

- A. Incorrect because it calculated the GP's incentive fee based on the profit/loss in Year 2 only. Therefore Total incentive fee = MAX [$\$0, -\$10 \text{ million} \times 20\%$] = MAX [$\$0, -\2 million] = \$0.
- B. **Correct** because the GP would initially accrue a 20% of $\$[25]$ million profit at the end of the first year, equal to $\$[5]$ million. Typically, this amount would be held in escrow for the benefit of the GP but not actually paid. But then the GP loses \$10 million of the initial $\$[25]$ million gain, so the aggregate whole-of-fund gain at the end of the second year would be only $\$[15]$ million; this amount times 20% would result in only an $\[$3 \text{ million}]$ incentive fee. The general partner would then have to return \$2 million of the previously accrued incentive fees to the capital accounts of LP investors because of the clawback provision.
- C. Incorrect because it calculated the GP's incentive fee based on the profit/loss in Year 1 only. Therefore Total incentive fee = $\$25 \text{ million} \times 20\% = \5 million .

Alternative Investment Performance and Returns

- calculate and interpret alternative investment returns both before and after fees

Solution

- A. **Correct** because the ex-date is the first date that a share trades without (i.e., "ex") the dividend. Because buyers of a company's shares on the ex-dividend date are no longer eligible to receive the upcoming dividend, all else being equal, on that day the company's share price immediately decreases by the amount of the foregone dividend. Therefore, the trading day before the ex-date is the last date for an investor to purchase shares to be eligible for upcoming dividends.
- B. Incorrect because the record date is the date that a shareholder listed on the company's books will be deemed to have ownership of the shares for purposes of receiving the upcoming dividend. Because buyers of a company's shares on the ex-dividend date are no longer eligible to receive the upcoming dividend, all else being equal, on that day the company's share price immediately decreases by the amount of the foregone dividend. Therefore, the trading day before the ex-date is the last date for an investor to purchase shares to be eligible for upcoming dividends.
- C. Incorrect because the declaration date is the day that the company issues a statement declaring a specific dividend. Next comes the ex-dividend date (or ex- date), the first date that a share trades without (i.e., "ex") the dividend. Because buyers of a company's shares on the ex-dividend date are no longer eligible to receive the upcoming dividend, all else being equal, on that day the company's share price immediately decreases by the amount of the foregone dividend. Therefore, the trading day before the ex-date is the last date for an investor to purchase shares to be eligible for upcoming dividends.

Equity Valuation: Concepts and Basic Tools

- describe dividend payment chronology

Solution

- A. Incorrect because this answer uses the correct formula but multiplies the result by 2, not 4, to annualize. Since this is a zero coupon bond, we use a version of the equation

$PV = (PMT + FV) / (1 + Z_N)^N$, where PMT and FV are the single payment received at maturity and N is the number of periods until maturity (equation also shown as $80 = 100 / (1 + r)^{20}$. In this case $90 = 100 / (1 + Z_{12})^{12}$. $100/90 = (1 + Z_{12})^{12}$. Solving this equation $Z_{12} = .00882$. To get to the annual yield to maturity, multiply Z_{12} by 4 for 3.527%. In this answer the annual yield was incorrectly derived by multiplying by 2 to arrive at .0176 or $\approx 1.8\%$.

- B. Incorrect because this answer calculates using the 4th power and does not multiply the result by 4. Since this is a zero coupon bond, we use a version of the equation

$PV = (PMT + FV) / (1 + Z_N)^N$, where PMT and FV are the single payment received at maturity and N is the number of periods until maturity (equation also shown as $80 = 100 / (1 + r)^{20}$. In this case $90 = 100 / (1 + Z_{12})^4$. $100/90 = (1 + Z_{12})^4$. Solving for $1 + Z_{12} = 1.0267$ or $Z_{12} = .0267 \approx 2.7\%$.

- C. **Correct** because since this is a zero coupon bond, we use a version of the equation

$PV = (PMT + FV) / (1 + Z_N)^N$, where PMT and FV are the single payment received at maturity and N is the number of periods until maturity (equation also shown as $80 = 100 / (1 + r)^{20}$. In this case $90 = 100 / (1 + Z_{12})^{12}$. $100/90 = (1 + Z_{12})^{12}$. Solving this equation $Z_{12} = .00882$. To get to the annual yield to maturity, multiply Z_{12} by 4 for 3.527%.

Yield and Yield Spread Measures for Fixed-Rate Bonds

- calculate annual yield on a bond for varying compounding periods in a year

Solution

- A. Incorrect because issuers predominantly use derivatives to offset or hedge market-based underlying exposures incidental to their commercial operations and financing activities. In contrast, investors use derivatives to replicate a cash market strategy, hedge a fund's value against adverse movements in underlyings, or modify or add exposures using derivatives, which in some cases are unavailable in cash markets. The flexibility to take short positions or to increase or otherwise modify exposure using derivatives beyond cash alternatives is an attractive feature for portfolio managers (i.e., investors).
- B. Incorrect because in contrast, investors use derivatives to replicate a cash market strategy.
- C. **Correct** because issuers predominantly use derivatives to offset or hedge market-based underlying exposures incidental to their commercial operations and financing activities. In contrast, investors use derivatives to replicate a cash market strategy, hedge a fund's value against adverse movements in underlyings, or modify or add exposures using derivatives, which in some cases are unavailable in cash markets.

Derivative Benefits, Risks, and Issuer and Investor Uses

- compare the use of derivatives among issuers and investors

- A. **Correct** because each forward contract will be created at the fixed price that corresponds to the fixed price of a swap of the same maturity with payments made at the same dates as the series of forward contracts. That means that some of the forward contracts would have positive values and some would have negative values, but their combined values would equal zero.
- B. Incorrect because a swap is not similar to a series of forward contracts when all the forward contracts have the same maturity date.
- C. Incorrect because each forward contract will be created at the fixed price that corresponds to the fixed price of a swap of the same maturity with payments made at the same dates as the series of forward contracts. That means that some of the forward contracts would have positive values and some would have negative values, but their combined values would equal zero. Therefore, a swap contract is similar to a series of long forward contracts of which some have positive values and some have negative values, but long forward contracts are not matched with the short forward contracts at each swap payment date.

Pricing and Valuation of Interest Rates and Other Swaps

- describe how swap contracts are similar to but different from a series of forward contracts

- A. Incorrect because a more conservative and accurate approach is to use bid prices for long positions and ask prices for short positions because these are more realistic prices at which the positions could be closed.
- B. Correct** because a more conservative and accurate approach is to use bid prices for long positions and ask prices for short positions because these are more realistic prices at which the positions could be closed.
- C. Incorrect because the more conservative and accurate approach is to use bid prices for long positions and ask prices for short positions because these are more realistic prices at which the positions could be closed. However, some managers use a simplifying approach whereby they take the average of the bid and the ask; this approach is not as accurate and could be misleading.

Alternative Investment Performance and Returns

- describe the performance appraisal of alternative investments

Solution

- A. Incorrect because undervaluation is defined based on the difference between market price and estimated intrinsic value, not based on par value and estimated intrinsic value: if the estimated value exceeds the market price, the analyst infers the security is undervalued.
- B. Incorrect because undervaluation is defined based on the difference between market price and estimated intrinsic value, not based on book value and estimated intrinsic value: if the estimated value exceeds the market price, the analyst infers the security is undervalued.
- C. **Correct** because if the estimated value exceeds the market price, the analyst infers the security is undervalued.

Equity Valuation: Concepts and Basic Tools

- evaluate whether a security, given its current market price and a value estimate, is overvalued, fairly valued, or undervalued by the market

Solution

- A. **Correct** because the Sharpe ratio, also called the reward-to-variability ratio, is simply the slope of the capital allocation line equal to $[E(R_p) - R_f] / \sigma_p$.
- B. Incorrect because the Treynor ratio is the additional return required for every increment of systematic risk, equal to $[E(R_p) - R_f] / \beta_p$. The slope of the capital allocation line is the additional return required for every increment of total risk, equal to $[E(R_p) - R_f] / \sigma_p$.
- C. Incorrect because Jensen's alpha is the vertical distance from the SML measuring the excess return for the same risk as that of the market and is given by $\alpha_p = R_p - \{R_f + \beta_p[E(R_m) - R_f]\}$. The slope of the capital allocation line is the additional return required for every increment of total risk, equal to $[E(R_p) - R_f] / \sigma_p$.

Portfolio Risk and Return: Part II

- calculate and interpret the Sharpe ratio, Treynor ratio, M 2, and Jensen's alpha

Solution

A. Incorrect because it assumes the management fee and performance fee accrued for the two-year cumulative return rather than on year-by-year basis:

$$\text{Management fees for two years} = 100 \times 2\% \times 2 = 4.0$$

$$\text{Performance fee for the two years} = (110 - 4 - 100) \times 20\% = 1.2$$

$$\text{Total fees to the hedge fund manager} = 4.0 + 1.2 = 5.2.$$

B. Incorrect because it includes a clawback of performance fee in Year 2:

$$\text{Management fee for Year 1} = 125 \times 2\% = 2.5$$

$$\text{Performance fee for Year 1} = (125 - 2.5 - 100) \times 20\% = 4.5$$

$$\text{Assets under management (AUM) at beginning of Year 2} = 125 - 2.5 - 4.5 = 118 \text{ (high-water mark)}$$

$$\text{Management fee for Year 2} = 110 \times 2\% = 2.2$$

$$\text{Performance fee for Year 2} = (110 - 2.2 - 118) \times 20\% \approx -2.0$$

$$\text{Total fees to the hedge fund manager} = 2.5 + 4.5 + 2.2 - 2.0 \approx 7.2$$

C. Correct because:

$$\text{Management fee for Year 1} = 125 \times 2\% = 2.5$$

$$\text{Performance fee for Year 1} = (125 - 2.5 - 100) \times 20\% = 4.5$$

$$\text{Assets under management (AUM) at beginning of Year 2} = 125 - 2.5 - 4.5 = 118 \text{ (high-water mark)}$$

$$\text{Management fee for Year 2} = 110 \times 2\% = 2.2$$

As the fund has a loss in Year 2 and the AUM falls below the high-water mark, there is no performance fee for Year 2.

$$\text{Total fees to the hedge fund manager} = 2.5 + 4.5 + 2.2 = 9.2$$

Alternative Investment Performance and Returns

- calculate and interpret alternative investment returns both before and after fees

Solution

- A. **Correct** because the price of a forward contract remains constant throughout its life. It is set as part of the contract specifications. The value varies with changes in the price of the underlying.
- B. Incorrect because the price is constant, but value varies with changes in the price of the underlying.
- C. Incorrect because the price is constant, but value varies with changes in the price of the underlying.

Pricing and valuation of forward contracts and for an underlying with varying maturities

- Explain how the value and price of a forward contract are determined at initiation, during the life of the contract, and at expiration

- A. Incorrect because it subtracts the market value of debt, rather than adding it \neq Market capitalization – Market value of debt – Enterprise value = \$43 – \$5 – \$33 = \$5 billion.
- B. Incorrect because it subtracts the enterprise value from the market capitalization \neq Market capitalization – Enterprise value = \$43 – \$33 = \$10 billion.
- C. **Correct** because enterprise value is determined as market capitalization plus market value of preferred stock plus market value of debt minus cash and investments (cash equivalents and short-term investments). Therefore cash and short-term investments = Market capitalization + Market value of debt – Enterprise value = \$43 + \$5 – \$33 = \$15 billion.

Equity Valuation: Concepts and Basic Tools

- describe enterprise value multiples and their use in estimating equity value

- A. Incorrect because the value of a European put option can be either directly or inversely related to the time to expiration. The direct effect is more common, but the inverse effect can prevail with a put the longer the time to expiration, the higher the risk-free rate, and the deeper it is in-the-money.
- B. Correct** because the value of a European put option can be either directly or inversely related to the time to expiration. The direct effect is more common, but the inverse effect can prevail with a put the longer the time to expiration, the higher the risk-free rate, and the deeper it is in-the-money.
- C. Incorrect because the value of a European put option can be either directly or inversely related to the time to expiration. The direct effect is more common, but the inverse effect can prevail with a put the longer the time to expiration, the higher the risk-free rate, and the deeper it is in-the-money.

Pricing and Valuation of Options

- identify the factors that determine the value of an option and describe how each factor affects the value of an option

- A. **Correct** because behavioral explanations for value anomalies, presenting the anomalies as mispricing rather than compensation for increased risk. These studies recognize the emotional factors involved in appraising stocks. The halo effect, for example, extends a favorable evaluation of some characteristics to other characteristics. A company with a good growth record and good previous share price performance might be seen as a good investment, with higher expected returns than its risk characteristics merit. This view is a form of representativeness that can lead investors to extrapolate recent past performance into expected returns. Overconfidence can also be involved in predicting growth rates, potentially leading growth stocks to be overvalued.
- B. Incorrect because the loss-aversion bias refers to the tendency to strongly prefer avoiding losses to achieving gains. The loss-aversion bias is also known as the disposition effect: the holding of investments that have experienced losses too long, and the selling of investments that have experienced gains too quickly (i.e., holding on to losers and selling winners). Hence, the disposition effect does not contribute to an explanation of the value stock anomaly.
- C. Incorrect because the framing bias is an information-processing bias in which a person answers a question differently based on the way in which it is asked or framed. It is often possible to frame a given decision problem in more than one way. Further, as a result of framing bias, FMPs (financial market participants) may do the following: Misidentify risk tolerances because of how questions about risk tolerance were framed, becoming more risk-averse when presented with a gain frame of reference and more risk-seeking when presented with a loss frame of reference. This misidentification may result in suboptimal portfolios. Focus on short-term price fluctuations, which may result in long-run considerations being ignored in the decision making process. Hence, the effects of the framing bias do not contribute to an explanation of the value stock anomaly.

The Behavioral Biases of Individuals

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

- A. Incorrect because Investment 2's standard deviation of an equally weighted portfolio is not simply the average of the standard deviations of the individual shares. Investment 2 offers a lower standard deviation of return than the average of its individual components due to the correlations or interactions between the individual securities. Therefore, Investment 1's standard deviation is most likely higher, not equal to, or lower than Investment 2's standard deviation.
- B. Incorrect because Investment 2's standard deviation of an equally weighted portfolio is not simply the average of the standard deviations of the individual shares. Investment 2 offers a lower standard deviation of return than the average of its individual components due to the correlations or interactions between the individual securities. Therefore, Investment 1's standard deviation is most likely higher, not equal to, or lower than Investment 2's standard deviation.
- C. **Correct** because the equally weighted portfolio's return is the same as the return on the randomly selected security. However, the same does not hold true for the portfolio standard deviation. That is, the standard deviation of an equally weighted portfolio is not simply the average of the standard deviations of the individual shares. Investment 2 offers a lower standard deviation of return than the average of its individual components due to the correlations or interactions between the individual securities.

Portfolio Management: An Overview

- describe the portfolio approach to investing

- A. **Correct** because the current yield is the sum of the coupon payments received over the year divided by the flat price. If a bond is trading at a premium, the denominator in the current yield calculation will be greater than 100 and the current yield will be less than the coupon rate.
- B. Incorrect because the bond's current yield will be less than, not equal to, its coupon rate.
- C. Incorrect because the bond's current yield will be less, not greater than, its coupon rate.

Yield and Yield Spread Measures for Fixed-Rate Bonds

- compare, calculate, and interpret yield and yield spread measures for fixed-rate bonds

A. **Correct** because the slope of the [capital market] line referred to as the market price of risk is $[E(R_m) - R_f]/\sigma_m$, where $E(R_m)$ is the expected market return, R_f is the risk-free rate, and σ_m is the standard deviation of market returns.

Thus, the slope of the capital market line is $(0.10 - 0.02)/0.11 = 0.08/0.11 = 0.7273 \approx 0.73$.

B. Incorrect because the slope of the capital market line is calculated incorrectly as $E(R_m)/\sigma_m$, where $E(R_m)$ is the expected market return and σ_m is the standard deviation of market returns.

Thus, the slope of the capital market line is calculated as $0.10/0.11 = 0.9091 \approx 0.91$.

C. Incorrect because the slope of the capital market line is calculated incorrectly as $\sigma_m/[E(R_m) - R_f]$, where $E(R_m)$ is the expected market return, R_f is the risk-free rate, and σ_m is the standard deviation of market returns.

Thus, the slope of the capital market line is calculated as $0.11/(0.10 - 0.02) = 0.11/0.08 = 1.375 \approx 1.38$.

Portfolio Risk and Return: Part II

- explain the capital allocation line (CAL) and the capital market line (CML)

- A. **Correct** because one key catalyst supporting the growth of passive investing is low cost for investors—management fees for index (or other passive) funds are often a fraction of those for active strategies.
- B. Incorrect because it is active investing, not passive investing that seeks to outperform benchmarks. Through fundamental research, quantitative research, or a combination of both, active asset managers generally attempt to outperform either predetermined performance benchmarks, such as the S&P 500, or, for multi-asset class portfolios, a combination of benchmarks. In contrast to active managers, passive managers attempt to replicate the returns of a market index.
- C. Incorrect because a low correlation of returns between traditional investments and alternative investments is a catalyst explaining the relative growth in alternative investing, not the growth in passive investing. Assets under management in alternative investments have grown rapidly since the mid-1990s. This growth has largely occurred because of interest in these investments from institutions, such as endowments and pension funds, and from family offices seeking diversification and return opportunities. Alternative investments offer broader diversification (because of their lower correlation with traditional asset classes).

Portfolio Management: An Overview

- describe aspects of the asset management industry

- A. Incorrect because approximate convexity is computed as: $[(PV_-) + (PV_+) - (2 \times PV_0)]/[(\Delta Yield)^2 \times (PV_0)]$. This answer multiplies the change in yield in the denominator by 2 rather than squaring it: $[103.52 + 103.84 - (2 \times 103.67)]/[(2 \times 0.002) \times 103.67] = 0.0482 \approx 0.048$.
- B. Incorrect because approximate convexity is computed as: $[(PV_-) + (PV_+) - (2 \times PV_0)]/[(\Delta Yield)^2 \times (PV_0)]$. This answer fails to square the change in yield in the denominator: $[103.52 + 103.84 - (2 \times 103.67)]/[0.002 \times 103.67] = 0.09645 \approx 0.096$
- C. **Correct** because approximate convexity is computed as: $[(PV_-) + (PV_+) - (2 \times PV_0)]/[(\Delta Yield)^2 \times (PV_0)] = [103.52 + 103.84 - (2 \times 103.67)]/[(0.002)^2 \times 103.67] = 48.22996 \approx 48.230$.

Yield-Based Bond Convexity and Portfolio Properties

- calculate and interpret convexity and describe the convexity adjustment

A. **Correct** because it has correctly applied margin requirement and calculated the effect of leverage on the return calculation, accordingly:

$$\text{Cost of purchase} = \text{Shares purchased} \times \text{Purchase price} = 1,000 \times \$30 = \$30,000$$

$$\begin{aligned}\text{Initial investment} &= \text{Equity invested} = \text{Cost of purchase} \times \text{Margin requirement} \\ &= \$30,000 \times 75\% = \$22,500\end{aligned}$$

$$\text{Proceeds from sale} = \text{Shares sold} \times \text{Sales price} = 1,000 \times \$26 = \$26,000$$

$$\begin{aligned}\text{Loss on the position} &= \text{Proceeds from Sale} - \text{Cost of purchase} \\ &= \$26,000 - \$30,000 = -\$4,000\end{aligned}$$

$$\text{Return on investment} = \text{Loss on the position} / \text{Initial investment}$$

$$= -\$4,000 / \$22,500 = 0.1777\dots \approx 17.78\%$$

Alternatively, it can also be calculated as $\text{Return on investment} = \text{Loss on the position} / \text{Cost of purchase} / \text{Margin requirement} = (-\$4,000 / \$30,000) / 75\% = -0.1777\dots \approx -17.78\%$

B. Incorrect because it has omitted the margin requirement and the effect of leverage on the return calculation, consequently:

$$\text{Cost of purchase} = \text{Shares purchased} \times \text{Purchase price} = 1,000 \times \$30 = \$30,000$$

$$\text{Initial investment} = \text{Cost of purchase} = \$30,000$$

$$\text{Proceeds from sale} = \text{Shares sold} \times \text{Sales price} = 1,000 \times \$26 = \$26,000$$

$$\begin{aligned}\text{Loss on the position} &= \text{Proceeds from Sale} - \text{Cost of purchase} \\ &= \$26,000 - \$30,000 = -\$4,000\end{aligned}$$

$$\text{Return on investment} = \text{Loss on the position} / \text{Initial investment}$$

$$= -\$4,000 / \$30,000 = -0.1333\dots \approx -13.33\%$$

C. Incorrect because it has incorrectly applied margin requirement and miscalculated the effect of leverage on the return calculation, consequently:

$$\text{Cost of purchase} = \text{Shares purchased} \times \text{Purchase price} = 1,000 \times \$30 = \$30,000$$

$$\text{Initial investment} = \text{Equity invested} = \text{Cost of purchase} / \text{Margin requirement}$$

$$= \$30,000 / 75\% = \$40,000$$

$$\text{Proceeds from sale} = \text{Shares sold} \times \text{Sales price} = 1,000 \times \$26 = \$26,000$$

$$\begin{aligned}\text{Loss on the position} &= \text{Proceeds from Sale} - \text{Cost of purchase} \\ &= \$26,000 - \$30,000 = -\$4,000\end{aligned}$$

$$\text{Return on investment} = \text{Loss on the position} / \text{Initial investment}$$

$$= -\$4,000 / \$40,000 = 0.1 = 10.00\%$$

Alternatively, it can also be calculated as $\text{Return on investment} = \text{Loss on the position} / \text{Cost of purchase} \times \text{Margin requirement} = -\$4,000 / \$30,000 \times 75\% = -10.00\%$

Market Organization and Structure

- calculate and interpret the leverage ratio, the rate of return on a margin transaction, and the security price at which the investor would receive a margin call

- A. **Correct** because there are two types of waterfalls: *deal-by-deal* (or *American*) waterfalls and *whole-of-fund* (or *European*) waterfalls. Deal-by-deal waterfalls are more advantageous to the GP because performance fees are collected on a per-deal basis, allowing the GP to get paid before LPs receive both their initial investment *and* their preferred rate of return (i.e., the hurdle rate) on the entire fund.
- B. Incorrect because there are two types of waterfalls: *deal-by-deal* (or *American*) waterfalls and *whole-of-fund* (or *European*) waterfalls. In contrast to deal-by-deal waterfalls, whole-of-fund waterfalls occur at the aggregate fund level (i.e., after *all* investments have been exited) and are more advantageous to the LPs.
- C. Incorrect because there are two types of waterfalls: *deal-by-deal* (or *American*) waterfalls and *whole-of-fund* (or *European*) waterfalls. In contrast to deal-by-deal waterfalls, whole-of-fund waterfalls occur at the aggregate fund level (i.e., after *all* investments have been exited) and are more advantageous to the LPs.

Alternative Investment Features, Methods, and Structures

- describe investment ownership and compensation structures commonly used in alternative investments

- A. **Correct** because cumulative preference shares have lower risk than non-cumulative preference shares because the cumulative feature gives investors the right to receive any unpaid dividends before any dividends can be paid to common shareholders.
- B. Incorrect because preference shares are less risky than common shares.
- C. Incorrect because preference shares are less risky than common shares.

Overview of Equity Securities

- compare the risk and return characteristics of different types of equity securities

- A. **Correct** because the forward and spot curves are interconnected to each other. The spot curve can be calculated from the forward curve, and the forward curve can be calculated from the spot curve. Either curve can be used to value fixed-rate bonds.
- B. Incorrect because the spot curve can be calculated from the forward curve, and the forward curve can be calculated from the spot curve.
- C. Incorrect because the spot curve can be calculated from the forward curve, and the forward curve can be calculated from the spot curve.

The Term Structure of Interest Rates: Spot, Par, and Forward Curves

- define par and forward rates, and calculate par rates, forward rates from spot rates, spot rates from forward rates, and the price of a bond using forward rates

- A. Incorrect because it represents the put price p_0 less the difference between the exercise price X and the price of the underlying S_T at expiration: $30 - (620 - 600) = 10$. This would be the profit to the seller of a call option, $\Pi = -\text{Max}(0, S_T - X) + c_0$, with the same exercise price and the same selling price. By contrast, to the put seller, the profit is $\Pi = -\text{Max}(0, X - S_T) + p_0$. Therefore, $\Pi = -\text{Max}(0, 600 - 620) + 30 = 30$.
- B. Incorrect because it represents the payoff to the call buyer $c_T = \text{Max}(0, S_T - X)$, where S_T is the price of the underlying at expiration and X is the exercise price. Therefore, $c_T = \text{Max}(0, 620 - 600) = 20$. By contrast, to the put seller, the profit is $\Pi = -\text{Max}(0, X - S_T) + p_0$, where p_0 is the put price. Therefore, $\Pi = -\text{Max}(0, 600 - 620) + 30 = 30$.
- C. **Correct** because to the put seller, the profit is $\Pi = -\text{Max}(0, X - S_T) + p_0$, where X is the exercise price, S_T is the price of the underlying at expiration, and p_0 is the put price. Therefore, $\Pi = -\text{Max}(0, 600 - 620) + 30 = 30$.

Forward Commitment and Contingent Claim Features and Instruments

- determine the value at expiration and profit from a long or a short position in a call or put option

- A. Incorrect because information about an investor's tax status should be classified as a tax concern, not a legal and regulatory factor. Tax status varies among investors. Some investors will be subject to taxation on investment returns and some will not. For example, in many countries returns to pension funds are exempt from tax. A candidate may select this answer choice due to the perceived regulatory nature of an investor's tax regime.
- B. Correct** because the IPS (investment policy statement) should state any legal and regulatory restrictions that constrain how the portfolio is invested. In some countries, such institutional investors as pension funds are subject to restrictions on the composition of the portfolio. Pension funds also often face restrictions on the percentage of assets that can be invested in securities issued by the plan sponsor, so called self-investment limits.
- C. Incorrect because an investor's desire to avoid investments in the weapons and gambling industries should be classified as a unique circumstance, not a legal and regulatory factor. A client may have considerations derived from his or her religion or ethical values that could constrain investment choices. For instance, a client may have personal objections to certain products (e.g., pornography, weapons, tobacco, gambling) which could lead to the exclusion of certain companies, countries, or types of securities from the investable universe as well as the client's benchmark. A candidate may select this answer choice due to the fact that the weapons and gambling industries are heavily regulated.

Basics of Portfolio Planning and Construction

- describe the investment constraints of liquidity, time horizon, tax concerns, legal and regulatory factors, and unique circumstances and their implications for the choice of portfolio assets

Solution

- A. Incorrect because neither put–call parity nor put–call–forward parity support this interpretation.
- B. Incorrect because neither put–call parity nor put–call–forward parity support this interpretation.
- C. **Correct** because put-call-forward parity can be written as:

$$p_0 - c_0 = [X - F_0(T)]/(1 + r)^T$$

This means that the difference between the price of a put and the price of a call is equal to the difference between exercise price and forward price discounted at the risk-free rate.

Option Replication Using Put–Call Parity

- explain put–call forward parity for European options

- A. Incorrect because value at risk is used to measure an absolute risk objective, not a relative risk objective. Measures of absolute risk include the variance or standard deviation of returns and value at risk.
- B. **Correct** because quantitative risk objectives can be absolute or relative or a combination of the two. Some clients may choose to express relative risk objectives, which relate risk relative to one or more benchmarks perceived to represent appropriate risk standards. For risk relative to a benchmark, the measure could be tracking risk, or tracking error.
- C. Incorrect because standard deviation of returns is used to measure an absolute risk objective, not a relative risk objective. Measures of absolute risk include the variance or standard deviation of returns and value at risk.

Basics of Portfolio Planning and Construction

- describe risk and return objectives and how they may be developed for a client

- A. **Correct** because when the underlying is beyond the exercise price in the appropriate direction (higher for a call, lower for a put), the option is said to be in the money. Thus, if the underlying value [at expiration] exceeds the exercise price ($S_T > X$), then the option value is positive and equal to $S_T - X$. The call option is then said to be in the money. Accordingly, if $X - S_T < 0$, the call option is in the money.
- B. Incorrect because when the underlying is precisely at the exercise price, the option is said to be at the money. Thus, when $S_T = X$, the call option is said to be at the money. Accordingly, when the exercise price minus the price of the underlying at expiration or $X - S_T = 0$, the call option is at the money, not in the money.
- C. Incorrect because when the underlying has not reached the exercise price (currently lower for a call, higher for a put), the option is said to be out of the money. Thus, when the underlying value [at expiration] is less than the exercise price, the call option is said to be out of the money. Accordingly, when $X - S_T > 0$, the call option is out of the money, not in the money.

Pricing and Valuation of Options

- explain the exercise value, moneyness, and time value of an option

- A. **Correct** because accrued interest is calculated using Equation $AI = t/T \times PMT$. Further, the 30/360 day-count convention often is used for corporate bonds. It assumes that each month has 30 days and that a full year has 360 days. Therefore for settlement on February 5, interest will have accrued for two months and 5 days, or 65 days. $(65/180) \times (5.0/2) = 0.9028$ per 100 par value $\approx \$9.03$ per bond.
- B. Incorrect because accrued interest is calculated using Equation $AI = t/T \times PMT$. Further, the 30/360 day-count convention often is used for corporate bonds. It assumes that each month has 30 days and that a full year has 360 days. This response uses an incorrect denominator of 365 days and an incorrect payment of \$5. $(67/365) \times 5 = 0.9178$ per 100 par value $\approx \$9.18$ per bond.
- C. Incorrect because accrued interest is calculated using Equation $AI = t/T \times PMT$. Further, the 30/360 day-count convention often is used for corporate bonds. It assumes that each month has 30 days and that a full year has 360 days. This response uses an incorrect numerator of actual days. $(67/180) \times (5/2) = .9306$ per 100 par value $\approx \$9.31$ per bond.

Fixed-Income Bond Valuation: Prices and Yields

- calculate a bond's price given a yield-to-maturity on or between coupon dates

- A. Incorrect because 18% is the result of multiplying the percentages: $0.05 \times 0.03 \times 0.12 = 0.00018$, then mistakenly assuming the need to adjust the decimal as is common in calculating percentages, to arrive at 18%. This is also close to the other two answers so could look feasible to a candidate.
- B. Incorrect because 20% is the result of adding the percentage returns rather than calculating the geometric return.
 $5\% + 3\% + 12\% = 20\%$.
- C. **Correct** because the calculation of index values over multiple time periods requires geometrically linking the series of index returns. The formula is: $\text{Return} = ((1 + R_{t1}) \times (1 + R_{t2}) \times (1 + R_{t3})) - 1$. Where R_{tx} = return in period x. $((1 + 0.05) \times (1 + 0.03) \times (1 + 0.12)) - 1 \approx 0.21$ or 21%.

Security Market Indexes

- calculate and interpret the value, price return, and total return of an index

- A. **Correct** because weak form efficiency implies security prices reflect all past market data and investors cannot predict future price changes by extrapolating prices or patterns of prices from the past. If the analyst can profitably trade on price patterns, then the market is not weak form efficient, and consequently cannot be semi-strong or strong form efficient either.
- B. Incorrect because weak form efficiency implies security prices reflect all past market data and investors cannot predict future price changes by extrapolating prices or patterns of prices from the past. If the analyst can profitably trade on price patterns, then the market is not weak form efficient, and consequently cannot be semi-strong or strong form efficient either.
- C. Incorrect because weak form efficiency implies security prices reflect all past market data and investors cannot predict future price changes by extrapolating prices or patterns of prices from the past. If the analyst can profitably trade on price patterns, then the market is not weak form efficient, and consequently cannot be semi-strong or strong form efficient either.

Market Efficiency

- contrast weak-form, semi-strong-form, and strong-form market efficiency

A. **Correct** because the value of the company's preferred stock is given as:

$$V_0 = D_0/r = \$100(0.06)/0.115 = \$51.17$$

B. Incorrect. It uses D_1 instead of D_0

$$V = \$100(0.06)(1.05)/0.115 = \$54.78$$

C. Incorrect. It uses constant growth (where growth is $\neq 0$) model;

$$V = \$100(0.06)(1.05)/(0.115 - 0.05) = \$96.92$$

Equity Valuation: Concepts and Basic Tools

- calculate the intrinsic value of a non-callable, non-convertible preferred stock

- A. Incorrect because under the uniform pricing rule all trades execute at the same price. The market chooses the price that maximizes the total quantity traded.
- B. Incorrect because under the derivative pricing rule the price is derived from another market, typically at the midpoint of the best bid and ask quotes published by the exchange at which the security primarily trades.
- C. **Correct** because under the discriminatory pricing rule the limit price of the order or quote that first arrived—the standing order—determines the trade price.

Market Organization and Structure

- describe how securities, contracts, and currencies are traded in quote-driven, order-driven, and brokered markets

- A. Incorrect because although Investor A has an investment horizon shorter than the Macaulay duration of 5.5 years, it is not substantially shorter. Also, he is not as vulnerable to an increase in rates as Investor B, whose bond has considerable market price risk.
- B. **Correct** because Investor B has an investment horizon shorter than the Macaulay duration of 5.5 years. When the investment horizon is shorter than the Macaulay duration of the bond, market price risk dominates coupon reinvestment risk. The investor is vulnerable to higher interest rates.
- C. Incorrect because Investor C has an investment horizon longer than the Macaulay duration. In this case, coupon reinvestment risk dominates market price risk. Also, assuming an interest rate increase, the gain from reinvesting coupon payments at a higher rate will outweigh any loss incurred from a drop in bond price.

Interest Rate Risk and Return

- describe the relationships among a bond's holding period return, its Macaulay duration, and the investment horizon;

- A. Incorrect because both, Asset 1 and Asset 2 have lower standard deviations than Asset 3. A candidate may choose this because it has the highest correlation with the market.
- B. Incorrect because both, Asset 1 and Asset 2 have lower standard deviations than Asset 3. A candidate may choose this because it has the highest beta.
- C. **Correct** because beta is defined as: $\beta_i = \rho_{i,m} \sigma_i / \sigma_m$, so $\sigma_i = (\beta_i \times \sigma_m) / \rho_i$.

Where: $\rho_{i,m}$ is the correlation between Asset i and the market portfolio, σ_i is the standard deviation of Asset i , and σ_m is the standard deviation of the market portfolio.

$$\text{Asset 1's standard deviation} = (1.000 \times 0.2) / 0.8 = 0.25$$

$$\text{Asset 2's standard deviation} = (1.225 \times 0.2) / 0.7 = 0.35$$

$$\text{Asset 3's standard deviation} = (1.125 \times 0.2) / 0.5 = 0.45$$

Therefore, the asset with the highest standard deviation is Asset 3, where standard deviation = 0.45.

Portfolio Risk and Return: Part II

- calculate and interpret beta

A. Correct. The standard deviation of the portfolio is calculated as follows:

$$\sigma_p = \sqrt{(0.1^2 \times 0.35^2) + (0.9^2 \times 0.7^2) + (2 \times 0.1 \times 0.9 \times (-0.1) \times 0.35 \times 0.7)}$$

$$= 62.75\%$$

B. Incorrect. It is calculated as follows:

$$\sigma_p = \sqrt{(0.1^2 \times 0.35^2) + (0.9^2 \times 0.7^2)}$$

$$= 63.10\%$$

C. Incorrect. It is calculated as follows:

$$\sigma_p = \sqrt{(0.1^2 \times 0.35^2) + (0.9^2 \times 0.7^2) + (2 \times 0.1 \times 0.9 \times 0.1 \times 0.35 \times 0.7)}$$

$$= 63.45\%$$

Portfolio Risk and Return: Part I

- calculate and interpret portfolio standard deviation

- A. **Correct** because the effective duration and modified duration of an option-free bond are identical only in the rare circumstance of an absolutely flat yield curve. Typically, the two duration measures will differ, but the difference narrows when the yield curve is flatter, the bond's time to maturity is shorter, and the bond is priced closer to its par value.
- B. Incorrect because effective duration is a curve duration statistic that measures interest rate risk in terms of a parallel shift in the benchmark yield curve, assuming all yields change by the same amount. Interest rate sensitivity associated with non-parallel yield curve shifts is measured by key rate duration rather than effective duration.
- C. Incorrect because effective duration is a curve duration statistic that measures interest rate risk in terms of a parallel shift in the benchmark yield curve (not a change in the bond's own yield to maturity). Yield duration statistics, such as Macaulay duration and modified duration, measure interest rate risk in terms of a change in the bond's own yield to maturity.

Curve-Based and Empirical Fixed-Income Risk Measures

- explain why effective duration and effective convexity are the most appropriate measures of interest rate risk for bonds with embedded options

- Solution
- A. Incorrect because Kurtosis is related to the fat-tail feature.
 - B. Incorrect because positive skew has more large positive deviation from the mean.
 - C. **Correct** because the negatively skewed investment characteristic is usually related to the stock returns whose distribution is concentrated to the right.

Portfolio Risk and Return: Part I

- describe characteristics of the major asset classes that investors consider in forming portfolios

- A. Incorrect because the important point to understand is that while the risk aversion of investors is relevant to pricing assets, it is not relevant to pricing derivatives. As such, derivatives pricing is sometimes called risk-neutral pricing. Therefore, investors are not assumed to be risk averse.
- B. **Correct** because the risk aversion of the investor is not relevant to pricing the derivative, one can just as easily obtain the derivative price by assuming that the investor is risk neutral. That means that the expected payoff of the derivative can be discounted at the risk-free rate rather than the risk-free rate plus a risk premium.
- C. Incorrect because the derivative price is the price that guarantees the risk-free combination of the derivative and the underlying produces a risk-free return. Also, risk-neutral pricing uses the fact that arbitrage opportunities guarantee that a risk-free portfolio consisting of the underlying and the derivative must earn the risk-free rate, not a rate of return equal to the risk-free rate plus a risk premium.

Arbitrage, Replication, and the Cost of Carry in Pricing Derivatives

- explain how the concepts of arbitrage and replication are used in pricing derivatives

Solution

- A. Incorrect because most digital assets do not have an inherent value based on underlying assets or on the potential cash flow—interest and dividends—they can or are expected to generate.
- B. **Correct** because the main similarity between digital assets and traditional financial assets is the emergence of indirect investment vehicles such as exchange-traded funds and hedge funds that invest both in traditional financial assets and in digital assets.
- C. Incorrect because one key difference between digital assets and traditional financial instruments is that traditional assets are generally recorded in private ledgers maintained by central intermediaries.

Introduction to Digital Assets

- explain investment features of digital assets and contrast them with other asset classes

- A. Incorrect because credit risk has two components. The first is known as default risk, or default probability, which is the probability that a borrower defaults—that is, fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security.
- B. **Correct** because credit risk has two components. The second component is loss severity (also known as “loss given default”) in the event of default—that is, the portion of a bond’s value (including unpaid interest) an investor loses.
- C. Incorrect because although it is sometimes important to consider the entire distribution of potential losses and their respective probabilities, it is often convenient to summarize the risk with a single default probability and loss severity and to focus on the expected loss: $\text{Expected loss} = \text{Default probability} \times \text{Loss severity given default}$.

Credit Risk

- describe credit risk and its components, probability of default and loss given default

- A. **Correct** because many commercial loans backing commercial mortgage-backed securities (CMBS) are balloon loans that require significant repayment of principal at maturity. The risk that the borrower will not be able to make the balloon payment is called balloon risk. The lender may decide to extend the loan over a period of time called the workout period. Because the term of the loan can be extended, balloon risk is a type of extension risk.
- B. Incorrect because shorter-term tranches in a CMO structure have less extension risk than longer-term tranches. Some protection against prepayment risk is provided for each tranche in a CMO structure. The protection arises because prioritizing the distribution of principal (that is, establishing the payment rule for the principal repayment) effectively protects the shorter-term tranche against extension risk. This protection comes from the longer-term tranches. At the same time, longer-term tranches benefit because they are provided protection against contraction risk from short-term tranches. Thus, the sequential-pay CMO structure allows investors concerned about extension risk to invest in short-term tranches, and those concerned about contraction risk to invest in long-term tranches.
- C. Incorrect because planned amortization class tranches in a CMO structure offer investors reduction in both extension and contraction risk. A further evolution of the sequential pay CMO are CMOs that include Planned Amortization Class (PAC) tranches, occasionally accompanied by support tranches. PAC tranches offer greater predictability and stability of the cash flows. These tranches make scheduled and fixed principal payments over a predetermined time period to their investors if the prepayment levels in the pool are within a certain maximum and minimum range. If the prepayment rate is within the specified range, all prepayment risk is absorbed by the support tranche.

Mortgage-Backed Security (MBS) Instrument and Market Features

- define prepayment risk and describe time tranching structures in securitizations and their purpose

- A. **Correct** because a fiduciary call consists of a long call and long bond.
- B. Incorrect because this combination represents a synthetic underlying.
- C. Incorrect because this combination represents a synthetic put.

Option Replication Using Put–Call Parity

- explain put–call parity for European options

- A. **Correct** because the justified forward P/E = $p / r - g$, where p is the dividend payout ratio, r is the required return and g is the growth rate. $P/E = 0.45 / (0.10 - 0.07) = 0.45 / 0.03 = 15$.
- B. Incorrect because it uses the earnings retention rate ($1 - \text{dividend payout ratio}$) instead of the dividend payout ratio when calculating the P/E: $0.55 / (0.10 - 0.07) = 0.55 / 0.03 = 18.333 \approx 18$.
- C. Incorrect because it uses the earnings estimate instead of the dividend payout ratio and divides correctly by $(r - g)$ = $\$0.60 / (0.10 - 0.07) = \$0.60 / 0.03 = 20$.

Equity Valuation: Concepts and Basic Tools

- calculate and interpret the following multiples: price to earnings, price to an estimate of operating cash flow, price to sales, and price to book value

A. Incorrect because 50% is the result when using 9% as r rather than 8%:

$$r = 9\%: V_0 = 2 / (0.09 - 0.04) = 2 / 0.05 = \$40;$$

A decrease from \$40 to \$20 equals a 50% decrease.

B. **Correct** because the estimated value (V_0) is expressed as:

$$V_0 = \frac{D_1}{r-g}$$

Where: D_1 = next year's expected dividend

r = required return

g = dividend growth rate

Under the two required rate of return scenarios, the value is:

$$r = 8\%: V_0 = 2 / (0.08 - 0.04) = 2 / 0.04 = \$50$$

$$r = 14\%: V_0 = 2 / (0.14 - 0.04) = 2 / 0.10 = \$20$$

When the required rate of return increases to 14%, the value estimate decreases \$30 from \$50, or 60%.

C. Incorrect because 75% is the increase from 8% to 14%. $14\% / 8\% - 1 = 0.75 = 75\%$.

Equity Valuation: Concepts and Basic Tools

- calculate and interpret the intrinsic value of an equity security based on the Gordon (constant) growth dividend discount model or a two-stage dividend discount model, as appropriate

- A. Incorrect because cattle futures are an example of a derivative contract with a soft commodity underlying. Soft commodities are agricultural products, such as cattle and corn.
- B. Incorrect because soybean options [and futures] are an example of a derivative contract with an agricultural, or soft, commodity underlying.
- C. **Correct** because aluminum futures are an example of a metals contract, which is a derivative with a hard commodity underlying.

Derivative Instrument and Derivative Market Features

- define a derivative and describe basic features of a derivative instrument

- A. Incorrect because the historical results forecasting approach is also less appropriate for companies that are changing their competitive strategy or restructuring in some way, such as making a large acquisition or divestiture that renders historical results non-comparable.
- B. Incorrect because the historical results forecasting approach is a less appropriate forecast approach for companies in cyclical industries, because a future period is likely to be at a different point in the business cycle than the current or past period, and so results will differ.
- C. **Correct** because the historical results forecasting approach may be appropriate for companies operating in industries where the analyst does not expect the industry structure (e.g., Porter's Five Forces, PESTLE influences) to change, as well as for companies that have a low sensitivity to changes in the business cycle.

Company Analysis: Forecasting

- explain principles and approaches to forecasting a company's financial results and position

- A. Incorrect because the three main parties to a securitization are the seller of the collateral, sometimes called the depositor, the SPE that purchases the loans or receivables and uses them as collateral to issue the ABS and the servicer of the loans. The SPE purchases the collateral, it is not the seller of the collateral.
- B. Incorrect because the three main parties to a securitization are the seller of the collateral, sometimes called the depositor, the SPE that purchases the loans or receivables and uses them as collateral to issue the ABS and the servicer of the loans. The SPE purchases the collateral, it does not service the collateral.
- C. **Correct** because the three main parties to a securitization are the seller of the collateral, sometimes called the depositor, the SPE that purchases the loans or receivables and uses them as collateral to issue the ABS and the servicer of the loans. Therefore the SPE purchases the collateral.

Fixed-Income Securitization

- describe securitization, including the parties and the roles they play

- A. **Correct** because infrastructure investments can also be categorized by the underlying assets' stage of development. Greenfield investments, developing new assets and new infrastructure, are opportunistic investments. The intent may be to lease or sell the assets to the government after construction or to hold and operate the assets. If they are held, it can be over the long term or for a shorter period until operational maturity, with subsequent sale to new investors, thus ensuring capital appreciation to reflect the construction and commissioning risk.
- B. Incorrect because the correctional facility is to be constructed; it is not an existing facility. Brownfield investments expand existing facilities and may involve privatization of public assets or a sale leaseback of completed greenfield projects.
- C. Incorrect because a correctional facility is a social infrastructure asset. Economic infrastructure investments support economic activity through transportation assets, information and communication technology (ICT) assets, and utility and energy assets. Social infrastructure investments are directed toward human activities and include such assets as educational, health care, social housing, and correctional facilities.

Real Estate and Infrastructure

- explain features and characteristics of infrastructure

- A. Incorrect because it computes the future value of the coupon payment by just adding them up.
- B. Incorrect because it uses a reinvestment rate of 10% and a coupon payment of 8.00, as follows:

$$8(1.10)^6 + 8(1.10)^5 + 8(1.10)^4 + 8(1.10)^3 + 8(1.10)^2 + 8(1.10)^1 + 8 = 75.90$$

- C. **Correct** because the future value of the reinvested coupon payments is computed as the sum of payments, with each payment compounded at reinvestment rate of 8% for the number of years remaining in the holding period. The calculation is as follows:

$$10(1.08)^6 + 10(1.08)^5 + 10(1.08)^4 + 10(1.08)^3 + 10(1.08)^2 + 10(1.08)^1 + 10 = 89.23$$

Interest Rate Risk and Return

- calculate and interpret the sources of return from investing in a fixed-rate bond;

A. Incorrect because it assumed the sustainable growth rate = $(1 - \text{payout ratio}) \times \text{ROA}$, where ROA = Net income / Average total assets = $1,500/11,500 = 0.1304$.

Thus the sustainable growth rate = $(1 - 0.45) \times 0.1304 = 0.55 \times 0.1304 = 0.0717 \approx 7\%$.

B. Incorrect because it assumed the sustainable growth rate = Payout ratio × ROE, where ROE = Net income / Average shareholders' equity = $1,500 / 7,500 = 0.2$.

Thus sustainable growth rate is calculated as = $0.45 \times 0.2 = 0.09 = 9\%$.

C. **Correct** because the sustainable growth rate = Retention rate × ROE, where the retention rate = $(1 - \text{payout ratio})$ and ROE = Net income / Average shareholders' equity.

Thus sustainable growth rate = $(1 - 0.45) \times 1,500/7,500 = 0.55 \times 0.2 = 0.11 = 11\%$.

Equity Valuation: Concepts and Basic Tools

- calculate and interpret the intrinsic value of an equity security based on the Gordon (constant) growth dividend discount model or a two-stage dividend discount model, as appropriate

- A. Incorrect because an efficient market is thus a market in which asset prices reflect all past and present information and present information includes expectations. Thus, in an efficient market, prices should be expected to react only to the elements of information releases that are not anticipated fully by investors – that is, to the ‘unexpected’ or ‘surprise’ element of such releases.
- B. **Correct** because in an efficient market, prices should be expected to react only to the elements of information releases that are not anticipated fully by investors – that is, to the ‘unexpected’ or ‘surprise’ element of such releases.
- C. Incorrect because an efficient market is thus a market in which asset prices reflect all past and present information and present information includes expectations. Thus, in an efficient market, prices should be expected to react only to the elements of information releases that are not anticipated fully by investors – that is, to the ‘unexpected’ or ‘surprise’ element of such releases.

Market Efficiency

- describe market efficiency and related concepts, including their importance to investment practitioners

- A. Incorrect because MOIC is calculated as follows: $MOIC = (\text{Realized value of investment} + \text{Unrealized [or residual] value of investment}) / (\text{Total amount of invested capital})$. With MOIC, one simply measures the total value of all realized investments and residual asset values (assets that may still be awaiting their ultimate sale) relative to an initial total investment.
- B. Incorrect because MOIC is calculated as follows: $MOIC = (\text{Realized value of investment} + \text{Unrealized [or residual] value of investment}) / (\text{Total amount of invested capital})$. With MOIC, one simply measures the total value of all realized investments and residual asset values (assets that may still be awaiting their ultimate sale) relative to an initial total investment.
- C. **Correct** because MOIC is calculated as follows: $MOIC = (\text{Realized value of investment} + \text{Unrealized [or residual] value of investment}) / (\text{Total amount of invested capital})$. With MOIC, one simply measures the total value of all realized investments and residual asset values (assets that may still be awaiting their ultimate sale) relative to an initial total investment.

Alternative Investment Performance and Returns

- describe the performance appraisal of alternative investments

- A. Incorrect because the yield on the option-free bond will be higher.
- B. Incorrect because the yield on the option-free bond will be higher.
- C. **Correct** because the convertibility option provides a benefit to the investor, who will accept a lower yield on the convertible bond compared with the option-free bond.

Fixed-Income Cash Flows and Types

- describe common cash flow structures of fixed-income instruments and contrast cash flow contingency provisions that benefit issuers and investors

- A. **Correct** because a property unique to price-weighted indexes is that a stock split on one constituent security changes the weights on all the securities in the index.
- B. Incorrect because this is a characteristic associated with a price-weighted index. An equal weighted index is rebalanced when its constituent securities' prices change in order to maintain equal-weighting. After the index is constructed and the prices of constituent securities change, the index is no longer equally weighted. Therefore, maintaining equal weights requires frequent adjustments (rebalancing) to the index.
- C. Incorrect because this is a characteristic associated with a price-weighted index. A stock split would not change the relative weight of a security in a value-weighted index since the total market value of the security would be unchanged after the split. In market-capitalization weighting, or value weighting, the weight on each constituent security is determined by dividing its market capitalization by the total market capitalization (the sum of the market capitalization) of all the securities in the index. Market capitalization or value is calculated by multiplying the number of shares outstanding by the market price per share.

Security Market Indexes

- compare the different weighting methods used in index construction

- A. Incorrect because the two assets also have different levels of unsystematic risk to maintain the same total variance.
- B. Incorrect because the two assets also have different levels of systematic risk, as indicated by their different levels of expected return (according to the CAPM).
- C. **Correct** because the CAPM asserts that the expected returns of assets vary only by their systematic risk as measured by beta. Hence, if the two assets have different expected returns and are correctly priced according to the CAPM, they must have different levels of systematic risk. Moreover, Total variance = Systematic variance + Nonsystematic variance. Although the equality relationship is between variances, you will find frequent references to total risk as the sum of systematic risk and nonsystematic risk. The assets must have different levels of unsystematic risk since their total variances are the same but they each have different levels of systematic variance/risk.

Portfolio Risk and Return: Part II

- explain systematic and nonsystematic risk, including why an investor should not expect to receive additional return for bearing nonsystematic risk

- A. Incorrect because traders who offer to trade make a market. Those who trade with them take the market. Given the sell-order is behind the market there is no trade and thereby this order will not take the market. A candidate who confuses "bids" and "asks" may add market bid-ask spread to the best offer, instead of subtracting it. That is, \$48 plus \$2 to arrive at \$50 and then the candidate incorrectly assumes that the sell-order at \$49 will be executed and thereby takes the market.
- B. Incorrect because the space between the current best bid and offer is inside the market. If a new limit order arrives here, it makes a new market. A candidate may incorrectly add the market bid-ask spread to the best offer and then incorrectly assume that the buy limit order at \$49 is less than \$50 and thereby makes the market.
- C. **Correct** because a sell order placed above the best offer is behind the market. In this example the sell order [\$49] is placed above the best offer [\$48] and is therefore behind the market.

Market Organization and Structure

- compare market orders with limit orders

- A. Incorrect because small-denomination CDs are mostly traded by retail clients, while large-denomination CDs are traded by institutional investors. Small-denomination CDs are a retail-oriented product, and they are of secondary importance as a funding alternative. Large-denomination CDs, in contrast, are an important source of wholesale funds and are typically traded among institutional investors.
- B. Incorrect because only negotiable CDs can be sold in the open market prior to maturity. If the CD is non-negotiable, the deposit plus the interest are paid to the initial depositor at maturity. Alternatively, a negotiable CD allows any depositor (initial or subsequent) to sell the CD in the open market prior to the maturity date.
- C. **Correct** because like other money market securities, CDs are available in domestic bond markets as well as in the Eurobond market.

Fixed-Income Markets for Corporate Issuers

- compare short-term funding alternatives available to corporations and financial institutions

- A. Incorrect because the CAL and the capital market line (CML) do not apply to all securities or assets but only to portfolios on the efficient frontier. Total risk and systematic risk are equal only for efficient portfolios because those portfolios have no diversifiable risk remaining.
- B. **Correct** because the security market line (SML) is a graphical representation of the capital asset pricing model with beta reflecting systematic risk, on the x-axis and expected return on the y-axis.
- C. Incorrect because the CAL and the capital market line (CML) do not apply to all securities or assets but only to portfolios on the efficient frontier. Total risk and systematic risk are equal only for efficient portfolios because those portfolios have no diversifiable risk remaining.

Portfolio Risk and Return: Part II

- explain the capital asset pricing model (CAPM), including its assumptions, and the security market line (SML)

Solution

- A. Incorrect because the fund manager should be aware of liquidity risk associated with trading bonds. Liquidity risk refers to the transaction costs associated with selling a bond. More specifically, market liquidity risk refers to the risk that the price at which investors can actually transact may differ from the price indicated in the market.
- B. Correct** because the liquidity risk refers to the transaction costs associated with selling a bond. More specifically, market liquidity risk refers to the risk that the price at which investors can actually transact may differ from the price indicated in the market. An investor who plans to hold the bond to maturity most likely would not be concerned with liquidity risk as it does not intend to sell the bond.
- C. Incorrect because while the repo market represents a more stable funding source than short-term unsecured financing, both the uncommitted nature of repo markets and their very short (mostly overnight) maturity give rise to significant rollover and liquidity risks under adverse market conditions.

Credit Risk

- describe macroeconomic, market, and issuer-specific factors that influence the level and volatility of yield spreads

Solution

- A. Incorrect, because transaction fees are unrelated to the motivation for the trades.
- B. **Correct**, information-motivated traders expect to earn returns in excess of market returns because they trade on securities they believe the market has over- or undervalued. Unlike pure investors, they expect to earn a return on their information in addition to the normal return expected for bearing risk. Excess returns are generated when the market recognizes and corrects the valuation error on such a security.
- C. Incorrect because information-motivated traders arguably hold less diversified portfolios than pure investors because they focus on securities that are over- or undervalued.

Market Organization and Structure

- explain the main functions of the financial system

- A. Incorrect because solvency risk is the risk that the organization does not survive or succeed because it runs out of cash, even though it might otherwise be solvent.
- B. **Correct** because the investor's expected payoff is lower as a result of facing a credit risk that is compounded by market risk. Thus, the investor bears much more risk than initially thought as a result of the failure to consider the interaction of the two risks this sort of risk interaction is so common in markets that practitioners have given it a very fitting term—"wrong-way risk."
- C. Incorrect because operational risk is the risk that arises from inadequate or failed people, systems, and internal policies, procedures, and processes, as well as from external events that are beyond the control of the organization but that affect its operations.

Introduction to Risk Management

- identify financial and non-financial sources of risk and describe how they may interact

- A. Incorrect because GICS and ICB cover public companies, while TRBC also covers private companies, non-profits, and government entities.
- B. Correct** because GICS and ICB cover public companies, while TRBC also covers private companies, non-profits, and government entities.
- C. Incorrect because GICS and ICB cover public companies, while TRBC also covers private companies, non-profits, and government entities.

Industry and Competitive Analysis

- describe industry classification methods and compare methods by which companies can be grouped

- A. **Correct** because as a general rule, the higher the senior unsecured rating, the smaller the notching adjustment will be. The reason behind this is that the higher the rating, the lower the perceived risk of default, so the need to 'notch' the rating to capture the potential difference in loss severity is greatly reduced. For lower-rated credits, however, the risk of default is greater and thus the potential difference in loss from a lower (or higher) priority ranking is a bigger consideration in assessing an issue's credit riskiness. Thus, the rating agencies will typically apply larger rating adjustments.
- B. Incorrect because as a general rule, the higher the senior unsecured rating, the smaller the notching adjustment will be. The reason behind this is that the higher the rating, the lower the perceived risk of default, so the need to 'notch' the rating to capture the potential difference in loss severity is greatly reduced. For lower-rated credits, however, the risk of default is greater and thus the potential difference in loss from a lower (or higher) priority ranking is a bigger consideration in assessing an issue's credit riskiness. Thus, the rating agencies will typically apply larger rating adjustments.
- C. Incorrect because as a general rule, the higher the senior unsecured rating, the smaller the notching adjustment will be. The reason behind this is that the higher the rating, the lower the perceived risk of default, so the need to 'notch' the rating to capture the potential difference in loss severity is greatly reduced. For lower-rated credits, however, the risk of default is greater and thus the potential difference in loss from a lower (or higher) priority ranking is a bigger consideration in assessing an issue's credit riskiness. Thus, the rating agencies will typically apply larger rating adjustments.

Credit Analysis for Corporate Issuers

- describe the seniority rankings of debt, secured versus unsecured debt and the priority of claims in bankruptcy, and their impact on credit ratings

- A. Incorrect because when the company issues equity securities, it is not contractually obligated to repay the amount it receives from shareholders, nor is it contractually obligated to make periodic payments to shareholders for the use of their funds.
- B. Incorrect because when the company issues equity securities, it is not contractually obligated to repay the amount it receives from shareholders, nor is it contractually obligated to make periodic payments to shareholders for the use of their funds.
- C. **Correct** because common shares represent an ownership interest in a company and are the predominant type of equity security. As a result, investors share in the operating performance of the company, participate in the governance process through voting rights, and have a claim on the company's net assets in the case of liquidation.

Overview of Equity Securities

- describe characteristics of types of equity securities

- A. **Correct** because mezzanine debt is riskier than senior secure debt which is riskier than infrastructure debt (graphically displayed by the Private Capital Risk and Return Levels by Category chart). Because of its typically junior ranking and its usually unsecured status, mezzanine debt is riskier than senior secured debt. Investments in private capital vary in terms of risk and return across the corporate capital structure hierarchy. Typically, private equity, as the riskiest alternative, offers the highest returns, with private debt returns declining on a continuum down to the safest, most secured form of debt—infrastructure debt.
- B. Incorrect because senior direct lending is less risky than mezzanine debt. Because of its typically junior ranking and its usually unsecured status, mezzanine debt is riskier than senior secured debt.
- C. Incorrect because investments in private capital vary in terms of risk and return across the corporate capital structure hierarchy. Typically, private equity, as the riskiest alternative, offers the highest returns, with private debt returns declining on a continuum down to the safest, most secured form of debt—infrastructure debt.

Probability Trees and Conditional Expectations

- explain features of private debt and its investment characteristics

Solution

-66-

- A. **Correct** because the use of derivatives is a typical feature of contemporary hedge funds.
- B. Incorrect because hedge funds tend to impose restrictions on the withdrawal of funds.
- C. Incorrect because investing in hedge funds is open only to a limited number of investors.

Hedge Funds

- explain investment features of hedge funds and contrast them with other asset classes

- A. **Correct** because the coupon rate of a floating rate bond is typically expressed as a reference rate plus a spread or margin. The spread is usually set when the bond is issued and remains constant until maturity. The reference rate, however, resets periodically. Therefore, the coupon rate adjusts to the level of market interest rates each time the reference rate is reset.
- B. Incorrect because a change in the issuer's credit quality does not typically result in an adjustment in the coupon rate of a floating rate bond after issuance. The spread is usually set when the bond is issued and remains constant until maturity. It is primarily a function of the issuer's credit risk at issuance. Changes in the issuer's credit quality that occur after issuance are reflected in the price of the bond, not in the coupon rate; a floating rate bond whose issuer credit quality is unchanged is more likely to consistently trade very near par, whereas a bond whose issuer credit quality has changed since issuance is more likely to trade at a price noticeably different than par.
- C. Incorrect because a change in the issuer's credit quality does not typically result in an adjustment in the coupon rate of a floating rate bond after issuance. The spread is usually set when the bond is issued and remains constant until maturity. It is primarily a function of the issuer's credit risk at issuance. Changes in the issuer's credit quality that occur after issuance are reflected in the price of the bond, not in the coupon rate; a floating rate bond whose issuer credit quality is unchanged is more likely to consistently trade very near par, whereas a bond whose issuer credit quality has changed since issuance is more likely to trade at a price noticeably different than par.

Fixed-Income Instrument Features

- describe the features of a fixed-income security

Solution

- A. Incorrect because this is the stock price minus the initial margin requirement; $\$108 - (\$108 \times 40\%) = \$64.80$.
- B. **Correct** because the price below which a margin call will take place is calculated with the following equation:
 $(\text{Equity/share}) / (\text{Price/share}) = (\$43.20 + P - \$108) / P = 20\%$, which can be solved for $P = \$81.00$.
- C. Incorrect because this is the price 20% below the initial stock price ($\$108 \times (1 - 20\%) = \86.40) and not the level that triggers the margin call.

Market Organization and Structure

- calculate and interpret the leverage ratio, the rate of return on a margin transaction, and the security price at which the investor would receive a margin call

- A. **Correct** because if volatility increases, the difference between S_1^+ and S_1^- increases, which widens the range between c_{1+} and c_{1-} , leading to a higher option value. Changing the c's to p's leads to the same pricing formula for put options as for call options. Therefore both put and call option values will increase.
- B. Incorrect because if volatility increases, the difference between S_1^+ and S_1^- increases, which widens the range between c_{1+} and c_{1-} , leading to a higher option value. Changing the c's to p's leads to the same pricing formula for put options as for call options. Therefore both put and call option values will increase when volatility increases.
- C. Incorrect because if volatility increases, the difference between S_1^+ and S_1^- increases, which widens the range between c_{1+} and c_{1-} , leading to a higher option value. Changing the c's to p's leads to the same pricing formula for put options as for call options. Therefore both put and call option values will increase when volatility increases.

Valuing a derivative using a one-period binomial model

- explain how to value a derivative using a one-period binomial model

- A. Incorrect because Macaulay duration is not suitable for instruments with uncertain future cash flows like callable bonds, since in brief, a callable bond does not have a well-defined internal rate of return (yield-to-maturity). Therefore, yield duration statistics, such as modified and Macaulay durations, do not apply; effective duration is the appropriate duration measure.
- B. **Correct** because effective duration is suitable for instruments with uncertain future cash flows like callable bonds, since in brief, a callable bond does not have a well-defined internal rate of return (yield-to-maturity). Therefore, yield duration statistics, such as modified and Macaulay durations, do not apply; effective duration is the appropriate duration measure.
- C. Incorrect because modified duration is not suitable for instruments with uncertain future cash flows like callable bonds, since in brief, a callable bond does not have a well-defined internal rate of return (yield-to-maturity). Therefore, yield duration statistics, such as modified and Macaulay durations, do not apply; effective duration is the appropriate duration measure.

Curve-Based and Empirical Fixed-Income Risk Measures

- explain why effective duration and effective convexity are the most appropriate measures of interest rate risk for bonds with embedded options

- A. **Correct** because the put's value at expiration = $p_T = \text{Max}(0, X - S_T)$, where p_T is the value of the put at expiration, X is the exercise price, and S_T is the price of the underlying at expiration. In this case, $\text{Max}(0, 58 - 57) = \1 . The put buyer's profit = $\Pi = p_T - p_0$ (where p_0 is the price of the put at time 0) = $1 - 4 = -\$3$.
- B. Incorrect because this is the put's value at expiration. The put's value at expiration = $p_T = \text{Max}(S_T - 0, X)$, where p_T is the value of the put at expiration, X is the exercise price, and S_T is the price of the underlying at expiration. In this case, $\text{Max}(0, 58 - 57) = \1 .
- C. Incorrect because this is the put seller's profit. The put's value at expiration = $-p_T = -\text{Max}(0, X - S_T)$, where p_T is the value of the put at expiration, X is the exercise price, and S_T is the price of the underlying at expiration. In this case, $-\text{Max}(0, 58 - 57) = -\1 . The put seller's profit = $\Pi = -p_T + p_0$ (where p_0 is the price of the put at time 0) = $-1 + 4 = \$3$.

Forward Commitment and Contingent Claim Features and Instruments

- determine the value at expiration and profit from a long or a short position in a call or put option

- Solution
- A. Incorrect because the writer of a put option has a long exposure to the underlying.
 - B. **Correct** because put contract holders [buyers] have long exposure to their option contract and short exposure to the underlying instrument.
 - C. Incorrect because the holder (buyer) of a call option has a long exposure to the underlying.

Market Organization and Structure

- compare positions an investor can take in an asset

Solution

- A. Incorrect because, all else equal, lower-coupon bonds have higher durations and more interest rate risk, so a discount bond would have higher interest rate risk than a comparable premium bond.
- B. Correct** because, all else equal, high-coupon bonds have less interest rate risk (lower duration) than low-coupon bonds. Therefore, a bond trading at a premium will have lower interest rate risk than a comparable zero-coupon or discount bond.
- C. Incorrect because, all else equal, lower-coupon bonds have higher durations and more interest rate risk, so a zero-coupon bond would have the highest interest rate risk.

Yield-Based Bond Duration Measures and Properties

- explain how a bond's maturity, coupon, and yield level affect its interest rate risk

- A. Incorrect because risk tolerance of banks is quite low whereas the risk tolerance for endowments is typically high.
- B. **Correct** because the risk tolerance of endowments is typically high whereas the risk tolerance of insurance companies are typically quite low. The risk tolerance of banks is quite low. Therefore, the risk tolerance of endowments is highest.
- C. Incorrect because risk tolerance of insurance companies is typically quite low whereas the risk tolerance for endowments is typically high.

Portfolio Management: An Overview

- describe types of investors and distinctive characteristics and needs of each

- A. Incorrect because with negative correlation between futures prices and interest rates, falling prices lead to losses during periods of rising interest rates. Forward prices will be higher than futures prices.
- B. Incorrect because in this case, futures and forward prices will be the same.
- C. **Correct** because if there is a positive correlation between futures prices and interest rates, an investor with a long position will favor futures over forwards because rising prices lead to futures profits that are reinvested at higher interest rates. With forwards, all the gains are received at expiration and thus there is no gain from reinvestment.

Pricing and Valuation of Futures Contracts

- explain why forward and futures prices differ

- A. **Correct** because real estate investment trusts (REITs) provide investors with indirect equity real estate exposure. Real estate limited partnerships are a form of direct real estate equity investment. Commercial mortgage-backed securities (CMBS) provide investors with indirect debt investment opportunities in real estate.
- B. Incorrect because real estate limited partnerships are a form of direct real estate equity investment.
- C. Incorrect because commercial mortgage backed securities (CMBS) provide investors with indirect debt investment opportunities in real estate.

Real Estate and Infrastructure

- explain features and characteristics of real estate

- A. **Correct** because the risk tolerance of an organization should reflect both an “inside” view and an “outside” view. The inside view asks what level of loss will leave the organization unable to meet critical objectives. The outside view asks what sources of uncertainty or risk the organization faces.
- B. Incorrect because both an “inside” and “outside” view must be reflected.
- C. Incorrect because both an “inside” and “outside” view must be reflected.

Introduction to Risk Management

- explain how risk tolerance affects risk management

- A. Incorrect because a firm commitment requires both counterparties to perform under a derivative contract [introducing counterparty risk], while an option [a contingent claim] buyer can decide whether to perform under the contract at maturity depending on the underlying price relative to the exercise price.
- B. Incorrect because a firm commitment requires both counterparties to perform under a derivative contract [introducing counterparty risk], while an option [a contingent claim] buyer can decide whether to perform under the contract at maturity depending on the underlying price relative to the exercise price.
- C. **Correct** because a firm commitment requires both counterparties to perform under a derivative contract [introducing counterparty risk], while an option [a contingent claim] buyer can decide whether to perform under the contract at maturity depending on the underlying price relative to the exercise price.

Forward Commitment and Contingent Claim Features and Instruments

- contrast forward commitments with contingent claims

- A. Incorrect because private equity funds raise committed capital and draw down on those commitments, generally over three to five years, when they have a specific investment to make. Note that the management fee is typically based on committed capital, not invested capital; the committed-capital basis for management fees is an important distinction from hedge funds, whose management fees are based on assets under management (AUM).
- B. Correct** because private equity funds raise committed capital and draw down on those commitments, generally over three to five years, when they have a specific investment to make. Note that the management fee is typically based on committed capital, not invested capital; the committed-capital basis for management fees is an important distinction from hedge funds, whose management fees are based on assets under management (AUM).
- C. Incorrect because private equity funds raise committed capital and draw down on those commitments, generally over three to five years, when they have a specific investment to make. Note that the management fee is typically based on committed capital, not invested capital; the committed-capital basis for management fees is an important distinction from hedge funds, whose management fees are based on assets under management (AUM).

Alternative Investment Features, Methods, and Structures

- describe investment ownership and compensation structures commonly used in alternative investments

- A. Incorrect because farm products must be harvested when ripe, with little flexibility in production. By contrast, timberland serves as both a factory and a warehouse. Timber (trees) can be grown (i.e., timberland's factory characteristic) and easily stored by simply not harvesting the trees (i.e., timberland's warehouse characteristic). This characteristic offers the flexibility of harvesting when timber prices are up and delaying harvests when prices are down.
- B. **Correct** because timberland serves as both a factory and a warehouse. Timber (trees) can be grown (i.e., timberland's factory characteristic) and easily stored by simply not harvesting the trees (i.e., timberland's warehouse characteristic). This characteristic offers the flexibility of harvesting when timber prices are up and delaying harvests when prices are down.
- C. Incorrect because farm products must be harvested when ripe, with little flexibility in production. By contrast, timberland serves as both a factory and a warehouse. Timber (trees) can be grown (i.e., timberland's factory characteristic) and easily stored by simply not harvesting the trees (i.e., timberland's warehouse characteristic). This characteristic offers the flexibility of harvesting when timber prices are up and delaying harvests when prices are down.

Natural Resources

- explain features of raw land, timberland, and farmland and their investment characteristics

- A. Incorrect because co-investing offers reduced control over the investment selection process compared with direct investing. Hence, direct investing offers higher control over the investment selection process.
- B. Incorrect because co-investing offers reduced control over the investment selection process compared with direct investing. Hence, direct investing offers higher control over the investment selection process.
- C. **Correct** because co-investing offers reduced control over the investment selection process compared with direct investing. Hence, direct investing offers higher control over the investment selection process.

Alternative Investment Features, Methods, and Structures

- compare direct investment, co-investment, and fund investment methods for alternative investments

- A. Incorrect because a risk-averse investor would prefer the guaranteed payoff. The expected value in both cases is \$50, one with certainty and the other with uncertainty. If an investor chooses the guaranteed outcome, he/she is said to be risk averse because the investor does not want to take the chance of not getting anything at all.
- B. Incorrect because a risk-neutral investor would be indifferent between the two options and thus should not always prefer one or the other. The expected value in both cases is \$50, one with certainty and the other with uncertainty. If an investor is indifferent about the gamble or the guaranteed outcome, then the investor may be risk neutral.
- C. **Correct** because the expected value in both cases is \$50, one with certainty and the other with uncertainty. If an investor chooses the gamble (the option with uncertainty), then the investor is said to be risk loving or risk seeking.

Portfolio Risk and Return: Part I

- explain risk aversion and its implications for portfolio selection

- A. Incorrect because the size effect results from the observation that equities of small-cap companies [not companies with low price-to-earnings ratios] tend to outperform equities of large-cap companies.
- B. Correct** because the value effect is based on the observation that stocks that have below-average price-to-earnings (P/E) have consistently outperformed growth stocks over long periods of time.
- C. Incorrect because the earnings surprise anomaly refers to the observation that companies that display the largest positive earnings surprises subsequently display superior stock return performance, whereas poor subsequent performance is displayed by companies with low or negative earnings surprises. Thus, earnings surprise does not explain the outperformance of low P/E stocks.

Market Efficiency

- describe market anomalies

- A. **Correct** because the Procedures section of the IPS explains the steps to take to keep the IPS current and the procedures to follow to respond to various contingencies.
- B. Incorrect because it is the Investment Guidelines section (and not Procedures) that provides information about how policy should be executed (e.g., on the permissible use of leverage and derivatives) and on specific types of assets excluded from investment, if any.
- C. Incorrect because the investor's policy with respect to rebalancing asset class weights is detailed in the Strategic Asset Allocation section or the Rebalancing Policy section that typically are included in the appendices.
- Appendices: (A) Strategic Asset Allocation (B) Rebalancing Policy. Many investors specify a strategic asset allocation (SAA), also known as the policy portfolio, which is the baseline allocation of portfolio assets to asset classes in view of the investor's investment objectives and the investor's policy with respect to rebalancing asset class weights. This SAA may include a statement of policy concerning hedging risks such as currency risk and interest rate risk.

Basics of Portfolio Planning and Construction

- describe the major components of an IPS

- A. **Correct** because the calculation of the modified duration (ModDur) statistic of a bond requires a simple adjustment to Macaulay duration. It is the Macaulay duration statistic divided by one plus the yield per period. If interest rates are positive, modified duration is less than Macaulay duration because the denominator in the calculation is greater than 1.
- B. Incorrect because the calculation of the modified duration (ModDur) statistic of a bond requires a simple adjustment to Macaulay duration. It is the Macaulay duration statistic divided by one plus the yield per period. If interest rates are positive, modified duration is less [not the same as] than Macaulay duration because the denominator in the calculation is greater than 1.
- C. Incorrect because the calculation of the modified duration (ModDur) statistic of a bond requires a simple adjustment to Macaulay duration. It is the Macaulay duration statistic divided by one plus the yield per period. If interest rates are positive, modified duration is less [not greater] than Macaulay duration because the denominator in the calculation is greater than 1.

Yield-Based Bond Duration Measures and Properties

- define, calculate, and interpret modified duration, money duration, and the price value of a basis point (PVBP)

- A. Incorrect because mortgage pass-through security cash flows are uncertain because they depend on actual prepayments. This risk is called prepayment risk.
- B. Incorrect because the creation of a [collateralized mortgage obligation] cannot eliminate or change prepayment risk; it can only distribute the various forms of this risk among different bond classes.
- C. **Correct** because a critical investment feature that distinguishes CMBS from RMBS is the protection against early prepayments available to investors known as call protection. An investor in an RMBS is exposed to considerable prepayment risk because the borrower has the right to prepay a loan, in whole or in part, before the scheduled principal repayment date. The discussion of CMOs highlighted how investors can purchase certain types of tranches to modify or reduce prepayment risk. CMBS investors have considerable call protection, which results in CMBS trading more like corporate bonds than RMBS.

Mortgage-Backed Security (MBS) Instrument and Market Features

- describe characteristics and risks of commercial mortgage-backed securities

- A. **Correct** because if the discount rate increases to 7.5% from 6.5%, the price of a bond decreases. At a discount rate of 7.5%, the bond sells at a discount to face value. As a discount bond approaches maturity, it will increase in price over time until it reaches par at maturity.
- B. Incorrect because the price action is reversed.
- C. Incorrect because as the bond approaches maturity its price will increase as it is "pulled to par."

Fixed-Income Bond Valuation: Prices and Yields

- identify the relationships among a bond's price, coupon rate, maturity, and yield-to-maturity

Solution

- A. Incorrect because assigning relative weights to securities based on nonsystematic risk is the focus of security selection, not strategic asset allocation. The SAA is a means of providing the investor with exposure to the systematic risks of asset classes in proportions that meet the risk and return objectives. Additionally, the returns of an investment strategy depend on two other sources: tactical asset allocation and security selection. What should the relative weight of securities in the portfolio be? Because we are concerned with maximizing risk-adjusted return, securities with a higher α_i should have a higher weight, and securities with greater nonsystematic risk should be given less weight in the portfolio. Therefore, SAA does not take into account nonsystematic risk.
- B. **Correct** because the focus on the SAA (strategic asset allocation) is the result of a number of important investment principles. One principle is that a portfolio's systematic risk accounts for most of its change in value over the long term. A second principle is that the returns to groups of similar assets (e.g., long-term debt claims) predictably reflect exposures to certain sets of systematic factors (e.g., for the debt claims, unexpected changes in the inflation rate). Thus, the SAA is a means of providing the investor with exposure to the systematic risks of asset classes in proportions that meet the risk and return objectives. Further, apart from the exposures to systematic risk factors specified in the strategic asset allocation, the returns of an investment strategy depend on two other sources: tactical asset allocation and security selection.
- C. Incorrect because the efficiency of the asset class is not a principle used in the formation of a client's strategic asset allocation; however, managers attempt to generate higher returns than the asset class benchmark by selecting securities with a higher expected return. Further, apart from the exposures to systematic risk factors specified in the strategic asset allocation, the returns of an investment strategy depend on two other sources: tactical asset allocation and security selection. The likelihood of adding a significant amount of value from security selection depends on the skills of the manager and the informational efficiency of the market for the asset class his skill relates to. The more efficient an asset class or a subset of that asset class (such as a regional stock, bond, or real estate market or a size category within the stock market), the more skillful an asset manager has to be to add value.

Basics of Portfolio Planning and Construction

- describe the principles of portfolio construction and the role of asset allocation in relation to the IPS

Solution

- A. **Correct** because commodity indexes do not have an obvious weighting mechanism, such as market capitalization, commodity index providers create their own weighting methods.
- B. Incorrect because a broad equity market index, as its name suggests, represents an entire given equity market and typically includes securities representing more than 90 percent of the selected market. For example, the Shanghai Stock Exchange Composite Index (SSE) is a market-capitalization-weighted index.
- C. Incorrect because some REITs are market-cap weighted, for example the FTSE EPRA/NAREIT Global Real Estate Index uses the float-adjusted market cap weighting method.

Security Market Indexes

- compare types of security market indexes

Solution

- A. Incorrect because it treats convexity as a negative in the formula.
$$= (-\text{Duration} \times \Delta y) + (0.5 \times C \times (\Delta y)^2) = (-4.50 \times 0.005) + (0.5 \times -39.20 \times 0.005^2) = -0.0230 \text{ or } -2.30\%.$$
- B. Incorrect because it ignores convexity.
- C. **Correct** because incorporating both duration and convexity, the percentage change in a bond's price $= (-\text{Duration} \times \Delta y) + (0.5 \times C \times (\Delta y)^2) = (-4.50 \times 0.005) + (0.5 \times 39.20 \times 0.005^2) = -0.0220 \text{ or } -2.20\%.$

Yield-Based Bond Convexity and Portfolio Properties

- calculate the percentage price change of a bond for a specified change in yield, given the bond's duration and convexity