

Solution

- A. Incorrect because it is computed by reversing the formula: $r/(1 + r) = 8/1.08 = 7.41$.
- B. Incorrect because it is just the given market yield.
- C. **Correct** because the Macaulay duration of a non-callable perpetual bond is:

$$\text{MacDur} = (1 + r)/r$$

$$= 1.08/0.08 = 13.5$$

Interest Rate Risk and Return

- define, calculate, and interpret Macaulay duration.

A. Incorrect because this is the implied forward rate that starts in year 1 and ends in year 2 with a tenor of 1 ($= 2 - 1$) year, denoted with $\text{IFR}_{1,1}$, whereas what is being asked is $\text{IFR}_{1,2}$. The general formula for the relationship between the two spot rates (z_A, z_B) and the implied forward rate ($\text{IFR}_{A,B-A}$) [that starts in period A and ends in period B] is given by $(1 + z_A)^A \times (1 + \text{IFR}_{A,B-A})^{B-A} = (1 + z_B)^B$

Therefore, for the provided information:

$$(1 + z_1)^1 \times (1 + \text{IFR}_{1,2-1})^{2-1} = (1 + z_2)^2,$$

$$(1 + 1.5\%)^1 \times (1 + \text{IFR}_{1,1})^1 = (1 + 2\%)^2,$$

$$\text{IFR}_{1,2} \neq \text{IFR}_{1,1} = (1 + 2\%)^2 / (1 + 1.5\%)^1 - 1 = 0.025025 \approx 2.50\%$$

B. Correct because this is the implied forward rate that starts in year 1 and ends in year 3 with a tenor of 2 ($= 3 - 1$) years, denoted as $\text{IFR}_{1,2}$. The general formula for the relationship between the two spot rates (z_A, z_B) and the implied forward rate ($\text{IFR}_{A,B-A}$) [that starts in period A and ends in period B] is given by $(1 + z_A)^A \times (1 + \text{IFR}_{A,B-A})^{B-A} = (1 + z_B)^B$

Therefore, for the provided information:

$$(1 + z_1)^1 \times (1 + \text{IFR}_{1,3-1})^{3-1} = (1 + z_3)^3,$$

$$(1 + 1.5\%)^1 \times (1 + \text{IFR}_{1,2})^2 = (1 + 2.25\%)^3,$$

$$\text{IFR}_{1,2} = [(1 + 2.25\%)^3 / (1 + 1.5\%)^1]^{1/2} - 1 = 0.026271 \approx 2.63\%$$

C. Incorrect because this is the implied forward rate zero-coupon bond that starts in year 2 and ends in year 3 with a tenor of 1 ($= 3 - 2$) year, denoted with $\text{IFR}_{2,1}$, whereas what is being asked is $\text{IFR}_{1,2}$. The general formula for the relationship between the two spot rates (z_A, z_B) and the implied forward rate ($\text{IFR}_{A,B-A}$) [that starts in period A and ends in period B] [is given by] $(1 + z_A)^A \times (1 + \text{IFR}_{A,B-A})^{B-A} = (1 + z_B)^B$

Therefore, for the provided information:

$$(1 + z_2)^2 \times (1 + \text{IFR}_{2,3-2})^{3-2} = (1 + z_3)^3,$$

$$(1 + 2\%)^2 \times (1 + \text{IFR}_{2,1})^1 = (1 + 2.25\%)^3,$$

$$\text{IFR}_{1,2} \neq \text{IFR}_{2,1} = (1 + 2.25\%)^3 / (1 + 2\%)^2 - 1 = 0.027518 \approx 2.75\%$$

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

- Explain how forward rates are determined for interest rate forward contracts and describe the uses of these forward rates.

- A. Incorrect because whole-of-fund [or European] waterfalls occur at the aggregate fund level (i.e., after all investments have been exited) and are more advantageous to the LPs.
- B. Incorrect because whole-of-fund [or European] waterfalls occur at the aggregate fund level (i.e., after all investments have been exited), not on a deal-by-deal basis.
- C. **Correct** because whole-of-fund (or European) waterfalls occur at the aggregate fund level (i.e., after all investments have been exited) and are more advantageous to the LPs. In alternative investments, a **waterfall** represents the distribution method that defines the order in which allocations are made to LPs and GPs. 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. In whole-of-fund waterfalls, all distributions go to the LPs as deals are exited and the GP does not participate in any profits until the LPs receive their initial investment and the hurdle rate has been met. 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

Solution

- A. **Correct** because an embedded put option reduces the effective duration of the bond, especially when rates are rising.
- B. Incorrect because an embedded put option reduces the effective duration of the bond, especially when rates are rising.
- C. Incorrect because an embedded put option reduces the effective duration of the bond, especially when rates are rising.

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. Incorrect because the liquidity section of the IPS should state what the client's requirements are to draw cash from the portfolio.
- B. Correct** because the unique circumstances section of the IPS should cover any other aspect of the client's circumstances, including beliefs and values, that is likely to have a material impact on the composition of the portfolio. Such considerations are often referred to as ESG (environmental, social, governance). Examples of ESG issues include environmental issues such as air and water pollution.
- C. Incorrect because the client's objectives are specified in terms of risk tolerance and return requirements in the investment objectives section.

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

- A. Incorrect because the optimal investor portfolio is always situated on the capital allocation line. The optimal investor portfolio is selected on the capital allocation line by overlaying the indifference curves that incorporate investor preferences.
- B. **Correct** because the location of an optimal investor portfolio depends on the investor's risk preferences. Some less risk-averse investors (i.e., with a high risk tolerance) may wish to accept even more risk because of the chance of higher return. Such an investor may borrow money to invest more in the risky portfolio. The optimal investor portfolio for such an investor will lie to the right of the optimal risky portfolio on the capital allocation line.
- C. Incorrect because this is the optimal risky portfolio, not the optimal investor portfolio. With the addition of the risk-free asset, we are able to narrow our selection of risky portfolios to a single optimal risky portfolio, P, which is at the tangent of (the dominant capital allocation line) CAL(P) and the efficient frontier of risky assets. Also, the two portfolios cannot be identical because the investor's risk preference determines a levered portfolio, which is situated to the right of the optimal risky portfolio on the capital allocation line.

Portfolio Risk and Return: Part I

- explain the selection of an optimal portfolio, given an investor's utility (or risk aversion) and the capital allocation line

Solution

- A. **Correct** because this right to exercise in the future has a value that is paid upfront to the option seller in the form of an option premium.
- B. Incorrect because for forwards, at time $t = 0$, the counterparties do not exchange a payment upfront but, rather, agree on delivery of the underlying at time T for a forward price of $F_0(T)$.
- C. Incorrect because for a forward contract, at time $t = 0$, the counterparties do not exchange a payment upfront but, rather, agree on delivery of the underlying at time T for a forward price of $F_0(T)$.

Forward Commitment and Contingent Claim Features and Instruments

- contrast forward commitments with contingent claims

Solution

- A. Incorrect because for the same coupon rate and time-to-maturity, the percentage price change is greater (in absolute value, meaning without regard to the sign of the change) when the market discount rate goes down than when it goes up (the convexity effect).
- B. Incorrect because for the same coupon rate and time-to-maturity, the percentage price change is greater (in absolute value, meaning without regard to the sign of the change) when the market discount rate goes down than when it goes up (the convexity effect).
- C. **Correct** because for an option-free bond with the same coupon rate and time-to-maturity, the percentage price change is greater (in absolute value, meaning without regard to the sign of the change) when the market discount rate goes down than when it goes up (the convexity effect).

Fixed-Income Bond Valuation: Prices and Yields

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

- A. **Correct** because a depository receipt (DR) is a security that trades like an ordinary share on an investor's local exchange and represents an economic interest in a foreign company. It allows the publicly listed shares of a foreign company to be traded on an exchange outside its domestic market.
- B. Incorrect because a depository receipt (DR) is a security that trades like an ordinary share on an investor's local exchange and represents an economic interest in a foreign company. It allows the publicly listed shares of a foreign company to be traded on an exchange outside its domestic market. It trades in investors', not the company's, local currency.
- C. Incorrect because depository receipts represent the equity of international companies and are traded on local exchanges and in the local currencies. With these securities, investors have to worry less about currency conversions (price quotations and dividend payments are in the investor's local currency), unfamiliar market practices, and differences in accounting standards.

Overview of Equity Securities

- describe methods for investing in non-domestic equity securities

- A. **Correct** because beta is a measure of the sensitivity of a security's returns to the returns on the market portfolio. Beta measures relative risk, meaning how much market risk an asset contributes to a well-diversified portfolio. Beta describes risk well for a portfolio of equities, but other sources of risk may require other descriptive risk metrics. The risk associated with derivatives is one example of this.
- B. Incorrect because vega is a first-order measure of the change in the derivative price for a change in the volatility of the underlying. Vega is an appropriate measure of derivatives risk, whereas beta is not.
- C. Incorrect because the sensitivity of the derivative price to a small change in the value of the underlying asset is called the delta. It is perhaps the most important measure of derivatives risk.

Introduction to Risk Management

- describe methods for measuring and modifying risk exposures and factors to consider in choosing among the methods

- A. Incorrect because it multiplies the sustainable growth rate by the retention rate rather than dividing it by the retention rate and calculates $\text{ROE} = \text{Sustainable growth rate} \times (1 - \text{Dividend payout ratio}) = 6\% \times 60\% = 3.6\%$.
- B. Correct** because Sustainable growth rate = Retention rate \times ROE where the retention rate is the complement of the dividend payout ratio (i.e., $1 - \text{payout ratio}$). Rearranging gives $\text{ROE} = \text{Sustainable growth rate} / (1 - \text{Dividend payout ratio}) = 6\% / 60\% = 10\%$.
- C. Incorrect because it mistakes dividend payout ratio for retention rate and calculates $\text{ROE} = \text{Sustainable growth rate} / \text{Dividend payout ratio} = 6\% / 40\% = 15\%$.

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

Solution

- A. **Correct** because if the costs of arranging trades are low, the financial system is operationally efficient.
- B. Incorrect because if the prices of the assets and contracts reflect all available information related to fundamental values, the financial system is informationally efficient.
- C. Incorrect because economies that use resources where they are most valuable are allocationally efficient.

Market Organization and Structure

- describe characteristics of a well-functioning financial system

- A. Incorrect because commodity indexes do not have an obvious weighting mechanism; therefore, commodity index providers create their own weighting methods.
- B. Incorrect because different weighting methods lead to different exposure to specific commodities and result in different risk and return profiles. Unlike commodity indexes, broad equity and fixed-income indexes that target the same markets share similar risk and return profiles.
- C. **Correct** because the performance of commodity indexes can be different from their underlying commodities because the indexes consist of futures contracts on the commodities rather than the actual commodities. Commodity index returns reflect the risk-free interest rate, the changes in future prices, and the roll yield.

Security Market Indexes

- describe indexes representing alternative investments

- A. Incorrect because macro hedge funds emphasize a top-down approach to identify economic trends. Trades are made on the basis of expected movements in economic variables. Generally, these funds trade opportunistically in fixed-income, equity, currency, and commodity markets. Macro hedge funds use long and short positions to profit from a view on the overall direction of the market as it is influenced by major economic trends and events.
- B. **Correct** because event-driven strategies seek to profit from defined catalyst events, typically those that involve changes in corporate structure, such as an acquisition or restructuring. This strategy is considered to be underpinned by bottom-up security-specific analysis, as opposed to top-down analysis. Investments may include long and short positions in common and preferred stocks, debt securities, and options.
- C. Incorrect because relative value funds seek to profit from a pricing discrepancy, an unusual short-term relationship, between related securities. The expectation is that the pricing discrepancy will be resolved over time.

Hedge Funds

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

- A. **Correct** because the realized horizon yield matches the original yield-to-maturity if (1) coupon payments are reinvested at the same interest rate as the original yield-to-maturity, and (2) the bond is sold at a price on the constant-yield price trajectory, which implies that the investor does not have any capital gains or losses when the bond is sold. Since the bond is sold prior to maturity, the bond would have to be sold at a price greater than 98 but less than 100.
- B. Incorrect because if the bond was sold at par, the horizon yield would be greater than the yield-to-maturity.
- C. Incorrect because if the bond was sold above par, the horizon yield would be greater than the yield-to-maturity.

Interest Rate Risk and Return

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

- A. Incorrect because it uses the security's correlation with the market as the measurement for beta in the CAPM calculation: $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$. Therefore, it incorrectly calculates expected return as $R_f + \rho_{i,m} \times (\text{market risk premium}) = 2\% + (0.5) \times (8\%) = 6\%$. The correlation metric is used to calculate beta, but it is not equal to beta.
- B. Incorrect because it inputs the market risk premium as the expected return on the market in the CAPM calculation: $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$. Therefore, it incorrectly calculates expected return as $2\% + (1.5) \times (8\% - 2\%) = 11\%$.
- C. **Correct** because the calculation of the security's expected return using the CAPM calculation is as follows: $E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 2\% + (1.5) \times (8\%) = 14\%$. The market risk premium is the expected return minus the risk free rate so you do not need to subtract the risk free rate because it is already reflected in the market risk premium.

Portfolio Risk and Return: Part II

- calculate and interpret the expected return of an asset using the CAPM

Solution

- A. Incorrect because it multiplies the total position with 1 plus the minimum margin requirement. $100\% \times (1 + 0.55) = 1.55$.
- B. **Correct** because the maximum leverage ratio associated with a position financed by the minimum margin requirement is one divided by the minimum margin requirement. $100\% / 55\% \approx 1.82$.
- C. Incorrect because it subtracts the minimum margin requirement from one in the denominator: $100\% / (1 - \text{minimum margin requirement})$. $100\% / (1 - 55\%) = 100\% / (0.45) \approx 2.22$.

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

Solution

- A. Incorrect because the market price of an ETF is likely to be close to the NAV of the underlying investments.
- B. Incorrect because an open-end fund will accept new investment money and issue additional shares at a value equal to the NAV of the fund at the time of investment and funds can also be withdrawn at the NAV per share.
- C. **Correct** because closed-end funds can trade at a premium or discount to their NAV due to the fixed number of shares outstanding. That is, one consequence of this fixed share base is that, unlike open-end funds in which new shares are created and sold at the current NAV per share, closed-end funds can sell for a premium or discount to NAV depending on the demand for the shares.

Portfolio Management: An Overview

- describe mutual funds and compare them with other pooled investment products

- A.** Incorrect because 13.24% results from calculating the incentive fee independently from the management fee as opposed to net of the management fee:

Portfolio gain = year-end value – beginning value = \$11.8 million – \$10 million = \$1.8 million

Hurdle amount = beginning value × hurdle % = \$10 million × 6% = \$600,000

Management fee = year-end value × management fee % = \$11.8 million × 2% = \$236,000

Incentive fee = (portfolio gain – hurdle amount) × incentive fee %

= (\$1.8 million – \$600,000) × 20% = \$240,000

Total fees = management fee + incentive fee = \$236,000 + \$240,000 = \$476,000

Net-of-fees return = (portfolio gain – total fees)/beginning value

= (\$1.8 million – \$476,000)/\$10 million = 13.24%

- B. Correct** because the net-of-fees return to the investor at year-end is closest to 13.71%.

Portfolio gain = year-end value – beginning value = \$11.8 million – \$10 million = \$1.8 million

Hurdle amount = beginning value × hurdle % = \$10 million × 6% = \$600,000

Management fee = year-end value × management fee % = \$11.8 million × 2% = \$236,000

Incentive fee = (portfolio gain – hurdle amount – management fee) × Incentive fee %

= (\$1.8 million – \$600,000 – \$236,000) × 20% = \$192,800

Total fees = management fee + incentive fee = \$236,000 + \$192,800 = \$428,800

Net-of-fees return = (portfolio gain – total fees)/beginning value

= (\$1.8 million – \$428,800)/\$10 million = 13.71%

- C.** Incorrect because 13.93% results from calculating the hurdle amount based on the end-of-period value instead of the beginning-of-period value:

Portfolio gain = year-end value – beginning value = \$11.8 million – \$10 million = \$1.8 million

Hurdle amount = ending value × hurdle % = \$11.8 million × 6% = \$708,000

Management fee = year-end value × management fee % = \$11.8 million × 2% = \$236,000

Incentive fee = (portfolio gain – hurdle amount – management fee) × incentive fee %

= (\$1.8 million – \$708,000 – 236,000) × 20% = \$171,200

Total fees = management fee + incentive fee = \$236,000 + \$171,200 = \$407,200

Net-of-fees return = (portfolio gain – total fees)/beginning value

= (\$1.8 million – \$407,200)/\$10 million = 13.93%

Alternative Investment Performance and Returns

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

Solution

- A. **Correct** because a return-generating model is a model that can provide an estimate of the expected return of a security given certain parameters.
- B. Incorrect because the expected return of the market portfolio is an input into many return-generating models, such as the market model. That is, the most common implementation of a single-index model is the market model, in which the market return is the single factor or single index.
- C. Incorrect because the excess return on the market portfolio is one of the factors in the four-factor model proposed by Fama and French (1992) and Carhart (1997).

Portfolio Risk and Return: Part II

- explain return generating models (including the market model) and their uses

- Solution
- A. Incorrect because neither stock prices nor splits have an impact on a value-weighted index.
 - B. Incorrect because neither stock prices nor splits have an impact on a value-weighted index.
 - C. **Correct** because the impact of a given percentage price change of a large-cap stock is larger than the impact of the same percentage price change of a small-cap stock, which is a source of bias for value-weighted indexes.

Security Market Indexes

- compare the different weighting methods used in index construction

- A. **Correct** because the time value of an option is the difference between the market price of the option and its intrinsic value.
- B. Incorrect because the time value of an option is the difference between the market price of the option and its intrinsic value.
- C. Incorrect because the time value of an option is the difference between the market price of the option and its intrinsic value.

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

Solution

- A. Incorrect because greenfield investments are more risky than brownfield investments.
- B. **Correct** because operational secondary-stage assets with an existing track record of generating steady, bond-like cash flows possess the lowest risk and offer the lowest return to the investors. Brownfield investments, redevelopment of existing infrastructure, are incrementally riskier, and greenfield projects are the riskiest.
- C. Incorrect because greenfield investments are more risky than brownfield investments.

Real Estate and Infrastructure

- explain the investment characteristics of infrastructure investments

- A. Incorrect because M^2 utilizes total risk rather than systematic risk. Total risk is relevant for an investor when he or she holds a portfolio that is not fully diversified, which is not a desirable portfolio. In such cases, the Sharpe ratio and M^2 are appropriate performance measures.
- B. Incorrect because a well-diversified investor is only exposed to systematic risk, as measured by beta. The Sharpe ratio uses the total risk of the portfolio, not its systematic risk. Total risk is relevant for an investor when he or she holds a portfolio that is not fully diversified.
- C. **Correct** because Jensen's alpha is based on systematic risk. Performance measures relative to beta risk—Treynor ratio and Jensen's alpha—are relevant when the investor holds a well-diversified portfolio with negligible diversifiable risk.

Portfolio Risk and Return: Part II

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

- A. Incorrect because a limitation of the CAPM is that it is a single-period model that does not consider multi-period implications or investment objectives of future periods, which can lead to myopic and suboptimal investment decisions.
- B. **Correct** because applications of the CAPM include comparison of the actual return of a portfolio or portfolio manager with the CAPM return for performance appraisal.
- C. Incorrect because a limitation of the CAPM is that it is a single-factor model. Only systematic risk or beta risk is priced in the CAPM. Thus, the CAPM states that no other investment characteristics should be considered in estimating returns.

Portfolio Risk and Return: Part II

- describe and demonstrate applications of the CAPM and the SML

- A. Incorrect because this activity is supported by early-stage financing, not seed-stage financing. Early-stage financing (early-stage VC), or start-up stage financing, goes to companies moving toward operation but prior to commercial production or sales, in both of which early-stage financing may be injected to initiate.
- B. **Correct** because seed-stage financing, or seed capital, generally supports product development and marketing efforts, including market research. This is the first stage at which VC funds usually invest.
- C. Incorrect because this activity is supported by pre-seed capital, not seed-stage financing. Pre-seed capital, or angel investing, is capital provided at the idea stage. Funds may be used to develop a business plan and to assess market potential.

Investments in Private Capital: Equity and Debt

- explain features of private equity and its investment characteristics

- A. Incorrect because a credit card receivable ABS would typically have a lockout period during which the cash flow that is paid out to security holders is based only on finance charges collected and fees.
- B. **Correct** because a credit card receivable ABS is an example of an ABS with a non-amortizing collateral.
- C. Incorrect because a credit card receivable ABS may require early amortization of the principal if certain events occur. Such an early amortization provision would safeguard the credit quality of the issue.

Asset-Backed Security (ABS) Instrument and Market Features

- describe types and characteristics of non-mortgage asset-backed securities, including the cash flows and risks of each type

- A. Incorrect because university endowments are established to provide continuing financial support to a university and its students.
- B. **Correct** because a defined-benefit pension plan defines the future benefit that an employer has the obligation to pay in terms of the retirement income benefits owed to participants.
- C. Incorrect because in a defined-contribution pension plan contributions rather than benefits are specified.

Portfolio Management: An Overview

- describe defined contribution and defined benefit pension plans

- A. Incorrect because private equity refers to investment in privately owned companies or in public companies with the intent to take them private.
- B. Correct** because for private debt, in addition to private loans or bonds, venture debt is extended to early-stage firms with little or no cash flow.
- C. Incorrect because for private debt, in addition to private loans or bonds, distressed debt involves public or private debt of corporate issuers believed to be close to or in bankruptcy that could benefit from investors with capital restructuring skills.

Investments in Private Capital: Equity and Debt

- explain features of private debt and its investment characteristics

- A. Incorrect because concerns about the quality of management could suggest a discount from NAV.
- B. Incorrect because excess redemption demand suggests selling pressure, which could indicate a discount to NAV.
- C. **Correct** because closed-end funds may trade at a premium (discount) to NAV when investors believe that the portfolio securities are undervalued (overvalued).

Market Organization and Structure

- describe the major types of securities, currencies, contracts, commodities, and real assets that trade in organized markets, including their distinguishing characteristics and major subtypes

- A. Incorrect because portfolio risk is less than the weighted average of the risk of the two assets in the portfolio only when the correlation coefficient is less than one.
- B. Correct** because with a correlation coefficient of +1.0, no diversification benefits are obtained and the portfolio risk is equal to the weighted average of the risk of the two assets in the portfolio.
- C. Incorrect because portfolio risk can never be greater than the weighted average of the risk of the two assets in the portfolio.

Portfolio Risk and Return: Part I

- describe the effect on a portfolio's risk of investing in assets that are less than perfectly correlated

- A. **Correct** because it is common for securitizations to include a form of internal credit enhancement called subordination, also referred to as credit tranching. In such a structure, there is more than one bond class or tranche, and the bond classes differ as to how they will share any losses resulting from defaults of the borrowers whose loans are in the collateral. This type of protection is also commonly referred to as a waterfall structure because of the cascading flow of payments between bond classes in the event of default.
- B. Incorrect because overcollateralization refers to the process of posting more collateral than is needed to obtain or secure financing. It represents a form of internal credit enhancement because the additional collateral can be used to absorb losses.
- C. Incorrect because bank guarantees and surety bonds are very similar in nature because they both reimburse bondholders for any losses incurred if the issuer defaults. The major difference between a bank guarantee and a surety bond is that the former is issued by a bank, whereas the latter is issued by a rated and regulated insurance company. Insurance companies that specialize in providing financial guarantees are typically called monoline insurance companies or monoline insurers.

Asset-Backed Security (ABS) Instrument and Market Features

- describe typical credit enhancement structures used in securitizations

- A. **Correct** because the limit buy order will be filled first with the most aggressively priced limit sell order and will be followed by filling with the higher priced limit sell orders that are needed up to and including the limit buy price until the order is filled.

$$\begin{aligned}\text{Average price} &= [(200 \times \$20.20) + (300 \times \$20.35) + (200 \times \$20.50)]/700 \\ &= \$20.35.\end{aligned}$$

- B. Incorrect because it simply uses the sell limit price that is exactly equal to the limit buy order.
C. Incorrect because orders are filled starting with the highest limit sell price and moving downward.

$$\begin{aligned}\text{Average price} &= [(200 \times \$20.70) + (100 \times \$20.65) + (400 \times \$20.50)]/700 \\ &= \$20.58\end{aligned}$$

Market Organization and Structure

- compare market orders with limit orders

- A. Incorrect because investors seeking higher returns than core strategies provide may also accept development, redevelopment, repositioning, and leasing risk. Finite-life closed-end funds are more commonly used for alpha- and beta-generating value-add and opportunistic investment styles. Value-add investments may require modest redevelopment or upgrades, the leasing of vacant space, or repositioning the underlying properties to earn a higher return than core properties. Opportunistic investments accept much higher risks than value-add or core strategies.
- B. Incorrect because investors seeking higher returns may also accept development, redevelopment, repositioning, and leasing risk. Finite-life closed-end funds are more commonly used for alpha- and beta-generating value-add and opportunistic investment styles. Value-add investments may require modest redevelopment or upgrades, the leasing of vacant space, or repositioning the underlying properties to earn a higher return than core properties.
- C. **Correct** because investors seeking higher returns may also accept development, redevelopment, repositioning, and leasing risk. Finite-life closed-end funds are more commonly used for alpha- and beta-generating value-add and opportunistic investment styles. Value-add investments may require modest redevelopment or upgrades, the leasing of vacant space, or repositioning the underlying properties to earn a higher return than core properties. Opportunistic investing accepts the much higher risks of development, major redevelopment, repurposing of assets, taking on large vacancies, and speculating on significant improvement in market conditions.

Real Estate and Infrastructure

- explain features and characteristics of real estate

- A. Incorrect because as a result of overconfidence bias, investors may underestimate, not overestimate, downside risks.
- B. Incorrect because as a result of overconfidence bias investors may overestimate, not underestimate, expected returns.
- C. **Correct** because as a result of overconfidence bias, investors may underestimate risks and overestimate expected returns and/or hold poorly diversified portfolios, which may result in significant downside risk.

The Behavioral Biases of Individuals

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

A. Incorrect because the payout ratio is used instead of the retention ratio in the computation of g .

$$g = 0.40 \times 0.12 = 0.048 = 4.80\%$$

$$D_1 = 3.60 \times (1.048) = \$3.77$$

$$V_0 = 3.77 / (0.15 - 0.048) = \$36.96$$

B. Incorrect because the current year dividend is not adjusted by the growth rate. D_0 is used instead of D_1 .

$$V_0 = 3.60 / (0.15 - 0.072) = \$46.15$$

C. **Correct** because the intrinsic value per share can be calculated using the Gordon growth model, as follows:

First, calculate the growth rate g :

$$g = b \times \text{ROE}$$

$$b = \text{Earnings retention rate} = (1 - \text{Dividend payout ratio})$$

$$b = 1 - 0.40 = 0.60$$

$$g = 0.60 \times 0.12 = 0.072 = 7.2\%$$

Then, use the Gordon growth model to calculate intrinsic value =

$$V_0 = D_1 / (r - g) \text{ where}$$

$$D_1 = D_0 \times (1 + g)$$

$$D_1 = 3.60 \times (1.072) = \$3.86$$

$$V_0 = 3.86 / (0.15 - 0.072) = \$49.49$$

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

Solution

- A. Incorrect because the processes underlying DLT generally require massive amounts of energy to verify transaction activity, and also DLT requires huge amounts of computer power normally associated with high electricity usage.
- B. Incorrect because DLT features enable the creation of records that are, for the most part, considered immutable, or unchangeable, and immutability of transactions means accidental or canceled trades can be undone only by submitting an equal and offsetting trade.
- C. **Correct** because consensus mechanism is the process by which the computer entities (or nodes) in a network agree on a common state of the ledger.

Introduction to Digital Assets

- describe financial applications of distributed ledger technology

- Solution
- A. Incorrect because risk budgeting applies to both business management and portfolio management, not only to portfolio management.
 - B. Incorrect because risk budgeting applies to both business management and portfolio management, not only to business management.
 - C. **Correct** because risk budgeting applies to both business management and portfolio management. Its foundation is the perspective that business or portfolio management involves assembling a number of risk activities or securities, which can be collated into an assemblage of various risk characteristics.

Introduction to Risk Management

- describe risk budgeting and its role in risk governance

- A. **Correct** because the spot curve can be calculated as the *geometric average* of the forward rates. Here, the two-year implied spot rate is: $(1.0231 \times 1.0282) = (1 + z_2)^2$, $z_2 = 0.0256 = 2.56\%$.
- B. Incorrect because this 2.82% is simply the one-year forward rate one year from now.
- C. Incorrect because the incorrect forward rates are used: $(1.0282 \times 1.0297) = (1 + z_2)^2$, $z_2 = 0.0289 = 2.89\%$.

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. **Correct** because for parallel shifts in the benchmark yield curve, yields at all maturity segments of the curve move the same in both direction and magnitude and the curve maintains its shape (no flattening or steepening). As a result, key rate durations at all maturity segments will indicate the same interest rate sensitivity as effective duration, the measure of interest rate risk in terms of a parallel shift in the benchmark yield curve.
- B. Incorrect because modified duration is a yield duration (rather than a curve duration) statistic that does not measure a bond's sensitivity to a change in the benchmark yield curve.
- C. Incorrect because Macaulay duration is a yield duration (rather than a curve duration) statistic that does not measure a bond's sensitivity to a change in the benchmark yield curve.

Curve-Based and Empirical Fixed-Income Risk Measures

- define key rate duration and describe its use to measure price sensitivity of fixed-income instruments to benchmark yield curve changes

- A. Incorrect because book value reflects the difference between a company's total assets and total liabilities and not expectations regarding future earnings. The book value of a company's equity reflects the historical operating and financing decisions of its management.
- B. **Correct** because market value reflects the collective and differing expectations of investors concerning the amount, timing, and uncertainty of the company's future cash flows, and an unexpected change in a company's earnings forecast will change investors' expectations.
- C. Incorrect because book value reflects the difference between the company's total assets and total liabilities and not expectations regarding future earnings. The book value of a company's equity reflects the historical operating and financing decisions of its management. The market value of the company's equity reflects these decisions as well as investors' collective assessment and expectations about the company's future cash flows generated by its positive net present value investment opportunities.

Overview of Equity Securities

- contrast the market value and book value of equity securities

Solution

- A. Incorrect because as a general rule, the higher the senior unsecured rating, the smaller the notching adjustment will be. Speculative grade issuers have lower senior unsecured ratings and hence larger notching adjustments.
- B. Incorrect because as a general rule, the higher the senior unsecured rating, the smaller the notching adjustment will be. Speculative grade issuers have lower senior unsecured ratings and hence larger notching adjustments.
- C. **Correct** because as a general rule, the higher the senior unsecured rating, the smaller the notching adjustment will be. Speculative grade issuers have lower senior unsecured ratings and hence larger notching 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 it calculates the management fee based on beginning-of-year AUM as opposed to end-of-year
AUM = \$50 million \times 2% = \$1.0 million.

$$\text{Incentive fee} = (\$60 - \$50 - \$1) \text{ million} \times 20\% = \$1.8 \text{ million.}$$

$$\text{Total fees} = \$1.0 \text{ million} + \$1.8 \text{ million} = \$2.8 \text{ million.}$$

B. **Correct** because management fee = end of year AUM \times management fee = \$60 million \times 2% = \$1.2 million; where
end of year AUM = beginning of year AUM \times (1+ annual return) = \$50million \times 1.20= \$60 million

$$\text{Incentive fee} = (\text{end of year AUM} - \text{beginning of year AUM} - \text{management fee}) \times \text{incentive fee} = (\$60 - \$50 - \$1.2) \\ \text{million} \times 20\% = \$1.76 \text{ million.}$$

$$\text{Total fees} = \text{management fee} + \text{incentive fee} = \$1.2 \text{ million} + \$1.76 \text{ million} = \$2.96 \text{ million.}$$

C. Incorrect because it fails to adjust the incentive fee for the management fee:

$$\text{management fee} = \$60 \text{ million} \times 2\% = \$1.2 \text{ million. Incentive fee} = (\$60 - \$50) \text{ million} \times 20\% = \$2.0 \text{ million} \\ \text{incentive fee.}$$

$$\text{Total fees} = \$1.2 \text{ million} + \$2.0 \text{ million} = \$3.2 \text{ million.}$$

Alternative Investment Performance and Returns

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

A. Incorrect because the formula converts from annual to quarterly compounding:

$$(1 + (\text{APR}/1))^1 = (1 + (\text{APR}/4))^4$$

$$(1 + (0.43)) = (1 + (\text{APR}/4))^4$$

$$\text{APR} \neq 0.042324 \approx 4.23\%.$$

B. Correct because the formula to convert from semi-annual to quarterly compounding is:

$$(1 + (\text{APR}/2))^2 = (1 + (\text{APR}/4))^4$$

$$(1 + (0.043/2))^2 = (1 + (\text{APR}/4))^4$$

$$\text{APR} = 0.042771 \approx 4.28\%.$$

C. Incorrect because the formula converts from quarterly to semi-annual compounding:

$$(1 + (\text{APR}/2))^{42} = (1 + (\text{APR}/4))^{24}$$

$$(1 + (\text{APR}/2))^{42} = (1 + (0.043/4))^{24}$$

$$\text{APR} \neq 0.043231 \approx 4.32\%.$$

Yield and Yield Spread Measures for Fixed-Rate Bonds

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

A. **Correct** because over the period the interest coverage ratio decreased, which indicates that the company is worse positioned to service its debt. A higher ratio indicates higher credit quality.

Interest coverage ratio is calculated as EBITDA/Interest expense and EBITDA = Operating income + Depreciation and amortization, hence the ratios are:

Year 1: EBITDA: $168 + 422 = 590 \Rightarrow$ Interest coverage: $590/120 = 4.92 \approx 4.9x$;

Year 2: EBITDA: $217 + 416 = 633 \Rightarrow$ Interest coverage: $633/155 = 4.08 \approx 4.1x$.

B. Incorrect because EBIT (i.e., operating income) is used instead of EBITDA to calculate the interest coverage ratio.

If the interest coverage ratio is calculated as EBIT/Interest expense, the ratios are:

Year 1: $168/120 = 1.4x$;

Year 2: $217/155 = 1.4x$.

This stable ratio would imply no change to the company's creditworthiness.

C. Incorrect because over the period the interest coverage ratio decreased and a higher [not lower] ratio indicates higher credit quality.

Credit Analysis for Corporate Issuers

- calculate and interpret financial ratios used in credit analysis

Solution

- A. Incorrect because when the underlying is below the put exercise price, the option is said to be in the money.
- B. Incorrect because when the underlying is precisely at the exercise price, the option is said to be at the money.
- C. **Correct** because when the underlying is higher than the exercise price of the put option, the option is said to be out of the money.

Pricing and Valuation of Options

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

- A. Incorrect because the present value (PV) of Preference Share 1 is greater than the PV of Preference Share 2. That is, the present value (PV) of a non-callable, non-convertible, perpetual preference share is solved using the equation: $V_0 = D_0 / r$, where: D_0 = current dividend; r = required rate of return on the stock. Therefore the PV of Preference Share 1 = $\$6 / 0.08\% = \75.00 , which is greater than the PV of Preference Share 2 = $\$8 / 0.11 \approx \72.73 .
- B. Incorrect because the present value (PV) of Preference Share 1 is greater than the PV of Preference Share 2. That is, the present value (PV) of a non-callable, non-convertible, perpetual preference share is solved using the equation: $V_0 = D_0 / r$, where: D_0 = current dividend; r = required rate of return on the stock. Therefore the PV of Preference Share 1 = $\$6 / 0.08 = \75.00 , which is greater than the PV of Preference Share 2 = $\$8 / 0.11 \approx \72.73 .
- C. **Correct** because the present value (PV) of a non-callable, non-convertible, perpetual preference share is solved using the equation: $V_0 = D_0 / r$, (where: D_0 = current dividend; r = required rate of return on the stock). Therefore the PV of Preference Share 1 = $\$6 / 0.08 = \75.00 , which is greater than the PV of Preference Share 2 = $\$8 / 0.11 \approx \72.73 .

Equity Valuation: Concepts and Basic Tools

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

Solution

- A. Incorrect because this is the definition of backwardation.
- B. Incorrect because this is neither contango nor backwardation.
- C. **Correct** because when a commodity market is in contango, futures prices are higher than the spot price.

Natural Resources

- describe features of commodities and their investment characteristics

- A. Incorrect because it is the median of the bonds' durations. $(3.2+7.6)/2 = 5.4$
- B. Incorrect because it is the arithmetic mean (average) of the bonds' durations. $(3.2+7.6+12.4+1.5)/4 \approx 6.2$
- C. **Correct** because the duration of a portfolio is the weighted average of the bonds' durations in which the weight for each bond is its contribution to the portfolio's value, as follows:

$\text{Duration}_{\text{portfolio}} = \sum w_{\text{bond}} \times \text{Duration}_{\text{bond}}$, where,

$$w_{\text{bond}} = \frac{\text{Value}_{\text{bond}}}{\text{Value}_{\text{portfolio}}}$$

In this case, value of the portfolio is $1.2 + 3.4 + 2.9 + 1.6 = \9.1 million, and the portfolio duration equals $(1.2/9.1 \times 3.2) + (3.4/9.1 \times 7.6) + (2.9/9.1 \times 12.4) + (1.6/9.1 \times 1.5) = 0.4220 + 2.8396 + 3.9516 + 0.2637 \approx 7.5$.

Yield-Based Bond Convexity and Portfolio Properties

- calculate portfolio duration and convexity and explain the limitations of these measures

- A. Incorrect because under co-investing, the investor invests in assets indirectly through the fund but also possesses rights (known as co-investment rights) to invest directly in the same assets.
- B. Incorrect because fund investing can be viewed as an indirect method of investing in alternative assets. In addition, under co-investing, the investor invests in assets indirectly through the fund but also possesses rights (known as co-investment rights) to invest directly in the same assets.
- C. **Correct** because fund investing can be viewed as an indirect method of investing in alternative assets. In addition, under co-investing, the investor invests in assets indirectly through the fund but also possesses rights (known as co-investment rights) to invest directly in the same assets.

Alternative Investment Features, Methods, and Structures

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

- A. Incorrect because FCFE is a measure of dividend-paying capacity.
- B. Incorrect because FCFE increases with an increase in the firm's net borrowing.
- C. **Correct** because dividends, a discretionary cash flow from financing activities, have no bearing on a firm's FCFE, as can be seen from the formula: $\text{FCFE} = \text{CFO} - \text{FCInv} + \text{Net borrowing}$.

Equity Valuation: Concepts and Basic Tools

- explain the rationale for using present value models to value equity and describe the dividend discount and free-cash-flow-to-equity models

- A. **Correct** because the price below which the investor will receive a margin call can be calculated using the equation for calculating maintenance margin.

Maintenance margin = Equity ÷ Market value =

$$\frac{5,000 + (P \times 300) - (30 \times 300)}{P \times 300} = 30\%$$

Solving for Price, P = \$19.05

- B. Incorrect because this answer is derived by using the total purchase price of the stock instead of the margin loan.

$$\frac{(P \times 300) - (30 \times 300)}{P \times 300} = 30\%$$

P = \$23.08

- C. Incorrect because this answer is derived by subtracting the equity instead of the margin loan in the numerator.

$$\frac{(P \times 300) - 5,000}{P \times 300} = 30\%$$

P = \$23.81

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

Solution

- A. Incorrect because unlike futures contracts, forward contracts are not standardized.
- B. Incorrect because forward contracts are not marked to market like futures contracts.
- C. **Correct** because futures contracts differ from forward contracts in that they have standard terms, and are traded on a futures exchange, whereas forward contracts are traded over-the-counter.

Pricing and Valuation of Futures Contracts

- explain why forward and futures prices differ

- Solution
- A. Incorrect because portfolio construction is part of the execution step.
 - B. **Correct** because performance measurement, along with portfolio monitoring and rebalancing, is part of the feedback step.
 - C. Incorrect because developing the investment policy statement is part of the planning step.

Portfolio Management: An Overview

- describe the steps in the portfolio management process

- A. **Correct** because the value effect—that is, stocks with below-average price-to-earnings and market-to-book ratios and above-average dividend yields have consistently outperformed growth stocks over long periods—is a cross-sectional anomaly.
- B. Incorrect because overreaction effect is a time-series anomaly, not a cross-sectional anomaly.
- C. Incorrect because a closed-end fund discount is an anomaly where a closed-end fund trades at a discount from its net asset value. It is not a cross-sectional anomaly.

Market Efficiency

- describe market anomalies

- A. Incorrect because the variances are used in the calculation of covariance instead of the standard deviations: $\text{Cov}_{i,j} = \rho_{i,j}\sigma_i\sigma_j = 0.0625 \times 0.090 \times 0.450 = 0.0025$.
- B. **Correct** because covariance is calculated as $\text{Cov}_{i,j} = \rho_{i,j}\sigma_i\sigma_j$, where

$\rho_{i,j}$ = correlation coefficient between two stocks

σ_i = variance of returns for Stock 1

σ_j = variance of returns for Stock 2

Plugging in the values:

$$\text{Cov}_{i,j} = 0.0625^{1/2} \times 0.090^{1/2} \times 0.450 = 0.0338$$

- C. Incorrect because the covariance is incorrectly multiplied by 2 in the calculation: $\text{Cov}_{i,j} = \rho_{i,j}\sigma_i\sigma_j = 2 \times 0.0625^{1/2} \times 0.090^{1/2} \times 0.450 = 0.0675$.

Portfolio Risk and Return: Part I

- calculate and interpret the mean, variance, and covariance (or correlation) of asset returns based on historical data

- A. Incorrect because this describes a reverse stock split which involves a reduction in the number of shares outstanding with a corresponding increase in share price.
- B. **Correct** because a stock split involves an increase in the number of shares outstanding with a consequent decrease in share price.
- C. Incorrect because a stock split involves an increase in the number of shares outstanding with a consequent decrease in share price.

Equity Valuation: Concepts and Basic Tools

- describe regular cash dividends, extra dividends, stock dividends, stock splits, reverse stock splits, and share repurchases

- A. **Correct** because credit card receivable-backed securities are non-amortizing loans. They have a lockout period during which the only cash flows paid to investors are based on finance charges and fees. When the lockout period is over, principal payments are distributed to investors in periodic payments. In contrast, principal is received monthly in automobile loan-backed securities.
- B. Incorrect because for credit card receivable-backed securities, principal received during the lockout period is reinvested in additional credit card receivables. After the lockout period, principal payments are used to pay off the outstanding principal.
- C. Incorrect because with credit card receivable-backed securities principal payments are not distributed to investors as a balloon payment. After the lockout period, the principal received is distributed as part of the periodic payments made to investors.

Mortgage-Backed Security (MBS) Instrument and Market Features

- describe characteristics and risks of commercial mortgage-backed securities

Solution

- A. Incorrect because if investors believe an asset market is relatively inefficient, they may try to develop an independent estimate of intrinsic value, indicating market prices are not likely to be accepted as reflecting intrinsic values.
- B. **Correct** because if investors believe a market is highly efficient, they will usually accept market prices as accurately reflecting intrinsic values.
- C. Incorrect because if investors believe an asset market is relatively inefficient, they may try to develop an independent estimate of intrinsic value, indicating market prices are not likely to be accepted as reflecting intrinsic values.

Market Efficiency

- contrast market value and intrinsic value

- A. Incorrect because if securities markets are weak-form and semi-strong-form efficient, the implication is that active trading, whether attempting to exploit price patterns or public information, is not likely to generate abnormal returns. And, although fundamental analysis requires costly information, this analysis can be profitable in terms of generating abnormal returns if the analyst creates a comparative advantage with respect to this information; however, this is not "most likely". Portfolio managers cannot beat the market on a consistent basis.
- B. **Correct** because fundamental analysis is necessary in a well-functioning market because this analysis helps market participants understand the value implications of information.
- C. Incorrect because fundamental analysis is the examination of publicly available information and the formulation of forecasts to estimate the intrinsic value of assets. Instead, investors using technical analysis attempt to profit by looking at patterns of prices and trading volumes.

Market Efficiency

- explain the implications of each form of market efficiency for fundamental analysis, technical analysis, and the choice between active and passive portfolio management

- A. **Correct** because the combination of the risk-free asset and a risky asset can result in a better risk–return trade-off than an investment in only one type of asset because the risk-free asset has zero correlation with the risky asset. The combination is called the capital allocation line.
- B. Incorrect because the curve that lies above and to the right of the global minimum-variance portfolio is referred to as the Markowitz efficient frontier because it contains all portfolios of risky assets that rational, risk-averse investors will choose. That is, the Markowitz efficient frontier only contains risky assets, while the capital allocation line is a combination of the risk-free asset and a risky asset.
- C. Incorrect because the capital allocation line (CAL) is comprised of an unlimited number of risk–return pairs or portfolios. Which *one* of these portfolios should be chosen by an investor? The answer lies in combining indifference curves from utility theory with the capital allocation line from portfolio theory. Utility theory gives us the utility function or the indifference curves for an individual, and the capital allocation line gives us the set of feasible investments. Overlaying each individual's indifference curves on the capital allocation line will provide us with the optimal portfolio for that investor. Therefore, the investor's indifference curve is not the combination of the risk-free asset and a risky asset.

Portfolio Risk and Return: Part II

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

A. Correct because the value of the bond is found by the formula:

$$PV = [PMT / (1 + r)^1] + [PMT / (1 + r)^2] + \dots + [(FV + PMT) / (1 + r)^N]$$

where:

PV = present value, or the price of the bond

PMT = coupon payment per period

FV = future value paid at maturity, or the par value of the bond

r = market discount rate, or required rate of return per period

N = number of evenly spaced periods to maturity

Alternatively, the change in value after one year can be calculated by solving for *I* and calculating the new value with a 100 basis point change in yield (*I*) with the following calculator inputs; *N* = $(3 \times 2) = 6$, *PMT* = $(5\% / 2) \times 100 = \$2.50$, *FV* = \$100, *PV* = \$98, Solve *I*, is equal to 2.8675%, or 2.868%. Annualized, *I* = $2.868 \times 2 = 5.736\%$. If the yield to maturity drops by 100 bps, the new yield to maturity is equal to $5.736 - 1.00 = 4.736\%$, or 2.368% on a semi-annual basis.

The price of the bond after one year and the new yield to maturity (or *I*) is computed using the following calculator inputs: *N* = $(2 \times 2) = 4$, *PMT* = \$2.50, *FV* = \$100, *I* = $(5.736\% - 1\%) / 2 = 2.368\%$. Solving for *PV*, the new value is equal to \$100.498.

Therefore, the change in value of the bond, on an absolute basis = $| \$98.00 - \$100.498 | = \$2.498$, rounded to \$2.50.

B. Incorrect because it fails to modify the term remaining to reflect the passage of one year, where the price of the bond after one year is computed as:

$$PV = [PMT / (1 + r)^1] + [PMT / (1 + r)^2] + \dots + [(FV + PMT) / (1 + r)^N]; \text{ where:}$$

PV = present value, or the price of the bond

PMT = coupon payment per period

FV = future value paid at maturity, or the par value of the bond

r = market discount rate, or required rate of return per period

N = number of evenly spaced periods to maturity

The change in value after one year can be calculated by solving for *I* and calculating the new value with a 100 basis point change in yield (*I*) with the following calculator inputs; *N* = $(3 \times 2) = 6$, *PMT* = $(5\% / 2) \times 100 = \$2.5$, *FV* = \$100, *PV* = \$98, Solve for *I* is equal to 2.868%. Annualized, *I* = $2.868 \times 2 = 5.736$. If the yield to maturity drops by 100 bps, the new yield to maturity is equal to $5.736 - 1.00 = 4.736$, or 2.368 on a semi-annual basis.

The price of the bond with the new yield to maturity (or *I*), without adjusting the time period is computed using the following calculator inputs: *N* = 6, *PMT* = \$2.5, *FV* = \$100, *I* = $(5.736\% - 1\%) / 2 = 2.368\%$. Solving for *PV*, the new value is equal to \$100.73.

Therefore, the change in value of the bond, on an absolute basis = $| \$98.00 - \$100.73 | = \$2.73$.

C. Incorrect because it uses the annual interest rate and does not adjust back to semi-annual, where the price of the bond after one year is computed as: $PV = [PMT \div (1 + r)^1] + [PMT \div (1 + r)^2] + \dots + [(FV + PMT) \div (1 + r)^N]$; where:

PV = present value, or the price of the bond

PMT = coupon payment per period

FV = future value paid at maturity, or the par value of the bond

r = market discount rate, or required rate of return per period

N = number of evenly spaced periods to maturity

The change in value after one year can be calculated by solving for *I* and calculating the new value with a 100 basis point change in yield (*I*) with the following calculator inputs; *N* = $(3 \times 2) = 6$, *PMT* = $(5\% \div 2) \times 100 = \2.5 , *FV* = \$100, *PV* = \$98, Solve for *I* is equal to 2.868%. Annualized, *I* = $2.868 \times 2 = 5.736$ or 5.374%. If the yield to maturity drops by 100 bps, the new yield to maturity is equal to $5.74 - 1.00 = 4.74\%$.

The the price of the bond using the annual rate of 4.736% after one year is computed using the following calculator inputs: *N* = 4, *PMT* = \$2.5, *FV* = \$100, *I* = $(5.74\% - 1\%) = 4.74\%$. Solving for *PV*, the new value is equal to \$92.01.

Therefore, the change in value of the bond, on an absolute basis = $| \$98.00 - \$92.01 | = \$5.98$.

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 the 1 bp reduction and increase is wrongly applied to the coupon rate, not the yield-to-maturity:

$$PVBP = (1,002.58 - 997.42) / 2 = 2.58,$$

whereby PV_- : FV = 1,000; PMT = 10; N = 30; I/Y = 0.99%; CPT PV = 1,002.58 and

PV_+ : FV = 1,000; PMT = 10; N = 30; I/Y = 1.01%; CPT PV = 997.42.

B. Correct because:

$PVBP = [(full\ price\ calculated\ by\ lowering\ the\ yield-to-maturity\ by\ 1\ bp) - (full\ price\ calculated\ by\ raising\ the\ yield-to-maturity\ by\ 1\ bp)] / 2$

$$PVBP = (1,055.90 - 1,050.42) / 2 = 2.74,$$

whereby PV_- : FV = 1,000; PMT = 10; N = 30; I/Y = 0.79%; CPT PV = 1,055.90 and

PV_+ : FV = 1,000; PMT = 10; N = 30; I/Y = 0.81%; CPT PV = 1,050.42.

C. Incorrect because the 1 bp is wrongly multiplied with the 30-year tenor of the bond and the par value:

$$PVBP = 30 \times 0.01\% \times 1,000 = 3.00.$$

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 asset-based valuations work well for companies that do not have a high proportion of intangible or "off the books" assets.
- B. Incorrect because companies with assets that do not have easily determinable market (fair) values—such as those with significant property, plant, and equipment—are very difficult to analyze using asset valuation methods.
- C. **Correct** because asset-based valuations work well for companies that do not have a high proportion of intangible or "off the books" assets and that do have a high proportion of current assets and current liabilities.

Equity Valuation: Concepts and Basic Tools

- describe asset-based valuation models and their use in estimating equity value

- A. Incorrect because in a shelf registration, the corporation makes all public disclosures that it would for a regular offering, but it does not sell the shares in a single transaction. Instead, it sells the shares directly into the secondary market over time, generally when it needs additional capital.
- B. **Correct** because in a private placement, corporations sell securities directly to a small group of qualified investors, usually with the assistance of an investment bank. Qualified investors have sufficient knowledge and experience to recognize the risks that they assume, and sufficient wealth to assume those risks responsibly. Most countries allow corporations to do private placements without nearly as much public disclosure as is required for public offerings.
- C. Incorrect because a best effort offering is a public offering of securities in which the investment bank acts only as broker. If the offering is undersubscribed, the issuer will not sell as much as it hoped to sell. Before a public offering, the issuer generally makes a very detailed disclosure of its business, of the risks inherent in it, and of the uses to which the new funds will be placed.

Market Organization and Structure

- define primary and secondary markets and explain how secondary markets support primary markets

A. Incorrect because a long call = long put + long asset + short risk-free bond.

B. **Correct** because the put–call parity relationship states that:

$$S_0 + p_0 = c_0 + \frac{x}{(1+r)^t}$$

That is,

Long asset + long put = long call + long risk-free bond.

Rearranging terms gives:

Long call = long put + long asset + short risk-free bond.

C. Incorrect because long call = long put + long asset + short risk-free bond.

Option Replication Using Put–Call Parity

- explain put–call parity for European options

- A. **Correct** because in periods of high demand for bonds, spreads will move tighter. Wider spreads hurt bond performance, whereas narrower spreads help bond performance.
- B. Incorrect because wider spreads hurt bond performance, whereas narrower spreads help bond performance.
- C. Incorrect because weakening economic conditions will push investors to desire a greater risk premium and drive overall credit spreads wider. Wider spreads hurt bond performance, whereas narrower spreads help bond performance.

Credit Risk

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

- A. **Correct** because the yield spread in basis points over an actual or interpolated government bond is known as the G-spread. Using the data provided, the yield for the Canadian Government Bond is found by $101 = 3 / (1 + r) + 103 / (1 + r)^2$. $r = 2.48\%$. While the yield on the corporate bond is $102 = 5 / (1 + r) + 105 / (1 + r)^2$. $r = 3.94\%$. G spread = $3.94 - 2.48 = 1.46$ or 146 basis points.
- B. Incorrect because the yield spread in basis points over an actual or interpolated government bond is known as the G-spread. This answer incorrectly uses the difference between the coupon rates $5.00 - 3.00 = 2.00$ or 200 basis points.
- C. Incorrect because the yield spread in basis points over an actual or interpolated government bond is known as the G-spread. This answer is only the yield of the Canadian Government Bond. $101 = 3 / (1 + r) + 103 / (1 + r)^2$. $r = 2.48\%$ or 248 basis points.

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 for risk relative to a benchmark, the measure could be tracking risk, or tracking error. Further, an expected tracking risk of 2% would imply a return within 4% of the index return approximately 95% of the time. Remember that tracking risk is stated as a one standard deviation measure.
- B. Incorrect because measures of absolute risk include the variance or standard deviation of returns and value at risk. For example, the 12-month 95% value at risk of the portfolio must be no more than ¥1 billion.
- C. Incorrect because maintaining cash is an IPS constraint, not a risk objective.

Basics of Portfolio Planning and Construction

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

A. Incorrect because the put seller's payoff (not profit) is calculated as: $-\text{Max}(0, X - S_T) = -\text{Max}(0, \$40.00 - \$35.00) = -\5.00 .

B. **Correct** because the put seller's profit is: $\Pi = -\text{Max}(0, X - S_T) + p_0$, where

X = exercise price

S_T = strike price

p_0 = price of put option

Plugging in the values:

$$\Pi = -\text{Max}(0, \$40.00 - \$35.00) + \$1.00 = -\$4.00.$$

C. Incorrect because the put buyer's (not seller's) profit is calculated as: $\text{Max}(0, X - S_T) - p_0 = \text{Max}(0, \$40.00 - \$35.00) - \$1.00 = \$4.00$.

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 derivatives usually take their values from the underlying by constructing a hypothetical combination of the derivatives and the underlyings that eliminates risk. With the risk eliminated, it follows that the hedge portfolio should earn the risk-free rate, and not zero return.
- B. **Correct** because derivatives usually take their values from the underlying by constructing a hypothetical combination of the derivatives and the underlyings that eliminates risk. This combination is typically called a hedge portfolio. With the risk eliminated, it follows that the hedge portfolio should earn the risk-free rate.
- C. Incorrect because even though the portfolio consists of underlyings and derivatives on those underlyings, the risk has been neutralized as it is a hedge portfolio. It follows that the return should be equal to the risk-free rate.

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

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

- A. **Correct** because forward price = $F_0(T) = (S_0 - \gamma + \theta)(1 + r)^T = (\text{underlying price} - \text{interest earned} + \text{storage cost}) \times (1 + \text{risk free rate})^{\text{(time to expiration)}}$. Therefore, the forward price will increase with an increase in storage costs of the underlying asset.
- B. Incorrect because forward price = $F_0(T) = (S_0 - \gamma + \theta)(1 + r)^T = (\text{underlying price} - \text{interest earned} + \text{storage cost}) \times (1 + \text{risk free rate})^{\text{(time to expiration)}}$. Therefore, the forward price will increase with a decrease, not increase, in interest earned on the underlying asset.
- C. Incorrect because forward price = $F_0(T) = (S_0 - (\gamma - \theta))(1 + r)^T = (\text{underlying price} - \text{convenience yield}) \times (1 + \text{risk free rate})^{\text{(time to expiration)}}$. Therefore, the forward price will increase with a decrease, not increase, in convenience yield of the underlying asset.

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

- explain the difference between the spot and expected future price of an underlying and the cost of carry associated with holding the underlying asset

- A. Incorrect because a put provision gives the bondholders the right to sell the bond back to the issuer at a pre-determined price on specified dates. Because a put provision has value to the bondholders, the price of a putable bond will be higher than the price of an otherwise similar bond issued without the put provision. Similarly, the yield on a bond with a put provision will be lower than the yield on an otherwise similar non-putable bond.
- B. Incorrect because from the investor's perspective, a convertible bond offers several advantages relative to a non-convertible bond. Because the conversion provision is valuable to bondholders, the price of a convertible bond is higher than the price of an otherwise similar bond without the conversion provision. Similarly, the yield on a convertible bond is lower than the yield on an otherwise similar non-convertible bond.
- C. **Correct** because bonds with contingent write-down provisions are convertible on the downside. In the case of contingent convertible bonds (CoCos), conversion is automatic if a specified event occurs. In such cases, the CoCos immediately convert into equity. Because the conversion is not at the option of the bondholders but automatic, CoCos force bondholders to take losses. For this reason, CoCos must offer a higher yield than otherwise similar bonds.

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

Solution

- A. **Correct** because issuers' disclosures about operating costs are typically less detailed than revenue disclosures. Rather than modeling costs separately for different geographic regions, business segments, or product lines, analysts are often forced to use more aggregated forecast objects such as consolidated financial statement lines (e.g., cost of sales, SG&A) or summary measures like EBITDA margins on a consolidated or segment basis.
- B. Incorrect because issuers' disclosures about operating costs are typically less detailed than, not as detailed as, revenue disclosures.
- C. Incorrect because issuers' disclosures about operating costs are typically less detailed than revenue disclosures.

Company Analysis: Forecasting

- explain approaches to forecasting a company's operating expenses and working capital

- A. Incorrect because this describes a fair value hedge, not a net investment hedge. A fair value hedge designation applies when a derivative is deemed to offset the fluctuation in fair value of an asset or liability.
- B. Incorrect because this describes a cash flow hedge, not a net investment hedge. Derivatives designated as absorbing the variable cash flow of a floating-rate asset or liability such as foreign exchange, interest rates, or commodities are referred to as cash flow hedges.
- C. **Correct** because net investment hedges occur when either a foreign currency bond or a derivative such as an FX swap or forward is used to offset the exchange rate risk of the equity of a foreign operation.

Derivative Benefits, Risks, and Issuer and Investor Uses

- compare the use of derivatives among issuers and investors

Solution

- A. **Correct** because funds sometimes impose a gate, which limits or restricts redemptions for a period of time.
Investors should be aware of their liquidity needs before investing in a fund with restrictive provisions.
- B. Incorrect because a gate limits or restricts redemptions, not inflows, for a period of time.
- C. Incorrect because a gate limits or restricts redemptions, not leverage, for a period of time.

Alternative Investment Performance and Returns

- describe the performance appraisal of alternative investments

- A. **Correct** because the procedures section explains the steps to take to keep the IPS current and the procedures to follow to respond to various contingencies.
- B. Incorrect because the investment guidelines section provides information about how policy should be executed and on specific types of assets excluded from investment, if any.
- C. Incorrect because this evaluation and review section provides guidance on obtaining feedback on investment results.

Basics of Portfolio Planning and Construction

- describe the major components of an IPS

Solution

- A. Incorrect because Eurobonds are bonds issued internationally, outside the jurisdiction of any single country to bypass the legal, regulatory, and tax constraints imposed on bond issuers and investors. The bonds registered with the SEC are not classified as Eurobonds.
- B. Incorrect because global bonds are bonds that are issued simultaneously in the Eurobond market and in at least one domestic bond market.
- C. **Correct** because bonds issued by entities that are incorporated in another country are called foreign bonds. Therefore, the bonds issued by a South Korean company in the United States are known as foreign bonds.

Fixed-Income Cash Flows and Types

- describe how legal, regulatory, and tax considerations affect the issuance and trading of fixed-income securities

A. Incorrect because this answer mistakenly flips the strike price and the forward price in the equation $p_0 = c_0 + [X - F_0(T)] / (1 + r)^T$. This incorrect answer is calculated as $p_0 = 0.0500 + (1.2000 - 1.2250) / (1 + 0.05)^2 = 0.0273$.

B. **Correct** because put–call forward parity can be expressed as:

$$F_0(T)(1 + r)^{-T} + p_0 = c_0 + X(1 + r)^{-T},$$

where $F_0(T)(1 + r)^{-T}$ is the present value of $F_0(T)$ discounted at the risk-free rate, p_0 is the price of the put option on the underlying at $t = 0$, c_0 is the price of the call option on the underlying at $t = 0$, $X(1 + r)^{-T}$ is a risk-free bond that pays the amount of the exercise price X at $t = T$.

In other words, under put–call parity, at $t = 0$ the price of the long underlying asset plus the long put must equal the price of the long call plus the risk-free asset.

Rearranging the formula yields:

$$F_0(T)(1 + r)^{-T} - X(1 + r)^{-T} = c_0 - p_0$$

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

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

Substituting in yields:

$$p_0 = 0.0500 + (1.2250 - 1.2000) / (1 + 0.05)^2 = 0.0727.$$

C. Incorrect because this fails to take the present value of the strike price minus the forward price. In other words, it fails to divide by $(1 + r)^T$ in the equation $p_0 = c_0 + [X - F_0(T)] / (1 + r)^T$. This incorrect answer is calculated as $p_0 = 0.0500 + (1.2250 - 1.2000) = 0.0750$.

Option Replication Using Put–Call Parity

- explain put–call forward parity for European options

- A. Incorrect because thematic investing focuses on investment in objectives, themes, and trends that relate positively to ESG issues. In impact investing, an investment is selected primarily on its expected social or environmental benefits with measurable investment returns. While thematic investing does not exclude directed proxy voting, the client invests in assets that already meet an objective and firm behavior is consistent with client objectives.
- B. Incorrect because negative screening is the practice of excluding certain sectors or excluding companies that deviate from accepted standards or norms. Exclusion based on values, such as exclusion of gambling, alcohol and tobacco-related companies, relate to an investor's moral or ethical beliefs in a company's or sector's business. Since these firms are not owned by the client, there are no proxy votes.
- C. **Correct** because shareholder engagement is the practice of entering into a dialogue with companies (including with respect to ESG issues). With shareholder engagement, clients and investment managers have to be clear with each other about the exercise of voting rights, filing shareholder proposals or entering into conversations with company management. Alternatively, the client may instruct some proxy agent to vote on its behalf and according to its own stewardship policies.

Basics of Portfolio Planning and Construction

- describe how environmental, social, and governance (ESG) considerations may be integrated into portfolio planning and construction

- A. **Correct** because over-the-counter derivatives are characterized by a lower degree of market transparency as many transactions in OTC markets will retain a degree of privacy with lower transparency. In contrast, exchange markets are said to have transparency, which means that full information on all transactions is disclosed to exchanges and regulatory bodies. So, over-the-counter derivatives have lower market transparency than exchange-traded derivatives.
- B. Incorrect because over-the-counter derivatives are characterized by a lower degree of market transparency as many transactions in OTC markets will retain a degree of privacy with lower transparency. In contrast, exchange markets are said to have transparency, which means that full information on all transactions is disclosed to exchanges and regulatory bodies. So, over-the-counter derivatives have lower market transparency than exchange-traded derivatives.
- C. Incorrect because over-the-counter derivatives are characterized by a lower degree of market transparency as many transactions in OTC markets will retain a degree of privacy with lower transparency. In contrast, exchange markets are said to have transparency, which means that full information on all transactions is disclosed to exchanges and regulatory bodies. So, over-the-counter derivatives have lower market transparency than exchange-traded derivatives.

Derivative Instrument and Derivative Market Features

- describe the basic features of derivative markets, and contrast over-the-counter and exchange-traded derivative markets

- A. **Correct** because in addition to the high quality of underlying securities, repos include features designed to reduce the risk of a collateral shortfall over the contract life. One such feature is the provision of collateral in excess of the cash exchanged, known as initial margin. A 100% initial margin indicates a fully collateralized loan, while a higher margin indicates even greater initial collateral protection. This is alternatively considered a *reduction* or haircut of the underlying loan relative to the initial collateral value. The repo margin allows for some worsening in market value, and thus provides the cash lender a margin of safety if the collateral's market value declines.
- B. Incorrect because in addition to the high quality of underlying securities, repos include features designed to reduce the risk of a collateral shortfall over the contract life. One such feature is the provision of collateral in excess of the cash exchanged, known as initial margin. The repo margin allows for some worsening in market value, and thus provides the cash lender, not the cash borrower, a margin of safety if the collateral's market value declines.
- C. Incorrect because in addition to the high quality of underlying securities, repos include features designed to reduce the risk of a collateral shortfall over the contract life. One such feature is the provision of collateral in excess of the cash exchanged, known as initial margin. The repo margin allows for some worsening in market value, and thus provides only to the cash lender a margin of safety if the collateral's market value declines.

Fixed-Income Markets for Corporate Issuers

- describe repurchase agreements (repos), their uses, and their benefits and risks

- A. Incorrect because for new industries for which data are unavailable or which are still in an early, unprofitable stage, the Porter analysis of industry structure can help point to potential profitability levels. Hence, Porter's Five Force's framework can still be applied, and would be especially useful, for new industries.
- B. Incorrect because assessing the barriers to exiting an industry should be considered when assessing the rivalry among existing competitors, not when assessing the threat of new entrants. If exiting an industry is difficult or costly, such as shutting down natural resource-producing assets, companies with low profitability may remain in the industry for much longer than in other industries, which can result in lingering competition.
- C. **Correct** because Porter's Five Forces is a framework for assessing industry structure that determines an industry's long-run profitability measure by its returns on invested capital.

Industry and Competitive Analysis

- analyze an industry's structure and external influences using Porter's Five Forces and PESTLE frameworks

A. **Correct** because the formula for effective duration is $[(PV_-) - (PV_+)]/[2 \times (\Delta\text{Curve}) \times (PV_0)]$.

$$\text{In this case EffDur} = [132.41 - 127.66]/[2 \times 0.0025 \times 130]$$

$$4.75/[0.005 \times 130] = 7.3077 \approx 7.3.$$

B. Incorrect because it uses the current price of par, 100 instead of the actual current price of 130. In this case EffDur

$$= [132.41 - 127.66]/[2 \times 0.0025 \times 100]$$

$$4.75 \div [0.005 \times 100] = 9.5.$$

C. Incorrect because it omits the divisor of 2. $[(PV_-) - (PV_+)]/[(\Delta\text{Curve}) \times (PV_0)]$ instead of the correct formula of $[(PV_-) - (PV_+)]/[2 \times (\Delta\text{Curve}) \times (PV_0)]$.

$$\text{In this case EffDur} = [132.41 - 127.66]/[0.002 \times 100]$$

$$4.75/[0.0025 \times 130] = 14.615 \approx 14.6.$$

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. Incorrect because \$622.40 is the value of the underlying assuming that this was a put option instead of a call option. The payoff to the put buyer at expiration is $p_T = \text{Max}(0, X - S_T)$, where X is the exercise price and S_T is the price of the underlying at expiration. Given the information in the stem we get $\$47.60 = \text{Max}(0, \$670 - S_T)$ which yields $S_T = \$670 - \$47.60 = \$622.40$.
- B. Incorrect because \$692.90 is the profit from the option position added to the strike price. It is computed as $(c_T - c_0) + X$ where c_T is the value of the option at expiration, c_0 is the purchase price of the option and X is the strike price. Given the information in the stem we get $(\$47.60 - \$24.70) + \$670 = \692.90 .
- C. **Correct** because the value or payoff to the call buyer at expiration is $c_T = \text{Max}(0, S_T - X)$ where X is the strike price, S_T is the price of the underlying at expiration. Given the information in the stem we get $\$47.60 = \text{Max}(0, S_T - \$670)$. Hence, $S_T = \$670 + \$47.60 = \$717.60$.

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 the convexity adjustment is subtracted instead of added:

$$\neq [-6.2 \times 0.003] - [0.5 \times 328 \times 0.003^2]$$

$$= [-0.0186] - [0.001476] = -0.020076, \text{ rounded to } -2.01\%.$$

B. Correct because the percentage price change for this bond is:

$$\% \Delta PV^{Full} \approx [-\text{AnnModDur} \times \Delta \text{Yield}] + [0.5 \times \text{AnnConvexity} \times (\Delta \text{Yield})^2]$$

$$= [-6.2 \times 0.003] + [0.5 \times 328 \times (0.003)^2]$$

$$= [-0.0186] + [0.001476] = -0.017124, \text{ rounded to } -1.71\%.$$

C. Incorrect because 0.5 in the convexity adjustment is omitted:

$$\neq [-6.2 \times 0.003] + [328 \times 0.003^2]$$

$$= [-0.0186] + [0.002952] = -0.015648, \text{ rounded to } -1.56\%.$$

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

A. Incorrect because 109.2 is the return for a price-weighted index. The sum of prices at the beginning of the period is $(30 + 40 + 50) = 120$. The sum of price at the end of the period is $(36 + 45 + 50) = 131$. Hence, the return is $((131/120) - 1) = 0.09166 \approx 9.17\%$. Using this increase of 9.17%, the index value at year end is $100 \times 1.0917 \approx 109.2$.

B. **Correct** because to calculate the index value of an equal-weighted index, the return for each security is first calculated using the formula: (ending value / beginning value) – 1.

$$\text{Stock 1: } ((36/30) - 1) = 0.2 = 20\%$$

$$\text{Stock 2: } ((45/50) - 1) = -0.1 = -10\%$$

$$\text{Stock 3: } ((50/40) - 1) = 0.25 = 25\%$$

These returns are then averaged: $((20\% - 10\% + 25\%)/3) \approx 11.67\%$.

The index value at year end is the beginning index value \times average return =

$$100 \times 1.1167 \approx 111.7$$

C. Incorrect because 113.5 is the return for a value-weighted index. The market value at the beginning of the period is $(30 \times 500 + 50 \times 200 + 40 \times 300) = 37,000$. The market value at the end of the period is $(36 \times 500 + 45 \times 200 + 50 \times 300) = 42,000$. The return is $((42,000/37,000) - 1) \approx 0.1351 = 13.51\%$. Using this return, the index value at year end is $100 \times 1.135 = 113.5$.

Security Market Indexes

- calculate and analyze the value and return of an index given its weighting method

- A. Incorrect because the partnership agreement usually specifies that the performance fee is earned only after the fund achieves a return known as a hurdle rate. The hurdle rate is a minimum rate of return, typically 8%, that the GP must exceed in order to earn the performance fee. GPs typically receive 20% of the total profit of the private equity fund either net of any hard hurdle rate, in which case the GP earns fees on annual returns in excess of the hurdle rate, or net of the soft hurdle rate, in which case the fee is calculated on the entire annual gross return as long as the set hurdle is exceeded. Hurdle rates are less common for hedge funds but do appear from time to time.
- B. Incorrect because for most alternative investment funds, particularly hedge funds and private equity funds, the GP does not earn a performance fee until the LPs have received their initial investment and the total return generated on the investment has exceeded a specified hurdle rate. A catch-up clause may be included in the partnership agreement.
- C. **Correct** because a clawback provision reflects the right of LPs to reclaim part of the GP's performance fee. Along either waterfall path, if a GP ever accrues (or actually pays itself) an incentive fee on gains that are not yet fully realized and then subsequently gives back these gains, an investor is typically able to claw back prior incentive fee accruals and payments. Clawback provisions are usually activated when a GP exits successful deals early on but incurs losses on deals later in the fund's life.

Alternative Investment Features, Methods, and Structures

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

- A. **Correct** because in a one-period binomial model, the risk-neutral probabilities are determined only by the risk-free rate over the life of the option and the underlying asset's volatility (as measured by the up and down gross returns, R_u and R_d).
- B. Incorrect because of the ability to construct a perfect hedge of the option using the underlying asset, an option's price is independent of investors' risk aversion and the probability of the underlying price moving up (or down).
- C. Incorrect because of the ability to construct a perfect hedge of the option using the underlying asset, an option's price is independent of investors' risk aversion and the probability of the underlying price moving up (or down).

Valuing a derivative using a one-period binomial model

- describe the concept of risk neutrality in derivatives pricing

- A. Incorrect because based on the Gordon growth model, the justified forward P/E is calculated by dividing the dividend payout ratio by the difference between the required rate of return and dividend growth rate. The P/E and the payout ratio appear to be positively related. This relationship may not be true, however, because a higher payout ratio may imply a slower growth rate as a result of the company retaining a lower proportion of earnings for reinvestment.
- B. **Correct** because, based on the Gordon growth model, the justified forward P/E is calculated by dividing the dividend payout ratio by the difference between the required rate of return and dividend growth rate. The P/E is inversely related to the required rate of return and positively related to the growth rate; that is, as the required rate of return increases, the P/E declines, and as the growth rate increases, the P/E increases.
- C. Incorrect because, based on the Gordon growth model, the justified forward P/E is calculated by dividing the dividend payout ratio by the difference between the required rate of return and dividend growth rate. The P/E is inversely related to the required rate of return. As the required rate of return increases, the P/E declines.

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