

Set 1 Questions

1. The Mambo Large-Cap Fund has yielded a return of 12.5% in the current year. The fund is benchmarked to the large cap market index which yielded a return of 10.0%. The fund manager however, took riskier bets during the year due to which the fund's beta relative to the index was 1.2. The fund's alpha is *closest* to:
 - A. 2.5%.
 - B. 5.0%.
 - C. 0.5%.

2. The return on the SEFCO equity fund is 30%. The benchmark equity index return is 27%. The return on the SEFCO bond fund is 8% whereas that on the fixed income benchmark index is 9%. The strategic asset allocation is given as 60% equities and 40% bonds. The investor's asset allocation is 65% equity and 35% bonds. The active return attributable to asset allocation is *closest* to:
 - A. 1.6%.
 - B. 0.9%.
 - C. 2.5%.

3. The return on the SEFCO equity fund is 30%. The benchmark equity index return is 27%. The return on the SEFCO bond fund is 8% whereas that on the fixed income benchmark index is 9%. The strategic asset allocation is given as 60% equities and 40% bonds. The investor's asset allocation is 65% equity and 35% bonds. The active return attributable to security selection is *closest* to:
 - A. 1.6%.
 - B. 0.9%.
 - C. 2.5%.

4. The *most likely* difference between the information ratio and sharp ratio is:
 - A. Sharpe ratio can be measured ex-ante or ex-post but information ratio is only measured ex-post.
 - B. Sharpe ratio uses portfolio standard deviation as a measure of volatility whereas information ratio relies on portfolio beta as a volatility measure.
 - C. Adding cash to a portfolio does not change the Sharpe ratio but changes the information ratio.

5. The CXY opportunity fund is a small-cap equity fund. The fund posted a return of 12% last year. The fund's benchmark, the Cospy 100 Index yielded a return of 10.5% during the same period. The standard deviation of the fund's returns was 4.5% whereas that of the benchmark's return was 3.5%. The standard deviation of the fund's active return is 3% and the risk-free rate is 5%. Based on this information, the fund's Sharpe ratio and information ratio are *closest* to:

Sharpe Ratio	Information Ratio
A. 1.56	0.5
B. 0.33	0.5
C. 1.56	1.5

6. The return and risk data for three funds and their benchmark is given below:

	Benchmark	Fund A	Fund B	Fund C
Average return	15%	17%	21%	11%
Standard deviation	10%	9%	18%	5%
Sharpe ratio	1.10	1.44	0.94	1.40
Information ratio		-0.15	0.09	0.12

Which fund would be *best* to combine with a passively managed portfolio?

- A. Fund A.
B. Fund B.
C. Fund C.
7. Freedom Frontier Fund is an actively managed fund with active risk of 11% and an information ratio of 0.5. Its benchmark has a Sharpe ratio of 0.3 and standard deviation of 8%. The optimal active risk is *closest* to:
A. 13.33%.
B. 13.60%.
C. 14.10%.
8. Manager A invests in 40 securities and has an information coefficient of 0.3 and a transfer coefficient of 0.7. Manager B invests in 60 securities and has an information coefficient of 0.2 and a transfer coefficient of 0.9. Both fund managers are targeting an active risk of 4%. Which of the following statements is *most* likely true?
A. Manager A has a higher active return than Manager B.
B. Manager B has a higher active return than Manager A.
C. Both Manager A and Manager B have the same active return.
9. Three investment managers are being evaluated for managing an equity fund. The managers' expected active returns and active weights for three securities are given below. The risk of these stocks and their actual active returns are also given:

	Manager 1		Manager 2		Manager 3			
	Active wt.	E (R_A)	Active wt.	E (R_A)	Active wt.	E (R_A)	Risk	Realized R_A
Descon Co.	0.05	0.02	0.075	0.04	-0.05	0.02	0.15	0.06
Huda Co.	-0.025	0.01	0.03	0.025	0.05	0.04	0.17	0.02
JJ Co.	0.03	0.04	-0.1	0.01	0.02	0.05	0.13	0.04

Suppose all three managers claim to be good at forecasting returns. According to the full fundamental law of active management, which manager is the best at building portfolios by anticipating future returns?

- A. Manager 1.
B. Manager 2.
C. Manager 3.

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	Manager 1		Manager 2		Manager 3			
	Active wt.	E (R_A)	Active wt.	E (R_A)	Active wt.	E (R_A)	Risk	Realized R_A
Descon Co.	0.05	0.02	0.075	0.04	-0.05	0.02	0.15	0.06
Huda Co.	-0.025	0.01	0.03	0.025	0.05	0.04	0.17	0.02
JJ Co.	0.03	0.04	-0.1	0.01	0.02	0.05	0.13	0.04

Suppose all three managers claim to be efficient in portfolio construction. According to the full fundamental law of active management, which manager is the best at building portfolios to make full use of their ability to correctly anticipate returns?

- A. Manager 1.
B. Manager 2.
C. Manager 3.
11. Which of the following statements is *most likely* true about combining a benchmark portfolio with an active portfolio?
- A. When given a choice, the fund manager with the highest information ratio should be selected to manage the portfolio.
B. When combining an active portfolio with a benchmark portfolio, the optimal level of risk is given as the product of information ratio of the active portfolio and Sharpe ratio of the benchmark portfolio.
C. Selecting the portfolio with the highest Information ratio does not necessarily ensure that the Sharpe ratio would be highest as well.
12. Two active management strategies involving individual stock selection with a benchmark of 50 securities, and industrial sector selection with a benchmark of 12 sectors. The active security returns uncorrelated, and forecasts are independent. The individual stock investor has an information coefficient of 0.06, while the industrial sector investor has an information coefficient of 0.19. The expected information ratio for each strategy, assuming each investor's forecasts can be implemented without constraints is *closest* to:
- A. IR(security selection) = 0.40; IR(industrial sector) = 0.70.
B. IR(security selection) = 0.60; IR(industrial sector) = 0.80.
C. IR(security selection) = 0.80; IR(industrial sector) = 0.30.
13. Which of the following statements about limitations of the fundamental law of active management is *least likely* true?
- A. Active investors assume that they have superior skills compared to other active managers.
B. Calculating the ex-ante information ratio has a drawback that managers tend to underestimate their ability to outperform the market.
C. The asset forecasts over time may not be truly independent.

Set 1 Solutions

- C** is correct. The alpha is calculated as the difference between the fund return and risk adjusted benchmark return: $12.5\% - 1.2(10\%) = 0.5\%$. Section 2.2. LO.a.
- B** is correct. The active weight on equities is $65 - 60 = 5\%$. The active weight on bonds is $35 - 40 = -5\%$. The active return from asset allocation is given as $5\%(27\%) + (-5\%)(9\%) = 0.90\%$. Section 2.3. LO.a.
- A** is correct. The return from security selection is calculated as $(65\%)(30\% - 27\%) + (35\%)(8\% - 9\%) = 1.60\%$. Section 2.3. LO.a.
- C** is correct. Adding cash or leverage to a portfolio does not change the Sharpe ratio but changes the information ratio. Both ratios can be measured ex-ante and ex-post and both use standard deviation as a measure of volatility. Sharpe ratio uses standard deviation of portfolio returns, i.e. total risk, and information ratio employs standard deviation of active return, i.e. active risk. Section 3.2. LO.b.
- A** is correct. The Sharpe ratio is calculated as $\frac{R_p - R_f}{STD_p} = (12 - 5)/4.5 = 1.56$. The information ratio is calculated as $\frac{R_p - R_b}{STD(R_p - R_b)} = \frac{12 - 10.5}{3} = 0.5$. Sections 3.1, 3.2. LO.b.
- C** is correct. Fund C has the highest information ratio therefore combining it with the passively managed portfolio will produce the highest Sharpe ratio. Section 3.3. LO.b.
- A** is correct. The optimal active risk is given as $STD(R_A) = IR \times \frac{STD_B}{SR_B} = 0.5 \times \frac{8\%}{0.3} = 13.33\%$. Section 3.3. LO.b.
- B** is correct. Manager A's $IR = TC \times IC \times \sqrt{B} = 0.7 \times 0.3 \times \sqrt{40} = 1.33$. Manager B's $IR = 0.9 \times 0.2 \times \sqrt{60} = 1.39$. With active risk of 4%, Manager A's active return is $1.33 \times 4\% = 5.3\%$ and Manager B's active return is $1.39 \times 4\% = 5.6\%$. Section 4.3. LO.c.
- A** is correct. The ability of the fund manager to accurately forecast active returns is measured by the information coefficient. The IC is found as the correlation between risk-adjusted active return expectation and risk-adjusted realized active returns:

	Risk weighted forecasts [E (R _A)/σ]			R _A /σ
	Manager 1	Manager 2	Manager 3	Realized
Descon	0.13	0.27	0.13	0.40
Huda	0.06	0.15	0.24	0.12
JJ	0.31	0.08	0.38	0.31
IC	0.461	0.454	(0.248)	

Manager 1 has the highest IC. Section 4.1. LO.c.

10. **B** is correct. The ability of the fund manager to efficiently construct portfolios by using their forecasted active returns is indicated by the transfer coefficient. The TC is measured as the correlation between risk-adjusted forecasted active returns and risk-adjusted actual active weights.

	Risk weighted forecasts [$E(R_A)/\sigma$]			Risk adjusted weights [Act. wt. $\times \sigma$]		
	Manager 1	Manager 2	Manager 3	Manager 1	Manager 2	Manager 3
Descon	0.13	0.27	0.13	0.0075	0.0113	(0.0075)
Huda	0.06	0.15	0.24	(0.0043)	0.0051	0.0085
JJ	0.31	0.08	0.38	0.0039	(0.0130)	0.0026
TC	0.476	0.910	0.569			

Manager 2 has the highest TC. Section 4.3. LO.c.

11. **A** is correct. When comparing different fund managers the one with the highest information ratio should be selected. Section 3.3. LO.d.
12. **A** is correct. IR of the unconstrained security selection strategy = $IR = 0.06 \times \sqrt{50} = 0.42$; IR of the industrial sector selection strategy = $IR = 0.19 \times \sqrt{12} = 0.658$. Section 5. LO.e.
13. **B** is correct. Managers tend to overestimate their ability to outperform the market hence over estimate their ICs. Section 6. LO.f.

Set 2 Questions

The following information relates to questions 1 - 3.

Diana Yeatz, is the chief financial officer of the Eckart Foundation, which finances college education by providing grants and loans to students determined on the basis of merit and need. Eckart has \$1.4 billion in assets managed by external portfolio managers. Yeatz and Ali Nathani, senior analyst at Eckart, are conducting the department's quarterly review process of evaluating active portfolio managers.

Nathani collects the following information for Eckart's balanced funds, presented in Exhibit 1 and Exhibit 2.

Exhibit 1. Selected Fund Statistics

	One-Year Returns		Weights		One-Year Total Return
	Equity	Bond	Equity	Bond	
Fund A	15.0%	7.0%	69%	31%	12.52%
Fund B	11.0%	6.8%	66%	34%	9.57%
Benchmark	12.0%	7.0%	60%	40%	10.00%

Exhibit 2. Selected Fund Statistics

	Fund A	Fund B	Benchmark
Five-year annualized return	13.5%	12.8%	10.25%
Standard deviation	14.4%	10.4%	9.60%
Active return	3.25%	2.55%	
Active risk	7.00%	2.12%	
Risk-free rate	5.5%		

Yeatz reviews the fund information, and then asks Nathani to evaluate the managers. The fund managers have the following characteristics:

Manager 1: A fund made of stocks of companies from the major developed markets. Its benchmark is the S&P Global BMI.

Manager 2: A fund with a total return objective of exceeding the return of the S&P Global BMI. The fund can allocate up to 25% to cash.

Manager 3: A fund that holds developed countries' sovereign bonds. Its benchmark is the S&P Global Developed Sovereign Bond Index.

- Based on Exhibit 1, the performance attribution *most likely* shows that:
 - Fund A overperformed through security selection and asset allocation.
 - Fund B underperformed through asset allocation.
 - Fund A and Fund B added value through security selection.
- Based on the information ratio calculated using Exhibit 2, which of the following statements is *most likely* correct?
 - The manager of Fund B achieved the highest risk-adjusted returns.
 - The manager of Fund A achieved the highest risk-adjusted returns.

- C. The managers of both the funds achieved the same return per unit of risk.
3. Nathani is *least likely* to use the Sharpe ratio to evaluate the portfolio returns of:
- Manager 1.
 - Manager 2.
 - Manager 3.

The following information relates to questions 4 – 6.

Ling Mei, is the chief investment officer at Drexel Corp. responsible for the company's employees' pension fund. She is interviewing Karl Seyfried for the post of an analyst. Mei wants to determine whether Seyfried is familiar with the portfolio construction and management process. Mei asks Seyfried about the fundamental law of active management. Seyfried responds, "According to the fundamental law, the expected active return, is the product of four key parameters: the transfer coefficient (TC), the information coefficient (IC), breadth, and portfolio active risk. Managers with better ability to forecast returns or higher IC will add more value over time. The transfer coefficient is low when there are constraints over portfolio construction, and breadth is lower for positively correlated securities."

Mei shares the following information (Exhibit 1) with Seyfried and asks him to evaluate the portfolio managers.

Exhibit 1. Portfolio Manager Comparison

Manager A	Manager B
Based on monthly forecasts of commodity prices and interest rates, the manager allocates weights between a short-term US treasury bond fund and a commodity exchange-traded fund (ETF). The benchmark portfolio is 50% commodity and 50% US T-bond.	Based on internal forecasts, the manager may allocate weights to 20 developed countries using country-specific ETFs with quarterly rebalancing.

Seyfried makes the following notes:

- Manager A would improve its information ratio by rebalancing more frequently.
- Manager B has a lower breadth than specified because of the likelihood of positive correlation of country returns.
- Because both managers have constrained portfolios, therefore information coefficients will generally increase with aggressiveness of the strategy.

Mei questions Seyfried about practical limitations of the Fundamental Law of Active Management. Seyfried answers as follows:

- There is a lack of independence in investment decisions. For example, almost all bonds have some form of credit risk and duration risk, therefore returns are highly correlated in subtle ways.
- When forecasts are not independent or derivatives are used breadth is not equal to the number of individual assets.

- 3: Most investors overestimate their forecasting skills and thus overstate the information ratio.”
4. Is Seyfried *correct* in his interpretation of the fundamental law?
- No, incorrect regarding lower TC of a constrained portfolio.
 - No, incorrect regarding the four parameters of the fundamental law.
 - Yes.
5. Based on Exhibit 1 and the fundamental law of active management, which of the notes of Seyfried is *most likely* correct?
- I.
 - II.
 - III.
6. Is Seyfried *most likely* correct about the limitations of the fundamental law?
- Yes.
 - No, incorrect about high correlation in fixed-income returns due to credit risk and duration risk.
 - No, incorrect about breadth being not equal to the number of individual assets.

The following information relates to questions 7 – 9.

Karlene Burnell is the new chief investment officer at Prost & Ingsol Foundation which finances secondary school education. The foundation has €1 billion in assets managed by outside portfolio managers. Burnell is responsible for selecting and evaluating portfolio managers.

Burnell is meeting with Ray Peterson, a newly hired member of her team, to gauge his knowledge regarding manager selection and evaluation. She starts by asking, "How is value added to a portfolio?" Peterson responds by making the following statements:

- “Value is added when the portfolio return is greater than the benchmark return.
- Positive value is added when securities with returns greater than the benchmark are overweighted and those with lower than benchmark returns are underweighted.
- Value added can be from asset allocation and security selection.”

Burnell then asks Peterson to review the information for Brye Investment Consultants and include the information ratio.

Exhibit 1: Brye Investment Consultants Selected Data

Fund average annual return (%)	15.58	Benchmark standard deviation (%)	8.03
Fund standard deviation (%)	8.9	Sharpe ratio	1.41
Benchmark average annual return (%)	15.25	Active risk	1.38

Burnell comments, “The information ratio helps assess the active performance of a manager for incurring the level of active risk and is useful in selecting managers.” She asks Peterson about his understanding of the information ratio. Peterson remarks:

- I. For any given asset class, the manager with the highest expected skill as measured by the information ratio should be chosen.
- II. The information ratio of a portfolio without constraints is unaffected if the active weights deviate from the benchmark weights.
- III. The information ratio of a combined portfolio will be unaffected if cash is added or leverage is used.

7. Is Peterson *correct* in his statements about “value added” ?
- A. Yes.
 - B. No, incorrect with respect to value added from asset allocation and security selection.
 - C. No, incorrect with respect to overweighting/underweighting of securities relative to benchmark.
8. Based on the data given in Exhibit 1, the information ratio is *closest* to:
- A. 0.38.
 - B. 0.24.
 - C. 0.04.
9. Regarding his remarks about the information ratio, Peterson is *least likely* correct with respect to:
- A. I.
 - B. II.
 - C. III.

The following information relates to questions 10 - 12.

Bill White, senior investment officer at Black Stone Investments is conducting a training session of the new analysts hired by the firm. He asks one of the participants, Craig David, to explain the difference between the Sharpe ratio and the information ratio as both are useful tools in evaluating portfolio managers.

David states, "The information ratio provides benchmark relative expected or realized reward-to-risk measure, whereas the Sharpe ratio gives an absolute expected or realized reward-to-risk measure. Sharpe ratios helps understand the value added by the portfolio return in excess of the benchmark return for assuming the risk of the portfolio. Although the Sharpe ratio is not affected by the addition of cash or leverage, the information ratio typically shrinks with the addition of either."

White then explains the Fundamental Law of Active Management to her analysts and asks them if they could interpret the correlation triangle. One of the analysts, Ariana Miller notes, "A manager adds value if his forecasts correspond at least somewhat loosely to the realized active returns. Further, if the portfolio manager is able to translate his forecasts of the best relative returns into active weights, he will be able to achieve positive relative returns."

Finally, White gives an example of the application of the Fundamental Law of Active Management by evaluating the performance of Shenzua Investment Management Company.

White states, "Shenzua may be overstating its expected active return, because it rebalances frequently, and alleges that its number of independent decisions is high. Some of Shenzua's funds are invested in economic regions where the same general analysis applies to all securities within that region. That would mean that breadth is lower than stated. Furthermore, Shenzua follows investment strategies for security selection that are not changed for several months. It does not evaluate each security independently, therefore, the investment decisions are not independent. This would again result in a lower breadth."

10. In his statements regarding the Sharpe ratio and the information ratio, David is *least likely* correct with respect to:
- A. absolute value versus relative value.
 - B. Sharpe ratio and portfolio return.
 - C. The effect of cash or leverage.
11. Is Miller *correct* in her interpretation of the fundamental law?
- A. Yes.
 - B. No, incorrect with respect to translation of forecasted returns into active weights.
 - C. No, incorrect with respect to value added through forecasted returns corresponding to realized returns.
12. Is White *correct* in his assessment of Shenzua overstating its expected active return?
- A. No, incorrect regarding the impact of investment decisions.
 - B. Yes.
 - C. No, incorrect regarding lower breadth for securities within the same region.

Set 2 Solutions

1. A is correct. Positive value added is generated by overweighting securities that have returns greater than the benchmark and underweighting securities that have returns less than the benchmark. Performance attribution systems can decompose the value added into *multiple* sources. The most common decomposition is between value added due to asset allocation and value added due to security selection. Fund A overweighted the equity class (66% versus 60%) which performed better than the bond class, and the equity portion of Fund A outperformed the equity benchmark (15.0% versus 7.0%). Section 2. LO.a.
2. A is correct. The information ratio of an actively managed portfolio, IR, is calculated by dividing the active return by active risk: $IR = \frac{R_P - R_B}{STD(R_P - R_B)}$
 $IR_{Fund A} = \frac{(13.5 - 10.25)}{7} = 0.46$. $IR_{Fund B} = \frac{(12.8 - 10.25)}{2.12} = 1.20$. The IRs indicate that the manager for Fund B achieved the highest returns per unit of risk or the highest risk-adjusted returns. Section 3.2. LO.b.
3. B is correct. The Sharpe ratio is unaffected by the addition of cash or leverage in a portfolio. Therefore, it would not be appropriate to use Sharpe ratio to evaluate a portfolio where allocation to cash is a key investment decision. Section 3.1. LO.a.
4. C is correct. Seyfried is correct in his response about the fundamental law. The law states that the expected active return, $E(R_A)$, is the product of four key parameters: the transfer coefficient, TC; the assumed information coefficient, IC; the square root of breadth, BR; and portfolio active risk. Investors with higher IC will add more value over time. TC is lower for constrained portfolios. Sections 4.1.- 4.3. LO.c.
5. B is correct. BR is lower than the number of securities if their returns are positively correlated. Although increasing the rebalancing frequency may increase the information ratio, it will do so if the sequential active management decisions remain independent. An unconstrained IR is invariant to the level of active risk, however the IR for a *constrained* portfolio generally decreases with the aggressiveness of the strategy. Section 5. LO.f.
6. A is correct. Seyfried correctly states the limitations of the fundamental law. Section 6. LO.f.
7. A is correct. Peterson correctly explains value added. Value added or “active return” of an actively managed portfolio is calculated by the difference between the return on that portfolio and the return on the benchmark portfolio. Positive value added is by overweighting the portfolio with securities that have returns greater than the benchmark and underweighting securities that have returns less than the benchmark. Value added can be from asset allocation and security selection. Section 2.2-2.3. LO.a.
8. B is correct. The information ratio is calculated by dividing the active return (R_A) by the active risk. The active risk is the standard deviation of the difference between portfolio return and the benchmark return $STD(R_P - R_B)$. $IR = \frac{R_A}{STD(R_P - R_B)}$.

$$IR = \frac{(15.58 - 15.25)}{1.38} = 0.239. \text{ Section 3.2. LO.b.}$$

9. C is correct. Unlike the Sharpe ratio, the information ratio is affected by the addition of cash or the use of leverage. The information ratio for such a combined portfolio will generally be lower. However, the information ratio of an unconstrained portfolio is unaffected by the aggressiveness of active weights. A and B are correct statements. Section 3.2-3.3. LO.d.
10. B is correct. The Sharpe ratio is a measure based on the portfolio return in excess of a riskless rate with the volatility of the portfolio return. The ratio provides a measure of how much the investor is receiving in excess of a riskless rate for assuming the portfolio risk. Sections 3.1-3.2. LO.b.
11. A is correct. Both statements are correct. A manager adds value if his forecasts of active returns correspond at least loosely to the realized active returns (information coefficient). Furthermore, the manager must translate into active weight the securities for which he has forecasted the best relative returns to generate positive relative returns (transfer coefficient). Section 4.1. LO.c.
12. B is correct. Expected active return = $(IC)\sqrt{BR} \times (\text{Active risk})$. If the investment decisions are not independent, or if individual securities are impacted by assumptions or strategies that remain the same through multiple rebalancing periods, then breadth will be lower reducing the information ratio and thus the expected return. Section 6.2. LO.e.