

Set 1 Questions

1. The price of which commodity *least likely* reflects the demand for industrial production activity?
 - A. Platinum.
 - B. Copper.
 - C. Coffee.
2. The quality of which of the following commodity sectors is *most likely* affected by storage?
 - A. Softs.
 - B. Industrial metals.
 - C. Grains.
3. Which of the following statements is *most accurate*?
 - A. The timing to maturity in livestock decreases with size.
 - B. Farmers and consumers trade grain futures with the delivery months matching the different growing cycle times of grains.
 - C. Ranchers trade cattle futures to hedge against meat commitments from live cattle but not young cattle.
4. Which of the following *best* describes the life cycle for crude oil and gasoline?
 - A. Straight-through production to consumption.
 - B. Input-output production life cycle.
 - C. Seasonal production.
5. Valuation of commodities depends upon the fact that stocks and bonds are financial assets whereas commodities are:
 - A. physical assets.
 - B. contingent claims.
 - C. derivative contracts with infinite time horizon.
6. Valuation of commodities *most likely* requires:
 - A. discounting future cash flows.
 - B. discounting of future prices where future prices are susceptible to supply and demand and expected price volatility of the commodities.
 - C. a thorough fundamental analysis.
7. One of the differences in valuation of commodities as opposed to financial assets is that commodities:
 - A. incur transportation and storage costs.
 - B. provide periodic income.
 - C. generate future cash flows.
8. Which of the following statements regarding participants of the commodity futures markets is *correct*?
 - A. Hedgers speculate on market direction and volatility.

- B. Exchanges often provide insurance to hedgers.
 - C. Traders and investors provide liquidity and price discovery for futures markets.
9. The difference between spot and futures prices is known as:
- A. basis.
 - B. calendar spread.
 - C. net futures price.
10. When the near-term futures contract price is *higher* than the longer-term futures contract price for the same commodity, the calendar spread is:
- A. positive and commodity futures markets are in backwardation.
 - B. negative and commodity futures market are in contango.
 - C. positive and the futures markets are in contango.
11. Which of the following statements is *least* accurate?
- A. Physical-settled commodity futures contracts require that the title of the commodity be transferred to the buyer.
 - B. Cash-settled commodity futures contracts ensure a convergence of the futures and spot market.
 - C. As opposed to commodity spot prices, futures prices can be global, standardized and act as a reference price for forward contracts.
12. Which of the following statements is *least* accurate? According to the Insurance Theory:
- A. producers sell their commodities in the futures markets to hedge sales prices, making their revenues more certain.
 - B. the futures curve is in backwardation “normally” because the producers constantly sell forward to lock in prices, resulting in lower prices in future.
 - C. the spot price is higher than the futures price because the producers take on the price risk.
13. In which situation is the Hedging Pressure Hypothesis similar to the Insurance Theory?
- A. When commodity producers selling forward exceed commodity consumers needed to complete the market resulting in the futures price curve in backwardation.
 - B. When price protection demanded by commodity producers equal the needs of the commodity consumers, and the hedging needs of the buyer offset those of the seller.
 - C. When there is an imbalance in the demand for price insurance where the buyers exceed the sellers causing the futures markets to be in contango.
14. Under the Theory of Storage, what is the relationship between convenience yield and the level of inventory?
- A. The level of inventory does not impact convenience yield.
 - B. As inventory becomes more abundant, convenience yield rises.
 - C. As inventory becomes scarce, convenience yield rises.
15. The total return on a fully collateralized commodity futures contract is given as the:
- A. spot price return plus the roll return plus the collateral return.

- B. spot price return minus the annualized spot return standard deviation plus the collateral return.
 - C. collateral return minus the roll return.
16. An investor has \$120 of exposure in soybean futures. The near contract is worth \$10, but the far contract is worth \$11. To keep the post-roll exposure close to the pre-roll exposure, he will *most likely* conduct the following transactions:
- A. buy 12 near contracts and sell 11 far contracts.
 - B. sell 12 near contracts and buy 11 far contracts.
 - C. buy 12 near contracts and buy 12 far contracts.
17. An investor earns a 3.1% price return on a commodity futures contract position and a 2.9% roll return after holding this position for one year. The required initial collateral was 20% of the position at a risk-free rate of 3% per year. Her total annualized return excluding leverage was:
- A. 3.60%.
 - B. 6.00%.
 - C. 6.60%.
18. Roll return is positive when futures markets are in:
- A. backwardation.
 - B. contango.
 - C. either backwardation or contango.
19. Long-only commodity portfolio strategies that involve overweighing of agriculture, livestock, precious metals and softs may expect to earn:
- A. positive roll return.
 - B. negative roll return.
 - C. flat roll return.
20. An oil refining company treasurer goes long a swap for a certain quality of Brent crude with a reference price of \$90 per barrel. According to the swap terms the company treasurer will pay the swap dealer a premium of \$15 for transferring risk to the dealer. At the end of every month the company will receive a payment if Brent crude is above the strike price of \$90. This is an example of a(n):
- A. total return swap.
 - B. excess return swap.
 - C. basis swap.
21. A portfolio manager of a large pension plan is seeking 4% of exposure of plan assets amounting to \$90 million to commodities index S&P GSCI for a period of three years. Consequently, he enters into a swap contract with a global bank. According to the swap terms, the payments received (net of fee paid) or made (plus fee charged) by the swap buyer to the bank will be based on the change in the index level over consecutive valuation dates multiplied by the notional amount of \$90 million. This type of swap is *best* known as a(n):
- A. total return swap.

- B. excess return swap.
 - C. basis swap.
22. In a trending market, production-weighted S&P GSCI will have an opportunity to outperform fixed-weight scheme indexes such as TR/CC CRB and RICI due to:
- A. higher rebalancing costs
 - B. frequent rebalancing.
 - C. lower rebalancing costs.

Set 1 Solutions

1. C is correct. The price of industrial (base) metals, specifically copper indicates the direction of industrial production. Industrial demand for silver, platinum, and palladium make up about 50% demand for these precious metals. Demand for softs, such as coffee is linked to global wealth. Section 2.1. LO.a.
2. A is correct. Storability affects the quality and weight of softs (cash crops). Most industrial metals can be stored for long periods therefore the quality is unlikely to be affected by weather. Grains are grown in specific seasons and are stored till the next season, hence not expected to cause a significant harm to quality. Section 2.1. LO.a.
3. B is correct. Grain futures have contract delivery maturities that match their growing cycle. A is incorrect because timing to maturity is dependent upon the animal size, as size increases so does maturity of the livestock. C is incorrect because ranchers can hedge both young cattle and live cattle. Section 2.2. LO.b.
4. B is correct. Crude oil is extracted which is used as an input for producing refined products such as gasoline and heating oil. Hence crude oil undergoes various processing steps depending upon its quality and the demand for the various refined products. A & C are incorrect. Natural gas has a life cycle characteristic which is straight-through consumption. Grains have seasonal production. Section 2.2. LO.b.
5. A is correct. Commodities are physical assets whereas stock and bonds represent financial assets. Section 2.3. LO.c.
6. B is correct. Valuation of commodities is not based on forecasting future cash flows as the case is in financial assets but is based on forecasting the supply, demand and volatility of the physical item. Commodities also require valuation by technical analysis rather than fundamental analysis. Section 2.3. LO.c.
7. A is correct. Commodities do not generate future cash flows or provide regular income. But they incur transportation and storage costs which are an important consideration while determining their future price. Section 2.3. LO.c.
8. C is correct. Traders and investors bet on market direction or volatility. They provide liquidity and price discovery. Exchanges are responsible for establishing trading rules and infrastructure, and analysts develop products based on the information communicated by exchanges. Section 3.1. LO.d.
9. A is correct. The difference between spot price and futures price is called basis. The price difference between the near-term futures price and the longer-term futures price is known as the calendar spread. Section 3.2. LO.e.
10. A is correct. When near-term futures contract price is higher than the longer-term futures price, the calendar spread associated with the futures market is positive and the markets are

in backwardation. If the near-term futures contract price is less than the longer-term futures contract price for the same commodity, then the futures market for that commodity is in contango. Section 3.2. LO.e.

11. B is correct. Physical delivery ensures a convergence of the futures and spot market which may not take place in cash-settled futures contracts. A & C are correct statements. Section 3.2. LO.e.
12. C is correct. According to the Insurance Theory, the futures price is lower than the spot price to induce the buyer (speculator) who takes on the price risk in exchange for the insurance he provides to the commodity seller (producer). A & B are true according to the Insurance Theory. Section 3.3.1. LO.f.
13. A is correct. According to the Hedging Pressure Hypothesis, hedging pressure occurs when both producers and consumers enter into price hedges to protect themselves from market price volatility. If commodity producers exceed the commodity consumers, then the imbalance in demand for price protection will cause the futures prices to be lower to provide for sufficient discount for the speculators who will take on the price risk. The futures price curve will represent backwardation and the situation will be similar to Keynes' Insurance Theory. Section 3.3.1. LO.f.
14. B is correct. Convenience yield is low when inventories are abundant but rises when stock diminishes due to demand exceeding supply raising concerns about the future availability of the commodity. Section 3.3.1.3. LO.f.
15. A is correct. The total return on commodity futures contract are the price return plus the roll return plus the collateral return. Section 3.3.2. LO.g.
16. B is correct. The investor original has $\$120/\$10 = 12$ contracts, but the far contract is worth \$11 of exposure. Therefore, for the investor to roll forward his contracts and maintain a constant level of exposure, he needs to sell 12 near contracts and buy 11 far contracts. Section 3.3.2. LO.g.
17. C is correct. Total return = Price return + Roll return + Collateral return
The investor holds the contracts for one year, so the price return of 3.1% and the roll return of 2.9% are annualized figures. The collateral return = $3\% \text{ per year} \times 20\% \text{ initial collateral investment} = 0.6\%$. Total return (annualized) = $3.1\% + 2.9\% + 0.6\% = 6.60\%$. Section 3.3.2. LO.g.
18. A is correct. Positive roll return is associated with periods of backwardation. Section 3.3.2. LO.h.
19. B is correct. "Indexes and long-only strategies that overweight agriculture, livestock, precious metals, and softs should expect to see negative roll returns (or roll yields). Energy commodities (apart from natural gas) have the opportunity for more positive roll return." Exhibit 14. Section 3.3.3. LO.h.

20. B is correct. This type of swap is known as an excess return swap. In a total return swap either party might receive payment. In a basis swap, payments are based on the difference between two related but not perfectly correlated reference prices of commodities. Section 4. LO.i.
21. A is correct. The total return swap in commodities involves a party receiving payments based on the change in the level of an index level over two consecutive valuation dates multiplied by the notional amount of the swap. Section 4. LO.i.
22. C is correct. S&P GSCI will most likely outperform TR/CC CRB and RICI due to lower rebalancing costs. This is because the higher (lower) futures prices usually coincide with higher (lower) physical prices. TR/CC CRB and RICI have a fixed-weighting scheme and will incur higher costs due to frequent rebalancing in a trending market. Section 5.6. LO.j.

Set 2 Questions

The following information relates to questions 1 – 3.

Sia Xander, a commodity analyst at BGB Commodity Fund Managers, is asked to research energy prices. She reviews the spot and future prices of West Texas Intermediate crude oil on the close of 31 May 2017 presented in Exhibit 1.

Exhibit 1: Spot and Future Prices WTI Crude Oil as of 31 May 2017

	<i>Price per barrel</i>
Spot price	\$51.11
NOV-2017	\$51.64
FEB-2018	\$51.79
MAY-2018	\$51.90

Xander knows that as sanctions are lifted from Iran, the world crude oil production is expected to increase, and likely add to the current surplus of 2 million barrels.

Xander's next assignment is to examine the industrial metals for investment by one of BGB's funds. She makes the following notes shown in Exhibit 2.

Exhibit 2: Investment Characteristics of Industrial (Base) Metals

Factors that affect industrial product prices	<ul style="list-style-type: none"> • GDP growth • Politics • Environmental pollution concerns
Product life cycle	<ul style="list-style-type: none"> • Flexible can be stored for longer time periods • Difficult to cut back production when supply exceeds demand • Time lag involved between planning capacity expansion and beginning production
Valuation	<ul style="list-style-type: none"> • Valuation is impacted by storage and transportation costs • Valuation is based on discounted cash flows

- Based on Exhibit 1, the futures market for WTI crude oil is *most likely*:
 - in backwardation.
 - in contango.
 - flat.
- Regarding the world crude oil production, the convenience yield for crude oil will *most likely*:
 - decrease.
 - increase.
 - remain unchanged.
- Based on Exhibit 2, which of Xander's notes about the investment/valuation characteristics of industrial metals is *least* appropriate?
 - Demand dependent upon GDP growth, politics, and pollution concerns.

- B. Product life cycle flexible and production cut backs difficult.
- C. Valuation based upon future cash flows.

The following information relates to questions 4 – 6.

Sam Brown, fund manager at DLN Investments, a firm specializing in commodity trading, is evaluating the performance of one of its funds. Brown compares the fund's sectors' returns with the return components of the S&P Goldman Sachs Commodities Index (GSCI). Brown finds that for the energy subindex of S&P GSCI (from 1982 – 2014), the spot return is 7.2%, the roll return is 2.55% and the collateral return is 5.26%.

While examining the roll return of various S&P GSCI subindexes, Brown makes the following observations:

- I. Roll return of energy subindex is positive when futures contract prices are in backwardation.
- II. Roll return on the livestock subindex is negative when spot livestock prices have been higher than future prices.
- III. Roll return is sector dependent therefore sector diversification will significantly impact an investor's overall roll return of a diversified commodity futures portfolio.

Brown discusses commodity sectors' returns with his colleague Mira Jones. Jones comments that the commodity futures returns are based on three theories. Brown agrees and makes the following statements:

- I. "The insurance theory proposes that the producer hedges his sales price risk by using commodity futures market to lock in prices hence the futures price curve is typically in backwardation."
- II. The hedging pressure perspective assumes a flat commodity curve if the two forces of sellers and buyers seeking price protection are equal.
- III. Finally, the theory of storage focuses on a direct relationship between the level of inventories and the convenience yield."

- 4. The excess return of the energy subindex of S&P GSCI, is *closest* to:
 - A. 15.01%.
 - B. 9.75%.
 - C. 12.46%.
- 5. Which of Brown's observations regarding roll return is *least likely* correct?
 - A. I.
 - B. II.
 - C. III.
- 6. Which of Brown's descriptions of the futures return theories is *least likely* correct?
 - A. The description of the insurance theory.
 - B. The description of the hedging pressure hypothesis.
 - C. The description of the theory of storage.

The following information relates to questions 7 – 9.

Keira White, a portfolio manager for an insurance company, has been given the mandate to add commodities to the company's current investment mix of stocks and bonds. White considers two funds, the CGT Commodity Fund and the VX Fund. The CGT Fund has access to storage facilities and capitalizes on mispricing between the spot and futures prices of commodities. The VX Fund tries to outperform by trading when the pricing is right, it attempts to benefit from an information advantage. It acts as an insurance provider in return for an expected profit. White chooses the CGT Commodity Fund and its asset allocations are given in Exhibit 1.

Exhibit 1: CGT Commodity Fund's Investment Mix

<i>Commodity Sector</i>	<i>Allocation (%)</i>
Energy	36%
Grains	31%
Industrial Metals	33%

7. The CGT Fund is *most likely* described as:
 - A. a hedger.
 - B. an arbitrageur.
 - C. a speculator.
8. The VX Fund is *most likely* characterized as:
 - A. an arbitrageur.
 - B. a speculator.
 - C. a hedger.
9. The factor that *most likely* affect the supply and demand of all sectors of the CGT Fund is:
 - A. weather.
 - B. disease.
 - C. politics.

The following information relates to questions 10 - 13.

Priya Patel, a commodity trader at a global investment firm, is reviewing the futures prices of the following commodities shown in Exhibit 1.

Exhibit 1: Selected Commodity Futures Prices

<i>Month</i>	<i>Copper price US cent/pound</i>	<i>Cotton price US cent/pound</i>	<i>Gasoline Price USD/gallon</i>
July	2.5645	0.7716	1.6107
September	2.5775	0.7449	1.5884
December	2.5950	0.7322	1.4350

Patel is informed by Arun Roshan, an analyst at the firm, that according to a recent report, cotton future prices will stay lower as the producers because of a bumper harvest continue to lock in their prices to make their revenues more predictable.

Next, Patel calculates the total return of a trade executed by the firm involving a fully collateralized long futures position in a nearer to expiration soybean futures contract at the quoted futures price of 939.2 (US cents/bushel). Three months later the entire position was rolled forward when the near-term price was 941.4 and the farther-term futures price was 945.6. The collateral earned a 0.50% annualized rate during the three-month period between the time that the initial long position was taken and the rolling of the contract.

10. Which futures market is *most likely* in contango?
 - A. Copper.
 - B. Cotton.
 - C. Gasoline.
11. Based on Exhibit 1, which commodity's roll return will *most likely* be negative?
 - A. Gasoline.
 - B. Copper.
 - C. Cotton.
12. Based on the conclusion of a report on cotton, the shape of the cotton futures curve in Exhibit 1 is *best* described by the:
 - A. insurance theory.
 - B. theory of storage.
 - C. hedging pressure hypothesis.
13. The three-month total return on the soybean futures trade is *closest* to:
 - A. 0.23%.
 - B. 0.81%.
 - C. -0.10%

Set 2 Solutions

1. B is correct. When the spot price is less than the futures price, the situation is called contango. In the futures market “when the near-term futures contract price is lower than the longer-term futures contract price, the futures market for the commodity is in contango.” The near-term futures contract price of WTI crude oil is lower than the longer-term futures price, hence the market is in contango. Section 3.2. LO.e.
2. A is correct. Convenience yield is the benefit derived from physically holding a commodity instead of going long in the respective futures contract. An increase in expected supply of the commodity will lower the convenience yield. Section 3.3.1.3. LO.f.
3. C is correct. Commodities do not generate cash flows. Hence unlike traditional asset classes like stocks and bonds, valuation of commodities is not based upon future cash flows but on discounted future prices. A & B are correct statements. Section 2.3. LO.c.
4. B is correct. The excess return = Spot return + roll return = 7.2% + 2.55% = 9.75%. (Excess over Government T-bills, the collateral) Section 3.3.2. LO.g.
5. B is correct. When future prices are lower than spot prices, the market is in backwardation. Roll return is positive for futures market in backwardation. Section 3.3.3. LO.h.
6. C is correct. The Theory of Storage gives the futures price as:
Futures price = Spot price of the physical commodity + Direct storage costs (such as rent and insurance) – Convenience yield. The convenience yield is inversely related to inventories. If inventories are abundant, convenience yield is low and vice versa. A & B are correct descriptions. Section 3.3.1. LO.f.
7. B is correct. Commodity arbitrage involves an ability to inventory physical commodities and to seek mispricing between the commodity spot and the futures price. A is incorrect because hedgers trade in the market to hedge their exposures related to the commodity. C is incorrect because speculators “seek to outperform the hedger by buying or selling futures contracts in conjunction with—or opposite from—the hedger.” Section 3.1.2. LO.d.
8. B is correct. Speculators seek to outperform the other participants by stepping in when the pricing is right and provide insurance to hedgers in return for an expected profit. Section 3.1.2. LO.d.
9. C is correct. Politics affect the demand/supply of all three sectors - energy, grains and industrial metals. Section 2.1. LO.a. Industrial metals are not impacted by weather. Disease will impact only the grain sector.
10. A is correct. When the near-term futures contract price is lower than the longer-term futures contract price, the futures markets are in a state of contango. Copper is the only one in Exhibit 1 which has a near-term futures price lower than the farther term futures contract price, therefore the copper futures market is in contango. Section 3.2. LO.e.

11. B is correct. Roll returns are generally negative when the futures market is in contango. Because the copper futures market is in contango, its roll return will most likely be negative. Section 3.3.3. LO.h.
12. A is correct. The shape of the futures price curve according to the insurance theory is normally in backwardation as the case is in the cotton futures market. “Keynes, in his 1930 tome *A Treatise on Money*, proposed that producers use commodity futures markets for insurance by locking in prices and thus make their revenues more predictable. A commodity producer is long the physical good and thus would be motivated to sell the commodity for future delivery to hedge its price.” Section 3.3.1. LO.f.
13. C is correct. Total return = price return + roll return + collateral return.
 Price return = $\frac{\text{current price} - \text{previous price}}{\text{previous price}} = \frac{941.4 - 939.2}{939.2} = 0.00234 = 0.23\%$.
 Roll return = 100% position rolled = $\left[\frac{941.4 - 945.6}{941.4} \right] \times 100\% = -0.446\%$.
 Collateral return = $\left[\frac{3}{12} \right] \times 0.50\% = 0.125\%$.
 Total return = $0.23\% - 0.45\% + 0.125\% = -0.095\%$. Section 3.3.2. LO.g.