PRACTICE PROBLEMS

1 A derivative is *best* described as a financial instrument that derives its performance by:
   A passing through the returns of the underlying.
   B replicating the performance of the underlying.
   C transforming the performance of the underlying.

2 Derivatives are similar to insurance in that both:
   A have an indefinite life span.
   B allow for the transfer of risk from one party to another.
   C allow for the transformation of the underlying risk itself.

3 A beneficial opportunity created by the derivatives market is the ability to:
   A adjust risk exposures to desired levels.
   B generate returns proportional to movements in the underlying.
   C simultaneously take long positions in multiple highly liquid fixed-income securities.

4 Compared with exchange-traded derivatives, over-the-counter derivatives would *most likely* be described as:
   A standardized.
   B less transparent.
   C more transparent.

5 Exchange-traded derivatives are:
   A largely unregulated.
   B traded through an informal network.
   C guaranteed by a clearinghouse against default.

6 The clearing and settlement process of an exchange-traded derivatives market:
   A provides a credit guarantee.
   B provides transparency and flexibility.
   C takes longer than that of most securities exchanges.

7 Which of the following statements *best* portrays the full implementation of post-financial-crisis regulations in the OTC derivatives market?
   A Transactions are no longer private.
   B Most transactions need to be reported to regulators.
   C All transactions must be cleared through central clearing agencies.

8 A characteristic of forward commitments is that they:
   A provide linear payoffs.
   B do not depend on the outcome or payoff of an underlying asset.
   C provide one party the right to engage in future transactions on terms agreed on in advance.

9 In contrast to contingent claims, forward contracts:
   A have their prices chosen by the participants.
   B could end in default by either party.

C can be exercised by physical or cash delivery.

10 Which of the following statements *best* describes the payoff from a forward contract?

A The buyer has more to gain going long than the seller has to lose going short.

B The buyer profits if the price of the underlying at expiration exceeds the forward price.

C The gains from owning the underlying versus owning the forward contract are equivalent.

11 Which of the following statements regarding the settlement of forward contracts is correct?

A Contract settlement by cash has different economic effects from those of a settlement by delivery.

B Non-deliverable forwards and contracts for differences have distinct settlement procedures.

C At cash settlement, when the long party acquires the asset in the market, it effectively pays the forward price.

12 A futures contract is *best* described as a contract that is:

A standardized.

B subject to credit risk.

C marked to market throughout the trading day.

13 Which of the following statements explains a characteristic of futures price limits? Price limits:

A help the clearinghouse manage its credit exposure.

B can typically be expanded intra-day by willing traders.

C establish a band around the final trade of the previous day.

14 Which of the following statements describes an aspect of margin accounts for futures?

A The maintenance margin is always less than the initial margin.

B The initial margin required is typically at least 10% of the futures price.

C A margin call requires a deposit sufficient to raise the account balance to the maintenance margin.

15 Which of the following factors is shared by forwards and futures contracts?

A Timing of profits

B Flexible settlement arrangements

C Nearly equivalent profits by expiration

16 Which of the following derivatives is classified as a contingent claim?

A Futures contracts

B Interest rate swaps

C Credit default swaps

17 In contrast to contingent claims, forward commitments provide the:

A right to buy or sell the underlying asset in the future.

B obligation to buy or sell the underlying asset in the future.

C promise to provide credit protection in the event of default.

18 Which of the following derivatives provide payoffs that are non-linearly related to the payoffs of the underlying?

A Options
B Forwards
C Interest-rate swaps

19 An interest rate swap is a derivative contract in which:
A two parties agree to exchange a series of cash flows.
B the credit seller provides protection to the credit buyer.
C the buyer has the right to purchase the underlying from the seller.

20 Forward commitments subject to default are:
A forwards and futures.
B futures and interest rate swaps.
C interest rate swaps and forwards.

21 A swap is:
A more like a forward than a futures contract.
B subject to simultaneous default by both parties.
C based on an exchange of two series of fixed cash flows.

22 A plain vanilla interest rate swap is also known as:
A a basis swap.
B a fixed-for-floating swap.
C an overnight indexed swap.

23 The notional principal of a swap is:
A not exchanged in the case of an interest rate swap.
B a fixed amount whenever it is matched with a loan.
C equal to the amount owed by one swap party to the other.

24 Which of the following derivatives is *least likely* to have a value of zero at initiation of the contract?
A Futures
B Options
C Forwards

25 The buyer of an option has a contingent claim in the sense that the option creates:
A a right.
B an obligation.
C a linear payoff with respect to gains and losses of the underlying.

26 Which of the following options grants the holder the right to purchase the underlying prior to expiration?
A American-style put option
B European-style call option
C American-style call option

27 A credit derivative is a derivative contract in which the:
A clearinghouse provides a credit guarantee to both the buyer and the seller.
B seller provides protection to the buyer against the credit risk of a third party.
C the buyer and seller provide a performance bond at initiation of the contract.

28 The junior and senior tranches of an asset-backed security:

A have equivalent expected returns.
B have claims on separate underlying portfolios.
C may be differentially impacted by prepayments or credit losses.

29 In a declining interest rate environment, compared with a CMO's Class A tranche, its Class C tranche will be repaid:
A earlier.
B at the same pace.
C later.

30 For a given CDO, which of the following tranches is *most likely* to have the highest expected return?
A Equity
B Senior
C Mezzanine

31 Which of the following derivatives allows an investor to pay the return on a stock index and receive a fixed rate?
A Equity swap
B Stock warrant
C Index futures contract

32 Which of the following is *most likely* the underlying of a plain vanilla interest rate swap?
A 180-day Libor
B 10-year US Treasury bond
C Bloomberg Barclay's US Aggregate Bond Index

33 Currency swaps are:
A rarely used.
B commonly used to manage interest rate risk.
C executed by two parties making a series of interest rate payments in the same currency.

34 Which of the following statements regarding commodity derivatives is correct?
A The primary commodity derivatives are futures.
B Commodities are subject to a set of well-defined risk factors.
C Commodity traders and financial traders today are distinct groups within the financial world.

35 Compared with the underlying spot market, derivative markets are *more likely* to have:
A greater liquidity.
B higher transaction costs.
C higher capital requirements.

36 Which of the following characteristics is *least likely* to be a benefit associated with using derivatives?
A More effective management of risk
B Payoffs similar to those associated with the underlying
C Greater opportunities to go short compared with the spot market

37 Which of the following statements *best* represents information discovery in the futures market?

A The futures price is predictive.
B Information flows more slowly into the futures market than into the spot market.
C The futures market reveals the price that the holder of the asset can take to avoid uncertainty.

38 The derivative markets tend to:
A transfer liquidity from the broader financial markets.
B not reflect fundamental value after it is restored in the underlying market.
C offer a less costly way to exploit mispricing in comparison to other free and competitive financial markets.

39 Which of the following statements *most likely* contributes to the view that derivatives have some role in causing financial crashes?
A Derivatives are the primary means by which leverage and related excessive risk is brought into financial markets.
B Growth in the number of investors willing to speculate in derivatives markets leads to excessive speculative trading.
C Restrictions on derivatives, such as enhanced collateral requirements and credit mitigation measures, in the years leading up to crashes introduce market rigidity.

40 In contrast to gambling, derivatives speculation:
A has a positive public image.
B is a form of financial risk taking.
C benefits the financial markets and thus society.

41 Derivatives may contribute to financial contagion because of the:
A centrally cleared nature of OTC derivatives.
B associated significant costs and high capital requirements.
C reliance by derivatives speculators on large amounts of leverage.

42 The complex nature of derivatives has led to:
A reliable financial models of derivatives markets.
B widespread trust in applying scientific principles to derivatives.
C financial industry employment of mathematicians and physicists.

43 Which of the following is *most likely* to be a destabilizing consequence of speculation using derivatives?
A Increased defaults by speculators and creditors
B Market price swings resulting from arbitrage activities
C The creation of trading strategies that result in asymmetric performance

44 The law of one price is *best* described as:
A the true fundamental value of an asset.
B earning a risk-free profit without committing any capital.
C two assets that will produce the same cash flows in the future must sell for equivalent prices.

45 Arbitrage opportunities exist when:
A two identical assets or derivatives sell for different prices.
B combinations of the underlying asset and a derivative earn the risk-free rate.
C arbitrageurs simultaneously buy takeover targets and sell takeover acquirers.

For questions 46–49, consider a call option selling for $4 in which the exercise price is $50.

46 Determine the value at expiration and the profile for a *buyer* if the price of the underlying at expiration is $55.

A $5

B $1

C –$1

47 Determine the value at expiration and the profile for a *buyer* if the price of the underlying at expiration is $48.

A –$4

B $0

C $2

48 Determine the value at expiration and the profit for a *seller* if the price of the underling at expiration is $49.

A $4

B $0

C –$1

49 Determine the value at expiration and the profit for a *seller* if the price of the underling at expiration is $52.

A –$2

B $5

C $2

For questions 50–52, consider the following scenario:

Suppose you believe that the price of a particular underlying, currently selling at $99, is going to increase substantially in the next six months. You decide to purchase a call option expiring in six months on this underlying. The call option has an exercise price of $105 and sells for $7.

50 Determine the profit if the price of the underlying six months from now is $99.

A $6

B $0

C –$7

51 Determine the profit if the price of the underlying six months from now is $112.

A $7

B $0

C –$3

52 Determine the profit if the price of the underlying six months from now is $115.

A $0

B $3

C –$3

For questions 53–55, consider the following scenario:

Suppose you believe that the price of a particular underlying, currently selling at $99, is going to decrease substantially in the next six months. You decide to purchase a put option expiring in six months on this underlying. The put option has an exercise price of $95 and sells for $5.

53 Determine the profit for you if the price of the underlying six months from now is $100.

A $0

B $5

C –$5

54 Determine the profit for you if the price of the underlying six months from now is $95.

A $0

B $5

C –$5

55 Determine the profit for you if the price of the underlying six months from now is $85.

A $10

B $5

C $0

SOLUTIONS

1 C is correct. A derivative is a financial instrument that transforms the performance of the underlying. The transformation of performance function of derivatives is what distinguishes it from mutual funds and exchange traded funds that pass through the returns of the underlying.

A is incorrect because derivatives, in contrast to mutual funds and exchange traded funds, do not simply pass through the returns of the underlying at payout. B is incorrect because a derivative transforms rather than replicates the performance of the underlying.

2 B is correct. Insurance is a financial contract that provides protection against loss. The party bearing the risk purchases an insurance policy, which transfers the risk to the other party, the insurer, for a specified period of time. The risk itself does not change, but the party bearing it does. Derivatives allow for this same type of risk transfer.

A is incorrect because derivatives, like insurance, have a definite, as opposed to indefinite, life span and expire on a specified date.

C is incorrect because both derivatives and insurance allow for the transfer of risk from one party (the purchaser of the insurance policy or of a derivative) to another party (the insurer or a derivative seller), for a specified period of time. The risk itself does not change, but the party bearing it does.

3 A is correct. Derivatives allow market participants to practice more effective risk management, a process by which an organization, or individual, defines the level of risk it wishes to take, measures the level of risk it is taking, and adjusts the latter to equal the former.

B is incorrect because derivatives are characterized by a relatively high degree of leverage, meaning that participants in derivatives transactions usually have to invest only a small amount, as opposed to a large amount, of their own capital relative to the value of the underlying. This allows participants to generate returns that are disproportional, as opposed to proportional, to movements in the underlying.

C is incorrect because derivatives are not needed to copy strategies that can be implemented with the underlying on a standalone basis. Rather, derivatives can be used to create strategies that cannot be implemented with the underlying alone. Simultaneously taking long positions in multiple highly liquid fixed-income securities is a strategy that can be implemented with the underlying securities on a standalone basis.

4 B is correct. Over-the counter-derivatives markets are customized and mostly unregulated. As a result, over-the-counter markets are less transparent in comparison with the high degree of transparency and standardization associated with exchange-traded derivative markets.

A is incorrect because exchange-traded derivatives are standardized, whereas over-the counter derivatives are customized. C is incorrect because exchange-traded derivatives are characterized by a high degree of transparency because all transactions are disclosed to exchanges and regulatory agencies, whereas over-the-counter derivatives are relatively opaque.

5 C is correct. Exchanged-traded derivatives are guaranteed by a clearinghouse against default.

A is incorrect because traded derivatives are characterized by a relatively high degree of regulation. B is incorrect because the terms of exchange-traded derivatives terms are specified by the exchange.

6 A is correct. The clearing and settlement process of derivative transactions provides a credit guarantee.

B is incorrect because although the exchange markets are said to have transparency, they also involve standardization. That entails a loss of flexibility, with participants limited to only those transactions permitted on the exchange.

C is incorrect because derivatives exchanges clear and settle all contracts overnight, which is faster than most securities exchanges, which require two business days.

7 B is correct. With full implementation of these regulations in the OTC derivatives market, most OTC transactions need to be reported to regulators.

A is incorrect because although under full implementation of the regulations information on most OTC transactions needs to be reported to regulators, many transactions retain a degree of privacy with lower transparency.

C is incorrect because although under full implementation of new regulations a number of OTC transactions have to be cleared through central clearing agencies, there are exemptions that cover a significant percentage of derivative transactions.

8 A is correct because forward commitments provide linear payoffs.

B is incorrect because forward commitments depend on the outcome or payoff of an underlying asset.

C is incorrect because forward commitments obligate parties to make (not provide the right to engage) a final payment contingent on the performance of the underlying.

9 B is correct. In a forward contract, either party could default, whereas in a contingent claim, default is possible only from the short to the long.

A is incorrect because the forward price is set in the pricing of the contract such that the starting contract value is zero, unlike contingent claims, under which parties can select any starting value.

C is incorrect because both forward contracts and contingent claims can be settled by either physical or cash delivery.

10 B is correct. The buyer is obligated to pay the forward price $F_0(T)$ at expiration and receives an asset worth S_T, the price of the underlying. The contract effectively pays off $S_T - F_0(T)$, the value of the contract at expiration. The buyer therefore profits if $S_T > F_0(T)$.

A is incorrect because the long and the short are engaged in a zero-sum game. This is a type of competition in which one participant's gains are the other's losses, with their payoffs effectively being mirror images.

C is incorrect because although the gain from owning the underlying and the gain from owning the forward are both driven by S_T, the price of the underlying at expiration, they are not the same value. The gain from owning the underlying would be $S_T - S_0$, the change in its price, whereas the gain from owning the forward would be $S_T - F_0(T)$, the value of the forward at expiration.

11 C is correct. In the case of cash settlement, the long can acquire the asset, effectively paying the forward price, $F_0(T)$.

A is incorrect because forward contracts settled by cash or by delivery have the same economic effect.

B is incorrect because both non-deliverable forwards and contracts for differences can settle by an exchange of cash.

12 A is correct. A futures contract is a standardized derivative contract.

B is incorrect because through its clearinghouse the futures exchange provides a credit guarantee that it will make up a loss in the event a losing party cannot pay.

C is incorrect because a futures contract is marked to market at the end of each day, a process in which the futures clearinghouse determines an average of the final futures trade of the day and designates that price as the settlement price.

13 A is correct. Price limits are important in helping the clearinghouse manage its credit exposure. Sharply moving prices make it more difficult for the clearinghouse to collect from parties losing money.

B is incorrect because typically the exchange rules allow for an expansion of price limits the next day (not intra-day) if traders are willing.

C is incorrect because price limits establish a band relative to the previous day's settlement price (not final trade).

14 A is correct. The maintenance margin is always significantly lower than the initial margin.

B is incorrect because the initial margin required is typically at most (not at least) 10% of the futures price.

C is incorrect because a margin call requires a deposit large enough to bring the balance up to the initial (not maintenance) margin.

15 C is correct. Comparing the derivatives, forward and futures contracts have nearly equivalent profits by the time of expiration of the forward.

A is incorrect because the timing of profits for a futures contract is different from that of forwards. Forwards realize the full amount at expiration, whereas futures contracts realize their profit in parts on a day-to-day basis.

B is incorrect because the settlement arrangements for the forwards can be agreed on at initiation and written in the contract based on the desires of the engaged parties. However, in the case of a futures contract, the exchange (not the engaged parties) specifies whether physical delivery or cash settlement applies.

16 C is correct. A credit default swap (CDS) is a derivative in which the credit protection seller provides protection to the credit protection buyer against the credit risk of a separate party. CDS are classified as a contingent claim.

A is incorrect because futures contracts are classified as forward commitments. B is incorrect because interest rate swaps are classified as forward commitments.

17 B is correct. Forward commitments represent an obligation to buy or sell the underlying asset at an agreed upon price at a future date.

A is incorrect because the right to buy or sell the underlying asset is a characteristic of contingent claims, not forward commitments. C is incorrect because a credit default swap provides a promise to provide credit protection to the credit protection buyer in the event of a credit event such as a default or credit downgrade and is classified as a contingent claim.

18 A is correct. Options are classified as a contingent claim which provides payoffs that are non-linearly related to the performance of the underlying.

B is incorrect because forwards are classified as a forward commitment, which provides payoffs that are linearly related to the performance of the underlying. C is incorrect because interest-rate swaps are classified as a forward commitment, which provides payoffs that are linearly related to the performance of the underlying.

19 A is correct. An interest rate swap is defined as a derivative in which two parties agree to exchange a series of cash flows: One set of cash flows is variable, and the other set can be variable or fixed.

B is incorrect because a credit derivative is a derivative contract in which the credit protection seller provides protection to the credit protection buyer. C is incorrect because a call option gives the buyer the right to purchase the underlying from the seller.

20 C is correct. Interest rate swaps and forwards are over-the-counter contracts that are privately negotiated and are both subject to default. Futures contracts are traded on an exchange, which provides a credit guarantee and protection against default.

A is incorrect because futures are exchange-traded contracts which provide daily settlement of gains and losses and a credit guarantee by the exchange through its clearinghouse. B is incorrect because futures are exchange-traded contracts which provide daily settlement of gains and losses and a credit guarantee by the exchange through its clearinghouse.

21 A is correct. A swap is a bit more like a forward contract than a futures contract in that it is an OTC contract, so it is privately negotiated and subject to default.

B is incorrect because in a swap, although either party can default, only one party can do so at a particular time. Money owed is based on the net owed by one party to the other, and only the party owing the greater amount can default to the counterparty owing the lesser amount.

C is incorrect because a swap involves an exchange between parties in which at least one party pays a variable series of cash flows determined by an underlying asset or rate.

22 B is correct. A plain vanilla swap is a fixed-for-floating interest rate swap, which is the most common type of swap.

A is incorrect because a basis swap is a transaction based on the TED spread (T-bills versus Eurodollars) and is not the same as a plain vanilla swap.

C is incorrect because an overnight indexed swap is a swap that is tied to a federal funds type of rate, reflecting the rate at which banks borrow overnight, and is not the same as a plain vanilla swap.

23 A is correct. The notional principal of a swap is not exchanged in the case of an interest rate swap.

B is incorrect because an amortizing loan will be matched with a swap with a pre-specified declining (not fixed) notional principal that matches the loan balance.

C is incorrect because the notional principal is equal to the loan balance. Although the loan has an actual balance (the amount owed by the borrower to the creditor), the swap does not have such a balance owed by one swap party to the other.

24 B is correct. The buyer of the option pays the option premium to the seller of the option at the initiation of the contract. The option premium represents the value of the option, whereas futures and forwards have a value of zero at the initiation of the contract.

A is incorrect because no money changes hands between parties at the initiation of the futures contract, thus the value of the futures contract is zero at initiation. C is incorrect because no money changes hands between parties at the initiation of the forward contract, thus the value of the forward contract is zero at initiation.

25 A is correct. A contingent claim, a derivative in which the outcome or payoff depends on the outcome or payoff of an underlying asset, has come to be associated with a right, but not an obligation, to make a final payment contingent on the performance of the underlying.

B is incorrect because an option, as a contingent claim, grants the right but not the obligation to buy or sell the underlying at a later date.

C is incorrect because the holder of an option has a choice of whether to exercise the option. This choice creates a payoff that transforms the underlying payoff in a more pronounced manner than does a forward, futures, or swap, which provide linear payoffs. Options are different in that they limit losses in one direction.

26 C is correct. The right to buy the underlying is referred to as a call option. Furthermore, options that can be exercised prior to the expiration date are referred to as American-style options.

A is incorrect because a put option grants the holder the right to sell, as opposed to buy, the underlying.

B is incorrect because European-style options can only be exercised at expiration.

27 B is correct. A credit derivative is a derivative contract in which the credit protection seller provides protection to the credit protection buyer against the credit risk of a third party.

A is incorrect because the clearinghouse provides a credit guarantee to both the buyer and the seller of a futures contract, whereas a credit derivative is between two parties, in which the credit protection seller provides a credit guarantee to the credit protection buyer. C is incorrect because futures contracts require that both the buyer and the seller of the futures contract provide a cash deposit for a portion of the futures transaction into a margin account, often referred to as a performance bond or good faith deposit.

28 C is correct. An asset-backed security is a derivative contract in which a portfolio of debt instruments is assembled and claims are issued on the portfolio in the form of tranches, which have different priorities of claims on the payments made by the debt securities such that prepayments or credit losses are allocated to the most junior tranches first and the most senior tranches last.

A is incorrect because the expected returns of the tranches vary according to the perceived credit risk, with the senior tranches having the highest credit quality and the junior tranches the lowest. Thus, the senior tranches have the lowest expected returns and the junior tranches have the highest. Notably, in a bond mutual fund or an ETF, all investors in the fund have equal claims, and so the rate of return earned by each investor is the same.

B is incorrect because an asset-backed security is a derivative contract in which a single portfolio of securities is assembled and claims are issued on the portfolio in the form of tranches.

29 A is correct. Lower interest rates entice homeowners to pay off their mortgages early because they can refinance at lower rates. The most junior tranche in a CMO will bear the first wave of prepayments until that tranche has been

completely repaid its full principal investment. At that point, the next tranche will bear prepayments until that tranche has been fully repaid. Therefore, the Class C tranche of a CMO will be repaid before the more senior Class A tranche.

B is incorrect because the tranches, which have different priorities of claims on the principal payments made by the underlying mortgages, will see prepayments allocated to the most junior tranches first and the most senior tranches last.

C is incorrect because the most junior tranche in a CMO will bear the first wave of prepayments until that tranche has been completely repaid its full principal investment. At that point, the next tranche will bear prepayments until that tranche has been fully repaid. Therefore, the Class C tranche will be repaid prior to, not after, the Class A tranche.

30 A is correct. The expected returns of the tranches vary according to the perceived credit risk, with the senior tranches having the highest credit quality and the junior tranches the lowest. Thus, the senior tranches have the lowest expected returns and the junior tranches have the highest. The most junior tranche is sometimes called the "equity tranche."

B is incorrect because the senior tranches in a CDO have the lowest expected returns and the junior (or equity) tranches have the highest.

C is incorrect because the senior tranches in a CDO have the lowest expected returns and the junior (or equity) tranches have the highest. A mezzanine tranche is intermediate between the senior and junior tranches.

31 A is correct. Equity swaps, also known as index swaps, are quite popular and permit investors to pay the return on one stock index and receive the return on another index or a fixed rate.

B is incorrect because warrants are options that are sold directly to the public, allowing holders to exercise and buy shares directly from the company as opposed to using stock indexes to determine returns.

C is incorrect because although index derivatives in the form of options, forwards, futures, and swaps are very popular, paying the return on a stock index and receiving a fixed rate describes an equity swap (or index swap), not a futures contract.

32 A is correct. In a plain vanilla interest rate swap, an interest rate, such as Libor, serves as the underlying. A plain vanilla interest rate swap is one of many derivatives in which a rate, not the instrument that pays the rate, is the underlying.

B is incorrect because a plain vanilla interest rate swap is one of many derivatives in which a rate, not an instrument that pays a rate, is the underlying.

C is incorrect because a plain vanilla interest rate swap is one of many derivatives in which a rate, not an instrument (or index) that pays a rate, is the underlying.

33 B is correct. Because interest rates and currencies are both subject to change, a currency swap has two sources of risk. Furthermore, companies operating across borders are subject to both interest rate risk and currency risk, and currency swaps are commonly used to manage these risks.

A is incorrect because currency risk is a major factor in global financial markets, and the currency derivatives market is extremely large, as opposed to small.

C is incorrect because a currency swap is executed by two parties making a series of interest rate payments to each other in different currencies, as opposed to the same currency.

34 A is correct. The primary commodity derivatives are futures, but forwards, swaps, and options are also used.

B is incorrect because the commodity market is extremely large and subject to an almost unimaginable array of risks.

C is incorrect because commodity and financial traders have become relatively homogeneous since the creation of financial futures. Historically, commodity traders and financial traders were quite different groups, and there used to be a tendency to think of the commodity world as somewhat separate from the financial world.

35 A is correct. Derivative markets typically have greater liquidity than the underlying spot market as a result of the lower capital required to trade derivatives compared with the underlying. Derivatives also have lower transaction costs and lower capital requirements than the underlying.

B is incorrect because transaction costs for derivatives are lower than the underlying spot market. C is incorrect because derivatives markets have lower capital requirements than the underlying spot market.

36 B is correct. One of the benefits of derivative markets is that derivatives create trading strategies not otherwise possible in the underlying spot market, thus providing opportunities for more effective risk management than simply replicating the payoff of the underlying.

A is incorrect because effective risk management is one of the primary purposes associated with derivative markets. C is incorrect because one of the operational advantages associated with derivatives is that it is easier to go short compared to the underlying spot market.

37 C is correct. The futures market reveals the price that the holder of an asset could take and avoid the risk of uncertainty.

A is incorrect because although the futures price is sometimes thought of as predictive, it provides only a little more information than does a spot price and is not really a forecast of the futures spot price.

B is incorrect because by virtue of the fact that the futures market requires less capital, information can flow into the futures market before it gets into the spot market.

38 C is correct. When prices deviate from fundamental values, derivative markets offer a less costly way to exploit mispricing in comparison to other free and competitive financial markets.

A is incorrect because derivative markets tend to transfer liquidity to (not from) the broader financial markets, because investors are far more willing to trade if they can more easily manage their risk, trade at lower cost and with less capital, and go short more easily. An increased willingness to trade leads to a more liquid market.

B is incorrect because it is likely (not unlikely) that fundamental value will be reflected in the derivative markets both before and after it is restored in the underlying market owing to lower capital requirements and transaction costs in the derivative markets.

39 B is correct. Opponents of derivatives claim that excessive speculative trading brings instability to the markets. Defaults by speculators can lead to defaults by their creditors, their creditors' creditors, and so on.

A is incorrect because derivatives are one of many mechanisms through which excessive risk can be taken. There are many ways to take on leverage that look far less harmful but can be just as risky.

C is incorrect because responses to crashes and crises typically call for more rules and regulations restricting the use of derivatives, such as requiring more collateral and credit mitigation measures. Such rules and regulations are generally implemented after a crash and are directed at limiting government bailouts of the costs from derivatives risks.

40 C is correct. Derivatives trading brings extensive benefits to financial markets (low costs, low capital requirements, ease of going short, etc.) and thus benefits society as a whole. Gambling, on the other hand, typically benefits only a limited number of participants.

A is incorrect because the general image of speculators is not a good one. Speculators are often thought to be short-term traders who attempt to exploit temporary inefficiencies, caring little about long-term fundamental values.

B is incorrect because speculation and gambling are both forms of financial risk taking.

41 C is correct. Opponents argue that speculators use large amounts of leverage, thereby subjecting themselves and their creditors to substantial risk if markets do not move in their hoped-for direction. Defaults by speculators can then lead to defaults by their creditors, their creditors' creditors, and so on. These effects can, therefore, be systemic and reflect an epidemic contagion whereby instability can spread throughout markets and an economy, if not the entire world.

A is incorrect because central clearing of OTC derivatives, similar to how exchange-traded derivatives are cleared, is intended to lessen the risk of contagion.

B is incorrect because it is derivatives' low cost and low capital requirements, not high cost and high capital requirements, that opponents point to as contributing to an excessive amount of speculative trading that brings instability to the markets.

42 C is correct. Many derivatives are extremely complex and require a high-level understanding of mathematics. As a result, the financial industry employs many mathematicians, physicists, and computer scientists.

A is incorrect because scientists create models of markets by using scientific principles that often fail. For example, to a physicist modeling the movements of celestial bodies, the science is reliable and the physicist is unlikely to misapply the science. The same science applied to financial markets is far less reliable. Financial markets are driven by the actions of people who are not as consistent as the movements of celestial bodies.

B is incorrect because the complex nature of derivatives has made many distrust, as opposed to trust, derivatives, the people who work with them, and the scientific methods they use.

43 A is correct. The benefits of derivatives, such as low transaction costs, low capital requirements, use of leverage, and the ease in which participants can go short, also can result in excessive speculative trading. These activities can lead to defaults on the part of speculators and creditors.

B is incorrect because arbitrage activities tend to bring about a convergence of prices to intrinsic value. C is incorrect because asymmetric performance is not itself destabilizing.

44 C is correct. The law of one price occurs when market participants engage in arbitrage activities so that identical assets sell for the same price in different markets.

A is incorrect because the law of one price refers to identical assets. B is incorrect because it refers to arbitrage not the law of one price.

45 A is correct. Arbitrage opportunities exist when the same asset or two equivalent combinations of assets that produce the same results sell for different prices. When this situation occurs, market participants would buy the asset in the cheaper market and simultaneously sell it in the more expensive market, thus earning a riskless arbitrage profit without committing any capital.

B is incorrect because it is not the definition of an arbitrage opportunity. C is incorrect because it is not the definition of an arbitrage opportunity.

46 B is correct. $C_T = Max(0,S_T - X) = Max(0,55 - 50) = 5$

$\Pi = C_T - C_0 = 5 - 4 = 1$

47 A is correct. $C_T = Max(0,S_T - X) = Max(0,48 - 50) = 0$

$\Pi = C_T - C_0 = 0 - 4 = -4$

48 A is correct. $-C_T = -Max(0,S_T - X) = -Max(0,49 - 50) = 0$

$\Pi = -C_T + C_0 = -0 + 4 = 4$

49 C is correct. $-C_T = -Max(0,S_T - X) = -Max(0,52 - 50) = -2$

$\Pi = -C_T + C_0 = -2 + 4 = 2$

50 C is correct. $C_T = Max(0,S_T - X) = Max(0,99 - 105) = 0$

$\Pi = C_T - C_0 = 0 - 7 = -7$

51 B is correct. $C_T = Max(0,S_T - X) = Max(0,112 - 105) = 7$

$\Pi = C_T - C_0 = 7 - 7 = 0$

Note: $112 is the breakeven price

52 B is correct. $C_T = Max(0,S_T - X) = Max(0,115 - 105) = 10$

$\Pi = C_T - C_0 = 10 - 7 = 3$

53 C is correct. $C_T = Max(0,S_T - X) = Max(0,95 - 100) = 0$

$\Pi = C_T - C_0 = 0 - 5 = -5$

54 C is correct. $C_T = Max(0,S_T - X) = Max(0,95 - 95) = 0$

$\Pi = C_T - C_0 = 0 - 5 = -5$

55 B is correct. $C_T = Max(0,S_T - X) = Max(0,95 - 85) = 10$

$\Pi = C_T - C_0 = 10 - 5 = 5$

PRACTICE PROBLEMS

1 For a risk-averse investor, the price of a risky asset, assuming no additional costs and benefits of holding the asset, is:
   A unrelated to the risk-free rate.
   B directly related to its level of risk.
   C inversely related to its level of risk.

2 An arbitrage opportunity is *least likely* to be exploited when:
   A one position is illiquid.
   B the price differential between assets is large.
   C the investor can execute a transaction in large volumes.

3 An arbitrageur will *most likely* execute a trade when:
   A transaction costs are low.
   B costs of short-selling are high.
   C prices are consistent with the law of one price.

4 An arbitrage transaction generates a net inflow of funds:
   A throughout the holding period.
   B at the end of the holding period.
   C at the start of the holding period.

5 Which of the following combinations replicates a long derivative position?
   A A short derivative and a long asset
   B A long asset and a short risk-free bond
   C A short derivative and a short risk-free bond

6 Most derivatives are priced by:
   A assuming that the market offers arbitrage opportunities.
   B discounting the expected payoff of the derivative at the risk-free rate.
   C applying a risk premium to the expected payoff of the derivative and its risk.

7 The price of a forward contract:
   A is the amount paid at initiation.
   B is the amount paid at expiration.
   C fluctuates over the term of the contract.

8 Assume an asset pays no dividends or interest, and also assume that the asset does not yield any non-financial benefits or incur any carrying cost. At initiation, the price of a forward contract on that asset is:
   A lower than the value of the contract.
   B equal to the value of the contract.
   C greater than the value of the contract.

9 With respect to a forward contract, as market conditions change:
   A only the price fluctuates.
   B only the value fluctuates.
   C both the price and the value fluctuate.

10 The value of a forward contract at expiration is:

A positive to the long party if the spot price is higher than the forward price.

B negative to the short party if the forward price is higher than the spot price.

C positive to the short party if the spot price is higher than the forward price.

11 At the initiation of a forward contract on an asset that neither receives benefits nor incurs carrying costs during the term of the contract, the forward price is equal to the:

A spot price.

B future value of the spot price.

C present value of the spot price.

12 Stocks BWQ and ZER are each currently priced at $100 per share. Over the next year, stock BWQ is expected to generate significant benefits whereas stock ZER is not expected to generate any benefits. There are no carrying costs associated with holding either stock over the next year. Compared with ZER, the one-year forward price of BWQ is *most likely*:

A lower.

B the same.

C higher.

13 If the net cost of carry of an asset is positive, then the price of a forward contract on that asset is *most likely*:

A lower than if the net cost of carry was zero.

B the same as if the net cost of carry was zero.

C higher than if the net cost of carry was zero.

14 If the present value of storage costs exceeds the present value of its convenience yield, then the commodity's forward price is *most likely*:

A less than the spot price compounded at the risk-free rate.

B the same as the spot price compounded at the risk-free rate.

C higher than the spot price compounded at the risk-free rate.

15 Which of the following factors *most likely* explains why the spot price of a commodity in short supply can be greater than its forward price?

A Opportunity cost

B Lack of dividends

C Convenience yield

16 When interest rates are constant, futures prices are *most likely*:

A less than forward prices.

B equal to forward prices.

C greater than forward prices.

17 In contrast to a forward contract, a futures contract:

A trades over-the-counter.

B is initiated at a zero value.

C is marked-to-market daily.

18 To the holder of a long position, it is more desirable to own a forward contract than a futures contract when interest rates and futures prices are:

A negatively correlated.

B uncorrelated.

C positively correlated.

19 The value of a swap typically:

A is non-zero at initiation.
B is obtained through replication.
C does not fluctuate over the life of the contract.

20 The price of a swap typically:
A is zero at initiation.
B fluctuates over the life of the contract.
C is obtained through a process of replication.

21 The value of a swap is equal to the present value of the:
A fixed payments from the swap.
B net cash flow payments from the swap.
C underlying at the end of the contract.

22 If no cash is initially exchanged, a swap is comparable to a series of forward contracts when:
A the swap payments are variable.
B the combined value of all the forward contracts is zero.
C all the forward contracts have the same agreed-on price.

23 For a swap in which a series of fixed payments is exchanged for a series of floating payments, the parties to the transaction:
A designate the value of the underlying at contract initiation.
B value the underlying solely on the basis of its market value at the end of the swap.
C value the underlying sequentially at the time of each payment to determine the floating payment.

24 A European call option and a European put option are written on the same underlying, and both options have the same expiration date and exercise price. At expiration, it is possible that both options will have:
A negative values.
B the same value.
C positive values.

25 At expiration, a European put option will be valuable if the exercise price is:
A less than the underlying price.
B equal to the underlying price.
C greater than the underlying price.

26 The value of a European call option at expiration is the greater of zero or the:
A value of the underlying.
B value of the underlying minus the exercise price.
C exercise price minus the value of the underlying.

27 For a European call option with two months until expiration, if the spot price is below the exercise price, the call option will *most likely* have:
A zero time value.
B positive time value.
C positive exercise value.

28 When the price of the underlying is below the exercise price, a put option is:
A in-the-money.
B at-the-money.

C out-of-the-money.

29 If the risk-free rate increases, the value of an in-the-money European put option will *most likely*:

A decrease.

B remain the same.

C increase.

30 The value of a European call option is inversely related to the:

A exercise price.

B time to expiration.

C volatility of the underlying.

31 The table below shows three European call options on the same underlying:

	Time to Expiration	Exercise Price
Option 1	3 months	$100
Option 2	6 months	$100
Option 3	6 months	$105

The option with the highest value is *most likely*:

A Option 1.

B Option 2.

C Option 3.

32 The value of a European put option can be either directly or inversely related to the:

A exercise price.

B time to expiration.

C volatility of the underlying.

33 Prior to expiration, the lowest value of a European put option is the greater of zero or the:

A exercise price minus the value of the underlying.

B present value of the exercise price minus the value of the underlying.

C value of the underlying minus the present value of the exercise price.

34 A European put option on a dividend-paying stock is *most likely* to increase if there is an increase in:

A carrying costs.

B the risk-free rate.

C dividend payments.

35 Based on put-call parity, a trader who combines a long asset, a long put, and a short call will create a synthetic:

A long bond.

B fiduciary call.

C protective put.

36 Which of the following transactions is the equivalent of a synthetic long call position?

A Long asset, long put, short call

B Long asset, long put, short bond

C Short asset, long call, long bond

37 Which of the following is *least likely* to be required by the binomial option pricing model?

A Spot price

B Two possible prices one period later

C Actual probabilities of the up and down moves

38 To determine the price of an option today, the binomial model requires:

A selling one put and buying one offsetting call.

B buying one unit of the underlying and selling one matching call.

C using the risk-free rate to determine the required number of units of the underlying.

39 Assume a call option's strike price is initially equal to the price of its underlying asset. Based on the binomial model, if the volatility of the underlying decreases, the lower of the two potential payoff values of the hedge portfolio:

A decreases.

B remains the same.

C increases.

40 Based on the binomial model, an increase in the actual probability of an upward move in the underlying will result in the option price:

A decreasing.

B remaining the same.

C increasing.

41 If a call option is priced higher than the binomial model predicts, investors can earn a return in excess of the risk-free rate by:

A investing at the risk-free rate, selling a call, and selling the underlying.

B borrowing at the risk-free rate, buying a call, and buying the underlying.

C borrowing at the risk-free rate, selling a call, and buying the underlying.

42 An at-the-money American call option on a stock that pays no dividends has three months remaining until expiration. The market value of the option will *most likely* be:

A less than its exercise value.

B equal to its exercise value.

C greater than its exercise value.

43 At expiration, American call options are worth:

A less than European call options.

B the same as European call options.

C more than European call options.

44 Which of the following circumstances will *most likely* affect the value of an American call option relative to a European call option?

A Dividends are declared

B Expiration date occurs

C The risk-free rate changes

45 Combining a protective put with a forward contract generates equivalent outcomes at expiration to those of a:

A fiduciary call.

B long call combined with a short asset.

C forward contract combined with a risk-free bond.

46 Holding an asset and buying a put on that asset is equivalent to:

A initiating a fiduciary call.

B buying a risk-free zero-coupon bond and selling a call option.

C selling a risk-free zero-coupon bond and buying a call option.

47 If an underlying asset's price is less than a related option's strike price at expiration, a protective put position on that asset versus a fiduciary call position has a value that is:

A lower.

B the same.

C higher.

48 Based on put–call parity, which of the following combinations results in a synthetic long asset position?

A A long call, a short put, and a long bond

B A short call, a long put, and a short bond

C A long call, a short asset, and a long bond

49 For a holder of a European option, put–call–forward parity is based on the assumption that:

A no arbitrage is possible within the spot, forward, and option markets.

B the value of a European put at expiration is the greater of zero or the underlying value minus the exercise price.

C the value of a European call at expiration is the greater of zero or the exercise price minus the value of the underlying.

50 Under put–call–forward parity, which of the following transactions is risk free?

A Short call, long put, long forward contract, long risk-free bond

B Long call, short put, long forward contract, short risk-free bond

C Long call, long put, short forward contract, short risk-free bond

SOLUTIONS

1 C is correct. An asset's current price, S_0, is determined by discounting the expected future price of the asset by r (the risk free rate) plus λ (the risk premium) over the period from 0 to T, as illustrated in the following equation:

$$S_0 = \frac{E(S_T)}{(1 + r + \lambda)^T}$$

Thus, an asset's current price inversely relates to its level of risk via the related risk premium, λ.

A is incorrect because an asset's current price in spot markets is calculated using the risk-free rate plus a risk premium.

B is incorrect because an asset's current price in spot markets is inversely related, not directly related, to its level of risk.

2 A is correct. An illiquid position is a limit to arbitrage because it may be difficult to realize gains of an illiquid offsetting position. A significant opportunity arises from a sufficiently large price differential or a small price differential that can be employed on a very large scale.

3 A is correct. Some arbitrage opportunities represent such small price discrepancies that they are only worth exploiting if the transaction costs are low. An arbitrage opportunity may require short-selling assets at costs that eliminate any profit potential. If the law of one price holds, there is no arbitrage opportunity.

4 C is correct. Arbitrage is a type of transaction undertaken when two assets or portfolios produce identical results but sell for different prices. A trader buys the asset or portfolio with the lower price and sells the asset or portfolio with the higher price, generating a net inflow of funds at the start of the holding period. Because the two assets or portfolios produce identical results, a long position in one and short position in the other means that at the end of the holding period, the payoffs offset. Therefore, there is no money gained or lost at the end of the holding period, so there is no risk.

5 B is correct. A long asset and a short risk-free asset (meaning to borrow at the risk-free rate) can be combined to produce a long derivative position.

A is incorrect because a short derivative and a long asset combine to produce a position equivalent to a long risk-free bond, not a long derivative.

C is incorrect because a short derivative and a short risk-free bond combine to produce a position equivalent to a short asset, not a long derivative.

6 B is correct. Virtually all derivative pricing models discount the expected payoff of the derivative at the risk-free rate.

A is incorrect because derivatives are priced by assuming that the market is free of arbitrage opportunities via the principle of no arbitrage, not by assuming that the market offers them.

C is incorrect because the application of a risk premium to the expected payoff of the derivative and its risk is not appropriate in the pricing of derivatives. An investor's risk premium is not relevant to pricing a derivative.

7 B is correct. The forward price is agreed upon at the start of the contract and is the fixed price at which the underlying will be purchased (or sold) at expiration. Payment is made at expiration. The value of the forward contract may change over time, but the forward price does not change.

8 C is correct. The price of a forward contract is a contractually fixed price, established at initiation, at which the underlying will be purchased (or sold) at expiration. The value of a forward contract at initiation is zero; therefore, the forward price is greater than the value of the forward contract at initiation.

9 B is correct. The value of the forward contract, unlike its price, will adjust as market conditions change. The forward price is fixed at initiation.

10 A is correct. When a forward contract expires, if the spot price is higher than the forward price, the long party profits from paying the lower forward price for the underlying. Therefore, the forward contract has a positive value to the long party and a negative value to the short party. However, if the forward price is higher than the spot price, the short party profits from receiving the higher forward price (the contract value is positive to the short party and negative to the long party).

11 B is correct. At initiation, the forward price is the future value of the spot price (spot price compounded at the risk-free rate over the life of the contract). If the forward price were set to the spot price or the present value of the spot price, it would be possible for one side to earn an arbitrage profit by selling the asset and investing the proceeds until contract expiration.

12 A is correct. The forward price of each stock is found by compounding the spot price by the risk-free rate for the period and then subtracting the future value of any benefits and adding the future value of any costs. In the absence of any benefits or costs, the one-year forward prices of BWQ and ZER should be equal. After subtracting the benefits related to BWQ, the one-year forward price of BWQ is lower than the one-year forward price of ZER.

13 A is correct. An asset's forward price is increased by the future value of any costs and decreased by the future value of any benefits: $F_0(T) = S_0(1 + r)^T - (\gamma - \theta)(1 + r)^T$. If the net cost of carry (benefits less costs) is positive, the forward price is lower than if the net cost of carry was zero.

14 C is correct. When a commodity's storage costs exceed its convenience yield benefits, the net cost of carry (benefits less costs) is negative. Subtracting this negative amount from the spot price compounded at the risk-free rate results in an addition to the compounded spot price. The result is a commodity forward price which is higher than the spot price compounded. The commodity's forward price is less than the spot price compounded when the convenience yield benefits exceed the storage costs and the commodity's forward price is the same as the spot price compounded when the costs equal the benefits.

15 C is correct. The convenience yield is a benefit of holding the asset and generally exists when a commodity is in short supply. The future value of the convenience yield is subtracted from the compounded spot price and reduces the commodity's forward price relative to it spot price. The opportunity cost is the risk-free rate. In the absence of carry costs, the forward price is the spot price compounded at the risk-free rate and will exceed the spot price. Dividends are benefits that reduce the forward price but the lack of dividends has no effect on the spot price relative to the forward price of a commodity in short supply.

16 B is correct. When interest rates are constant, forwards and futures will likely have the same prices. The price differential will vary with the volatility of interest rates. In addition, if futures prices and interest rates are uncorrelated, forward and futures prices will be the same. If futures prices are positively correlated with interest rates, futures contracts are more desirable to holders of long positions than are forwards. This is because rising prices lead to future profits that are reinvested in periods of rising interest rates, and falling prices lead to losses that occur in periods of falling interest rates. If futures prices are

negatively correlated with interest rates, futures contracts are less desirable to holders of long positions than are forwards. The more desirable contract will tend to have the higher price.

17 C is correct. Futures contracts are marked-to-market on a daily basis. The accumulated gains and losses from the previous day's trading session are deducted from the accounts of those holding losing positions and transferred to the accounts of those holding winning positions. Futures contracts trade on an exchange, forward contracts are over-the-counter transactions. Typically both forward and futures contracts are initiated at a zero value.

18 A is correct. If futures prices and interest rates are negatively correlated, forwards are more desirable to holders of long positions than are futures. This is because rising prices lead to futures profits that are reinvested in periods of falling interest rates. It is better to receive all of the cash at expiration under such conditions. If futures prices and interest rates are uncorrelated, forward and futures prices will be the same. If futures prices are positively correlated with interest rates, futures contracts are more desirable to holders of long positions than are forwards.

19 B is correct. Valuation of the swap during its life appeals to replication and the principle of arbitrage. Valuation consists of reproducing the remaining payments on the swap with other transactions. The value of that replication strategy is the value of the swap. The swap price is typically set such that the swap contract has a value of zero at initiation. The value of a swap contract will change during the life of the contract as the value of the underlying changes in value.

20 C is correct. Replication is the key to pricing a swap. The swap price is determined at initiation by replication. The value (not the price) of the swap is typically zero at initiation and the fixed swap price is typically determined such that the value of the swap will be zero at initiation.

21 B is correct. The principal of replication articulates that the valuation of a swap is the present value of all the net cash flow payments from the swap, not simply the present value of the fixed payments of the swap or the present value of the underlying at the end of the contract.

22 B is correct. When two parties engage in a series of forward contracts and initially agree on a price of $FS_0(T)$, some of the forward contracts have positive values and some have negative values, but their combined value equals zero.

A is incorrect because for a swap, all payments are fixed and equal, not variable.

C is incorrect because forward prices are determined by the spot price and the net cost of carry, meaning that forward contracts expiring at different times will have different prices, not the same price.

23 C is correct. On each payment date, the swap owner receives a payment based on the value of the underlying at the time of each respective payment.

A is incorrect because in a swap involving a series of fixed payments exchanged for a series of floating payments, each floating payment reflects the value of the underlying at the time of payment, not a designated value at contract initiation.

B is incorrect because in a swap involving a series of fixed payments exchanged for a series of floating payments, each floating payment is based on the value of the underlying at the time of each respective payment, not on the market value at the end of the swap.

24 B is correct. If the underlying has a value equal to the exercise price at expiration, both options will have zero value since they both have the same exercise price. For example, if the exercise price is $25 and at expiration the underlying

price is $25, both the call option and the put option will have a value of zero. The value of an option cannot fall below zero. The holder of an option is not obligated to exercise the option; therefore, the options each have a minimum value of zero. If the call has a positive value, the put, by definition, must have a zero value and vice versa. Both cannot have a positive value.

25 C is correct. A European put option will be valuable at expiration if the exercise price is greater than the underlying price. The holder can put (deliver) the underlying and receive the exercise price which is higher than the spot price. A European put option would be worthless if the exercise price was equal to or less than the underlying price.

26 B is correct. The value of a European call option at expiration is the greater of zero or the value of the underlying minus the exercise price.

27 B is correct. A European call option with two months until expiration will typically have positive time value, where time value reflects the value of the uncertainty that arises from the volatility in the underlying. The call option has a zero exercise value if the spot price is below the exercise price. The exercise value of a European call option is $\text{Max}(0,S_t - X)$, where S_t is the current spot price at time t and X is the exercise price.

28 A is correct. When the price of the underlying is below the exercise price for a put, the option is said to be in-the-money. If the price of the underlying is the same as the exercise price, the put is at-the-money and if it is above the exercise price, the put is out-of-the-money.

29 A is correct. An in-the-money European put option decreases in value with an increase in the risk-free rate. A higher risk-free rate reduces the present value of any proceeds received on exercise.

30 A is correct. The value of a European call option is inversely related to the exercise price. A lower exercise price means there are more potential outcomes at which the call expires in-the-money. The option value will be greater the lower the exercise price. For a higher exercise price, the opposite is true. Both the time to expiration and the volatility of the underlying are directly (positively) related to the value of a European call option.

31 B is correct. The value of a European call option is inversely related to the exercise price and directly related to the time to expiration. Option 1 and Option 2 have the same exercise price; however, Option 2 has a longer time to expiration. Consequently, Option 2 would likely have a higher value than Option 1. Option 2 and Option 3 have the same time to expiration; however, Option 2 has a lower exercise price. Thus, Option 2 would likely have a higher value than Option 3.

32 B is correct. The value of a European put option can be either directly or indirectly related to time to expiration. The direct effect is more common, but the inverse effect can prevail the longer the time to expiration, the higher the risk-free rate, and the deeper in-the-money is the put. The value of a European put option is directly related to the exercise price and the volatility of the underlying.

33 B is correct. Prior to expiration, the lowest value of a European put is the greater of zero or the present value of the exercise price minus the value of the underlying.

34 C is correct. Payments, such as dividends, reduce the value of the underlying which increases the value of a European put option. Carrying costs reduce the value of a European put option. An increase in the risk-free interest rate may decrease the value of a European put option.

35 A is correct. A long bond can be synthetically created by combining a long asset, a long put, and a short call. A fiduciary call is created by combining a long call with a risk free bond. A protective put is created by combining a long asset with a long put.

36 B is correct. According to put–call parity, a synthetic call can be constructed by combining a long asset, long put, and short bond positions.

37 C is correct. The actual probabilities of the up and down moves in the underlying do not appear in the binomial option pricing model, only the pseudo or "risk-neutral" probabilities. Both the spot price of the underlying and two possible prices one period later are required by the binomial option pricing model.

38 C is correct. Pricing an option relies on the facts that a perfectly hedged investment earns the risk-free rate and that, based on the binomial option pricing model, the size of the two possible changes in the option price (meaning the potential step up or step down in the option value) after one period are equivalent.

39 B is correct. When the volatility of the underlying decreases, the value of the option also decreases, meaning that the upper payoff value of the hedge portfolio combining them declines. However, the lower payoff value remains at zero.

40 B is correct. The binomial model does not consider the actual probabilities of upward and downward movements in determining the option value. Thus, a change in this probability has no effect on the calculated option price.

41 C is correct. If an option is trading above the value predicted by the binomial model, investors can engage in arbitrage by selling a call, buying shares of the underlying, and funding the transaction by borrowing at the risk-free rate. This will earn a return in excess of the risk-free rate.

42 C is correct. Prior to expiration, an American call option will typically have a value in the market that is greater than its exercise value. Although the American option is at-the-money and therefore has an exercise value of zero, the time value of the call option would likely lead to the option having a positive market value.

43 B is correct. At expiration, the values of American and European call options are effectively the same; both are worth the greater of zero and the exercise value.

44 A is correct. When a dividend is declared, an American call option will have a higher value than a European call option because an American call option holder can exercise early to capture the value of the dividend. At expiration, both types of call options are worth the greater of zero and the exercise value. A change in the risk-free rate does not affect the relative values of American and European call options.

45 A is correct. Put–call forward parity demonstrates that the outcome of a protective put with a forward contract (long put, long risk-free bond, long forward contract) equals the outcome of a fiduciary call (long call, long risk-free bond). The outcome of a protective put with a forward contract is also equal to the outcome of a protective put with asset (long put, long asset).

46 A is correct. Under put–call parity, initiating a fiduciary call (buying a call option on an asset that expires at time T together with a risk-free zero-coupon bond that also expires at time T) is equivalent to holding the same asset and initiating a protective put on it (buying a put option with an exercise price of X that can be used to sell the asset for X at time T).

47 B is correct. On the one hand, buying a call option on an asset and a risk-free bond with the same maturity is known as a fiduciary call. If the fiduciary call expires in the money (meaning that the value of the call, $S_T - X$, is greater than the risk-free bond's price at expiration, X), then the total value of the fiduciary call is $(S_T - X) + X$, or S_T. On the other hand, holding an underlying asset, S_T, and buying a put on that asset is known as a protective put. If the put expires out of the money, meaning that the value of the asset, S_T, is greater than the put's value at expiration, 0, then the total value of the protective put is $S_T - 0$, or S_T. A protective put and a fiduciary call produce the same result.

48 A is correct. One can synthetically create a long asset position by buying a call, shorting a put, and buying a bond.

B is incorrect because combining a short call and a short bond with the right to sell (not buy) another asset via a long put could not result in a new synthetic long asset position.

C is incorrect because combining a long call, a short asset, and a long bond creates a long put, not a synthetic long asset.

49 A is correct. Put–call–forward parity is based on the assumption that no arbitrage is possible within the spot, forward, and option markets.

B is incorrect because the value of a European put at expiration is the greater of either zero or the exercise price minus the value of the underlying, not the greater of zero or the underlying value minus the exercise price. In addition, put–call–forward parity is related to the equality of a fiduciary call and a synthetic protective put or to a protective put and a synthetic fiduciary call, not specifically to the value of a put at expiration.

C is incorrect because the value of a European call at expiration is the greater of either zero or the underlying value minus the exercise price, not the greater of zero or the exercise price minus the value of the underlying. In addition, put–call–forward parity is related to the equality of a fiduciary call and a synthetic protective put or to a protective put and a synthetic fiduciary call, not specifically to the value of a call at expiration.

50 A is correct. Purchasing a long forward contract and a risk-free bond creates a synthetic asset. Combining a long synthetic asset, a long put, and a short call is risk free because its payoffs produce a known cash flow of the value of the exercise price.