CFA Institute®
CFA Program

CORPORATE ISSUERS, EQUITY INVESTMENTS, FIXED INCOME

CFA® Program Curriculum
2023 • LEVEL 1 • VOLUME 4

Corporate Issuers

SOLUTIONS

1. B is correct.

    $r_e = 0.0425 + (1.3)(0.0482) = 0.1052$, or 10.52%.

2. B is correct.

    WACC = [(€900/€3300)(0.0925)(1 − 0.375)] + [(€2,400/€3,300)(0.1052)]

    = 0.0923, or 9.23%.

3. A is correct.

    Asset beta = Unlevered beta = 1.3/{1 + [(1 − 0.375)(€900/€2,400)]} = 1.053.

4. C is correct.

    Project beta = 1.053{1 + [(1 − 0.375)(€80/€20)]} = 1.053(3.5) = 3.686.

5. C is correct.

    $r_e = 0.0425 + 3.686(0.0482 + 0.0188) = 0.2895$, or 28.95%.

6. B is correct. Debt is generally less costly than preferred or common stock. The cost of debt is further reduced if interest expense is tax deductible.

7. B is correct. The weighted average cost of capital, using weights derived from the current capital structure, is the best estimate of the cost of capital for the average-risk project of a company.

8. C is correct. McClure should use the forecasted or target market values to calculate the weights.

    w_d = $63/($220 + 63) = 0.223.

    w_e = $220/($220 + 63) = 0.777.

9. The company's WACC is 13.64%, calculated as follows:

	Equity		Debt	WACC
Weight	0.80		0.20	
After-Tax Cost	15.6%		(1 − 0.30)8.28%	
Weight × Cost	12.48%	+	1.16%	= 13.64%

10. B is correct. The cost of equity is defined as the rate of return required by stockholders.

11. C is correct. FV = $1,000, PMT = $40, N = 10, and PV = $900.

    Solve for i. The six-month yield, i, is 5.3149%.

    YTM = 5.3149% × 2 = 10.62985%.

    $r_d(1 − t) = 10.62985\%(1 − 0.38) = 6.5905\%$.

12. C is correct. The bond rating approach depends on knowledge of the company's rating and can be compared with yields on bonds in the public market.

13. B is correct. The company can issue preferred stock at 6.5%. Therefore, the calculation of the preferred stock's current value is

P_p = $1.75/0.065 = $26.92.

14. A is correct. The relevant cost is the marginal cost of debt. The before-tax marginal cost of debt can be estimated by the yield to maturity of the company's expected new issue, which is 7%. After adjusting for tax, the after-tax cost is 7%(1 − 0.4) = 7%(0.6) = 4.2%.

15. For JPMorgan Chase, the required return is

$$r = R_F + \beta \left[\text{E} \left(R_M \right) - R_F \right] = 4.35\% + 1.50 \left(8.04\% \right) = 4.35\% + 12.06\%$$
$$= 16.41\%.$$

For Boeing, the required return is

$$r = R_F + \beta \left[\text{E} \left(R_M \right) - R_F \right] = 4.35\% + 0.80 \left(8.04\% \right) = 4.35\% + 6.43\%$$
$$= 10.78\%.$$

16. A. The required return is given by

$r = 0.025 + (–0.2)(0.045) = 2.5\% – 0.9\% = 1.6\%$.

This example indicates that Newmont Mining has a required return of 1.6%. When beta is negative, the CAPM calculation yields a required rate of return that is below the risk-free rate, which is arguably not meaningful. Cases of equities with negative betas are relatively rare.

B. The fact that the NEM's cost of debt is higher than the calculated required return on equity is another indicator that the return estimated using CAPM is not useful for valuing the company's equity.

17. B is correct. Asset risk does not change with a higher debt-to-equity ratio. Equity risk rises with higher debt.

18. B is correct. The debt-to-equity ratio of the new product should be used when making the adjustment from the asset beta, derived from the comparables, to the equity beta of the new product.

19. B is correct. The capital structure is as follows:

Market value of debt: FV = $10,000,000, PMT = $400,000, N = 10, and I/YR = 6.825%. Solving for PV gives $7,999,688.

Market value of equity: 1.2 million shares outstanding at $10 = $12,000,000.

Market value of debt	$7,999,688	40%
Market value of equity	12,000,000	60%
Total capital	$19,999,688	100%

To raise $7.5 million of new capital while maintaining the same capital structure, the company would issue $7.5 million × 40% = $3.0 million in bonds, which results in a before-tax rate of 16%.

$r_d(1 – t) = 0.16(1 – 0.3) = 0.112$, or 11.2%.

$r_e = 0.03 + 2.2(0.10 – 0.03) = 0.184$, or 18.4%.

$$\text{WACC} = 0.40(0.112) + 0.6(0.184) = 0.0448 + 0.1104 = 0.1552, \text{ or } 15.52\%.$$

20. B is correct.

    Asset beta: $\beta_{equity}/[1 + (1 - t)(D/E)]$

    Relevant $= 1.702/[1 + (0.77)(0)] = 1.702.$

    ABJ $= 2.8/[1 + (0.77)(0.003)] = 2.7918.$

    Opus $= 3.4/[1 + (0.77)(0.013)] = 3.3663.$

21. C is correct.

    Weights are determined on the basis of relative market values:

Comparables	Market Value of Equity in Millions	Proportion of Total
Relevant	$3,800	0.5490
ABJ	2,150	0.3106
Opus	972	0.1404
Total	$6,922	1.0000

    Weighted average beta $= (0.5490)(1.702) + (0.3106)(2.7918) + (0.1404)(3.3572)$
    $= 2.27.$

22. B is correct.

    Asset beta $= 2.27.$

    Levered beta $= 2.27[1 + (1 - 0.23)(0.01)] = 2.2875.$

    Cost of equity capital $= 0.0525 + (2.2875)(0.07) = 0.2126, \text{ or } 21.26\%.$

23. C is correct.

    For debt: $FV = 2,400,000;\ PV = 2,156,000;\ n = 10;\ PMT = 150,000.$

    Solve for i: $i = 0.07748$. YTM $= 15.5\%.$

    Before-tax cost of debt $= 15.5\%.$

    Market value of equity $= 1$ million shares outstanding $+ 1$ million newly issued shares $= 2$ million shares at $8
    $= \$16$ million.

    Total market capitalization $= \$2.156$ million $+ \$16$ million $= \$18.156$ million.

    Levered beta $= 2.27[1 + (1 - 0.23)(2.156/16)] = 2.27(1.1038) = 2.5055.$

    Cost of equity $= 0.0525 + 2.5055(0.07) = 0.2279, \text{ or } 22.79\%.$

    Debt weight $= \$2.156/\$18.156 = 0.1187.$

Equity weight = $16/$18.156 = 0.8813.

TagOn's MCC = (0.1187)(0.155)(1 − 0.23) + (0.8813)(0.2279)

= 0.01417 + 0.20084

= 0.2150. or 21.50%.

24. C is correct. Inferring the asset beta for the public company: Unlevered beta = 1.75/[1 + (1 − 0.35)(0.90)] = 1.104. Re-levering to reflect the target debt ratio of the private firm: Levered beta = 1.104 × [1 + (1 − 0.30)(1.00)] = 1.877.

25. B is correct. All else equal, the first issue's greater liquidity would tend to make its required return lower than the second issue's. However, the required return on equity increases as leverage increases. The first issue's higher required return must result from its higher leverage, more than offsetting the effect of its greater liquidity, given that both issues have the same market risk.

26. B is correct. Since the project will be financed with 50% equity, the company will issue £25 million of new stock. The flotation cost of external equity is (0.058 × 25,000,000) = 1,450,000. The NPV of the project using external equity is the NPV using internal equity less the flotation cost. Adjusting the cost of capital to reflect the flotation cost is not a preferred way to account for flotation costs.

SOLUTIONS

1. C is correct. Stock dividends, like stock splits, have no impact on the value of a company's equity. Issuing shares to acquire a competitor would increase equity relative to debt in the capital structure. Share price appreciation would also increase the market value of equity, thus increasing equity relative to debt.

2. C is correct. For a start-up company of this nature, debt financing is likely to be unattractive to lenders—and therefore very expensive or difficult to obtain. Debt financing is also unappealing to the company, because it commits the company to interest and principal payments that might be difficult to manage given the company's uncertain cash flow outlook.

3. B is correct. Cash flow typically turns positive during the growth stage, but it may be negative, particularly at the beginning of this stage.

4. C is correct. An electric utility has the capacity to support substantial debt, with very stable and predictable revenues and cash flows. The software company also has these attributes, but it would have been much less likely to have raised debt during its development and may have raised equity. The mining company has fixed assets, which it would have needed to finance, but the cyclical nature of its business would limit its debt capacity.

5. C is correct. As cash flows become more predictable, the company is able to support more debt in its capital structure; the optimal capital structure includes a higher proportion of debt. While mature companies do borrow to support growth, this action would typically not occur because the company is optimizing its capital structure. Likewise, while a mature company might issue equity to finance growth, this action would not be the typical approach for a company optimizing its capital structure.

6. B is correct. Proposition I, or the capital structure irrelevance theorem, states that in perfect markets the level of debt versus equity in the capital structure has no effect on company value.

7. C is correct. The cost of equity rises with the use of debt in the capital structure (e.g., with increasing financial leverage).

8. C is correct. If the company's WACC increases as a result of taking on additional debt, the company has moved beyond the optimal capital range. The costs of financial distress may outweigh any tax benefits from the use of debt.

9. B is correct. The static trade-off theory indicates that there is a trade-off between the tax shield for interest on debt and the costs of financial distress, leading to an optimal amount of debt in a company's capital structure.

10. A is correct. The market value of equity is (USD30)(10,000,000) = USD300,000,000. With the market value of debt equal to USD100,000,000, the market value of the company is USD100,000,000 + USD300,000,000 = USD400,000,000. Therefore, the company is USD100,000,000/USD400,000,000 = 0.25, or 25% debt-financed.

11. A is correct. The after-tax cost of debt decreases as the marginal tax rate increases.

12. B is correct. A company's optimal and target capital structures may be different

from each other.

13. C is correct. Long-term debt is more exposed than short-term debt to the risk of a management decision that is not debtholder-friendly. Secured debt is less exposed than unsecured debt to such a risk, and with low leverage, the risk of a debt-equity conflict is reduced, not increased, relative to high leverage.

14. B is correct. Management is advocating an acquisition that is likely to be positive for the value of the company's options but negative for equityholders, given the substantial risk. A is an example of a debt-equity conflict. C is an example of stakeholder interests that are not being considered by management.

15. B is correct. Management is generally focused on maximizing the value of equity.

16. B is correct. A well-designed management compensation scheme can reduce, but not eliminate, agency costs.

17. The cyclical nature of ISS's revenues, which cause the company's earnings and cash flows to vary considerably over the business cycle, would point to a relatively high cost of borrowing and low proportion of debt in the capital structure. Revenue and earnings streams subject to relatively high volatility, and consequently less predictability, are less favorable for supporting debt in the capital structure. Further, companies with pay-per-use business models, rather than subscription-based models, are likely to have a lower degree of revenue predictability and a lower ability to support debt in the capital structure.

    Another factor pointing to a relatively high cost of borrowing and low proportion of debt in the capital structure is the fact that most of the company's assets are intangible and thus less likely to be accepted by lenders as collateral for secured financing. Asset-light companies with a lower proportion of tangible assets will have a lower ability to support debt in the capital structure.

18. The fact that Tillett earns about half of its revenues from subscription-based service agreements would suggest that the company's revenue stream is likely somewhat predictable. A high proportion of recurring revenues for a company is generally viewed as a positive for its ability to support debt, because the company's revenue stream is likely to be more predictable and less sensitive to the ups and downs of the macro economy. Further, Tillett's assets consist mostly of inventory and property, plant, and equipment, representing its production facilities. Tangible assets, such as inventory and property, plant, and equipment, are often deemed safer than intangible assets and can better serve as debt collateral. Finally, the fact that Tillett currently has no debt in its capital structure and has experienced improved profitability in recent years would also suggest that Tillett might be able to access debt capital at a reasonable cost to finance the additional growth.

19. Leverage ratios and interest coverage ratios are commonly used to determine whether a company can service additional debt. Regarding leverage ratios, a company's ratio of total debt to total assets measures the proportion of total assets funded by debt capital, and its ratio of total debt to EBITDA provides an estimate of how many years it would take to repay its total debt based on EBITDA (a proxy for operating cash flow). The interest coverage ratio (EBIT to interest expense) measures the number of times a company's EBIT could cover its interest payments.

20. A company's cost of debt is equal to a risk-free rate plus a credit spread specific to the company. Lower interest rates and tighter credit spreads would make borrowing less costly and make debt financing relatively more attractive than when

interest rates are high or credit spreads are wide.

21. C is correct. Share price changes will cause the market value of the company's equity to change; book value is unaffected.

    Statements A and B are accurate.

22. C is correct.

    w_d = USD63/(USD220 + USD63) = 0.223.

    w_e = USD220/(USD220 + USD63) = 0.777.

    Market values should be used in cost of capital calculations, and forecasted market values should be used in this case given that the cost of capital will be applied to *projected* cash flows in McClure's analysis.

23. C is correct. Companies generally raise capital when it is needed, such as for investment spending or when market pricing and terms are favorable for debt or equity issuance.

24. A is correct. According to the pecking order theory, internally generated funds are preferable to both new equity and new debt. If internal financing is insufficient, managers next prefer new debt, then new equity. Managers prefer forms of financing with the least amount of visibility to outsiders.

25. C is correct. According to the pecking order theory, managers prefer internal financing. If internal financing is insufficient, managers next prefer debt, then equity—in order of increasing visibility to outsiders.

SOLUTIONS

1. C is correct. Sales risk is defined as uncertainty with respect to the price or quantity of goods and services sold. 4G has a higher standard deviation of unit sales than Qphone; in addition, 4G's standard deviation of unit sales stated as a fraction of its level of unit sales, at 25,000/1,000,000 = 0.025, is greater than the comparable ratio for Qphone, 10,000/1,500,000 = 0.0067.

2. B is correct. Business risk is associated with operating earnings. Operating earnings are affected by sales risk (uncertainty with respect to price and quantity), and operating risk (the operating cost structure and the level of fixed costs).

3. C is correct. Operating risk refers to the risk arising from the mix of fixed and variable costs.

4. B is correct. $DOL = \dfrac{Q(P - V)}{Q(P - V) - F}$

   DOL @ 1,000,000 units $= \dfrac{1,000,000\,(¥108 - ¥72)}{1,000,000\,(¥108 - ¥72) - ¥22,500,000} = 2.67$

5. C is correct. Degree of financial leverage is

   $DFL = \dfrac{[Q(P - V) - F]}{[Q(P - V) - F - C]}$

   $= \dfrac{1,000,000\,(¥108 - ¥72) - ¥22,500,000}{1,000,000\,(¥108 - ¥72) - ¥22,500,000 - ¥9,000,000} = 3.00$

6. B is correct. The degree of operating leverage of Qphone is 1.4. The percentage change in operating income is equal to the DOL times the percentage change in units sold, therefore:

   Percentage change in operating income $= (DOL) \left(\begin{array}{l}\text{Percentage change} \\ \text{in units sold}\end{array}\right) = (1.4)\,(15\%) = 21\%$

7. C is correct. The breakeven quantity is computed

   $Q_{BE} = \dfrac{F + C}{P - V} = \dfrac{(¥22,500,000 + ¥9,000,000)}{(¥108 - ¥72)} = 875,000$

8. C is correct. 4G, Inc.'s degree of total leverage can be shown to equal 8, whereas Qphone Corp.'s degree of total leverage is only DOL × DFL = 1.4 × 1.15 = 1.61. Therefore, a 10 percent increase in unit sales will mean an 80 percent increase in net income for 4G, but only a 16.1 percent increase in net income for Qphone Corp. The calculation for 4G, Inc.'s DTL is

   $DTL = \dfrac{Q(P - V)}{Q(P - V) - F - C}$

   $= \dfrac{1,000,000\,(¥108 - ¥72)}{1,000,000\,(¥108 - ¥72) - ¥22,500,000 - ¥9,000,000} = 8.00$

9. A is correct. Degree of total leverage is defined as the percentage change in net income divided by the percentage change in units sold.

10. C is correct. The companies' degree of operating leverage should be the same, consistent with C. Sales risk refers to the uncertainty of the number of units produced and sold and the price at which units are sold. Business risk is the joint effect of sales risk and operating risk.

11. C is correct. The degree of operating leverage is the elasticity of operating earnings with respect to the number of units produced and sold. As an elasticity, the degree of operating leverage measures the sensitivity of operating earnings to a change in the number of units produced and sold.

12. C is correct. Because DOL is 4, if unit sales increase by 5 percent, Fulcrum's operating earnings are expected to increase by 4 × 5% = 20%. The calculation for DOL is:

$$\text{DOL} = \frac{(40 \text{ million}) (\$100 - \$65)}{[(40 \text{ million}) (\$100 - \$65)] - \$1.05 \text{ billion}}$$

$$= \frac{\$1.400 \text{ billion}}{\$1.400 \text{ billion} - \$1.05 \text{ billion}} = \frac{\$1.4}{\$0.35} = 4$$

13. C is correct. Business risk reflects operating leverage and factors that affect sales (such as those given).

14. B is correct. Grundlegend's degree of operating leverage is the same as Basic Company's, whereas Grundlegend's degree of total leverage and degree of financial leverage are higher.

15. B is correct.

$$\text{Operating breakeven units} = \frac{¥1,290 \text{ million}}{(¥3,529 - ¥1,500)} = 635,781.173 \text{ units}$$

$$\text{Operating breakeven sales} = ¥3,529 \times 635,781.173 \text{ units} = ¥2,243,671,760$$

or

$$\text{Operating breakeven sales} = \frac{¥1,290 \text{ million}}{1 - (¥1,500/¥3,529)} = ¥2,243,671,760$$

$$\text{Total breakeven} = \frac{¥1,290 \text{ million} + ¥410 \text{ million}}{(¥3,529 - ¥1,500)} = \frac{¥1,700 \text{ million}}{¥2,029}$$

$$= 837,851.1582 \text{ units}$$

$$\text{Breakeven sales} = ¥3,529 \times 837,851.1582 \text{ units} = ¥2,956,776,737$$

or

$$\text{Breakeven sales} = \frac{¥1,700 \text{ million}}{1 - (¥1,500/¥3,529)} = ¥2,956,776,737$$

16. A is correct. For The Gearing Company,

$$Q_{BE} = \frac{F + C}{P - V} = \frac{\$40 \text{ million} + \$20 \text{ million}}{\$200 - \$120} = 750,000$$

For Hebelkraft, Inc.,

$$Q_{BE} = \frac{F + C}{P - V} = \frac{\$90 \text{ million} + \$20 \text{ million}}{\$200 - \$100} = 1,100,000$$

Equity Investments

SOLUTIONS

1. C is correct. Takabe is best characterized as an information-motivated trader. Takabe believes that his model provides him superior information about the movements in the stock market and his motive for trading is to profit from this information.

2. B is correct. Beach is an investor. He is simply investing in risky assets consistent with his level of risk aversion. Beach is not hedging any existing risk or using information to identify and trade mispriced securities. Therefore, he is not a hedger or an information-motivated trader.

3. A is correct. Smith is a hedger. The short position on the BRL futures contract offsets the BRL long position in three months. She is hedging the risk of the BRL depreciating against the USD. If the BRL depreciates, the value of the cash inflow goes down in USD terms but there is a gain on the futures contracts.

4. A is correct. Regulation of arbitrageurs' profits is not a function of the financial system. The financial system facilitates the allocation of capital to the best uses and the purposes for which people use the financial system, including borrowing money.

5. C is correct. The purchase of real estate properties is a transaction in the alternative investment market.

6. B is correct. The 90-day commercial paper and negotiable certificates of deposit are money market instruments.

7. B is correct. This transaction is a sale in the primary market. It is a sale of shares from the issuer to the investor and funds flow to the issuer of the security from the purchaser.

8. A is correct. Warrants are least likely to be part of the fund. Warrant holders have the right to buy the issuer's common stock. Thus, warrants are typically classified as equity and are least likely to be a part of a fixed-income mutual fund. Commercial paper and repurchase agreements are short-term fixed-income securities.

9. C is correct. When investors want to sell their shares, investors of an open-end fund sell the shares back to the fund whereas investors of a closed-end fund sell the shares to others in the secondary market. Closed-end funds are available to new investors but they must purchase shares in the fund in the secondary market. The shares of a closed-end fund trade at a premium or discount to net asset value.

10. B is correct. SPDRs trade in the secondary market and are a pooled investment vehicle.

11. B is correct. The investment companies that create exchange-traded funds (ETFs) are financial intermediaries. ETFs are securities that represent ownership in the assets held by the fund. The transaction costs of trading shares of ETFs are substantially lower than the combined costs of trading the underlying assets of the ETF.

12. A is correct. Once you have entered into a forward contract, it is difficult to exit from the contract. As opposed to a futures contract, trading out of a forward contract is quite difficult. There is no exchange of cash at the origination of a

forward contract. There is no exchange on a forward contract until the maturity of the contract.

13. A is correct. Harris is least likely to find counterparty risk associated with a futures contract. There is limited counterparty risk in a futures contract because the clearinghouse is on the other side of every contract.

14. B is correct. Buying a put option on the dollar will ensure a minimum exchange rate but does not have to be exercised if the exchange rate moves in a favorable direction. Forward and futures contracts would lock in a fixed rate but would not allow for the possibility to profit in case the value of the dollar three months later in the spot market turns out to be greater than the value in the forward or futures contract.

15. B is correct. The agreement between the publisher and the paper supplier to respectively buy and supply paper in the future at a price agreed upon today is a forward contract.

16. B is correct. The holder of the call option will exercise the call options if the price is above the exercise price of $305 per share. Note that if the stock price is above $305 but less than $308, the option would be exercised even though the net result for the option buyer after considering the premium is a loss. For example, if the stock price is $307, the option buyer would exercise the option to make $2 = $307 − $305 per share, resulting in a loss of $1 = $3 − $2 after considering the premium. It is better to exercise and have a loss of only $1, however, rather than not exercise and lose the entire $3 premium.

17. B is correct. The process can best be described as arbitrage because it involves buying and selling instruments, whose values are closely related, at different prices in different markets.

18. A is correct. Robert's exposure to the risk of the stock of the Michelin Group is long. The exposure as a result of the long call position is long. The exposure as a result of the short put position is also long. Therefore, the combined exposure is long.

19. B is correct. The maximum leverage ratio is 1.82 = 100% position ÷ 55% equity. The maximum leverage ratio associated with a position financed by the minimum margin requirement is one divided by the minimum margin requirement.

20. C is correct. The return is 50 percent. If the position had been unleveraged, the return would be 20% = (60 − 50)/50. Because of leverage, the return is 50% = 2.5 × 20%.

Another way to look at this problem is that the equity contributed by the trader (the minimum margin requirement) is 40% = 100% ÷ 2.5. The trader contributed $20 = 40% of $50 per share. The gain is $10 per share, resulting in a return of 50% = 10/20.

21. B is correct. The return is −15.4 percent.

    Total cost of the purchase = $16,000 = 500 × $32
    Equity invested = $12,000 = 0.75 × $16,000
    Amount borrowed = $4,000 = 16,000 − 12,000
    Interest paid at month end = $80 = 0.02 × $4,000
    Dividend received at month end = $250 = 500 × $0.50
    Proceeds on stock sale = $14,000 = 500 × $28

Total commissions paid = $20 = $10 + $10

Net gain/loss = −$1,850 = −16,000 − 80 + 250 + 14,000 − 20

Initial investment including commission on purchase = $12,010

Return = −15.4% = −$1,850/$12,010

22. A is correct. She will need to contribute €3,760 as margin. In view of the possibility of a loss, if the stock price goes up, she will need to contribute €3,760 = 40% of €9,400 as the initial margin. Rogers will need to leave the proceeds from the short sale (€9,400 = 200 × €47) on deposit.

23. B is correct. A margin call will first occur at a price of $17.86. Because you have contributed half and borrowed the remaining half, your initial equity is 50 percent of the initial stock price, or $12.50 = 0.50 × $25. If *P* is the subsequent price, your equity would change by an amount equal to the change in price. So, your equity at price *P* would be 12.50 + (*P* − 25). A margin call will occur when the percentage margin drops to 30 percent. So, the price at which a margin call will occur is the solution to the following equation.

$$\frac{\text{Equity/Share}}{\text{Price/Share}} = \frac{12.50 + P - 25}{P} = 30\%$$

The solution is *P* = $17.86.

24. C is correct. The market is 9.95 bid, offered at 10.02. The best bid is at €9.95 and the best offer is €10.02.

25. C is correct. This order is said to make a new market. The new buy order is at ¥123.40, which is better than the current best bid of ¥123.35. Therefore, the buy order is making a new market. Had the new order been at ¥123.35, it would be said to make the market. Because the new buy limit order is at a price less than the best offer of ¥123.80, it will not immediately execute and is not taking the market.

26. A is correct. This order is said to take the market. The new sell order is at $54.62, which is at the current best bid. Therefore, the new sell order will immediately trade with the current best bid and is taking the market.

27. B is correct. An instruction regarding when to fill an order is considered a validity instruction.

28. B is correct. The maximum possible loss is $1,300. If the stock price crosses $50, the stop buy order will become valid and will get executed at a maximum limit price of $55. The maximum loss per share is $13 = $55 − $42, or $1,300 for 100 shares.

29. B is correct. The most appropriate order is a good-till-cancelled stop sell order. This order will be acted on if the stock price declines below a specified price (in this case, $27.50). This order is sometimes referred to as a good-till-cancelled stop loss sell order. You are generally bullish about the stock, as indicated by no immediate intent to sell, and would expect a loss on short selling the stock. A stop buy order is placed to buy a stock when the stock is going up.

30. B is correct. The investment bank bears the risk that the issue may be undersubscribed at the offering price. If the entire issue is not sold, the investment bank underwriting the issue will buy the unsold securities at the offering price.

31. B is correct. This sale is a private placement. As the company is already publicly traded, the share sale is clearly not an initial public offering. The sale also does

not involve a shelf registration because the company is not selling shares to the public on a piecemeal basis.

32. A is correct. This offering is a rights offering. The company is distributing rights to buy stock at a fixed price to existing shareholders in proportion to their holdings.

33. C is correct. Order III (time of arrival of 9:53:04) has precedence. In the order precedence hierarchy, the first rule is price priority. Based on this rule, sell orders II, III, and IV get precedence over order I. The next rule is display precedence at a given price. Because order II is a hidden order, orders III and IV get precedence. Finally, order III gets precedence over order IV based on time priority at same price and same display status.

34. C is correct. The order for 500 shares would get cancelled; there would be no fill. Li is willing to buy at CNY 74.25 or less but the minimum offer price in the book is CNY 74.30; therefore, no part of the order would be filled. Because Li's order is immediate-or-cancel, it would be cancelled.

35. B is correct. Ian's average trade price is:

$$\pounds 19.92 = \frac{300 \times \pounds 20.02 + 400 \times \pounds 19.89 \ + \ 200 \times \pounds 19.84}{300 + 400 + 200}$$

Ian's sell order first fills with the most aggressively priced buy order, which is Mary's order for 300 shares at £20.02. Ian still has 700 shares for sale. The next most aggressively priced buy order is Ann's order for 400 shares at £19.89. This order is filled. Ian still has 300 shares for sale. The next most aggressively priced buy order is Paul's order for 200 shares at £19.84. A third trade takes place. Ian still has 100 shares for sale.

The next buy order is Keith's order for 1,000 shares at £19.70. However, this price is below Ian's limit price of £19.83. Therefore, no more trade is possible.

36. C is correct. In such a market, well-informed traders will find it easy to trade and their trading will make the market more informationally efficient. In a liquid market, it is easier for informed traders to fill their orders. Their trading will cause prices to incorporate their information and the prices will be more in line with the fundamental values.

37. C is correct. Ensure that investors in the stock market achieve a rate of return that is at least equal to the risk-free rate of return is least likely to be included as an objective of market regulation. Stocks are risky investments and there would be occasions when a stock market investment would not only have a return less than the risk-free rate but also a negative return. Minimizing agency costs and ensuring that financial markets are fair and orderly are objectives of market regulation.

SOLUTIONS

1. C is correct. A security market index represents the value of a given security market, market segment, or asset class.

2. C is correct. The difference between a price return index and a total return index consisting of identical securities and weights is the income generated over time by the underlying securities. If the securities in the index do not generate income, both indexes will be identical in value.

3. A is correct. At inception, the values of the price return and total return versions of an index are equal.

4. A is correct. Security market indexes are constructed and managed like a portfolio of securities.

5. A is correct. The first decision is identifying the target market that the index is intended to represent because the target market determines the investment universe and the securities available for inclusion in the index.

6. B is correct. The price return is the sum of the weighted returns of each security. The return of Able is 20 percent [(12 − 10)/10]; of Baker is −5 percent [(19 − 20)/20]; and of Charlie is 0 percent [(30 − 30)/30]. The price return index assigns a weight of 1/3 to each asset; therefore, the price return is 1/3 × [20% + (−5%) + 0%] = 5%.

7. C is correct. The total return of an index is calculated on the basis of the change in price of the underlying securities plus the sum of income received or the sum of the weighted total returns of each security. The total return of Able is 27.5 percent; of Baker is 0 percent; and of Charlie is 6.7 percent:

   Able: (12 − 10 + 0.75)/10 = 27.5%

   Baker: (19 − 20 + 1)/20 = 0%

   Charlie: (30 − 30 + 2)/30 = 6.7%

   An equal-weighted index applies the same weight (1/3) to each security's return; therefore, the total return = 1/3 × (27.5% + 0% + 6.7%) = 11.4%.

8. B is correct. The price return of the price-weighted index is the percentage change in price of the index: (68 − 75)/75 = −9.33%.

Security	Beginning of Period Price (£)	End of Period Price (£)
ABC	25.00	27.00
DEF	35.00	25.00
GHI	15.00	16.00
TOTAL	75.00	68.00

9. B is correct. The price return of the index is (48,250,000 − 53,750,000)/53,750,000 = −10.23%.

Security	Beginning of Period Price (¥)	Shares Outstanding	Beginning of Period Value (¥)	End of Period Price (¥)	End of Period Value (¥)
MNO	2,500	5,000	12,500,000	2,700	13,500,000
QRS	3,500	7,500	26,250,000	2,500	18,750,000
XYZ	1,500	10,000	15,000,000	1,600	16,000,000
Total			53,750,000		48,250,000

10. B is correct. The total return of the market-capitalization-weighted index is calculated below:

Security	Beginning of Period Value (¥)	End of Period Value (¥)	Total Dividends (¥)	Total Return (%)
MNO	12,500,000	13,500,000	500,000	12.00
QRS	26,250,000	18,750,000	1,125,000	−24.29
XYZ	15,000,000	16,000,000	1,000,000	13.33
Total	53,750,000	48,250,000	2,625,000	−5.35

11. A is correct. The target market determines the investment universe and the securities available for inclusion in the index.

12. A is correct. The sum of prices at the beginning of the period is 96; the sum at the end of the period is 100. Regardless of the divisor, the price return is $100/96 − 1 = 0.042$ or 4.2 percent.

13. B is correct. It is the percentage change in the market value over the period:

Market value at beginning of period: $(20 \times 300) + (50 \times 300) + (26 \times 2,000) = 73,000$

Market value at end of period: $(22 \times 300) + (48 \times 300) + (30 \times 2,000) = 81,000$

Percentage change is $81,000/73,000 − 1 = 0.1096$ or 11.0 percent with rounding.

14. C is correct. With an equal-weighted index, the same amount is invested in each security. Assuming $1,000 is invested in each of the three stocks, the index value is $3,000 at the beginning of the period and the following number of shares is purchased for each stock:

Security A: 50 shares

Security B: 20 shares

Security C: 38.46 shares.

Using the prices at the beginning of the period for each security, the index value at the end of the period is $3,213.8: $(\$22 \times 50) + (\$48 \times 20) + (\$30 \times 38.46)$. The price return is $\$3,213.8/\$3,000 − 1 = 7.1\%$.

15. A is correct. In the price weighting method, the divisor must be adjusted so the index value immediately after the split is the same as the index value immediately prior to the split.

16. C is correct. The main source of return differences arises from outperformance

of small-cap securities or underperformance of large-cap securities. In an equal-weighted index, securities that constitute the largest fraction of the market are underrepresented and securities that constitute only a small fraction of the market are overrepresented. Thus, higher equal-weighted index returns will occur if the smaller-cap equities outperform the larger-cap equities.

17. C is correct. "Float" is the number of shares available for public trading.

18. B is correct. Fundamental weighting leads to indexes that have a value tilt.

19. C is correct. Rebalancing refers to adjusting the weights of constituent securities in an index to maintain consistency with the index's weighting method.

20. B is correct. Changing market prices will cause weights that were initially equal to become unequal, thus requiring rebalancing.

21. C is correct. Reconstitution is the process by which index providers review the constituent securities, re-apply the initial criteria for inclusion in the index, and select which securities to retain, remove, or add. Constituent securities that no longer meet the criteria are replaced with securities that do. Thus, reconstitution reduces the likelihood that the index includes securities that are not representative of the target market.

22. C is correct. Security market indexes play a critical role as proxies for asset classes in asset allocation models.

23. A is correct. Security market indexes are used as proxies for measuring market or systematic risk, not as measures of systemic risk.

24. B is correct. Sector indexes provide a means to determine whether a portfolio manager is more successful at stock selection or sector allocation.

25. C is correct. Style indexes represent groups of securities classified according to market capitalization, value, growth, or a combination of these characteristics.

26. A is correct. The large number of fixed-income securities—combined with the lack of liquidity of some securities—makes it costly and difficult for investors to replicate fixed-income indexes.

27. C is correct. An aggregate fixed-income index can be subdivided by market sector (government, government agency, collateralized, corporate), style (maturity, credit quality), economic sector, or some other characteristic to create more narrowly defined indexes.

28. C is correct. Coupon frequency is not a dimension on which fixed-income indexes are based.

29. C is correct. The fixed-income market has more issuers and securities than the equity market.

30. A is correct. Commodity indexes consist of futures contracts on one or more commodities.

31. C is correct. The performance of commodity indexes can be quite different from that of the underlying commodities because the indexes consist of futures contracts on the commodities rather than the actual commodities.

32. B is correct. It is not a real estate index category.

33. B is correct. Hedge funds are not required to report their performance to any party other than their investors. Therefore, each hedge fund decides to which database(s) it will report its performance. Thus, for a hedge fund index, constituents determine the index rather than index providers determining the constituents.

34. A is correct. Voluntary performance reporting may lead to survivorship bias, and poorer performing hedge funds will be less likely to report their performance.

SOLUTIONS

1. B is correct. A security's intrinsic value and market value should be equal when markets are efficient.

2. B is correct. The intrinsic value of an undervalued asset is greater than the market value of the asset, where the market value is the transaction price at which an asset can be currently bought or sold.

3. B is correct. The market value is the transaction price at which an asset can be currently bought or sold.

4. C is correct. Today's price change is independent of the one from yesterday, and in an efficient market, investors will react to new, independent information as it is made public.

5. A is correct. Reducing the number of market participants can accentuate market imperfections and impede market efficiency (e.g., restrictions on foreign investor trading).

6. A is correct. According to theory, reducing the restrictions on trading will allow for more arbitrage trading, thereby promoting more efficient pricing. Although regulators argue that short selling exaggerates downward price movements, empirical research indicates that short selling is helpful in price discovery.

7. C is correct. Regulation to restrict unfair use of nonpublic information encourages greater participation in the market, which increases market efficiency. Regulators (e.g., US SEC) discourage illegal insider trading by issuing penalties to violators of their insider trading rules.

8. A is correct. Restricting short selling will reduce arbitrage trading, which promotes market efficiency. Permitting foreign investor trading increases market participation, which makes markets more efficient. Penalizing insider trading encourages greater market participation, which increases market efficiency.

9. A is correct. Operating inefficiencies reduce market efficiency.

10. A is correct. The weak-form efficient market hypothesis is defined as a market where security prices fully reflect all market data, which refers to all past price and trading volume information.

11. B is correct. In semi-strong-form efficient markets, security prices reflect all publicly available information.

12. B is correct. The strong-form efficient market hypothesis assumes all information, public or private, has already been reflected in the prices.

13. B is correct. If all public information should already be reflected in the market price, then the abnormal trading profit will be equal to zero when fundamental analysis is used.

14. B is correct. Costs associated with active trading strategies would be difficult to recover; thus, such active trading strategies would have difficulty outperforming passive strategies on a consistent after-cost basis.

15. B is correct. In a semi-strong-form efficient market, passive portfolio strategies should outperform active portfolio strategies on a risk-adjusted basis.

16. B is correct. Technical analysts use past prices and volume to predict future prices, which is inconsistent with the weakest form of market efficiency (i.e., weak-form market efficiency). Weak-form market efficiency states that investors cannot earn abnormal returns by trading on the basis of past trends in price and volume.

17. C is correct. Fundamental analysts use publicly available information to estimate a security's intrinsic value to determine if the security is mispriced, which is inconsistent with the semi-strong form of market efficiency. Semi-strong-form market efficiency states that investors cannot earn abnormal returns by trading based on publicly available information.

18. C is correct. If markets are not semi-strong-form efficient, then fundamental analysts are able to use publicly available information to estimate a security's intrinsic value and identify misvalued securities. Technical analysis is not able to earn abnormal returns if markets are weak-form efficient. Passive portfolio managers outperform fundamental analysis if markets are semi-strong-form efficient.

19. B is correct. The excess returns in January are not attributed to any new information or news; however, research has found that part of the seasonal pattern can be explained by tax-loss selling and portfolio window dressing.

20. A is correct. Finding significant abnormal returns does not necessarily indicate that markets are inefficient or that abnormal returns can be realized by applying the strategy to future time periods. Abnormal returns are considered market anomalies because they may be the result of the model used to estimate the expected returns or may be the result of underestimating transaction costs or other expenses associated with implementing the strategy, rather than because of market inefficiency.

21. A is correct. Higher than average dividend yield is a characteristic of a value stock, along with low price-to-earnings and low market-to-book ratios. Growth stocks are characterized by low dividend yields and high price-to-earnings and high market-to-book ratios.

22. B is correct. Trading based on historical momentum indicates that price patterns exist and can be exploited by using historical price information. A momentum trading strategy that produces abnormal returns contradicts the weak form of the efficient market hypothesis, which states that investors cannot earn abnormal returns on the basis of past trends in prices.

23. C is correct. If markets are efficient, the information from the annual report is reflected in the stock prices; therefore, the gradual changes must be from the release of additional information.

24. A is correct. The efficient market hypothesis and asset-pricing models only require that the market is rational. Behavioral finance is used to explain *some* of the market anomalies as irrational decisions.

25. B is correct. Behavioral theories of loss aversion can explain observed overreaction in markets, such that investors dislike losses more than comparable gains (i.e., risk is not symmetrical).

26. C is correct. Behavioral theories of loss aversion allow for the possibility that the dislike for risk is not symmetrical, which allows for loss aversion to explain observed overreaction in markets such that investors dislike losses more than they like comparable gains.

SOLUTIONS

1. C is correct. The company is not obligated to make dividend payments. It is at the discretion of the company whether or not it chooses to pay dividends.

2. B is correct. Statutory voting is the type of equity voting right that grants one vote per share owned.

3. A is correct. Preference shares do not have to be either callable or putable.

4. C is correct. Participating preference shares entitle shareholders to receive an additional dividend if the company's profits exceed a pre-determined level.

5. B is correct. Private equity securities do not have market-determined quoted prices.

6. C is correct. Venture capital investments can be used to provide mezzanine financing to companies in their early stage of development.

7. B is correct. Regulatory and investor relations costs are lower for private equity firms than for public firms. There are no stock exchange, regulatory, or shareholder involvements with private equity, whereas for public firms these costs can be high.

8. C is correct. The trends in emerging markets have not led to the stability of foreign exchange markets.

9. A is correct. In an unsponsored DR, the depository bank owns the voting rights to the shares. The bank purchases the shares, places them into a trust, and then sells shares in the trust—not the underlying shares—in other markets.

10. A is correct. The listing fees on Level III sponsored ADRs are high.

11. C is correct. An ETF is used to gain exposure to a basket of securities (equity, fixed income, commodity futures, etc.).

12. A is correct. The formula states $R_t = (P_t - P_{t-1} + D_t)/P_{t-1}$. Therefore, total return $= (42 - 50 + 2)/50 = -12.0\%$.

13. A is correct. The depreciated value of the euro will create an additional loss in the form of currency return that is lower than the ETF's return.

14. C is correct. Some equity securities do not pay dividends, and therefore the standard deviation of dividends cannot be used to measure the risk of all equity securities.

15. A is correct. Putable shares, whether common or preference, give the investor the option to sell the shares back to the issuer at a pre-determined price. This pre-determined price creates a floor for the share's price that reduces the uncertainty of future cash flows for the investor (i.e., lowers risk relative to the other two types of shares listed).

16. C is correct. Issuing shares in the primary (and secondary) market *reduces* a company's return on equity because it increases the total amount of equity capital invested in the company (i.e., the denominator in the ROE formula).

17. C is correct. Capital is raised to ensure the company's existence only when it is

required. It is not a typical goal of raising capital.

18. A is correct. A company's book value increases when a company retains its net income.

19. A is correct. The book value of the company is equal to total assets minus total liabilities, which is €12,000,000 − €7,500,000 = €4,500,000.

20. A is correct. A company's market value is affected by management's decisions. Management's decisions can directly affect the company's *book* value, which can then affect its market value.

21. B is correct. A company's ROE is calculated as (NI_t/BVE_{t-1}). The BVE_{t-1} is equal to the beginning total assets minus the beginning total liabilities, which equals £50,000,000 − £35,000,000 = £15,000,000. Therefore, ROE = £2,000,000/£15,000,000 = 13.3%.

22. C is correct. A company's ROE will increase if it issues debt to repurchase outstanding shares of equity.

23. B is correct. The cost of equity is not easily determined. It is dependent on investors' required rate of return on equity, which reflects the different risk levels of investors and their expectations about the company's future cash flows.

24. B is correct. Companies try to raise funds at the lowest possible cost. Therefore, cost of equity is used as a proxy for the minimum required rate of return.

SOLUTIONS

1. C is correct. Tactical asset allocation involves timing investments in asset classes and does not make use of industry analysis.

2. C is correct. A sector rotation strategy is conducted by investors wishing to time investment in industries through an analysis of fundamentals and/or business-cycle conditions.

3. B is correct. Determination of a company's competitive environment depends on understanding its industry.

4. B is correct. Business-cycle sensitivity falls on a continuum and is not a discrete "either/or" phenomenon.

5. C is correct. Cyclical companies are sensitive to the business cycle, with low product demand during periods of economic contraction and high product demand during periods of economic expansion. They, therefore, experience wider-than-average fluctuations in product demand.

6. C is correct. Customers' flexibility as to when they purchase a product makes the product more sensitive to the business cycle.

7. C is correct. Varying conditions of recession or expansion around the world would affect the comparisons of companies with sales in different regions of the world.

8. B is correct. Personal care products are classified as consumer staples in the "Description of Representative Sectors."

9. C is correct. Automobile manufacturers are classified as consumer discretionary. Consumer discretionary companies derive a majority of revenue from the sale of consumer-related products for which demand tends to exhibit a high degree of economic sensitivity—that is, high demand during periods of economic expansion and low demand during periods of contraction.

10. C is correct. Commercial systems are generally updated more frequently than government systems and include only publicly traded for-profit companies.

11. B is correct. Constructing a peer group is a subjective process, and a logical starting point is to begin with a commercially available classification system. This system will identify a group of companies that may have properties comparable to the business activity of interest.

12. A is correct because it is a false statement. Reviewing the annual report to find management's discussion about the competitive environment and specific competitors is a suggested step in the process of constructing a peer group.

13. B is correct. The company could be in more than one peer group depending on the demand drivers for the business segments, although the multiple business segments may make it difficult to classify the company.

14. C is correct. For the automobile industry, the high capital requirements and other elements mentioned in the reading provide high barriers to entry, and recognition that auto factories are generally only of use for manufacturing cars implies a high barrier to exit.

15. C is correct. A slow pace of product innovation often means that customers prefer to stay with suppliers they know, implying stable market shares.

16. C is correct. Capacity increases in providing insurance services would not involve several factors that would be important to the other two industries, including the need for substantial fixed capital investments or, in the case of a restaurant, outfitting rental or purchased space. These requirements would tend to slow down, respectively, steel production and restaurant expansion.

17. C is correct. The embryonic stage is characterized by slow growth and high prices.

18. C is correct. The growth phase is not likely to experience price wars because expanding industry demand provides companies the opportunity to grow even without increasing market share. When industry growth is stagnant, companies may only be able to grow by increasing market share—for example, by engaging in price competition.

19. B is correct. The industry life-cycle model shows how demand evolves over time as an industry passes from the embryonic stage through the stage of decline.

20. A is correct. Industry consolidation and relatively high barriers to entry are two characteristics of a mature-stage industry.

21. C is correct. The relatively few members of the industry generally try to avoid price competition.

22. C is correct. With short lead times, industry capacity can be rapidly increased to satisfy demand, but it may also lead to overcapacity and lower profits.

23. A is correct. An industry that has high barriers to entry generally requires substantial physical capital and/or financial investment. With weak pricing power in the industry, finding a buyer for excess capacity (i.e., to exit the industry) may be difficult.

24. C is correct. Economic profit is earned and value is created for shareholders when the industry earns returns above the company's cost of capital.

25. B is correct. The alcoholic beverage industry is concentrated and possesses strong pricing power.

26. B is correct. Vision typically deteriorates at advanced ages. An increased number of older adults implies more eyewear products will be purchased.

27. B is correct. As their educational level increases, workers are able to perform more skilled tasks, earn higher wages, and as a result, have more income left for discretionary expenditures.

28. A is correct. Seeking economies of scale would tend to reduce per-unit costs and increase profit.

29. A is correct. Companies with low-cost strategies must be able to invest in productivity-improving equipment and finance that investment at a low cost of capital. Market share and pricing depend on whether the strategy is pursued defensively or offensively.

30. A is correct. The cost structure is an appropriate element when analyzing the supply of the product, but analysis of demand relies on the product's differentiating characteristics and the customers' needs and wants.

31. C is correct. The corporate profile would provide an understanding of these elements.

SOLUTIONS

1. A is correct. The current market price of the stock exceeds the upper bound of the analyst's estimate of the intrinsic value of the stock.

2. A is correct. The market price is less than the estimated intrinsic, or fundamental, value.

3. C is correct. Asset-based valuation models calculate the intrinsic value of equity by subtracting liabilities from the market value of assets.

4. C is correct. FCFE can be used in a form of present value, or discounted cash flow, model. Both EV and price to free cash flow are forms of multiplier models.

5. C is correct. Multiplier valuation models (in the form of P/B) and asset-based valuation models (in the form of adjustments to book value) use book value, whereas present value models typically discount future expected cash flows.

6. B is correct. To use a discounted cash flow model, the analyst will require FCFE or dividend data. In addition, the analyst will need data to calculate an appropriate discount rate.

7. B is correct. The FCFE model assumes that dividend-paying capacity is reflected in FCFE.

8. C is correct. According to the dividend discount model, the intrinsic value of a stock today is the present value of all future dividends. In this case, the intrinsic value is the present value of D_1, D_2, and P_2. Note that P_2 is the present value at Period 2 of all future dividends from Period 3 to infinity.

9. A is correct. In the FCFE model, the intrinsic value of stock is calculated by discounting expected future FCFE to present value. No further adjustments are required.

10. C is correct. Dividend discount models can be used for a stock that pays a current dividend or a stock that is expected to pay a dividend. FCFE can be used for both of those stocks and for stocks that do not, or are not expected to, pay dividends in the near future. Both of these models are forms of present value models.

11. B is correct. The expected annual dividend is 4.80% × $25 = $1.20. The value of a preferred share is $1.20/0.0449 = $26.73.

12. B is correct. The required rate of return, r, can vary widely depending on the inputs and is not unique. A preferred stock with a constant dividend would not have a growth rate to estimate, and the investor's time horizon would have no effect on the calculation of intrinsic value.

13. C is correct. $P_0 = D_1/(r - g) = 1.75(1.092)/(0.123 - 0.092) = \$61.65$.

14. C is correct. According to the Gordon growth model, $V_0 = D_1/(r - g)$. In this case, $D_1 = \$2.00 \times 1.04 = \$2.08$, so $V_0 = \$2.08/(0.07 - 0.04) = \$69.3333 = \$69.33$.

15. B is correct. The Gordon growth model (also known as the constant growth model) can be used to value dividend-paying companies in a mature phase of growth. A stable dividend growth rate is often a plausible assumption for such companies.

16. B is correct. Very small changes in inputs, such as required rate of return or

dividend growth rate, can result in large changes to the valuation model output. Some present value models, such as FCFE models, can be used to value companies without dividends. Also, the intrinsic value of a security is independent of the investor's holding period.

17. A is correct. The current price of €22.56 is less than the intrinsic value (V_0) of €24.64; therefore, the stock appears to be currently undervalued. According to the two-stage dividend discount model:

$$V_0 = \sum_{t=1}^{n} \frac{D_0(1+g_S)^t}{(1+r)^t} + \frac{V_n}{(1+r)^n} \text{ and } V_n = \frac{D_{n+1}}{r-g_L}$$

$D_{n+1} = D_0(1+g_S)^n(1+g_L)$

$D_1 = €1.60 \times 1.09 = €1.744$

$D_2 = €1.60 \times (1.09)^2 = €1.901$

$D_3 = €1.60 \times (1.09)^3 = €2.072$

$D_4 = €1.60 \times (1.09)^4 = €2.259$

$D_5 = [€1.60 \times (1.09)^4](1.04) = €2.349$

$V_4 = €2.349/(0.12 - 0.04) = €29.363$

$V_0 = \frac{1.744}{(1.12)^1} + \frac{1.901}{(1.12)^2} + \frac{2.072}{(1.12)^3} + \frac{2.259}{(1.12)^4} + \frac{29.363}{(1.12)^4}$

$= 1.557 + 1.515 + 1.475 + 1.436 + 18.661$

$= €24.64$ (which is greater than the current price of €22.56)

18. C is correct.

$$V_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{P_2}{(1+r)^2}$$

$= \frac{0.70}{(1.083)} + \frac{0.80}{(1.083)^2} + \frac{31.29}{(1.083)^2}$

$= \$28.01$

Note that $D_1 = 0.58(1.20) = 0.70$, $D_2 = 0.58(1.20)(1.15) = 0.80$, and $P_2 = D_3/(k-g)$ $= 0.80(1.056)/(0.083 - 0.056) = 31.29$

19. B is correct.

$$V_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{D_4}{(1+r)^4} + \frac{P_4}{(1+r)^4}$$

$= \frac{468}{(1.12)} + \frac{486.72}{(1.12)^2} + \frac{506.19}{(1.12)^3} + \frac{526.44}{(1.12)^4} + \frac{9000}{(1.12)^4}$

$= ¥7,220$

20. C is correct. The Gordon growth model is best suited to valuing mature companies. The two-stage model is best for companies that are transitioning from a growth stage to a mature stage. The three-stage model is appropriate for young companies just entering the growth phase.

21. A is correct. The company is a mature company with a steadily growing dividend rate. The two-stage (or multistage) model is unnecessary because the dividend growth rate is expected to remain stable. Although an FCFE model could be used, that model is more often chosen for companies that currently pay no dividends.

22. C is correct. The justified forward P/E is calculated as follows:

$$\frac{P_0}{E_1} = \frac{\frac{D_1}{E_1}}{r - g}$$

P/E is inversely related to the required rate of return, r, and directly related to the growth rate, g, and the dividend payout ratio, D/E.

23. A is correct. Multiples based on comparables are grounded in the law of one price and take into account historical multiple values. In contrast, P/E multiples based on fundamentals can be based on the Gordon growth model, which takes into account future expected dividends.

24. A is correct. The statement is inaccurate in both respects. Although multiples can be calculated from historical data, forecasted values can be used as well. For companies without accounting earnings, several other multiples can be used. These multiples are often specific to a company's industry or sector and include price-to-sales and price-to-cash flow.

25. B is correct.

$$\frac{P_0}{E_1} = \frac{\frac{D_1}{E_1}}{r - g} = \frac{\frac{2.7}{5.7}}{0.0835 - 0.0275} = 8.5$$

26. A is correct. Tanaka shares are most likely overvalued. As the table below shows, all the 2018 multiples are currently above their 2014–2017 averages.

Year	P/E	P/CF	P/R
2014	4.9	5.4	1.2
2015	6.1	8.6	1.5
2016	8.3	7.3	1.9
2017	9.2	7.9	2.3
Average	7.1	7.3	1.7

27. B is correct. P/E = Current price/EPS, and Estimated P/E = Current price/Estimated EPS.

    Alpha P/E = $57.32/$3.82 = 15.01

    Alpha estimated P/E = $57.32/4.75 = 12.07

    Delta P/E = $18.93/$1.35 = 14.02

    Delta estimated P/E = $18.93/$1.40 = 13.52

28. C is correct. Relative to the others, Pioneer Trust has the lowest P/E multiple and the P/B multiple is tied for the lowest with Prime Bank. Given the law of one price, similar companies should trade at similar P/B and P/E levels. Thus, based on the information presented, Pioneer is most likely to be undervalued.

29. C is correct. Enterprise value is calculated as the market value of equity plus the market value of debt and preferred stock minus short-term investments. Therefore, the market value of equity is enterprise value minus the market value of debt and preferred stock plus short-term investments.

30. A is correct. Operating income may be used in place of EBITDA when calculating the enterprise value multiple. EBITDA may be used when company earnings are negative because EBITDA is usually positive. The book value of debt cannot be used in place of market value of debt.

31. A is correct.

    EV = 10.2 × 22,000,000 = $224,400,000

    Equity value = EV – Debt + Cash

    = 224,400,000 – 56,000,000 + 1,500,000

    = $169,900,000

32. B is correct. The market value of debt must be calculated and taken out of the enterprise value. Enterprise value, sometimes known as the cost of a takeover, is the cost of the purchase of the company, which would include the assumption of the company's debts at market value.

33. B is correct. According to the reading, analysts may have not have access to market quotations for company debt.

34. B is correct. Intangible assets are hard to value. Therefore, asset-based valuation models work best for companies that do not have a high proportion of intangible assets.

35. A is correct. Asset-based valuations are most often used when an analyst is valuing private enterprises. Both B and C are considerations in asset-based valuations but are more likely to be reasons to avoid that valuation model rather than reasons to use it.

36. A is correct. Although all models can be used to compare various companies, multiplier models have the advantage of reducing varying fundamental data points into a format that allows direct comparisons. As long as the analyst applies the data in a consistent manner for all the companies, this approach provides useful comparative data.

Fixed Income

SOLUTIONS

1. A is correct. The tenor of the bond is the time remaining until the bond's maturity date. Although the bond had a maturity of ten years at issuance (original maturity), it was issued four years ago. Thus, there are six years remaining until the maturity date.

   B is incorrect because the nominal rate is the coupon rate (i.e., the interest rate that the issuer agrees to pay each year until the maturity date). Although interest is paid semi-annually, the nominal rate is 10%, not 5%. C is incorrect because it is the bond's price, not its redemption value (also called principal amount, principal value, par value, face value, nominal value, or maturity value), that is equal to 102% of the par value.

2. C is correct. A capital market security has an original maturity longer than one year.

   A is incorrect because a perpetual bond does not have a stated maturity date. Thus, the sovereign bond, which has a maturity of 15 years, cannot be a perpetual bond. B is incorrect because a pure discount bond is a bond issued at a discount to par value and redeemed at par. Some sovereign bonds (e.g., Treasury bills) are pure discount bonds, but others are not.

3. C is correct. The coupon rate that applies to the interest payment due on 30 June is based on the three-month MRR rate prevailing on 31 March. Thus, the coupon rate is 1.55% + 0.65% = 2.20%.

4. B is correct. The indenture, also referred to as trust deed, is the legal contract that describes the form of the bond, the obligations of the issuer, and the rights of the bondholders.

   A is incorrect because covenants are only one element of a bond's indenture. Covenants are clauses that specify the rights of the bondholders and any actions that the issuer is obligated to perform or prohibited from performing. C is incorrect because a debenture is a type of bond.

5. B is correct. A surety bond is an external credit enhancement (i.e., a guarantee received from a third party). If the issuer defaults, the guarantor who provided the surety bond will reimburse investors for any losses, usually up to a maximum amount called the penal sum.

   A is incorrect because covenants are legally enforceable rules that borrowers and lenders agree upon when the bond is issued. C is incorrect because over-collateralization is an internal, not external, credit enhancement. Collateral is a guarantee underlying the debt above and beyond the issuer's promise to pay, and overcollateralization refers to the process of posting more collateral than is needed to obtain or secure financing. Collateral, such as assets or securities pledged to ensure debt payments, is not provided by a third party. Thus, overcollateralization is not an external credit enhancement.

6. B is correct. Affirmative (or positive) covenants enumerate what issuers are required to do and are typically administrative in nature. A common affirmative covenant describes what the issuer intends to do with the proceeds from the bond issue.

   A and C are incorrect because imposing a limit on the issuer's leverage ratio or on the percentage of the issuer's gross assets that can be sold are negative covenants. Negative covenants prevent the issuer from taking actions that could reduce its ability to make interest payments and repay the principal.

7.   B is correct. Prohibiting the issuer from investing in risky projects restricts the issuer's potential business decisions. These restrictions are referred to as negative bond covenants.

A and C are incorrect because paying taxes as they come due and maintaining the current lines of business are positive covenants.

8.   A is correct. Covenants specify the rights of the bondholders and any actions that the issuer is obligated to perform or is prohibited from performing.

9.   A is correct. A covered bond is a debt obligation backed by a segregated pool of assets called a "cover pool." When the assets that are included in the cover pool become non-performing (i.e., the assets are not generating the promised cash flows), the issuer must replace them with performing assets.

10.   C is correct. Negative covenants enumerate what issuers are prohibited from doing. Restrictions on debt, including maintaining a minimum interest coverage ratio or a maximum debt usage ratio, are typical examples of negative covenants.

11.   A is correct. Affirmative covenants typically do not impose additional costs to the issuer, while negative covenants are frequently costly. B is incorrect because all bond covenants are legally enforceable rules, so there is no difference in this regard between positive and negative bond covenants. C is incorrect because borrowers and lenders agree on all bond covenants at the time of a new bond issue, so there is no difference in this regard between positive and negative bond covenants.

12.   C is correct. Bonds sold in a country and denominated in that country's currency by an entity from another country are referred to as foreign bonds.

A is incorrect because Eurobonds are bonds issued outside the jurisdiction of any single country. B is incorrect because global bonds are bonds issued in the Eurobond market and at least one domestic country simultaneously.

13.   A is correct. Eurobonds are typically issued as bearer bonds (i.e., bonds for which the trustee does not keep records of ownership). In contrast, domestic and foreign bonds are typically registered bonds for which ownership is recorded by either name or serial number.

B is incorrect because Eurobonds are typically issued as bearer bonds, not registered bonds. C is incorrect because Eurobonds are typically subject to lower, not greater, regulation than domestic and foreign bonds.

14.   C is correct. The original issue discount tax provision requires the investor to include a prorated portion of the original issue discount in his taxable income every tax year until maturity. The original issue discount is equal to the difference between the bond's par value and its original issue price.

A is incorrect because the original issue discount tax provision allows the investor to increase his cost basis in the bond so that when the bond matures, he faces no capital gain or loss. B is incorrect because the original issue discount tax provision does not require any tax deduction in the year the bond is purchased or afterwards.

15.   C is correct. A fully amortized bond calls for equal cash payments by the bond's issuer prior to maturity. Each fixed payment includes both an interest payment component and a principal repayment component such that the bond's outstanding principal amount is reduced to zero by the maturity date.

A and B are incorrect because a bullet bond or plain vanilla bond only make interest payments prior to maturity. The entire principal repayment occurs at maturity.

16. B is correct. A bond that is fully amortized is characterized by a fixed periodic payment schedule that reduces the bond's outstanding principal amount to zero by the maturity date. The stream of £230.97 payments reflects the cash flows of a fully amortized bond with a coupon rate of 5% and annual interest payments.

17. C is correct. A cap in a floating-rate note (capped FRN) prevents the coupon rate from increasing above a specified maximum rate. This feature benefits the issuer in a rising interest rate environment because it sets a limit to the interest rate paid on the debt.

    A is incorrect because a bond with a step-up coupon is one in which the coupon, which may be fixed or floating, increases by specified margins at specified dates. This feature benefits the bondholders, not the issuer, in a rising interest rate environment because it allows bondholders to receive a higher coupon in line with the higher market interest rates. B is incorrect because inflation-linked bonds have their coupon payments and/or principal repayment linked to an index of consumer prices. If interest rates increase as a result of inflation, this feature is a benefit for the bondholders, not the issuer.

18. C is correct. In contrast to fixed-rate bonds that decline in value in a rising interest rate environment, floating-rate notes (FRNs) are less affected when interest rates increase because their coupon rates vary with market interest rates and are reset at regular, short-term intervals. Consequently, FRNs are favored by investors who believe that interest rates will rise.

    A is incorrect because an inverse floater is a bond whose coupon rate has an inverse relationship to the reference rate, so when interest rates rise, the coupon rate on an inverse floater decreases. Thus, inverse floaters are favored by investors who believe that interest rates will decline, not rise. B is incorrect because fixed rate-bonds decline in value in a rising interest rate environment. Consequently, investors who expect interest rates to rise will likely avoid investing in fixed-rate bonds.

19. C is correct. Capital-indexed bonds pay a fixed coupon rate that is applied to a principal amount that increases in line with increases in the index during the bond's life. If the consumer price index increases by 2%, the coupon rate remains unchanged at 6%, but the principal amount increases by 2% and the coupon payment is based on the inflation-adjusted principal amount. On the first coupon payment date, the inflation-adjusted principal amount is $1,000 \times (1 + 0.02) = 1,020$ and the semi-annual coupon payment is equal to $(0.06 \times 1,020) \div 2 = 30.60$.

20. C is correct. A zero-coupon, or pure discount, bond pays no interest; instead, it is issued at a discount to par value and redeemed at par. As a result, the interest earned is implied and equal to the difference between the par value and the purchase price.

21. B is correct. A credit-linked coupon bond has a coupon that changes when the bond's credit rating changes. Because credit ratings tend to decline the most during recessions, credit-linked coupon bonds may thus provide some general protection against a poor economy by offering increased coupon payments when credit ratings decline.

22. B is correct. Deferred coupon bonds pay no coupon for their first few years but then pay higher coupons than they otherwise normally would for the remainder of their life. Deferred coupon bonds are common in project financing when the assets being developed may not generate any income during the development phase, thus not providing cash flows to make interest payments. A deferred coupon bond allows the issuer to delay interest payments until the project is completed and the cash flows generated by the assets can be used to service the debt.

23. A is correct. A put provision provides bondholders the right to sell the bond back to the issuer at a predetermined price prior to the bond's maturity date.

    B is incorrect because a make-whole call provision is a form of call provision (i.e., a provision that provides the issuer the right to redeem all or part of the bond before its maturity date). A make-whole call provision requires the issuer to make a lump sum payment to the bondholders based on the present value of the future coupon payments and principal repayments not paid because of the bond being redeemed early by the issuer. C is incorrect because an original issue discount provision is a tax provision relating to bonds issued at a discount to par value. The original issue discount tax provision typically requires the bondholders to include a prorated portion of the original issue discount (i.e., the difference between the par value and the original issue price) in their taxable income every tax year until the bond's maturity date.

24. C is correct. A putable bond is beneficial for the bondholder by guaranteeing a prespecified selling price at the redemption date, thus offering protection when interest rates rise and bond prices decline. Relative to a one-time put bond that incorporates a single sellback opportunity, a multiple put bond offers more frequent sellback opportunities, thus providing the most benefit to bondholders.

25. C is correct. An American call option gives the issuer the right to call the bond at any time starting on the first call date.

26. B is correct. A call provision (callable bond) gives the issuer the right to redeem all or part of the bond before the specified maturity date. If market interest rates decline or the issuer's credit quality improves, the issuer of a callable bond can redeem it and replace it by a cheaper bond. Thus, the call provision is beneficial to the issuer.

    A is incorrect because a put provision (putable bond) is beneficial to the bondholders. If interest rates rise, thus lowering the bond's price, the bondholders have the right to sell the bond back to the issuer at a predetermined price on specified dates. C is incorrect because a conversion provision (convertible bond) is beneficial to the bondholders. If the issuing company's share price increases, the bondholders have the right to exchange the bond for a specified number of common shares in the issuing company.

27. A is correct. A put feature is beneficial to the bondholders. Thus, the price of a putable bond will typically be higher than the price of an otherwise similar non-putable bond.

    B is incorrect because a call feature is beneficial to the issuer. Thus, the price of a callable bond will typically be lower, not higher, than the price of an otherwise similar non-callable bond. C is incorrect because a conversion feature is beneficial to the bondholders. Thus, the price of a convertible bond will typically be higher, not lower, than the price of an otherwise similar non-convertible bond.

28. A is correct. The conversion premium is the difference between the convertible bond's price and its conversion value.

SOLUTIONS

1. B is correct. The distinction between investment-grade and non-investment-grade debt relates to differences in credit quality, not tax status or maturity dates. Debt markets are classified based on the issuer's creditworthiness as judged by the credit ratings agencies. Ratings of Baa3 or above by Moody's Investors Service or BBB– or above by Standard & Poor's and Fitch Ratings are considered investment grade, whereas ratings below these levels are referred to as non–investment grade (also called high yield, speculative, or junk).

2. A is correct. Eurobonds are issued internationally, outside the jurisdiction of any single country. B is incorrect because foreign bonds are considered international bonds, but they are issued in a specific country, in the currency of that country, by an issuer domiciled in another country. C is incorrect because municipal bonds are US domestic bonds issued by a state or local government.

3. B is correct. Asset-backed securities are securitized debt instruments created by securitization, a process that involves transferring ownership of assets from the original owners to a special legal entity. The special legal entity then issues securities backed by the transferred assets. The assets' cash flows are used to pay interest and repay the principal owed to the holders of the securities. Assets that are typically used to create securitized debt instruments include loans (such as mortgage loans) and receivables (such as credit card receivables). The structured finance sector includes such securitized debt instruments (also called asset-backed securities).

4. B is correct. Many emerging countries lag developed countries in the areas of political stability, property rights, and contract enforcement. Consequently, emerging market bonds usually exhibit higher risk than developed market bonds. A is incorrect because emerging market bonds typically offer higher (not lower) yields than developed market bonds to compensate investors for the higher risk. C is incorrect because emerging market bonds usually benefit from higher (not lower) growth prospects than developed market bonds.

5. B is correct. The coupon rate of a floating-rate bond is expressed as a reference rate plus a spread. Different reference rates are used depending on where the bond is issued and its currency denomination, but one of the most widely used set of reference rates is Libor. A and C are incorrect because a bond's spread and frequency of coupon payments are typically set when the bond is issued and do not change during the bond's life.

6. A is correct. Changes in the coupon rate of interest on a floating-rate bond that uses a Libor reference rate result from changes in the reference rate (for example, 90-day Libor), which resets periodically. Therefore, the coupon rate adjusts to the level of market interest rates (plus the spread) each time the reference rate is reset.

7. C is correct. Interbank offered rates are used as reference rates not only for floating-rate bonds but also for other debt instruments, including mortgages, derivatives such as interest rate and currency swaps, and many other financial contracts and products. A and B are incorrect because an interbank offered rate such as Libor or Euribor is a set of reference rates (not a single reference rate) for different borrowing periods of up to one year (not 10 years).

8. A is correct. In an underwritten offering (also called firm commitment offering),

the investment bank (called the underwriter) guarantees the sale of the bond issue at an offering price that is negotiated with the issuer. Thus, the underwriter takes the risk of buying the newly issued bonds from the issuer and then reselling them to investors or to dealers, which then sell them to investors. B and C are incorrect because the bond issuing mechanism in which an investment bank acts as a broker and receives a commission for selling the bonds to investors, and incurs less risk associated with selling the bonds, is a best-efforts offering (not an underwritten offering).

9. A is correct. In major developed bond markets, newly issued sovereign bonds are sold to the public via an auction. B and C are incorrect because sovereign bonds are rarely issued via private placements or best-efforts offerings.

10. A is correct. Private placements are typically non-underwritten, unregistered bond offerings that are sold only to a single investor or a small group of investors.

11. B is correct. A shelf registration allows certain authorized issuers to offer additional bonds to the general public without having to prepare a new and separate offering circular. The issuer can offer multiple bond issuances under the same master prospectus and only has to prepare a short document when additional bonds are issued. A is incorrect because the grey market is a forward market for bonds about to be issued. C is incorrect because a private placement is a non-underwritten, unregistered offering of bonds that are not sold to the general public but directly to an investor or a small group of investors.

12. B is correct. In secondary bond markets, bonds are traded between investors. A is incorrect because newly issued bonds (whether from corporate issuers or other types of issuers) are issued in primary (not secondary) bond markets. C is incorrect because the major participants in secondary bond markets globally are large institutional investors and central banks (not retail investors).

13. C is correct. In over-the-counter (OTC) markets, buy and sell orders are initiated from various locations and then matched through a communications network. Most bonds are traded in OTC markets. A is incorrect because on organized exchanges, buy and sell orders may come from anywhere, but the transactions must take place at the exchange according to the rules imposed by the exchange. B is incorrect because open market operations refer to central bank activities in secondary bond markets. Central banks buy and sell bonds, usually sovereign bonds issued by the national government, as a means to implement monetary policy.

14. C is correct. Liquidity in secondary bond markets refers to the ability to buy or sell bonds quickly at prices close to their fair market value. A and B are incorrect because a liquid secondary bond market does not guarantee that a bond will sell at the price sought by the investor, or that the investor will not face a loss on his or her investment.

15. A is correct. The vast majority of corporate bonds are traded in over-the-counter (OTC) markets that use electronic trading platforms through which users submit buy and sell orders. Settlement of trades in the OTC markets occurs by means of a simultaneous exchange of bonds for cash on the books of the clearing system "on a paperless, computerized book-entry basis."

16. C is correct. Sovereign bonds are usually unsecured obligations of the national government issuing the bonds; they are backed not by collateral but by the taxing authority of the national government. A is incorrect because bonds issued by local governments are non-sovereign (not sovereign) bonds. B is incorrect because sovereign bonds are typically unsecured (not secured) obligations of a national

government.

17. C is correct. Bonds issued in the sovereign's currency and a strong domestic savings base are both favorable sovereign rating factors. It is common to observe a higher credit rating for sovereign bonds issued in local currency because of the sovereign's ability to tax its citizens and print its own currency. Although there are practical limits to the sovereign's taxing and currency-printing capacities, each tends to support a sovereign's ability to repay debt. A strong domestic savings base is advantageous because it supports the sovereign's ability to issue debt in local currency to domestic investors.

18. A is correct. Floaters are bonds with a floating rate of interest that resets periodically based on changes in the level of a reference rate, such as Libor. Because changes in the reference rate reflect changes in market interest rates, price changes of floaters are far less pronounced than those of fixed-rate bonds, such as coupon bonds and discount bonds. Thus, investors holding floaters are less exposed to interest rate risk than investors holding fixed-rate discount or coupon bonds.

19. C is correct. Agency bonds are issued by quasi-government entities. These entities are agencies and organizations usually established by national governments to perform various functions for them. A and B are incorrect because local and national governments issue non-sovereign and sovereign bonds, respectively.

20. B is correct. The IMF is a multilateral agency that issues supranational bonds. A and C are incorrect because sovereign bonds and quasi-government bonds are issued by national governments and by entities that perform various functions for national governments, respectively.

21. C is correct. Bonds issued by levels of government below the national level—such as provinces, regions, states, cities, and local government authorities—are classified as non-sovereign government bonds. These bonds are typically not guaranteed by the national government.

22. C is correct. Companies use commercial paper not only as a source of funding working capital and seasonal demand for cash but also as a source of interim financing for long-term projects until permanent financing can be arranged. A is incorrect because there is a secondary market for trading commercial paper, although trading is limited except for the largest issues. B is incorrect because commercial paper is issued by companies across the risk spectrum, although only the strongest, highly rated companies issue *low-cost* commercial paper.

23. A is correct. Commercial paper, whether US commercial paper or Eurocommercial paper, is negotiable—that is, investors can buy and sell commercial paper on secondary markets. B is incorrect because Eurocommercial paper can be denominated in any currency. C is incorrect because Eurocommercial paper may be issued on an interest-bearing (or yield) basis or a discount basis.

24. B is correct. With a serial maturity structure, a stated number of bonds mature and are paid off on a pre-determined schedule before final maturity. With a sinking fund arrangement, the issuer is required to set aside funds over time to retire the bond issue. Both result in a pre-determined portion of the issue being paid off according to a pre-determined schedule.

25. A is correct. A sinking fund arrangement is a way to reduce credit risk by making the issuer set aside funds over time to retire the bond issue. B and C are incorrect because a sinking fund arrangement has no effect on inflation risk or interest rate risk.

26. C is correct. Wholesale funds available for banks include central bank funds, interbank funds, and negotiable certificates of deposit. A and B are incorrect because demand deposits (also known as checking accounts) and money market accounts are retail deposits, not wholesale funds.

27. B is correct. A negotiable certificate of deposit (CD) allows any depositor (initial or subsequent) to sell the CD in the open market prior to maturity. A is incorrect because negotiable CDs are mostly available in large (not small) denominations. Large-denomination negotiable CDs are an important source of wholesale funds for banks, whereas small-denomination CDs are not. C is incorrect because a penalty is imposed if the depositor withdraws funds prior to maturity for non-negotiable (instead of negotiable) CDs.

28. B is correct. A repurchase agreement (repo) can be viewed as a collateralized loan in which the security sold and subsequently repurchased represents the collateral posted. A and C are incorrect because interbank deposits and negotiable certificates of deposit are unsecured deposits—that is, there is no collateral backing the deposit.

29. A is correct. Repo margins vary by transaction and are negotiated bilaterally between the counterparties.

30. A is correct. The repo margin (the difference between the market value of the underlying collateral and the value of the loan) is a function of the supply and demand conditions of the collateral. The repo margin is typically lower if the underlying collateral is in short supply or if there is a high demand for it. B and C are incorrect because the repo margin is usually higher (not lower) when the maturity of the repurchase agreement is long and when the credit risk associated with the underlying collateral is high.

SOLUTIONS

1. B is correct. The bond price is closest to 101.36. The price is determined in the following manner:

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT+FV}{(1+r)^3},$$

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

$$PV = \frac{5.5}{(1+0.05)^1} + \frac{5.5}{(1+0.05)^2} + \frac{5.5+100}{(1+0.05)^3}.$$

$PV = 5.24 + 4.99 + 91.13 = 101.36$.

2. C is correct. The bond price is closest to 98.11. The formula for calculating the price of this bond is

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT+FV}{(1+r)^2},$$

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

$$PV = \frac{3}{(1+0.04)^1} + \frac{3+100}{(1+0.04)^2} = 2.88 + 95.23 = 98.11.$$

3. A is correct. The bond price is closest to 95.00. The bond has six semiannual periods. Half of the annual coupon is paid in each period with the required rate of return also being halved. The price is determined in the following manner:

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \frac{PMT}{(1+r)^4} + \frac{PMT}{(1+r)^5} + \frac{PMT+FV}{(1+r)^6},$$

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

$$PV = \frac{4.5}{(1+0.055)^1} + \frac{4.5}{(1+0.055)^2} + \frac{4.5}{(1+0.055)^3} + \frac{4.5}{(1+0.055)^4} + \frac{4.5}{(1+0.055)^5} + \frac{4.5+100}{(1+0.055)^6}.$$

PV = 4.27 + 4.04 + 3.83 + 3.63 + 3.44 + 75.79 = 95.00.

4.　B is correct. The bond price is closest to 96.28. The formula for calculating this bond price is

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \frac{PMT+FV}{(1+r)^4},$$

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

$$PV = \frac{2}{(1+0.03)^1} + \frac{2}{(1+0.03)^2} + \frac{2}{(1+0.03)^3} + \frac{2+100}{(1+0.03)^4}.$$

PV = 1.94 + 1.89 + 1.83 + 90.62 = 96.28.

5.　B is correct. The bond price is closest to 112.54. The formula for calculating this bond price is

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \dots + \frac{PMT+FV}{(1+r)^{14}},$$

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

$$PV = \frac{2.5}{(1+0.015)^1} + \frac{2.5}{(1+0.015)^2} + \frac{2.5}{(1+0.015)^3} + \dots + \frac{2.5}{(1+0.015)^{13}} + \frac{2.5+100}{(1+0.015)^{14}}.$$

PV = 2.46 + 2.43 + 2.39 + . . . + 2.06 + 83.21 = 112.54.

6.　B is correct. The price of the zero-coupon bond is closest to 51.67. The price is determined in the following manner:

$$PV = \frac{100}{(1+r)^N},$$

where

PV = present value, or the price of the bond

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

N = number of evenly spaced periods to maturity

$$PV = \frac{100}{(1+0.045)^{15}}.$$

PV = 51.67.

7.　B is correct. The price difference between Bonds A and B is closest to 3.77. One method for calculating the price difference between two bonds with identical

Solutions

terms to maturity is to use the following formula:

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2},$$

where

PV = price difference

PMT = coupon difference per period

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

In this case, the coupon difference is (5% − 3%), or 2%.

$$PV = \frac{2}{(1+0.04)^1} + \frac{2}{(1+0.04)^2} = 1.92 + 1.85 = 3.77.$$

8. A is correct. Bond A offers the lowest yield-to-maturity. When a bond is priced at a premium above par value, the yield-to-maturity (YTM), or market discount rate, is less than the coupon rate. Bond A is priced at a premium, so its YTM is below its 5% coupon rate. Bond B is priced at par value, so its YTM is equal to its 6% coupon rate. Bond C is priced at a discount below par value, so its YTM is above its 5% coupon rate.

9. B is correct. Bond B will most likely experience the smallest percentage change in price if market discount rates increase by 100 bps. A higher-coupon bond has a smaller percentage price change than a lower-coupon bond when their market discount rates change by the same amount (the coupon effect). Also, a shorter-term bond generally has a smaller percentage price change than a longer-term bond when their market discount rates change by the same amount (the maturity effect). Bond B will experience a smaller percentage change in price than Bond A because of the coupon effect. Bond B will also experience a smaller percentage change in price than Bond C because of the coupon effect and the maturity effect.

10. B is correct. The bond price is most likely to change by less than 5%. The relationship between bond prices and market discount rate is not linear. The percentage price change is greater in absolute value when the market discount rate goes down than when it goes up by the same amount (the convexity effect). If a 100 bp decrease in the market discount rate will cause the price of the bond to increase by 5%, then a 100 bp increase in the market discount rate will cause the price of the bond to decline by an amount less than 5%.

11. B is correct. Generally, for two bonds with the same time-to-maturity, a lower-coupon bond will experience a greater percentage price change than a higher-coupon bond when their market discount rates change by the same amount. Bond B and Bond C have the same time-to-maturity (five years); however, Bond B offers a lower coupon rate. Therefore, Bond B will likely experience a greater percentage change in price in comparison to Bond C.

12. A is correct. Bond A will likely experience the greatest percentage change in price due to the coupon effect and the maturity effect. For two bonds with the same time-to-maturity, a lower-coupon bond has a greater percentage price change than a higher-coupon bond when their market discount rates change by the same amount. Generally, for the same coupon rate, a longer-term bond has a greater percentage price change than a shorter-term bond when their market discount rates change by the same amount. Relative to Bond C, Bond A and Bond B offer a lower coupon rate of 6%; however, Bond A has a longer time-to-maturity than Bond B. Therefore, Bond A will likely experience the greater percentage change

in price if the market discount rates for all three bonds increase by 100 bps.

13. A is correct. The bond price is closest to 101.93. The price is determined in the following manner:

$$PV = \frac{PMT}{(1+Z_1)^1} + \frac{PMT+FV}{(1+Z_2)^2},$$

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

Z_1 = spot rate, or the zero-coupon yield, for Period 1

Z_2 = spot rate, or the zero-coupon yield, for Period 2

$$PV = \frac{5}{(1+0.03)^1} + \frac{5+100}{(1+0.04)^2}.$$

$PV = 4.85 + 97.08 = 101.93.$

14. B is correct. The bond price is closest to 101.46. The price is determined in the following manner:

$$PV = \frac{PMT}{(1+Z_1)^1} + \frac{PMT}{(1+Z_2)^2} + \frac{PMT+FV}{(1+Z_3)^3},$$

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

Z_1 = spot rate, or the zero-coupon yield or zero rate, for Period 1

Z_2 = spot rate, or the zero-coupon yield or zero rate, for Period 2

Z_3 = spot rate, or the zero-coupon yield or zero rate, for Period 3

$$PV = \frac{10}{(1+0.08)^1} + \frac{10}{(1+0.09)^2} + \frac{10+100}{(1+0.095)^3}.$$

$PV = 9.26 + 8.42 + 83.78 = 101.46.$

15. B is correct. The bond price is closest to 95.28. The formula for calculating this bond price is

$$PV = \frac{PMT}{(1+Z_1)^1} + \frac{PMT}{(1+Z_2)^2} + \frac{PMT+FV}{(1+Z_3)^3},$$

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

Z_1 = spot rate, or the zero-coupon yield or zero rate, for Period 1

Z_2 = spot rate, or the zero-coupon yield or zero rate, for Period 2

Z_3 = spot rate, or the zero-coupon yield or zero rate, for Period 3

$$PV = \frac{8}{(1+0.08)^1} + \frac{8}{(1+0.09)^2} + \frac{8+100}{(1+0.10)^3}.$$

$PV = 7.41 + 6.73 + 81.14 = 95.28.$

16. C is correct. The bond price is closest to 92.76. The formula for calculating this bond price is

$$PV = \frac{PMT}{(1+Z_1)^1} + \frac{PMT}{(1+Z_2)^2} + \frac{PMT+FV}{(1+Z_3)^3},$$

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

Z_1 = spot rate, or the zero-coupon yield or zero rate, for Period 1

Z_2 = spot rate, or the zero-coupon yield or zero rate, for Period 2

Z_3 = spot rate, or the zero-coupon yield or zero rate, for Period 3

$$PV = \frac{7}{(1+0.08)^1} + \frac{7}{(1+0.09)^2} + \frac{7+100}{(1+0.10)^3}.$$

$PV = 6.48 + 5.89 + 80.39 = 92.76.$

17. B is correct. The yield-to-maturity is closest to 9.92%. The formula for calculating the price of Bond Z is

$$PV = \frac{PMT}{(1+Z_1)^1} + \frac{PMT}{(1+Z_2)^2} + \frac{PMT+FV}{(1+Z_3)^3},$$

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

Z_1 = spot rate, or the zero-coupon yield or zero rate, for Period 1

Z_2 = spot rate, or the zero-coupon yield or zero rate, for Period 2

Z_3 = spot rate, or the zero-coupon yield or zero rate, for Period 3

$$PV = \frac{6}{(1+0.08)^1} + \frac{6}{(1+0.09)^2} + \frac{6+100}{(1+0.10)^3}.$$

$PV = 5.56 + 5.05 + 79.64 = 90.25$.

Using this price, the bond's yield-to-maturity can be calculated as

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT+FV}{(1+r)^3}.$$

$$90.25 = \frac{6}{(1+r)^1} + \frac{6}{(1+r)^2} + \frac{6+100}{(1+r)^3}.$$

$r = 9.92\%$.

18. A is correct. Bond dealers usually quote the flat price. When a trade takes place, the accrued interest is added to the flat price to obtain the full price paid by the buyer and received by the seller on the settlement date. The reason for using the flat price for quotation is to avoid misleading investors about the market price trend for the bond. If the full price were to be quoted by dealers, investors would see the price rise day after day even if the yield-to-maturity did not change. That is because the amount of accrued interest increases each day. After the coupon payment is made, the quoted price would drop dramatically. Using the flat price for quotation avoids that misrepresentation. The full price, flat price plus accrued interest, is not usually quoted by bond dealers. Accrued interest is included in the full price, and bond dealers do not generally quote the full price.

19. B is correct. The bond's full price is 103.10. The price is determined in the following manner:

As of the beginning of the coupon period on 10 April 2020, there are 2.5 years (five semiannual periods) to maturity. These five semiannual periods occur on 10 October 2020, 10 April 2021, 10 October 2021, 10 April 2022, and 10 October 2022.

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \frac{PMT}{(1+r)^4} + \frac{PMT+FV}{(1+r)^5},$$

where

PV = present value

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

$$PV = \frac{2.5}{(1+0.02)^1} + \frac{2.5}{(1+0.02)^2} + \frac{2.5}{(1+0.02)^3} + \frac{2.5}{(1+0.02)^4} + \frac{2.5+100}{(1+0.02)^5}.$$

$PV = 2.45 + 2.40 + 2.36 + 2.31 + 92.84 = 102.36.$

The accrued interest period is identified as 66/180. The number of days between 10 April 2020 and 16 June 2020 is 66 days, based on the 30/360 day-count convention (20 days remaining in April + 30 days in May + 16 days in June = 66 days total). The number of days between coupon periods is assumed to be 180 days using the 30/360 day convention.

$PV^{Full} = PV \times (1+r)^{66/180}.$

$PV^{Full} = 102.36 \times (1.02)^{66/180} = 103.10.$

20. C is correct. The accrued interest per 100 of par value is closest to 0.92. The accrued interest is determined in the following manner: The accrued interest period is identified as 66/180. The number of days between 10 April 2020 and 16 June 2020 is 66 days, based on the 30/360 day-count convention (20 days remaining in April + 30 days in May + 16 days in June = 66 days total). The number of days between coupon periods is assumed to be 180 days using the 30/360 day convention.

Accrued interest $= \frac{t}{T} \times PMT,$

where

t = number of days from the last coupon payment to the settlement date

T = number of days in the coupon period

t/T = fraction of the coupon period that has gone by since the last payment

PMT = coupon payment per period

Accrued interest $= \frac{66}{180} \times \frac{5.00}{2} = 0.92.$

21. A is correct. The flat price of 102.18 is determined by subtracting the accrued interest (from Question 20) from the full price (from Question 19).

$PV^{Flat} = PV^{Full} - $ Accrued interest.

$PV^{Flat} = 103.10 - 0.92 = 102.18.$

22. B is correct. For bonds not actively traded or not yet issued, matrix pricing is a price estimation process that uses market discount rates based on the quoted prices of similar bonds (similar times-to-maturity, coupon rates, and credit quality).

23. A is correct. Matrix pricing is used in underwriting new bonds to get an estimate of the required yield spread over the benchmark rate. The benchmark rate is typically the yield-to-maturity on a government bond having the same or close to the same time-to-maturity. The spread is the difference between the yield-to-maturity on the new bond and the benchmark rate. The yield spread is the additional compensation required by investors for the difference in the credit risk, liquidity risk, and tax status of the bond relative to the government bond.

In matrix pricing, the market discount rates of comparable bonds and the yield-to-maturity on a government bond having a similar time-to-maturity are not estimated. Rather, they are known and are used to estimate the required yield

spread of a new bond.

24. B is correct. The formula for calculating this bond's yield-to-maturity is

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \cdots + \frac{PMT}{(1+r)^{39}} + \frac{PMT+FV}{(1+r)^{40}},$$

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

$$111 = \frac{2.5}{(1+r)^1} + \frac{2.5}{(1+r)^2} + \frac{2.5}{(1+r)^3} + \cdots + \frac{2.5}{(1+r)^{39}} + \frac{2.5+100}{(1+r)^{40}}.$$

$r = 0.0209$.

To arrive at the annualized yield-to-maturity, the semiannual rate of 2.09% must be multiplied by two. Therefore, the yield-to-maturity is equal to 2.09% × 2 = 4.18%.

25. B is correct. The annual yield-to-maturity, stated for a periodicity of 12, is 7.21%. It is calculated as follows:

$$PV = \frac{FV}{(1+r)^N}.$$

$$75 = \left(\frac{100}{(1+r)^{4\times12}}\right).$$

$$\frac{100}{75} = (1+r)^{48}.$$

$$1.33333 = (1+r)^{48}.$$

$$(1.33333)^{1/48} = [(1+r)^{48}]^{1/48}.$$

$$1.33333^{02083} = (1+r).$$

$$1.00601 = (1+r).$$

$$1.00601 - 1 = r.$$

$$0.00601 = r.$$

$r \times 12 = 0.07212$, or approximately 7.21%.

26. A is correct. The yield-to-maturity, stated for a periodicity of 12 (monthly periodicity), is 3.87%. The formula to convert an annual percentage rate (annual yield-to-maturity) from one periodicity to another is as follows:

$$\left(1 + \frac{APR_m}{m}\right)^m = \left(1 + \frac{APR_n}{n}\right)^n.$$

$$\left(1 + \frac{0.03897}{2}\right)^2 = \left(1 + \frac{APR_{12}}{12}\right)^{12}.$$

$$(1.01949)^2 = \left(1 + \frac{APR_{12}}{12}\right)^{12}.$$

$$1.03935 = \left(1 + \frac{APR_{12}}{12}\right)^{12}.$$

$$(1.03935)^{1/12} = \left[\left(1 + \frac{APR_{12}}{12}\right)^{12}\right]^{1/12}.$$

$$1.00322 = \left(1 + \frac{APR_{12}}{12}\right).$$

$$1.00322 - 1 = \left(\frac{APR_{12}}{12}\right).$$

$APR_{12} = 0.00322 \times 12 = 0.03865$, or approximately 3.87%.

27. B is correct. The yield-to-maturity is 5.77%. The formula for calculating this bond's yield-to-maturity is

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \cdots + \frac{PMT}{(1+r)^9} + \frac{PMT+FV}{(1+r)^{10}},$$

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

$$101 = \frac{3}{(1+r)^1} + \frac{3}{(1+r)^2} + \frac{3}{(1+r)^3} + \cdots + \frac{3}{(1+r)^9} + \frac{3+100}{(1+r)^{10}}.$$

$r = 0.02883$.

To arrive at the annualized yield-to-maturity, the semiannual rate of 2.883% must be multiplied by two. Therefore, the yield-to-maturity is equal to 2.883% × 2 = 5.77% (rounded).

28. C is correct. The yield-to-first-call is 6.25%. Given the first call date is exactly three years away, the formula for calculating this bond's yield-to-first-call is

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \cdots + \frac{PMT}{(1+r)^5} + \frac{PMT+FV}{(1+r)^6},$$

where

PV = present value, or the price of the bond

PMT = coupon payment per period

FV = call price paid at call date

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

$$101 = \frac{3}{(1+r)^1} + \frac{3}{(1+r)^2} + \frac{3}{(1+r)^3} + \cdots + \frac{3}{(1+r)^5} + \frac{3+102}{(1+r)^6}.$$

$r = 0.03123$.

To arrive at the annualized yield-to-first-call, the semiannual rate of 3.123% must be multiplied by two. Therefore, the yield-to-first-call is equal to 3.123% × 2 = 6.25% (rounded).

29. C is correct. The yield-to-second-call is 5.94%. Given the second call date is exactly four years away, the formula for calculating this bond's yield-to-second-call is

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \cdots + \frac{PMT}{(1+r)^7} + \frac{PMT+FV}{(1+r)^8},$$

where

PV = present value, or the price of the bond

PMT = coupon payment per period

FV = call price paid at call date

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

$$101 = \frac{3}{(1+r)^1} + \frac{3}{(1+r)^2} + \frac{3}{(1+r)^3} + \cdots \frac{3}{(1+r)^7} + \frac{3+101}{(1+r)^8}.$$

$r = 0.0297$.

To arrive at the annualized yield-to-second-call, the semiannual rate of 2.97% must be multiplied by two. Therefore, the yield-to-second-call is equal to 2.97% × 2 = 5.94%.

30. B is correct. The yield-to-worst is 5.77%. The bond's yield-to-worst is the lowest of the sequence of yields-to-call and the yield-to-maturity. From Questions 27 −29, we have the following yield measures for this bond:
Yield-to-first-call: 6.25%
Yield-to-second-call: 5.94%
Yield-to-maturity: 5.77%
Thus, the yield-to-worst is 5.77%.

31. B is correct. The discount or required margin is 236 bps. Given the floater has a maturity of two years and is linked to six-month MRR, the formula for calculating the discount margin is

$$PV = \frac{\frac{(\text{Index} + QM) \times FV}{m}}{\left(1 + \frac{\text{Index} + DM}{m}\right)^1} + \frac{\frac{(\text{Index} + QM) \times FV}{m}}{\left(1 + \frac{\text{Index} + DM}{m}\right)^2} + \cdots + \frac{\frac{(\text{Index} + QM) \times FV}{m} + FV}{\left(1 + \frac{\text{Index} + DM}{m}\right)^4},$$

where

PV = present value, or the price of the floating-rate note = 97

Index = reference rate, stated as an annual percentage rate = 0.01

QM = quoted margin, stated as an annual percentage rate = 0.0080

FV = future value paid at maturity, or the par value of the bond = 100

m = periodicity of the floating-rate note, the number of payment periods per year = 2

DM = discount margin, the required margin stated as an annual percentage rate

Substituting the given values:

$$97 = \frac{\frac{(0.01 + 0.0080) \times 100}{2}}{\left(1 + \frac{0.01 + DM}{2}\right)^1} + \frac{\frac{(0.01 + 0.0080) \times 100}{2}}{\left(1 + \frac{0.01 + DM}{2}\right)^2} + \cdots + \frac{\frac{(0.01 + 0.0080) \times 100}{2} + 100}{\left(1 + \frac{0.01 + DM}{2}\right)^4}.$$

$$97 = \frac{0.90}{\left(1 + \frac{0.01 + DM}{2}\right)^1} + \frac{0.90}{\left(1 + \frac{0.01 + DM}{2}\right)^2} + \frac{0.90}{\left(1 + \frac{0.01 + DM}{2}\right)^3} + \frac{0.90 + 100}{\left(1 + \frac{0.01 + DM}{2}\right)^4}.$$

To calculate *DM*, begin by solving for the discount rate per period:

$$97 = \frac{0.90}{(1 + r)^1} + \frac{0.90}{(1 + r)^2} + \frac{0.90}{(1 + r)^3} + \frac{0.90 + 100}{(1 + r)^4}.$$

$r = 0.0168$.

Now, solve for *DM*:

$$\frac{0.01 + DM}{2} = 0.0168.$$

$DM = 0.0236$.

The discount margin for the floater is equal to 236 bps.

32. A is correct. FRN X will be priced at a premium on the next reset date because the quoted margin of 0.40% is greater than the discount, or required, margin of 0.32%. The premium amount is the present value of the extra, or "excess," interest payments of 0.08% each quarter (0.40% − 0.32%). FRN Y will be priced at par value on the next reset date since there is no difference between the quoted and discount margins. FRN Z will be priced at a discount since the quoted margin is less than the required margin.

33. C is correct. The bond equivalent yield is closest to 3.78%. It is calculated as

$$AOR = \left(\frac{\text{Year}}{\text{Days}}\right) \times \left(\frac{FV - PV}{PV}\right),$$

where

PV = present value, principal amount, or the price of the money market instrument

FV = future value, or the redemption amount paid at maturity including interest

Days = number of days between settlement and maturity

Year = number of days in the year

AOR = add-on rate, stated as an annual percentage rate (also called bond equivalent yield)

$$AOR = \left(\frac{365}{350}\right) \times \left(\frac{100 - 96.5}{96.5}\right).$$

$AOR = 1.04286 \times 0.03627$.

$AOR = 0.03783$, or approximately 3.78%.

34. C is correct. The bond equivalent yield is closest to 4.40%. The present value of the banker's acceptance is calculated as

$$PV = FV \times \left(1 - \frac{\text{Days}}{\text{Year}} \times DR\right),$$

where

PV = present value, or price of the money market instrument

FV = future value paid at maturity, or face value of the money market instrument

Days = number of days between settlement and maturity

Year = number of days in the year

DR = discount rate, stated as an annual percentage rate

$$PV = 100 \times \left(1 - \frac{\text{Days}}{\text{Year}} \times DR\right).$$

$$PV = 100 \times \left(1 - \frac{180}{360} \times 0.0425\right).$$

$$PV = 100 \times (1 - 0.02125).$$

$$PV = 100 \times 0.97875.$$

$$PV = 97.875.$$

The bond equivalent yield (AOR) is calculated as

$$AOR = \left(\frac{\text{Year}}{\text{Days}}\right) \times \left(\frac{FV - PV}{PV}\right),$$

where

PV = present value, principal amount, or the price of the money market instrument

FV = future value, or the redemption amount paid at maturity including interest

Days = number of days between settlement and maturity

Year = number of days in the year

AOR = add-on rate (bond equivalent yield), stated as an annual percentage rate

$$AOR = \left(\frac{365}{180}\right) \times \left(\frac{100 - PV}{PV}\right).$$

$$AOR = \left(\frac{365}{180}\right) \times \left(\frac{100 - 97.875}{97.875}\right).$$

$$AOR = 2.02778 \times 0.02171.$$

$$AOR = 0.04402, \text{ or approximately } 4.40\%.$$

Note that PV is calculated using an assumed 360-day year and AOR (bond equivalent yield) is calculated using a 365-day year.

35. B is correct. All bonds on a par curve are assumed to have similar, not different, credit risk. Par curves are obtained from spot curves, and all bonds used to derive the par curve are assumed to have the same credit risk, as well as the same periodicity, currency, liquidity, tax status, and annual yields. A par curve is a sequence of yields-to-maturity such that each bond is priced at par value.

36. B is correct. The spot curve, also known as the strip, or zero, curve, is the yield curve constructed from a sequence of yields-to-maturity on zero-coupon bonds.

The par curve is a sequence of yields-to-maturity such that each bond is priced at par value. The forward curve is constructed using a series of forward rates, each having the same time frame.

37. B is correct. The forward rate can be interpreted to be the incremental or marginal return for extending the time-to-maturity of an investment for an additional time period. The add-on rate (bond equivalent yield) is a rate quoted for money market instruments, such as bank certificates of deposit, and indexes, such as MRR, Libor and Euribor. Yield-to-maturity is the internal rate of return on the bond's cash flows—the uniform interest rate such that when the bond's future cash flows are discounted at that rate, the sum of the present values equals the price of the bond. It is the implied market discount rate.

38. B is correct. The three-year implied spot rate is closest to 1.94%. It is calculated as the geometric average of the one-year forward rates:

$$(1.0080 \times 1.0112 \times 1.0394) = (1 + z_3)^3.$$

$$1.05945 = (1 + z_3)^3.$$

$$(1.05945)^{1/3} = [(1 + z_3)^3]^{1/3}.$$

$$1.01944 = 1 + z_3.$$

$$1.01944 - 1 = z_3.$$

$$0.01944 = z_3.$$

$z_3 = 1.944\%$, or approximately 1.94%.

39. B is correct. The value per 100 of par value is closest to 105.01. Using the forward curve, the bond price is calculated as follows:

$$\frac{3.5}{1.0080} + \frac{103.5}{(1.0080 \times 1.0112)} = 3.47 + 101.54 = 105.01.$$

40. C is correct. The spread component of a specific bond's yield-to-maturity is least likely impacted by changes in inflation in its currency of denomination. The effect of changes in macroeconomic factors, such as the expected rate of inflation in the currency of denomination, is seen mostly in changes in the benchmark yield. The spread or risk premium component is impacted by microeconomic factors specific to the bond and bond issuer, including tax status and quality rating.

41. A is correct. The I-spread, or interpolated spread, is the yield spread of a specific bond over the standard swap rate in that currency of the same tenor. The yield spread in basis points over an actual or interpolated government bond is known as the G-spread. The Z-spread (zero-volatility spread) is the constant spread that is added to each spot rate such that the present value of the cash flows matches the price of the bond.

42. B is correct. The G-spread is closest to 285 bps. The benchmark rate for UK fixed-rate bonds is the UK government benchmark bond. The euro interest rate spread benchmark is used to calculate the G-spread for euro-denominated corporate bonds, not UK bonds. The G-spread is calculated as follows:
Yield-to-maturity on the UK corporate bond:

$$100.65 = \frac{5}{(1 + r)^1} + \frac{5}{(1 + r)^2} + \frac{105}{(1 + r)^3}; r = 0.04762, \text{ or } 476 \text{ bps.}$$

Yield-to-maturity on the UK government benchmark bond:

$$100.25 \ = \ \frac{2}{(1+r)^1} + \frac{2}{(1+r)^2} + \frac{102}{(1+r)^3}; r \ = \ 0.01913, \text{ or } 191 \text{ bps.}$$

The G-spread is 476 − 191 = 285 bps.

43. A is correct. The value of the bond is closest to 92.38. The calculation is

$$PV = \frac{PMT}{\left(1 + z_1 + Z\right)^1} + \frac{PMT}{\left(1 + z_2 + Z\right)^2} + \frac{PMT + FV}{\left(1 + z_3 + Z\right)^3}$$

$$= \frac{5}{(1 + 0.0486 + 0.0234)^1} + \frac{5}{(1 + 0.0495 + 0.0234)^2} + \frac{105}{(1 + 0.0565 + 0.0234)^3}$$

$$= \frac{5}{1.0720} + \frac{5}{1.15111} + \frac{105}{1.25936} = 4.66 + 4.34 + 83.38 = 92.38.$$

44. C is correct. The option value in basis points per year is subtracted from the Z-spread to calculate the OAS. The Z-spread is the constant yield spread over the benchmark spot curve. The I-spread is the yield spread of a specific bond over the standard swap rate in that currency of the same tenor.

SOLUTIONS

1. B is correct. Securitization increases the funds available for banks to lend because it allows banks to remove loans from their balance sheets and issue bonds that are backed by those loans. Securitization repackages relatively simple debt obligations, such as bank loans, into more complex, not simpler, structures. Securitization involves transferring ownership of assets from the original owner—in this case, the banks—into a special legal entity. As a result, banks do not maintain ownership of the securitized assets.

2. C is correct. By removing the wall between ultimate investors and originating borrowers, investors can achieve better legal claims on the underlying mortgages and portfolios of receivables. This transparency allows investors to tailor interest rate risk and credit risk to their specific needs.

3. C is correct. Securitization allows for the creation of tradable securities with greater liquidity than the original loans on a bank's balance sheet. Securitization results in lessening the roles of intermediaries, which increases disintermediation. Securitization is a process in which relatively simple debt obligations, such as loans, are repackaged into more complex structures.

4. A is correct. Securitization allows investors to achieve more direct legal claims on loans and portfolios of receivables. As a result, investors can add to their portfolios exposure to the risk–return characteristics provided by a wider range of assets.

    B is incorrect because securitization does not reduce credit risk but, rather, provides a structure to mitigate and redistribute the inherent credit risks of pools of loans and receivables.

    C is incorrect because securitization does not eliminate the timing risks associated with ABS cash flows but, rather, provides a structure to mitigate and redistribute those risks, such as contraction risk and extension risk.

5. A is correct. In a securitization, the special purpose entity is the special legal entity responsible for the issuance of the asset-backed securities. The servicer, not the SPE, is responsible for both the collection of payments from the borrowers and the recovery of underlying assets if the borrowers default on their loans.

6. B is correct. In a securitization, the loans or receivables are initially sold by the depositor to the special purpose entity that uses them as collateral to issue the ABS.

    A is incorrect because the SPE, often referred to as the issuer, is the purchaser of the collateral rather than the seller of the collateral.

    C is incorrect because the underwriter neither sells nor purchases the collateral in a securitization. The underwriter performs the same functions in a securitization as it does in a standard bond offering.

7. C is correct. The first €25 (€5 + €20) million in default are absorbed by the subordinated classes (C and B). The senior Class A bonds will experience a loss only when defaults exceed €25 million.

8. A is correct. Time tranching is the process in which a set of bond classes or tranches is created that allow investors a choice in the type of prepayment risk—extension or contraction—that they prefer to bear. Senior and subordinated bond classes are used in credit tranching. Credit tranching structures allow investors to choose the amount of credit risk that they prefer to bear. Fully and partially amortizing loans are two types of amortizing loans.

9. B is correct. Credit tranching is a form of credit enhancement called subordination in which bond classes or tranches differ as to how they will share losses resulting from defaults of the borrowers whose loans are part of the collateral. This type of protection is commonly referred to as a waterfall structure because of the cascading flow of payments between bond classes in the event of default.

   A is incorrect because time tranching involves the creation of bond classes that possess different expected maturities rather than bond classes that differ as to how credit losses will be shared. Time tranching involves the redistribution of prepayment risk, whereas credit tranching involves the redistribution of credit risk.

   C is incorrect because although overcollateralization is a form of internal credit enhancement similar to subordination, it is the amount by which the principal amount of the pool of collateral exceeds the principal balance of the securities issued and backed by the collateral pool. Losses are absorbed first by the amount of overcollateralization and then according to the credit tranching structure.

10. A is correct. Time tranching is the creation of bond classes that possess different expected maturities so that prepayment risk can be redistributed among bond classes. When loan agreements provide borrowers the ability to alter payments, in the case of declining interest rates, this prepayment risk increases because borrowers tend to pay off part or all of their loans and refinance at lower interest rates.

    B is incorrect because it is possible and quite common for a securitization to have structures with both credit tranching and time tranching.

    C is incorrect because the subordinated structures of junior and senior bond classes differ as to how they will share any losses relative to defaults of the borrowers whose loans are in the collateral pool. Junior classes offer protection for senior classes, with losses first realized by the former. The classes are distinguished not by scheduled repayment terms but, rather, by a loss sharing hierarchy in the event of borrower default.

11. A is correct. The legal implication of a special purpose entity, a prerequisite for securitization, is that investors contemplating the purchase of bond classes backed by the assets of the SPE will evaluate the credit risk of those assets independently from the credit rating of the entity that sold the assets to the SPE. This separation of the seller's collateral from its credit rating provides the opportunity for the SPE to access a lower aggregate funding cost than what the seller might otherwise obtain.

    B is incorrect because the absolute priority rule, under which senior creditors are paid in full before subordinated creditors, has not always been upheld in bankruptcy reorganizations. There is no assurance that if a corporate bond has collateral, the rights of the bondholders will be respected. It is this uncertainty that creates the dominant influence of credit ratings over collateral in credit spreads.

    C is incorrect because corporate bond credit spreads will reflect the seller's credit rating primarily and the collateral only slightly. Securitization separates the seller's collateral from its credit rating, effectively altering the influence of collateral on the credit spread.

12. C is correct. In a partially amortizing loan, the sum of all the scheduled principal repayments is less than the amount borrowed. The last payment is for the remaining unpaid mortgage balance and is called the "balloon payment."

13. A is correct. In a recourse loan, the lender has a claim against the borrower for the shortfall between the amount of the mortgage balance outstanding and the proceeds received from the sale of the property. A prepayment option is a benefit to the borrower and would thus not offer protection to the lender. An

interest-only mortgage requires no principal repayment for a number of years and will not protect the lender from strategic default by the borrower.

14. B is correct. Bank Nederlandse has a claim against Marolf for EUR1.5 million, the shortfall between the amount of the mortgage balance outstanding and the proceeds received from the sale of the property. This indicates that the mortgage loan is a recourse loan. The recourse/non-recourse feature indicates the rights of a lender in foreclosure. If Marolf had a non-recourse loan, the bank would have been entitled to only the proceeds from the sale of the underlying property, or EUR2.5 million. A bullet loan is a special type of interest-only mortgage for which there are no scheduled principal payments over the entire term of the loan. Since the unpaid balance is less than the original mortgage loan, it is unlikely that Marolf has an interest-only mortgage.

15. A is correct. Because the loan has a non-recourse feature, the lender can look to only the underlying property to recover the outstanding mortgage balance and has no further claim against the borrower. The lender is simply entitled to foreclose on the home and sell it.

16. A is correct. A bullet mortgage is a special type of interest-only mortgage in which there are no scheduled principal repayments over the entire life of the loan. At maturity, a balloon payment is required equal to the original loan amount.

    B is incorrect because with a fully amortizing mortgage, the sum of all the scheduled principal repayments during the mortgage's life is such that when the last mortgage payment is made, the loan is fully repaid, with no balloon payment required.

    C is incorrect because with a partially amortizing mortgage, the sum of all the scheduled principal repayments is less than the amount borrowed, resulting in a balloon payment equal to the unpaid mortgage balance (rather than the original loan amount).

17. A is correct. In non-recourse loan jurisdictions, the borrower may have an incentive to default on an underwater mortgage and allow the lender to foreclose on the property because the lender has no claim against the borrower for the shortfall. For this reason, such defaults, known as strategic defaults, are more likely in non-recourse jurisdictions and less likely in recourse jurisdictions, where the lender does have a claim against the borrower for the shortfall.

    B is incorrect because strategic defaults in non-recourse jurisdictions do have negative consequences for the defaulting borrowers in the form of a lower credit score and a reduced ability to borrow in the future. These negative consequences can be a deterrent in the incidence of underwater mortgage defaults.

    C is incorrect because when a recourse loan defaults, the lender can look to both the property and the borrower to recover the outstanding mortgage balance. In a recourse loan, the lender has a claim against the borrower for the shortfall between the amount of the outstanding mortgage balance and the proceeds received from the sale of the property.

18. B is correct. Contraction risk is the risk that when interest rates decline, actual prepayments will be higher than forecasted. Extension risk is the risk that when interest rates rise, prepayments will be lower than forecasted. Yield maintenance results from prepayment penalties; the lender is protected from loss in yield by the imposition of prepayment penalties.

19. B is correct. Extension risk is the risk that when interest rate rise, fewer prepayments will occur. Homeowners will be reluctant to give up the benefit of a

contractual interest rate that is lower. As a result, the mortgage pass-through security becomes longer in maturity than anticipated at the time of purchase.

20. B is correct. CPR is an annualized rate that indicates the percentage of the outstanding mortgage pool balance at the beginning of the year that is expected to be prepaid by the end of the year.

21. C is correct. When interest rates decline, a mortgage pass-through security is subject to contraction risk. Contraction risk is the risk that when interest rates decline, actual prepayments will be higher than forecasted because borrowers will refinance at now-available lower interest rates. Thus, a security backed by mortgages will have a shorter maturity than was anticipated when the security was purchased.

22. A is correct. The coupon rate of a mortgage pass-through security is called the pass-through rate, whereas the mortgage rate on the underlying pool of mortgages is calculated as a weighted average coupon rate (WAC). The pass-through rate is lower than the WAC by an amount equal to the servicing fee and other administrative fees.

23. B is correct. The SMM is a monthly measure of the prepayment rate or prepayment speed. Contraction risk is the risk that when interest rates decline, actual prepayments will be higher than forecast. So if contraction risk falls, prepayments are likely to be lower than forecast, which would imply a decrease in the SMM.

A is incorrect because the SMM is a monthly measure of the prepayment rate or prepayment speed. Extension risk is the risk that when interest rates rise, actual prepayments will be lower than forecast. So if extension risk rises, prepayments are likely to be lower than forecast, which would imply a decrease, not an increase, in the SMM.

C is incorrect because at 100 PSA, investors can expect prepayments to follow the PSA prepayment benchmark. Based on historical patterns, the PSA standard model assumes that prepayment rates are low for newly initiated mortgages and then speed up as mortgages season. Thus, 100 PSA does not imply that the SMM remains the same but, rather, implies that it will vary over the life of the mortgage.

24. A is correct. Non-agency RMBS are credit enhanced, either internally or externally, to make the securities more attractive to investors. The most common forms of internal credit enhancement are senior/subordinated structures, reserve accounts, and overcollateralization. Conforming mortgages are used as collateral for agency (not non-agency) mortgage pass-through securities. An agency RMBS, rather than a non-agency RMBS, issued by a GSE (government sponsored enterprise), is guaranteed by the respective GSE.

25. C is correct. Using CMOs, securities can be created to closely satisfy the asset/liability needs of institutional investors. The creation of a CMO cannot eliminate prepayment risk; it can only distribute the various forms of this risk among various classes of bondholders. The collateral of CMOs is mortgage-related products, not the mortgages themselves.

26. C is correct. For a CMO with multiple sequential-pay tranches, the longest-term tranche will have the lowest contraction (prepayments greater than forecasted) risk because of the protection against this risk offered by the other tranches. The longest-term tranche is likely to have the highest average life and extension risk because it is the last tranche repaid in a sequential-pay tranche.

27. A is correct. PAC tranches have limited (but not complete) protection against both extension risk and contraction risk. This protection is provided by the support tranches. A sequential-pay tranche can protect against either extension risk or contraction risk but not both of these risks. The CMO structure with sequential-pay tranches allows investors concerned about extension risk to invest in shorter-term tranches and those concerned about contraction risk to invest in longer-term tranches.

28. C is correct. The greater predictability of cash flows provided in the planned amortization class (PAC) tranches comes at the expense of support tranches. As a result, investors in support tranches are exposed to higher extension risk and contraction risk than investors in PAC tranches. Investors will be compensated for bearing this risk because support tranches have a higher expected return than PAC tranches.

29. B is correct. CMOs are designed to redistribute cash flows of mortgage-related products to different bond classes or tranches through securitization. Although CMOs do not eliminate prepayment risk, they distribute prepayment risk among various classes of bondholders.

30. A is correct. If commercial mortgage loans are non-recourse loans, the lender can look to only the income-producing property backing the loan for interest and principal repayment. If there is a default, the lender looks to the proceeds from the sale of the property for repayment and has no recourse against the borrower for any unpaid mortgage loan balance. Call protection and prepayment penalty points protect against prepayment risk.

31. A is correct. With CMBS, investors have considerable call protection. An investor in an RMBS is exposed to considerable prepayment risk, but with CMBS, call protection is available to the investor at the structure and loan level. The call protection results in CMBS trading in the market more like a corporate bond than an RMBS. Both internal credit enhancement and the debt-service-coverage (DSC) ratio address credit risk, not prepayment risk.

32. A is correct. If specific ratios of debt to service coverage are needed and those ratios cannot be met at the loan level, subordination is used to achieve the desired credit rating. Call protection protects investors against prepayment risk. Balloon payments increase the risk of the underlying loans.

33. B is correct. In a non-recourse CMBS, the lender can look only to the income-producing property backing the loan for interest and principal repayment. If a default occurs, the lender can use only the proceeds from the sale of the property for repayment and has no recourse to the borrower for any unpaid balance.

34. B is correct. A critical feature that differentiates CMBS from RMBS is the call protection provided to investors. An investor in an RMBS is exposed to considerable prepayment risk because the borrower has the right to prepay the loan before maturity. CMBS provide investors with considerable call protection that comes either at the structure level or at the loan level.

35. A is correct. An excess spread account, sometimes called excess interest cash flow, is a form of internal credit enhancement that limits credit risk. It is an amount that can be retained and deposited into a reserve account and that can serve as a first line of protection against losses. An excess spread account does not limit prepayment risk—be it extension risk or contraction risk.

36. C is correct. During the lockout period, the cash flow that is paid out to owners

of credit card receivable asset-backed securities is based only on finance charges collected and fees.

37. C is correct. Because credit card receivable ABS are backed by non-amortizing loans that do not involve scheduled principal repayments, they are not affected by prepayment risk.

    A is incorrect because auto loan ABS are affected by prepayment risk since they are backed by amortizing loans involving scheduled principal repayments.

    B is incorrect because residential MBS are affected by prepayment risk since they are backed by amortizing loans involving scheduled principal repayments.

38. A is correct. In addition to a senior/subordinated (sequential-pay) structure, many auto loan ABS are structured with additional credit enhancement in the form of overcollateralization and a reserve account, often an excess spread account. The excess spread is an amount that can be retained and deposited into a reserve account that can serve as a first line of protection against losses.

    B is incorrect because in an auto loan ABS, losses are typically applied against the excess spread account and the amount of overcollateralization before the waterfall loss absorption of the sequential-pay structure.

    C is incorrect because in auto loan ABS, proceeds from the repossession and resale of autos are prepayment cash flows rather than a form of credit enhancement for loss protection.

39. C is correct. In credit card receivable ABS, the only way the principal cash flows can be altered is by triggering the early amortization provision. Such provisions are included in the ABS structure to safeguard the credit quality of the issue.

    A is incorrect because expiration of the lockout period does not result in the alteration of principal cash flows but instead defines when principal repayments are distributed to the ABS investors. During the lockout period, principal repayments by cardholders are reinvested. When the lockout period expires, principal repayments by cardholders are distributed to investors.

    B is incorrect because the excess spread account is a credit enhancement for loss absorption. When the excess spread account is depleted, losses are applied against the overcollateralization amount followed by the senior/subordinated structure. The only way principal cash flows can be altered is by triggering the early amortization provision.

40. C is correct. The mezzanine tranche consists of bond classes with credit ratings between senior and subordinated bond classes.

    A is incorrect because the equity tranche falls within and carries the credit rating applicable to the subordinated bond classes.

    B is incorrect because the residual tranche falls within and carries the credit ratings applicable to the subordinated bond classes.

41. C is correct. The key to whether a CDO is viable is whether a structure can be created that offers a competitive return for the subordinated tranche (often referred to as the residual or equity tranche). Investors in a subordinated tranche typically use borrowed funds (the bond classes issued) to generate a return above the funding cost.

    A is incorrect because the viability of a CDO depends on a structure that offers a competitive return for the subordinated tranche rather than the senior tranche.

    B is incorrect because the viability of a CDO depends on a structure that offers a competitive return for the subordinated tranche rather than the mezzanine tranche.

42. A is correct. When the collateral manager fails pre-specified tests, a provision is triggered that requires the payoff of the principal to the senior class until the tests are satisfied. This reduction of the senior class effectively deleverages the CDO because the CDO's cheapest funding source is reduced.

43. B is correct. Covered bonds usually carry lower credit risks and offer lower yields than otherwise similar ABS. The reason is, among other factors, covered bonds provide investors with dual recourse, to the cover pool and also to the issuer. Moreover, covered bonds have a dynamic cover pool, meaning sponsors must replace any prepaid or non-performing assets.