which portfolios can be reassigned. First, a portfolio can be switched from one composite to another if the client revises the mandate,

objective, or strategy governing the investment of portfolio assets and the guideline changes are documented. For instance, a client might decide to modify the portfolio mandate from mid-cap value to large-cap value, or from domestic equity to global equity, with a corresponding change in the benchmark, while retaining the same investment advisor to restructure and manage the “same” portfolio in accordance with the new strategy. Or perhaps a client might decide to allow the use of derivative securities, previously prohibited, triggering a change in the investment strategy and making it suitable to assign the portfolio to a composite made up of portfolios that use derivatives.

Second, a portfolio can be reassigned to another composite if the original composite is redefined in such a way that the portfolio no longer fits it. Generally, if a strategy changes over time, it is most appropriate to create a new composite; accordingly, the redefinition of an existing composite should be a highly unusual event.

In the event of **significant cash flows**, a portfolio may be temporarily removed from the composite.

A significant cash flow is a client-directed cash flow sufficiently large that it may temporarily prevent the firm from implementing the strategy. Significant cash flows are more likely to be an issue for strategies such as fixed income and emerging markets, wherein the liquidity of the underlying securities inhibits the ability to quickly invest the incoming cash or to conduct an orderly sale of portfolio securities to meet a cash outflow. Firms must define “significant” on an *ex ante*, composite-specific basis and must consistently follow the composite-specific significant cash flow policy.

Alternatively, firms may use **temporary new accounts** to remove the effect of a significant cash flow. Firms adopting this approach place client-initiated incoming cash and securities into a temporary account that is not included in any composite until the external cash flows have been invested in accordance with the portfolio’s investment mandate, objective, or strategy, at which time they would be transferred into the main portfolio and treated as an external cash flow. Relatedly, when the client initiates a large capital withdrawal, the firm transfers cash and securities in the desired amount to a temporary account until it liquidates the securities and the funds are distributed. The transfer is treated as an external cash outflow when calculating the portfolio’s time-weighted total return.

The provisions governing composite construction additionally address the issue of minimum asset levels. A firm might decide that a particular composite will not include any portfolios whose value is below a specified level, on the grounds, for instance, that the investment strategy can be fully implemented only for portfolios above a certain size. Portfolios below the minimum asset level would be considered non-discretionary with respect to that composite. If a firm establishes a minimum asset level for a composite, it must document policies addressing how portfolios will be treated if they fall below the minimum. As an example, a firm may elect to remove portfolios the month after they fall below the minimum. As another example, the firm may determine that the minimum asset level required to *add* a

portfolio to a composite is \$1 million but that a portfolio will not be *removed* from a composite unless its assets fall below \$900,000. The GIPS standards further state that any changes to a composite-specific minimum asset level must not be applied retroactively.

If a portfolio is removed from a composite because it fell below the minimum, its prior performance must remain in the composite. The firm must determine if the portfolio that has been removed meets any other composite definition and include it in the appropriate composite in a timely and consistent manner.

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## 8. PRESENTATION AND REPORTING REQUIREMENTS FOR COMPOSITES

- h. explain requirements of the GIPS standards with respect to presentation and reporting
- i. explain the conditions under which the performance of a past firm or affiliation may be linked to or used to represent the historical performance of a new or acquiring firm

Firms claiming compliance with the GIPS standards must make every reasonable effort to provide a GIPS Report to all prospective clients and limited distribution pooled fund investors. The GIPS Report must be one that represents the strategy being marketed to the prospect.

There are two types of GIPS Reports: a **GIPS Composite Report** and a **GIPS Pooled Fund Report**. A GIPS Composite Report includes all of the information required by the GIPS standards for a specific composite. A GIPS Pooled Fund Report includes all of the information required by the GIPS standards for a specific pooled fund. Sections 4 and 5 of the 2020 GIPS Standards for Firms address the requirements and recommendations for GIPS Composite Time-Weighted and Money-Weighted Return Reports, respectively. In this section, we will focus on certain required elements of the time-weighted return reports.

*Candidates should read Provisions 4.A.1 through 4.A.12 and 4.A.18 of the GIPS Standards for Firms for a more complete understanding of the requirements relating to Composite Time-Weighted Return Reports. Candidates are not responsible for Provisions 4.A.13 through 4.A.17 relating to carve-outs and overlay strategy and wrap fee composites.*

## 8.1. Minimum Years of Performance

For each GIPS Composite Report that includes time-weighted returns, the GIPS standards require that firms show at least 5 years of annual performance (unless the composite has been in existence for less than 5 years) and that the GIPS-compliant performance record must then be extended each year until at least 10 years of performance have been presented. If the composite has been in existence for less than 5 years, the firm may present returns since inception and build over time to the 10 years of required returns.

## 8.2. Required Elements of a GIPS Composite Report

The core elements of a GIPS Composite Report that presents a time-weighted return include the following:

- composite and benchmark annual returns for all years;
- the number of portfolios (if six or more) in the composite at each period end;
- the amount of assets in the composite;
- the amount of total firm assets at the end of each period;
- a measure of **internal dispersion** of individual portfolio returns for each annual period if the composite contains six or more portfolios for the full year; and
- if monthly composite returns are available, a three-year annualized *ex post* standard deviation of the composite and benchmark returns as of each annual period end.

### 8.2.1. Dispersion Measures

The GIPS standards require that for each annual period a measure of internal dispersion of the returns earned by individual portfolios in the composite be presented. This important requirement is intended to allow users to see how consistently the firm implemented its strategy across individual portfolios. A wide range of results should prompt the recipient of the performance presentation to inquire about possible causes of the variability of returns to portfolios that are purportedly managed in accordance with the same strategy. It may suggest, among many other possibilities, that the composite is defined too broadly to provide meaningful information.

The dispersion of annual returns for individual portfolios within a composite can be



measured in various ways. The GIPS Glossary entry for internal dispersion mentions several acceptable methods. Let us refer to the data in [Exhibit 7](#), showing the beginning values (in euros) and the annual rates of return earned by the 14 portfolios that were in a German equity composite for the full year 20XX. (Note that only those portfolios in the composite for the entire year are included in the calculation of this dispersion measure.) The portfolios presented in [Exhibit 7](#) are arrayed in descending order of returns.

### Exhibit 7. Data for Calculation of Dispersion

Portfolio	Beginning Value	20XX Return
A	€118,493	2.66%
B	€79,854	2.64%
C	€121,562	2.53%
D	€86,973	2.49%
E	€105,491	2.47%
F	€112,075	2.42%
G	€98,667	2.38%
H	€92,518	2.33%
I	€107,768	2.28%
J	€96,572	2.21%
K	€75,400	2.17%
L	€77,384	2.07%
M	€31,264	1.96%
N	€84,535	1.93%

The Glossary in the GIPS Standards for Firms defines **internal dispersion** as “a measure of the spread of the annual returns of individual portfolios within a composite” and indicates that acceptable measures include, but are not limited to, high/low, range, and the equal-weighted or asset-weighted standard deviation of portfolio returns. Using the data in [Exhibit 7](#), we will consider each of these measures.

The simplest method of expressing internal dispersion for an annual period is to disclose the highest and lowest returns earned by portfolios that were in the composite for the full year. In the case of the German equity composite, the highest return was 2.66% and the lowest was



1.93%. As an alternative, the high/low range—the arithmetic difference between the highest and the lowest return—might also be presented. In this case it was 0.73%, or 73 bps. In either form, the high/low disclosure is easy to understand. It has a potential disadvantage, however. In any annual period, an outlier—that is, one portfolio with an abnormally high or low return—may be present, resulting in a measure of dispersion that is not entirely representative of the distribution of returns. Although they are more difficult to calculate and to interpret, other dispersion measures may convey better information.

The standard deviation of returns for portfolios included in the composite is another acceptable measure of internal dispersion. As applied to composites, standard deviation measures the cross-sectional dispersion of returns for portfolios included in the composite for the full year. The standard deviation for a composite in which the constituent portfolios are equally weighted is calculated using Equation 9:

**Equation (9)**

$$S_c = \sqrt{\frac{\sum_{i=1}^n (r_i - \bar{r}_c)^2}{n}}$$

where  $r_i$  is the return of each individual portfolio,  $\bar{r}_c$  is the equal-weighted mean or arithmetic mean return to the portfolios in the composite, and  $n$  is the number of portfolios in the composite. Applying Equation 9 to the portfolio data given in Exhibit 7, assuming equal weighting, the mean return is 2.32% and the standard deviation is 22 bps (0.22%). If the individual portfolio returns are normally distributed around the mean return, then approximately two-thirds of the portfolios will have returns falling between the mean plus the standard deviation (2.32% + 0.22% = 2.54%) and the mean minus the standard deviation (2.32% – 0.22% = 2.10%).

Some firms prefer to present the asset-weighted standard deviation rather than the equal-weighted standard deviation. The asset-weighted standard deviation of individual portfolio returns within a composite can be calculated using Equation 10:

**Equation (10)**

$$S_{C_{aw}} = \sqrt{\sum_{i=1}^n \left[ (r_i - \bar{r}_{proxy})^2 \times w_i \right]}$$

where  $\bar{r}_{proxy}$  is the asset-weighted mean return of portfolios 1 through  $n$  (see Equation 9);  $w_i$  is the weight of portfolio  $i$ , calculated as the ratio of the beginning value of portfolio  $i$  to the total beginning value of the assets of portfolios 1 through  $n$ , that is,  $w_i = \frac{V_{0,i}}{V_{0,Total}}$ ; and the sum

of the weights  $w_1$  through  $w_n$  is 1.

### Equation (11)

$$\bar{r}_{proxy} = \sum_{i=1}^n (w_i \times r_i)$$

Applying [Equations 11](#) and [12](#) to the data given in [Exhibit 7](#), weighted standard deviation is 21 bps (0.21%).

Note that the GIPS standards do not limit firms to using one of the dispersion described here. A firm may prefer another way of expressing dispersion. The method chosen should, however, fairly represent the annual period.

The 2020 GIPS Standards for Firms also require that firms present historical variability of composite and benchmark returns. Specifically, state that, where monthly composite returns are available, firms must, at annual period end, the three-year annualized *ex post* standard deviation of returns of both the composite and the benchmark. The rationale is to provide an indication of the risk of an investment strategy as executed by the firm under consideration. Because all GIPS Composite Reports include the standard deviation measure is based on historical experience rather than subjective judgment, it allows for some degree of comparability among firms that claim compliance.

## 8.3. Portability

The “portability” of past performance is a complex and sometimes controversial concept. Performance from a past firm or affiliation may be linked to the new or acquiring firm if the new or acquiring firm meets certain requirements. The requirements, which apply on a composite-specific basis, are that (1) substantial decision makers are employed by the new or acquiring firm, (2) the track record remains substantially intact and independent within the new or acquiring firm, and (3) the new or acquiring firm has records that document and support the reported performance. If there is a break in the track record between the past firm or affiliation and the acquiring firm, and if the first three portability tests are met, then the past firm or affiliation may be used to represent the historical performance of the new or acquiring firm—but the two performance records may not be linked. If a firm acquires another firm or affiliation, the firm is given a one-year grace period to bring any non-compliant assets into compliance for future reporting purposes.





















































# GLOSSARY

## A

### **Absolute return benchmark**

A minimum target return that an investment manager is expected to beat.

### **Accounting defeasance**

Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

### **Accumulation phase**

Phase where the government predominantly contributes to a sovereign wealth pension reserve fund.

### **Active management**

A portfolio management approach that allows risk factor mismatches relative to a benchmark index causing potentially significant return differences between the active portfolio and the underlying benchmark.

### **Active return**

Portfolio return minus benchmark return.

### **Active risk**

The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

### **Active risk budgeting**

Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

## **Active share**

A measure of how similar a portfolio is to its benchmark. A manager who precisely replicates the benchmark will have an Active Share of zero; a manager with no holdings in common with the benchmark will have an Active Share of one.

## **Activist short selling**

A hedge fund strategy in which the manager takes a short position in a given security and then publicly presents his/her research backing the short thesis.

## **After-tax excess return**

Calculated as the after-tax return of the portfolio minus the after-tax return of the associated benchmark portfolio.

## **Agency trade**

A trade in which the broker is engaged to find the other side of the trade, acting as an agent. In doing so, the broker does not assume any risk for the trade.

## **Alpha decay**

In a trading context, alpha decay is the erosion or deterioration in short term alpha after the investment decision has been made.

## **Alternative trading systems**

(ATS) Non-exchange trading venues that bring together buyers and sellers to find transaction counterparties. Also called *multilateral trading facilities (MTF)*.

## **Anchoring and adjustment**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anchoring and adjustment bias**

An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

## **Anomalies**

Apparent deviations from market efficiency.

## **Arithmetic attribution**

An attribution approach which explains the arithmetic difference between the portfolio return and its benchmark return. The single-period attribution effects sum to the excess return, however, when combining multiple periods, the sub-period attribution effects will not sum to the excess return.

## **Arrival price**

In a trading context, the arrival price is the security price at the time the order was released to the market for execution.

## **Asset location**

The type of account an asset is held within, e.g., taxable or tax deferred.

## **Asset-only**

With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

## **Asset swap spread (ASW)**

The spread over MRR on an interest rate swap for the remaining life of the bond that is equivalent to the bond's fixed coupon.

## **Asset swaps**

Convert a bond's fixed coupon to MRR plus (or minus) a spread.

## **Authorized participants**

Institutional investors who create and redeem ETF shares using an OTC primary market with an ETF sponsor.

## **Availability bias**

An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

# **B**

## **Back-fill bias**

The distortion in index or peer group data which results when returns are reported to a database only after they are known to be good returns.

## **Barbell**

A fixed-income investment strategy combining short- and long-term bond positions.

## **Base**

With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in “one unit of a currency.”

## **Base-rate neglect**

A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

## **Basis risk**

The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

## **Bear flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in short-term bond yields-to-maturity.

## **Bear spread**

An option strategy that becomes more valuable when the price of the underlying asset declines, so requires buying one option and writing another with a *lower* exercise price. A put bear spread involves buying a put with a higher exercise price and selling a put with a lower exercise price. A bear spread can also be executed with calls.

## **Bear steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a rise in long-term bond yields-to-maturity.

## **Behavioral finance macro**

A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

## **Behavioral finance micro**

A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

## **Bequest**

The transferring, or bequeathing, of assets in some other way upon a person's death. Also referred to as a testamentary bequest or testamentary gratuitous transfer.

## **Best-in-class**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *positive screening*.

## **Bid price**

In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

## **Breadth**

The number of truly independent decisions made each year.

## **Buffering**

Establishing ranges around breakpoints that define whether a stock belongs in one index or another.

## **Bull flattening**

A decrease in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in long-term bond yields-to-maturity.

## **Bull spread**

An option strategy that becomes more valuable when the price of the underlying asset rises, so requires buying one option and writing another with a *higher* exercise price. A call bull spread involves buying a call with a lower exercise price and selling a call with a higher exercise price. A bull spread can also be executed with puts.

## **Bull steepening**

An increase in the yield spread between long- and short-term maturities across the yield curve, which is largely driven by a decline in short-term bond yields-to-maturity.

## **Bullet**

A fixed-income investment strategy that focuses on the intermediate term (or “belly”) of the yield curve.

## **Business cycle**

Fluctuations in GDP in relation to long-term trend growth, usually lasting 9-11 years.

## **Butterfly spread**

A measure of yield curve shape or curvature equal to double the intermediate yield-to-maturity less the sum of short- and long-term yields-to-maturity.

## **Butterfly strategy**

A common yield curve shape strategy that combines a long or short bullet position with a barbell portfolio in the opposite direction to capitalize on expected yield curve shape changes.

# **C**

## **Calendar rebalancing**

Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

## **Calendar spread**

A strategy in which one sells an option and buys the same type of option but with different expiration dates, on the same underlying asset and with the same strike. When the investor buys the more distant (near-term) call and sells the near-term (more distant) call, it is a long (short) calendar spread.

## **Canada model**

Characterized by a high allocation to alternatives. Unlike the endowment model, however, the Canada model relies more on internally managed assets. The innovative features of the Canada model are the: a) reference portfolio, b) total portfolio approach, and c) active management.

## **Capital gain or loss**

For tax purposes equals the selling price (net of commissions and other trading costs) of the asset less its tax basis.

## **Capital market expectations**

(CME) Expectations concerning the risk and return prospects of asset classes.

## **Capital needs analysis**

See *capital sufficiency analysis*.

## **Capital sufficiency analysis**

The process by which a wealth manager determines whether a client has, or is likely to accumulate, sufficient financial resources to meet his or her objectives; also known as *capital needs analysis*.

## **Capture ratio**

A measure of the manager's gain or loss relative to the gain or loss of the benchmark.

## **Carhart model**

A four factor model used in performance attribution. The four factors are: market (RMRF), size (SMB), value (HML), and momentum (WML).

## **Carry trade**

A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

## **Carry trade across currencies**

A strategy seeking to benefit from a positive interest rate differential across currencies by combining a short position (or borrowing) in a low-yielding currency and a long position (or lending) in a high-yielding currency.

## **Cash drag**

Tracking error caused by temporarily uninvested cash.

## **Cash flow matching**

Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives.



## **Cash-secured put**

An option strategy involving the writing of a put option and simultaneously depositing an amount of money equal to the exercise price into a designated account (this strategy is also called a fiduciary put).

## **CDS curve**

Plot of CDS spreads across maturities for a single reference entity or group of reference entities in an index.

## **Cell approach**

See *stratified sampling*.

## **Charitable gratuitous transfers**

Asset transfers to not-for-profit or charitable organizations. In most jurisdictions charitable donations are not subject to a gift tax and most jurisdictions permit income tax deductions for charitable donations.

## **Charitable remainder trust**

A trust setup to provide income for the life of named-beneficiaries. When the last named-beneficiary dies any remaining assets in this trust are distributed to the charity named in the trust, hence the term *charitable remainder* trust.

## **Closet indexer**

A fund that advertises itself as being actively managed but is substantially similar to an index fund in its exposures.

## **Cognitive cost**

The effort involved in processing new information and updating beliefs.

## **Cognitive dissonance**

The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

## **Cognitive errors**

Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

## **Collar**

An option position in which the investor is long shares of stock and then buys a put with an exercise price below the current stock price and writes a call with an exercise price above the current stock price. Collars allow a shareholder to acquire downside protection through a protective put but reduce the cash outlay by writing a covered call.

## **Completion overlay**

A type of overlay that addresses an indexed portfolio that has diverged from its proper exposure.

## **Completion portfolio**

Is an index-based portfolio that when added to a given concentrated asset position creates an overall portfolio with exposures similar to the investor's benchmark.

## **Conditional value at risk**

(CVaR) Also known as expected loss The average portfolio loss over a specific time period conditional on that loss exceeding the value at risk (VaR) threshold.

## **Confirmation bias**

A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

## **Conjunction fallacy**

An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

## **Conservatism bias**

A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

## **Contingent immunization**

Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

## **Controlled foreign corporation (CFC)**

A company located outside a taxpayer's home country in which the taxpayer has a controlling interest as defined under the home country law.

## **Covered call**

An option strategy in which a long position in an asset is combined with a short position in a call on that asset.

## **Covered interest rate parity**

The relationship among the spot exchange rate, the forward exchange rate, and the interest rate in two currencies that ensures that the return on a hedged (i.e., covered) foreign risk-free investment is the same as the return on a domestic risk-free investment. Also called *interest rate parity*.

## **Credit cycle**

The expansion and contraction of credit over the business cycle, which translates into asset price changes based on default and recovery expectations across maturities and rating categories.

## **Credit default swap (CDS) basis**

Yield spread on a bond, as compared to CDS spread of same tenor.

## **Credit loss rate**

The realized percentage of par value lost to default for a group of bonds equal to the bonds' default rate multiplied by the loss severity.

## **Credit migration**

The change in a bond's credit rating over a certain period.

## **Credit valuation adjustment (CVA)**

The present value of credit risk for a loan, bond, or derivative obligation.

## **Cross-currency basis swap**

An interest rate swap involving the periodic exchange of floating payments in one currency for another based upon respective market reference rates with an initial and final exchange of notional principal.

## **Cross hedge**

A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

## **Cross-sectional consistency**

A feature of expectations setting which means that estimates for all classes reflect the same underlying assumptions and are generated with methodologies that reflect or preserve important relationships among the asset classes, such as strong correlations. It is the internal consistency across asset classes.

## **Cross-sectional momentum**

A managed futures trend following strategy implemented with a cross-section of assets (within an asset class) by going long those that are rising in price the most and by shorting those that are falling the most. This approach generally results in holding a net zero (market-neutral) position and works well when a market's out- or underperformance is a reliable predictor of its future performance.

## **Currency overlay**

A type of overlay that helps hedge the returns of securities held in foreign currency back to the home country's currency.

## **Currency overlay programs**

A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

## **Custom security-based benchmark**

Benchmark that is custom built to accurately reflect the investment discipline of a particular investment manager. Also called a *strategy benchmark* because it reflects a manager's particular strategy.

## **D**

## **Decision price**

In a trading context, the decision price is the security price at the time the investment decision was made.

### **Decision-reversal risk**

The risk of reversing a chosen course of action at the point of maximum loss.

### **Decumulation phase**

Phase where the government predominantly withdraws from a sovereign wealth pension reserve fund.

### **Dedicated short-selling**

A hedge fund strategy in which the manager takes short-only positions in equities deemed to be expensively priced versus their deteriorating fundamental situations. Short exposures may vary only in terms of portfolio sizing by, at times, holding higher levels of cash.

### **Default intensity**

POD over a specified time period in a reduced form credit model.

### **Default risk**

Likelihood that a borrower will default or fail to meet its obligation to make full and timely payments of principal and interest according to the terms of a debt obligation.

### **Deferred annuity**

An annuity that enables an individual to purchase an income stream that will begin at a later date.

### **Defined benefit**

A retirement plan in which a plan sponsor commits to paying a specified retirement benefit.

### **Defined contribution**

A retirement plan in which contributions are defined but the ultimate retirement benefit is not specified or guaranteed by the plan sponsor.

### **Delay cost**

The (trading related) cost associated with not submitting the order to the market in a timely manner.

## **Delta**

The change in an option's price in response to a change in price of the underlying, all else equal.

## **Delta hedging**

Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

## **Demand deposits**

Accounts that can be drawn upon regularly and without notice. This category includes checking accounts and certain savings accounts that are often accessible through online banks or automated teller machines (ATMs).

## **Diffusion index**

An index that measures how many indicators are pointing up and how many are pointing down.

## **Direct market access**

(DMA) Access in which market participants can transact orders directly with the order book of an exchange using a broker's exchange connectivity.

## **Disability income insurance**

A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

## **Discount margin**

The discount (or required) margin is the yield spread versus the MRR such that the FRN is priced at par on a rate reset date.

## **Discretionary portfolio management**

An arrangement in which a wealth manager has a client's pre-approval to execute investment decisions.

## **Discretionary trust**

A trust that enables the trustee to determine whether and how much to distribute based on a beneficiary's general welfare.

## **Disposition effect**

As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

## **Dividend capture**

A trading strategy whereby an equity portfolio manager purchases stocks just before their ex-dividend dates, holds these stocks through the ex-dividend date to earn the right to receive the dividend, and subsequently sells the shares.

## **Domestic asset**

An asset that trades in the investor's domestic currency (or home currency).

## **Domestic currency**

The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

## **Domestic-currency return**

A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

## **Double taxation**

A term used to describe situations in which income is taxed twice. For example, when corporate earnings are taxed at the company level and then that portion of earnings paid as dividends is taxed again at the investor level.

## **Drawdown**

A decline in value (represented by a series of negative returns only) following a peak fund valuation.

## **Drawdown duration**

The total time from the start of the drawdown until the cumulative drawdown recovers to zero.

## **Due diligence**

Investigation and analysis in support of an investment action, decision, or recommendation.

## **Duration matching**

Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

## **Duration times spread**

Weighting of spread duration by credit spread in order to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage, rather than absolute, basis.

## **Duration Times Spread (DTS)**

Weighting of spread duration by credit spread to incorporate the empirical observation that spread changes for lower-rated bonds tend to be consistent on a percentage rather than absolute basis.

## **Dynamic asset allocation**

A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

## **Dynamic hedge**

A hedge requiring adjustment as the price of the hedged asset changes.

# **E**

## **Earnings risk**

The risk associated with the earning potential of an individual.

## **Econometrics**

The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.



## **Economic balance sheet**

A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet*.

## **Economic indicators**

Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

## **Economic net worth**

The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

## **Effective federal funds (FFE) rate**

The fed funds rate actually transacted between depository institutions, not the Fed's target federal funds rate.

## **Emotional biases**

Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

## **Empirical duration**

Estimation of the price-yield relationship using historical bond market data in statistical models.

## **Endowment bias**

An emotional bias in which people value an asset more when they hold rights to it than when they do not.

## **Endowment model**

Characterized by a high allocation to alternative investments (private investments and hedge funds), significant active management, and externally managed assets.

## **Enhanced indexing approach**

Maintains a close link to the benchmark but attempts to generate a modest amount of outperformance relative to the benchmark.

## **Enhanced indexing strategy**

Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

## **Equity monetization**

A group of strategies that allow investors to receive cash for their concentrated stock positions without an outright sale. These transactions are structured to avoid triggering the capital gains tax.

## **Estate**

Consists of all of the property a person owns or controls, which may consist of financial assets (e.g., bank accounts, stocks, bonds, business interests), tangible personal assets (e.g., artwork, collectibles, vehicles), immovable property (e.g., residential real estate, timber rights), and intellectual property (e.g., royalties).

## **Estate planning**

The process of preparing for the disposition of one's estate upon death and during one's lifetime.

## **Estate tax**

Levied on the total value of a deceased person's assets and paid out of the estate before any distributions to beneficiaries.

## **Evaluated pricing**

*See matrix pricing.*

## **Excess return**

Used in various senses appropriate to context: 1) The difference between the portfolio return and the benchmark return; 2) The return in excess of the risk-free rate.

## **Excess spread**

Credit spread return measure that incorporates both changes in spread and expected credit losses for a given period.

## **Exchange fund**

A partnership in which each of the partners have each contributed low cost-basis stock to the fund. Used in the United States as a mechanism to achieve a tax-free exchange of a concentrated asset position.

## **Execution cost**

The difference between the (trading related) cost of the real portfolio and the paper portfolio, based on shares and prices transacted.

## **Exhaustive**

An index construction strategy that selects every constituent of a universe.

## **Expected shortfall**

The average loss conditional on exceeding the VaR cutoff; sometimes referred to as *conditional VaR* or *expected tail loss*.

## **Expected tail loss**

See *expected shortfall*.

## **Extended portfolio assets and liabilities**

Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

# **F**

## **Factor-model-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

## **Family constitution**

Typically a non-binding document that sets forth an agreed-upon set of rights, values, and responsibilities of the family members and other stakeholders. Used by many wealth- and business-owning families as the starting point of conflict resolution

procedures.

## **Family governance**

The process for a family's collective communication and decision making designed to serve current and future generations based on the common values of the family.

## **Financial capital**

The tangible and intangible assets (excluding human capital) owned by an individual or household.

## **Fixed trust**

Distributions to beneficiaries of a fixed trust are specified in the trust document to occur at certain times or in certain amounts.

## **Forced heirship**

Is the requirement that a certain proportion of assets must pass to specified family members, such as a spouse and children.

## **Foreign assets**

Assets denominated in currencies other than the investor's home currency.

## **Foreign currency**

Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

## **Foreign-currency return**

The return of the foreign asset measured in foreign-currency terms.

## **Forward rate bias**

An empirically observed divergence from interest rate parity conditions that active investors seek to benefit from by borrowing in a lower-yield currency and investing in a higher-yield currency.

## **Foundation**

A legal entity available in certain jurisdictions. Foundations are typically set up to hold assets for a specific charitable purpose, such as to promote education or for

philanthropy. When set up and funded by an individual or family and managed by its own directors, it is called a *private foundation*. The term *family foundation* usually refers to a private foundation where donors or members of the donors' family are actively involved.

## **Framing**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Framing bias**

An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

## **Fulcrum securities**

Partially-in-the-money claims (not expected to be repaid in full) whose holders end up owning the reorganized company in a corporate reorganization situation.

## **Full replication approach**

When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

## **Fund-of-funds**

A fund of hedge funds in which the fund-of-funds manager allocates capital to separate, underlying hedge funds (e.g., single manager and/or multi-manager funds) that themselves run a range of different strategies.

## **Funding currencies**

The low-yield currencies in which borrowing occurs in a carry trade.

# **G**

## **G-spread**

Yield spread for a fixed-rate bond over a government benchmark.

## **Gamblers' fallacy**

A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

## **Gamma**

The change in an option's delta for a change in price of the underlying, all else equal.

## **General account**

Account holding assets to fund future liabilities from traditional life insurance and fixed annuities, the products in which the insurer bears all the risks—particularly mortality risk and longevity risk.

## **Generation-skipping tax**

Taxes levied in some jurisdictions on asset transfers (gifts) that skip one generation such as when a grandparent transfers assets to their grandchildren. (see related Gift Tax).

## **Gift tax**

Depending on the tax laws of the country, assets gifted by one person to another during the giftor's lifetime may be subject to a gift tax.

## **Goals-based**

With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

## **Goals-based investing**

An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

## **Green bonds**

Fixed-income instruments issued by private or public sector borrowers that directly fund ESG initiatives.

## **Grinold–Kroner model**

An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

# H

## **Halo effect**

An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

## **Hard-catalyst event-driven approach**

An event-driven approach in which investments are made in reaction to an already announced corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) in which security prices related to the event have yet to fully converge.

## **Hazard rate**

The conditional POD, or the likelihood that default will occur given that it has not already occurred in a prior period.

## **Health insurance**

A type of insurance used to cover health care and medical costs.

## **Health risk**

The risk associated with illness or injury.

## **Hedge ratio**

The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

## **Herding**

When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

## **High-water mark**

A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

## **Hindsight bias**

A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

### **Holdings-based attribution**

A “buy and hold” attribution approach which calculates the return of portfolio and benchmark components based upon the price and foreign exchange rate changes applied to daily snapshots of portfolio holdings.

### **Holdings-based style analysis**

A bottom-up style analysis that estimates the risk exposures from the actual securities held in the portfolio at a point in time.

### **Holistic balance sheet**

*See economic balance sheet.*

### **Home bias**

A preference for securities listed on the exchanges of one’s home country.

### **Home-country bias**

The favoring of domestic over non-domestic investments relative to global market value weights.

### **Home currency**

*See domestic currency.*

### **Human capital**

An implied asset; the net present value of an investor’s future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital*.

## **I**

### **I-spread (interpolated spread)**

Yield spread measure using swaps or constant maturity Treasury YTM as a benchmark.



## **Illusion of control**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Illusion of control bias**

A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

## **Immediate annuity**

An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

## **Immunization**

An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

## **Impact investing**

Investment approach that seeks to achieve targeted social or environmental objectives along with measurable financial returns through engagement with a company or by direct investment in projects or companies.

## **Implementation shortfall**

(IS) The difference between the return for a notional or paper portfolio, where all transactions are assumed to take place at the manager's decision price, and the portfolio's actual return, which reflects realized transactions, including all fees and costs.

## **Implied volatility**

The outlook for the future volatility of the underlying asset's price. It is the value (i.e., standard deviation of underlying's returns) that equates the model (e.g., Black–Scholes–Merton model) price of an option to its market price.

## **Implied volatility surface**

A three-dimensional plot, for put and call options on the same underlying asset, of days to expiration ( $x$ -axis), option strike prices ( $y$ -axis), and implied volatilities ( $z$ -axis). It

simultaneously shows the volatility skew (or smile) and the term structure of implied volatility.

### **Incremental VaR (or partial VaR)**

The change in the minimum portfolio loss expected to occur over a given time period at a specific confidence level resulting from increasing or decreasing a portfolio position.

### **Information coefficient**

Formally defined as the correlation between forecast return and actual return. In essence, it measures the effectiveness of investment insight.

### **Inheritance tax**

Paid by each individual beneficiary of a deceased person's estate on the value of the benefit the individual received from the estate.

### **Input uncertainty**

Uncertainty concerning whether the inputs are correct.

### **Interaction effect**

The attribution effect resulting from the interaction of the allocation and selection decisions.

### **Intertemporal consistency**

A feature of expectations setting which means that estimates for an asset class over different horizons reflect the same assumptions with respect to the potential paths of returns over time. It is the internal consistency over various time horizons.

### **Intestate**

A person who dies without a valid will or with a will that does not dispose of their property are considered to have died intestate.

### **Intrinsic value**

The difference between the spot exchange rate and the strike price of a currency option.

### **Investment currencies**

The high-yielding currencies in a carry trade.

## **Investment policy statement**

A written planning document that describes a client's investment objectives and risk tolerance over a relevant time horizon, along with the constraints that apply to the client's portfolio.

## **Investment style**

A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

## **Irrevocable trust**

The person whose assets are used to create the trust gives up the right to rescind the trust relationship and regain title to the trust assets.

# **K**

## **Key person risk**

The risk that results from over-reliance on an individual or individuals whose departure would negatively affect an investment manager.

## **Key rate duration**

A method of measuring interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

## **Knock-in/knock-out**

Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

# **L**

## **Leading economic indicators**

A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

## **Liability-based mandates**

Mandates managed to match or cover expected liability payments (future cash outflows) with future projected cash inflows.

## **Liability-driven investing**

An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

## **Liability driven investing (LDI) model**

In the LDI model, the primary investment objective is to generate returns sufficient to cover liabilities, with a focus on maximizing expected surplus return (excess return of assets over liabilities) and managing surplus volatility.

## **Liability glide path**

A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

## **Liability insurance**

A type of insurance used to manage liability risk.

## **Liability-relative**

With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

## **Liability risk**

The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

## **Life-cycle finance**

A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

## **Life insurance**

A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

## **Life settlement**

The sale of a life insurance contract to a third party. The valuation of a life settlement typically requires detailed biometric analysis of the individual policyholder and an understanding of actuarial analysis.

## **Limited-life foundations**

A type of foundation where founders seek to maintain control of spending while they (or their immediate heirs) are still alive.

## **Liquidity budget**

The portfolio allocations (or weightings) considered acceptable for the liquidity categories in the liquidity classification schedule (or time-to-cash table).

## **Liquidity classification schedule**

A liquidity management classification (or table) that defines portfolio liquidity “buckets” or categories based on the estimated time it would take to convert assets in that particular category into cash.

## **Longevity risk**

The risk of outliving one’s financial resources.

## **Loss-aversion bias**

A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

## **Loss severity**

Also known as loss given default (LGD). The amount of loss if a default occurs, usually expressed as a percentage in annual terms.

# **M**

## **Macro attribution**

Attribution at the sponsor level.

## **Manager peer group**

See *manager universe*.

## **Manager universe**

A broad group of managers with similar investment disciplines. Also called *manager peer group*.

## **Matrix pricing**

An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

## **Matrix pricing (or evaluated pricing)**

Methodology for pricing infrequently traded bonds using bonds from similar issuers and actively traded government benchmarks to establish a bond's fair value.

## **Mental accounting bias**

An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

## **Micro attribution**

Attribution at the portfolio manager level.

## **Minimum-variance hedge ratio**

A mathematical approach to determining the optimal cross hedging ratio.

## **Mission-related investing**

Aims to direct a significant portion of assets in excess of annual grants into projects promoting a foundation's mission.

## **Model uncertainty**

Uncertainty as to whether a selected model is correct.

## **Mortality table**

A table that indicates individual life expectancies at specified ages.

## **Multi-class trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and involves buying and selling different classes of shares of the same company, such as voting and non-voting shares.

### **Multi-manager fund**

Can be of two types—one is a multi-strategy fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund; the second type is a fund of hedge funds (or fund-of-funds) in which the manager allocates capital to separate, underlying hedge funds that themselves run a range of different strategies.

### **Multi-strategy fund**

A fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund.

### **Multilateral trading facilities**

(MTF) See *Alternative trading systems (ATS)*.

## **N**

### **Negative butterfly**

An increase in the butterfly spread due to lower short- and long-term yields-to-maturity and a higher intermediate yield-to-maturity.

### **Negative screening**

An ESG implementation approach that excludes certain sectors or companies that deviate from an investor's accepted standards.

### **Non-deliverable forwards**

Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

### **Nonstationarity**

A characteristic of series of data whose properties, such as mean and variance, are not constant through time. When analyzing historical data it means that different parts of a

data series reflect different underlying statistical properties.

## **Norway model**

Characterized by an almost exclusive reliance on public equities and fixed income (the traditional 60/40 equity/bond model falls under the Norway model), with largely passively managed assets and with very little to no allocation to alternative investments.

## **O**

### **OAS duration**

The change in bond price for a given change in OAS.

### **Offer price**

The price at which a counterparty is willing to sell one unit of the base currency.

### **Opportunity cost**

The (trading related) cost associated with not being able to transact the entire order at the decision price.

### **Option-adjusted spread (OAS)**

A generalization of the Z-spread yield spread calculation that incorporates bond option pricing based on assumed interest rate volatility.

### **Optional stock dividends**

A type of dividend in which shareholders may elect to receive either cash or new shares.

### **Options on bond futures contracts**

Instruments that involve the right, but not the obligation, to enter into a bond futures contract at a pre-determined strike (bond price) on a future date in exchange for an up-front premium.

### **Overbought**

When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.



## **Overconfidence bias**

A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

## **Overlay**

A derivative position (or positions) used to adjust a pre-existing portfolio closer to its objectives.

## **Oversold**

The opposite of overbought; see *overbought*.

# **P**

## **Packeting**

Splitting stock positions into multiple parts.

## **Pairs trading**

An equity market-neutral strategy that capitalizes on the misalignment in prices of pairs of similar under- and overvalued equities. The expectation is the differential valuations or trading relationships will revert to their long-term mean values or their fundamentally-correct trading relationships, with the long position rising and the short position declining in value.

## **Parameter uncertainty**

Uncertainty arising because a quantitative model's parameters are estimated with error.

## **Participant/cohort option**

Pools the DC plan member with a cohort that has a similar target retirement date.

## **Participant-switching life-cycle options**

Automatically switch DC plan members into a more conservative asset mix as their age increases. There may be several automatic de-risking switches at different age targets.

## **Passive investment**

In the fixed-income context, it is investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

## **Passive management**

A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

## **Percent-range rebalancing**

An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

## **Performance attribution**

Attribution, including return attribution and risk attribution; often used as a synonym for return attribution.

## **Permanent life insurance**

A type of life insurance that provides lifetime coverage.

## **Portfolio overlay**

An array of derivative positions managed separately from the securities portfolio to achieve overall intended portfolio characteristics.

## **Position delta**

The overall or portfolio delta. For example, the position delta of a covered call, consisting of long 100 shares and short one at-the-money call, is +50 (= +100 for the shares and -50 for the short ATM call).

## **Positive butterfly**

A decrease in the butterfly spread due to higher short- and long-term yields-to-maturity and a lower intermediate yield-to-maturity.

## **Positive screening**

An ESG implementation approach that seeks to identify the most favorable companies and sectors based on ESG considerations. Also called *best-in-class*.

## **Post-liquidation return**

Calculates the return assuming that all portfolio holdings are sold as of the end date of the analysis and that the resulting capital gains tax that would be due is deducted from the ending portfolio value.

## **Potential capital gain exposure (PCGE)**

Is an estimate of the percentage of a fund's assets that represents gains and measures how much the fund's assets have appreciated. It can be an indicator of possible future capital gain distributions.

## **Premature death risk**

The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

## **Present value of distribution of cash flows methodology**

Method used to address a portfolio's sensitivity to rate changes along the yield curve. This approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

## **Principal trade**

A trade in which the market maker or dealer becomes a disclosed counterparty and assumes risk for the trade by transacting the security for their own account. Also called *broker risk trades*.

## **Probability of default**

The likelihood that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest.

## **Probate**

The legal process to confirm the validity of the will so that executors, heirs, and other interested parties can rely on its authenticity.

## **Program trading**

A strategy of buying or selling many stocks simultaneously.

## **Progressive tax rate schedule**

A tax regime in which the tax rate increases as the amount of income or wealth being taxed increases.

## **Property insurance**

A type of insurance used by individuals to manage property risk.

## **Property risk**

The possibility that a person's property may be damaged, destroyed, stolen, or lost.

## **Protective put**

An option strategy in which a long position in an asset is combined with a long position in a put on that asset.

## **Pure indexing**

Attempts to replicate a bond index as closely as possible, targeting zero active return and zero active risk.

## **Put spread**

A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

# **Q**

## **Qualified dividends**

Generally dividends from shares in domestic corporations and certain qualified foreign corporations which have been held for at least a specified minimum period of time.

## **Quantitative market-neutral**

An approach to building market-neutral portfolios in which large numbers of securities are traded and positions are adjusted on a daily or even an hourly basis using algorithm-based models.

## **Quoted margin**

The yield spread over the MRR established upon issuance of an FRN to compensate investors for assuming an issuer's credit risk.

# R

## Re-base

With reference to index construction, to change the time period used as the base of the index.

## Realized volatility

Historical volatility, the square root of the realized variance of returns, which is a measure of the range of past price outcomes for the underlying asset.

## Rebalancing

In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

## Rebalancing overlay

A type of overlay that addresses a portfolio's need to sell certain constituent securities and buy others.

## Rebalancing range

A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

## Rebate rate

The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

## Reduced form credit models

Credit models that solve for default probability over a specific time period using observable company-specific variables such as financial ratios and macroeconomic variables.

## Reduced-form models

Models that use economic theory and other factors such as prior research output to describe hypothesized relationships. Can be described as more compact representations of underlying structural models. Evaluate endogenous variables in terms of observable

exogenous variables.

## **Regime**

The governing set of relationships (between variables) that stem from technological, political, legal, and regulatory environments. Changes in such environments or policy stances can be described as changes in regime.

## **Regret**

The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

## **Regret-aversion bias**

An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

## **Relative value**

A concept that describes the selection of the most attractive individual securities to populate the portfolio with, using ranking and comparing.

## **Relative value volatility arbitrage**

A volatility trading strategy that aims to source and buy cheap volatility and sell more expensive volatility while netting out the time decay aspects normally associated with options portfolios.

## **Relative VaR**

The minimum portfolio loss expected to occur over a given time period at a specific confidence level based on a portfolio containing active positions minus benchmark holdings.

## **Repo rate**

The interest rate on a repurchase agreement.

## **Representativeness bias**

A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

## **Repurchase agreements**

In repurchase agreements, or *repos*, a security owner agrees to sell a security for a specific cash amount while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

## **Request for quote**

(RFQ) A non-binding quote provided by a market maker or dealer to a potential buyer or seller upon request. Commonly used in fixed income markets these quotes are only valid at the time they are provided.

## **Reserve portfolio**

The component of an insurer's general account that is subject to specific regulatory requirements and is intended to ensure the company's ability to meet its policy liabilities. The assets in the reserve portfolio are managed conservatively and must be highly liquid and low risk.

## **Resistance levels**

Price points on dealers' order boards where one would expect to see a clustering of offers.

## **Return attribution**

A set of techniques used to identify the sources of the excess return of a portfolio against its benchmark.

## **Returns-based attribution**

An attribution approach that uses only the total portfolio returns over a period to identify the components of the investment process that have generated the returns. The Brinson–Hood–Beebower approach is a returns-based attribution approach.

## **Returns-based benchmarks**

Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

## **Returns-based style analysis**

A top-down style analysis that involves estimating the sensitivities of a portfolio to security market indexes.

## **Reverse repos**

Repurchase agreements from the standpoint of the lender.

## **Revocable trust**

The person whose assets are used to create the trust retains the right to rescind the trust relationship and regain title to the trust assets.

## **Risk attribution**

The analysis of the sources of risk.

## **Risk aversion**

The degree of an investor's unwillingness to take risk; the inverse of risk tolerance.

## **Risk budgeting**

The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

## **Risk capacity**

The ability to accept financial risk.

## **Risk perception**

The subjective assessment of the risk involved in the outcome of an investment decision.

## **Risk premium**

An extra return expected by investors for bearing some specified risk.

## **Risk reversal**

A strategy used to profit from the existence of an implied volatility skew and from changes in its shape over time. A combination of long (short) calls and short (long) puts on the same underlying with the same expiration is a long (short) risk reversal.

## **Risk tolerance**

The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.



# S

## **Sample-size neglect**

A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or “real” data).

## **Scenario analysis**

What-if analysis that involves changing multiple assumptions at the same time in order to evaluate the change in an investment’s value.

## **Seagull spread**

An extension of the risk reversal foreign exchange option strategy that limits downside risk.

## **Securities lending**

A form of collateralized lending that may be used to generate income for portfolios.

## **Selective**

An index construction methodology that targets only those securities with certain characteristics.

## **Self-attribution bias**

A bias in which people take personal credit for successes and attribute failures to external factors outside the individual’s control.

## **Self-control bias**

A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

## **Separate accounts**

Accounts holding assets to fund future liabilities from variable life insurance and variable annuities, the products in which customers make investment decisions from a menu of options and themselves bear investment risk.

## **Sharpe ratio**

The average return in excess of the risk-free rate divided by the standard deviation of return; a measure of the average excess return earned per unit of standard deviation of return. Also known as the *reward-to-variability ratio*.

## **Short-biased**

A hedge fund strategy in which the manager uses a less extreme version of dedicated short-selling. It involves searching for opportunities to sell expensively priced equities, but short exposure may be balanced with some modest value-oriented, or index-oriented, long exposure.

## **Shortfall probability**

The probability of failing to meet a specific liability or goal.

## **Shrinkage estimation**

Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

## **Single-manager fund**

A fund in which one portfolio manager or team of portfolio managers invests in one strategy or style.

## **Smart beta**

Involves the use of transparent, rules-based strategies as a basis for investment decisions.

## **Smart order routers**

(SOR) Smart systems used to electronically route small orders to the best markets for execution based on order type and prevailing market conditions.

## **Social proof**

A bias in which individuals tend to follow the beliefs of a group.

## **Soft-catalyst event-driven approach**

An event-driven approach in which investments are made proactively in anticipation of a corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) that has yet to occur.

## Special dividends

A dividend paid by a company that does not pay dividends on a regular schedule, or a dividend that supplements regular cash dividends with an extra payment.

## Spread duration

The change in bond price for a given change in yield spread. Also referred to as *OAS duration* when the option-adjusted spread (OAS) is the yield measure used.

## Staged diversification strategy

The simplest approach to managing the risk of a concentrated position involves selling the concentrated position over some period of time, paying associated tax, and reinvesting the proceeds in a diversified portfolio.

## Static hedge

A hedge that is not sensitive to changes in the price of the asset hedged.

## Status quo bias

An emotional bias in which people do nothing (i.e., maintain the “status quo”) instead of making a change.

## Stock lending

Securities lending involving the transfer of equities.

## Stop-losses

A trading order that sets a selling price below the current market price with a goal of protecting profits or preventing further losses.

## Stops

Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

## Straddle

An option combination in which one buys *both* puts and calls, with the same exercise price and same expiration date, on the same underlying asset. In contrast to this long straddle, if someone *writes* both options, it is a short straddle.

## **Strangle**

A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

## **Stratified sampling**

A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

## **Structural credit models**

Credit models that apply market-based variables to estimate the value of an issuer's assets and the volatility of asset value.

## **Structural models**

Models that specify functional relationships among variables based on economic theory. The functional form and parameters of these models are derived from the underlying theory. They may include unobservable parameters.

## **Structural risk**

Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

## **Stub trading**

An equity market-neutral strategy that capitalizes on misalignment in prices and entails buying and selling stock of a parent company and its subsidiaries, typically weighted by the percentage ownership of the parent company in the subsidiaries.

## **Support levels**

Price points on dealers' order boards where one would expect to see a clustering of bids.

## **Surplus**

The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

## **Surplus portfolio**

The component of an insurer's general account that is intended to earn higher expected returns than the reserve portfolio and so can assume more risk. Surplus portfolio assets are often managed aggressively with high-risk assets.

## **Survivorship bias**

Bias that arises in a data series when managers with poor track records are dropped from the database whereas managers with good track records remain. A data series of a given date reflects only entities that have survived to that date.

## **Swaption**

This instrument grants a party the right, but not the obligation, to enter into a rate swap at a pre-determined strike (fixed swap rate) on a future date, in exchange for an up-front premium.

## **Synthetic long forward position**

The combination of a long call and a short put with identical strike prices, both traded at the same time on the same underlying.

## **Synthetic short forward position**

The combination of a short call and a long put at the same strike price, both traded at the same time on the same underlying.

# **T**

## **Tactical asset allocation**

Asset allocation that involves making short-term adjustments to the portfolio based on short-term predictions of relative performance among asset classes.

## **Tax alpha**

Calculated by subtracting the pre-tax excess return from the total return. Tax alpha isolates the benefit of tax management of the portfolio.

## **Tax avoidance**

The legal activity of understanding the tax laws and finding ways to minimize tax liability.

















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