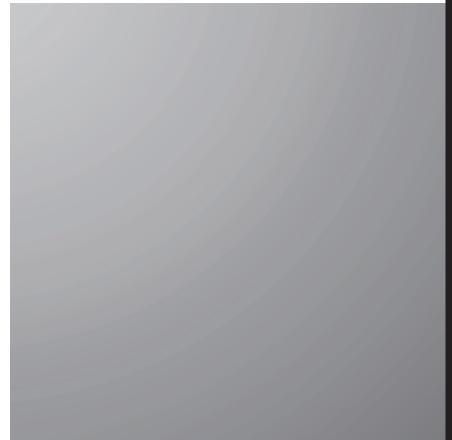


CFA PROGRAM CURRICULUM 2017 LEVEL I VOLUMES 1-6



CFA Institute

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PRACTICE PROBLEMS

Unless otherwise stated in the question, all individuals in the following questions are CFA Institute members or candidates in the CFA Program and, therefore, are subject to the CFA Institute Code of Ethics and Standards of Professional Conduct.

- 1 Smith, a research analyst with a brokerage firm, decides to change his recommendation for the common stock of Green Company, Inc., from a "buy" to a "sell." He mails this change in investment advice to all the firm's clients on Wednesday. The day after the mailing, a client calls with a buy order for 500 shares of Green Company. In this circumstance, Smith should:
 - A Accept the order.
 - B Advise the customer of the change in recommendation before accepting the order.
 - C Not accept the order because it is contrary to the firm's recommendation.
- 2 Which statement about a manager's use of client brokerage commissions violates the Code and Standards?
 - A A client may direct a manager to use that client's brokerage commissions to purchase goods and services for that client.
 - B Client brokerage commissions should be used to benefit the client and should be commensurate with the value of the brokerage and research services received.
 - C Client brokerage commissions may be directed to pay for the investment manager's operating expenses.
- 3 Jamison is a junior research analyst with Howard & Howard, a brokerage and investment banking firm. Howard & Howard's mergers and acquisitions department has represented the Britland Company in all of its acquisitions for the past 20 years. Two of Howard & Howard's senior officers are directors of various Britland subsidiaries. Jamison has been asked to write a research report on Britland. What is the best course of action for her to follow?
 - A Jamison may write the report but must refrain from expressing any opinions because of the special relationships between the two companies.
 - B Jamison should not write the report because the two Howard & Howard officers serve as directors for subsidiaries of Britland.
 - C Jamison may write the report if she discloses the special relationships with the company in the report.
- 4 Which of the following statements clearly *conflicts* with the recommended procedures for compliance presented in the CFA Institute *Standards of Practice Handbook*?
 - A Firms should disclose to clients the personal investing policies and procedures established for their employees.
 - B Prior approval must be obtained for the personal investment transactions of all employees.
 - C For confidentiality reasons, personal transactions and holdings should not be reported to employers unless mandated by regulatory organizations.
- 5 Bronson provides investment advice to the board of trustees of a private university endowment fund. The trustees have provided Bronson with the fund's financial information, including planned expenditures. Bronson receives a

phone call on Friday afternoon from Murdock, a prominent alumnus, requesting that Bronson fax him comprehensive financial information about the fund. According to Murdock, he has a potential contributor but needs the information that day to close the deal and cannot contact any of the trustees. Based on the CFA Institute Standards, Bronson should:

- A Send Murdock the information because disclosure would benefit the client.
 - B Not send Murdock the information to preserve confidentiality.
 - C Send Murdock the information, provided Bronson promptly notifies the trustees.
- 6 Miller heads the research department of a large brokerage firm. The firm has many analysts, some of whom are subject to the Code and Standards. If Miller delegates some supervisory duties, which statement best describes her responsibilities under the Code and Standards?
- A Miller's supervisory responsibilities do not apply to those subordinates who are not subject to the Code and Standards.
 - B Miller no longer has supervisory responsibility for those duties delegated to her subordinates.
 - C Miller retains supervisory responsibility for all subordinates despite her delegation of some duties.
- 7 Willier is the research analyst responsible for following Company X. All the information he has accumulated and documented suggests that the outlook for the company's new products is poor, so the stock should be rated a weak "hold." During lunch, however, Willier overhears a financial analyst from another firm whom he respects offer opinions that conflict with Willier's forecasts and expectations. Upon returning to his office, Willier releases a strong "buy" recommendation to the public. Willier:
- A Violated the Standards by failing to distinguish between facts and opinions in his recommendation.
 - B Violated the Standards because he did not have a reasonable and adequate basis for his recommendation.
 - C Was in full compliance with the Standards.
- 8 An investment management firm has been hired by ETV Corporation to work on an additional public offering for the company. The firm's brokerage unit now has a "sell" recommendation on ETV, but the head of the investment banking department has asked the head of the brokerage unit to change the recommendation from "sell" to "buy." According to the Standards, the head of the brokerage unit would be permitted to:
- A Increase the recommendation by no more than one increment (in this case, to a "hold" recommendation).
 - B Place the company on a restricted list and give only factual information about the company.
 - C Assign a new analyst to decide if the stock deserves a higher rating.
- 9 Albert and Tye, who recently started their own investment advisory business, have registered to take the Level III CFA examination. Albert's business card reads, "Judy Albert, CFA Level II." Tye has not put anything about the CFA designation on his business card, but promotional material that he designed for the business describes the CFA requirements and indicates that Tye participates in the CFA Program and has completed Levels I and II. According to the Standards:
- A Albert has violated the Standards, but Tye has not.

- B Tye has violated the Standards, but Albert has not.
- C Both Albert and Tye have violated the Standards.
- 10 Scott works for a regional brokerage firm. He estimates that Walkton Industries will increase its dividend by US\$1.50 a share during the next year. He realizes that this increase is contingent on pending legislation that would, if enacted, give Walkton a substantial tax break. The US representative for Walkton's home district has told Scott that, although she is lobbying hard for the bill and prospects for its passage are favorable, concern of the US Congress over the federal deficit could cause the tax bill to be voted down. Walkton Industries has not made any statements about a change in dividend policy. Scott writes in his research report, "We expect Walkton's stock price to rise by at least US\$8.00 a share by the end of the year because the dividend will increase by US\$1.50 a share. Investors buying the stock at the current time should expect to realize a total return of at least 15% on the stock." According to the Standards:
- A Scott violated the Standards because he used material inside information.
- B Scott violated the Standards because he failed to separate opinion from fact.
- C Scott violated the Standards by basing his research on uncertain predictions of future government action.
- 11 Which one of the following actions will help to ensure the fair treatment of brokerage firm clients when a new investment recommendation is made?
- A Informing all people in the firm in advance that a recommendation is to be disseminated.
- B Distributing recommendations to institutional clients prior to individual accounts.
- C Minimizing the time between the decision and the dissemination of a recommendation.
- 12 The mosaic theory holds that an analyst:
- A Violates the Code and Standards if the analyst fails to have knowledge of and comply with applicable laws.
- B Can use material public information and nonmaterial nonpublic information in the analyst's analysis.
- C Should use all available and relevant information in support of an investment recommendation.
- 13 Jurgen is a portfolio manager. One of her firm's clients has told Jurgen that he will compensate her beyond the compensation provided by her firm on the basis of the capital appreciation of his portfolio each year. Jurgen should:
- A Turn down the additional compensation because it will result in conflicts with the interests of other clients' accounts.
- B Turn down the additional compensation because it will create undue pressure on her to achieve strong short-term performance.
- C Obtain permission from her employer prior to accepting the compensation arrangement.
- 14 One of the discretionary accounts managed by Farnsworth is the Jones Corporation employee profit-sharing plan. Jones, the company president, recently asked Farnsworth to vote the shares in the profit-sharing plan in favor of the slate of directors nominated by Jones Corporation and against the directors sponsored by a dissident stockholder group. Farnsworth does not want to lose this account because he directs all the account's trades to a brokerage firm that provides Farnsworth with useful information about tax-free investments. Although this information is not of value in managing the Jones Corporation

account, it does help in managing several other accounts. The brokerage firm providing this information also offers the lowest commissions for trades and provides best execution. Farnsworth investigates the director issue, concludes that the management-nominated slate is better for the long-run performance of the company than the dissident group's slate, and votes accordingly. Farnsworth:

- A Violated the Standards in voting the shares in the manner requested by Jones but not in directing trades to the brokerage firm.
 - B Did not violate the Standards in voting the shares in the manner requested by Jones or in directing trades to the brokerage firm.
 - C Violated the Standards in directing trades to the brokerage firm but not in voting the shares as requested by Jones.
- 15 Brown works for an investment counseling firm. Green, a new client of the firm, is meeting with Brown for the first time. Green used another counseling firm for financial advice for years, but she has switched her account to Brown's firm. After spending a few minutes getting acquainted, Brown explains to Green that she has discovered a highly undervalued stock that offers large potential gains. She recommends that Green purchase the stock. Brown has committed a violation of the Standards. What should she have done differently?
- A Brown should have determined Green's needs, objectives, and tolerance for risk before making a recommendation of any type of security.
 - B Brown should have thoroughly explained the characteristics of the company to Green, including the characteristics of the industry in which the company operates.
 - C Brown should have explained her qualifications, including her education, training, and experience and the meaning of the CFA designation.
- 16 Grey recommends the purchase of a mutual fund that invests solely in long-term US Treasury bonds. He makes the following statements to his clients:
- I. "The payment of the bonds is guaranteed by the US government; therefore, the default risk of the bonds is virtually zero."
 - II. "If you invest in the mutual fund, you will earn a 10% rate of return each year for the next several years based on historical performance of the market."
- Did Grey's statements violate the CFA Institute Code and Standards?
- A Neither statement violated the Code and Standards.
 - B Only statement I violated the Code and Standards.
 - C Only statement II violated the Code and Standards.
- 17 Anderb, a portfolio manager for XYZ Investment Management Company—a registered investment organization that advises investment firms and private accounts—was promoted to that position three years ago. Bates, her supervisor, is responsible for reviewing Anderb's portfolio account transactions and her required monthly reports of personal stock transactions. Anderb has been using Jonelli, a broker, almost exclusively for brokerage transactions for the portfolio account. For securities in which Jonelli's firm makes a market, Jonelli has been giving Anderb lower prices for personal purchases and higher prices for personal sales than Jonelli gives to Anderb's portfolio accounts and other investors. Anderb has been filing monthly reports with Bates only for those months in which she has no personal transactions, which is about every fourth month. Which of the following is *most likely* to be a violation of the Code and Standards?
- A Anderb failed to disclose to her employer her personal transactions.

- B Anderb owned the same securities as those of her clients.
- C Bates allowed Anderb to use Jonelli as her broker for personal trades.
- 18 Which of the following is a correct statement of a member's or candidate's duty under the Code and Standards?
- A In the absence of specific applicable law or other regulatory requirements, the Code and Standards govern the member's or candidate's actions.
- B A member or candidate is required to comply only with applicable local laws, rules, regulations, or customs, even though the Code and Standards may impose a higher degree of responsibility or a higher duty on the member or candidate.
- C A member or candidate who trades securities in a securities market where no applicable local laws or stock exchange rules regulate the use of material nonpublic information may take investment action based on material non-public information.
- 19 Ward is scheduled to visit the corporate headquarters of Evans Industries. Ward expects to use the information he obtains there to complete his research report on Evans stock. Ward learns that Evans plans to pay all of Ward's expenses for the trip, including costs of meals, hotel room, and air transportation. Which of the following actions would be the *best* course for Ward to take under the Code and Standards?
- A Accept the expense-paid trip and write an objective report.
- B Pay for all travel expenses, including costs of meals and incidental items.
- C Accept the expense-paid trip but disclose the value of the services accepted in the report.
- 20 Which of the following statements is *correct* under the Code and Standards?
- A CFA Institute members and candidates are prohibited from undertaking independent practice in competition with their employer.
- B Written consent from the employer is necessary to permit independent practice that could result in compensation or other benefits in competition with a member's or candidate's employer.
- C Members and candidates are prohibited from making arrangements or preparations to go into a competitive business before terminating their relationship with their employer.
- 21 Smith is a financial analyst with XYZ Brokerage Firm. She is preparing a purchase recommendation on JNI Corporation. Which of the following situations is *most likely* to represent a conflict of interest for Smith that would have to be disclosed?
- A Smith frequently purchases items produced by JNI.
- B XYZ holds for its own account a substantial common stock position in JNI.
- C Smith's brother-in-law is a supplier to JNI.
- 22 Michelieu tells a prospective client, "I may not have a long-term track record yet, but I'm sure that you'll be very pleased with my recommendations and service. In the three years that I've been in the business, my equity-oriented clients have averaged a total return of more than 26% a year." The statement is true, but Michelieu only has a few clients, and one of his clients took a large position in a penny stock (against Michelieu's advice) and realized a huge gain. This large return caused the average of all of Michelieu's clients to exceed 26% a year. Without this one investment, the average gain would have been 8% a year. Has Michelieu violated the Standards?

- A No, because Michelieu is not promising that he can earn a 26% return in the future.
- B No, because the statement is a true and accurate description of Michelieu's track record.
- C Yes, because the statement misrepresents Michelieu's track record.
- 23 An investment banking department of a brokerage firm often receives material nonpublic information that could have considerable value if used in advising the firm's brokerage clients. In order to conform to the Code and Standards, which one of the following is the best policy for the brokerage firm?
- A Permanently prohibit both "buy" and "sell" recommendations of the stocks of clients of the investment banking department.
- B Establish physical and informational barriers within the firm to prevent the exchange of information between the investment banking and brokerage operations.
- C Monitor the exchange of information between the investment banking department and the brokerage operation.
- 24 Stewart has been hired by Goodner Industries, Inc., to manage its pension fund. Stewart's duty of loyalty, prudence, and care is owed to:
- A The management of Goodner.
- B The participants and beneficiaries of Goodner's pension plan.
- C The shareholders of Goodner.
- 25 Which of the following statements is a stated purpose of disclosure in Standard VI(C)–Referral Fees?
- A Disclosure will allow the client to request discounted service fees.
- B Disclosure will help the client evaluate any possible partiality shown in the recommendation of services.
- C Disclosure means advising a prospective client about the referral arrangement once a formal client relationship has been established.
- 26 Rose, a portfolio manager for a local investment advisory firm, is planning to sell a portion of his personal investment portfolio to cover the costs of his child's academic tuition. Rose wants to sell a portion of his holdings in Household Products, but his firm recently upgraded the stock to "strong buy." Which of the following describes Rose's options under the Code and Standards?
- A Based on his firm's "buy" recommendation, Rose cannot sell the shares because he would be improperly prospering from the inflated recommendation.
- B Rose is free to sell his personal holdings once his firm is properly informed of his intentions.
- C Rose can sell his personal holdings but only when a client of the firm places an order to buy shares of Household.
- 27 A former hedge fund manager, Jackman, has decided to launch a new private wealth management firm. From his prior experiences, he believes the new firm needs to achieve US\$1 million in assets under management in the first year. Jackman offers a \$10,000 incentive to any adviser who joins his firm with the minimum of \$200,000 in committed investments. Jackman places notice of the opening on several industry web portals and career search sites. Which of the following is *correct* according to the Code and Standards?

- A A member or candidate is eligible for the new position and incentive if he or she can arrange for enough current clients to switch to the new firm and if the member or candidate discloses the incentive fee.
- B A member or candidate may not accept employment with the new firm because Jackman's incentive offer violates the Code and Standards.
- C A member or candidate is not eligible for the new position unless he or she is currently unemployed because soliciting the clients of the member's or candidate's current employer is prohibited.
- 28 Carter works for Invest Today, a local asset management firm. A broker that provides Carter with proprietary research through client brokerage arrangements is offering a new trading service. The broker is offering low-fee, execution-only trades to complement its traditional full-service, execution-and-research trades. To entice Carter and other asset managers to send additional business its way, the broker will apply the commissions paid on the new service toward satisfying the brokerage commitment of the prior full-service arrangements. Carter has always been satisfied with the execution provided on the full-service trades, and the new low-fee trades are comparable to the fees of other brokers currently used for the accounts that prohibit soft dollar arrangements.
- A Carter can trade for his accounts that prohibit soft dollar arrangements under the new low-fee trading scheme.
- B Carter cannot use the new trading scheme because the commissions are prohibited by the soft dollar restrictions of the accounts.
- C Carter should trade only through the new low-fee scheme and should increase his trading volume to meet his required commission commitment.
- 29 Rule has worked as a portfolio manager for a large investment management firm for the past 10 years. Rule earned his CFA charter last year and has decided to open his own investment management firm. After leaving his current employer, Rule creates some marketing material for his new firm. He states in the material, "In earning the CFA charter, a highly regarded credential in the investment management industry, I further enhanced the portfolio management skills learned during my professional career. While completing the examination process in three consecutive years, I consistently received the highest possible scores on the topics of Ethics, Alternative Investments, and Portfolio Management." Has Rule violated Standard VII(B)—Reference to CFA Institute, the CFA Designation, and the CFA Program in his marketing material?
- A Rule violated Standard VII(B) in stating that he completed the exams in three consecutive years.
- B Rule violated Standard VII(B) in stating that he received the highest scores in the topics of Ethics, Alternative Investments, and Portfolio Management.
- C Rule did not violate Standard VII(B).
- 30 Stafford is a portfolio manager for a specialized real estate mutual fund. Her firm clearly describes in the fund's prospectus its soft dollar policies. Stafford decides that entering the CFA Program will enhance her investment decision-making skill and decides to use the fund's soft dollar account to pay the registration and exam fees for the CFA Program. Which of the following statements is *most likely* correct?
- A Stafford did not violate the Code and Standards because the prospectus informed investors of the fund's soft dollar policies.
- B Stafford violated the Code and Standards because improving her investment skills is not a reasonable use of the soft dollar account.

- C Stafford violated the Code and Standards because the CFA Program does not meet the definition of research allowed to be purchased with brokerage commissions.
- 31 Long has been asked to be the keynote speaker at an upcoming investment conference. The event is being hosted by one of the third-party investment managers currently used by his pension fund. The manager offers to cover all conference and travel costs for Long and make the conference registrations free for three additional members of his investment management team. To ensure that the conference obtains the best speakers, the host firm has arranged for an exclusive golf outing for the day following the conference on a local championship-caliber course. Which of the following is *least likely* to violate Standard I(B)?
- A Long may accept only the offer to have his conference-related expenses paid by the host firm.
- B Long may accept the offer to have his conference-related expenses paid and may attend the exclusive golf outing at the expense of the hosting firm.
- C Long may accept the entire package of incentives offered to speak at this conference.
- 32 Andrews, a private wealth manager, is conducting interviews for a new research analyst for his firm. One of the candidates is Wright, an analyst with a local investment bank. During the interview, while Wright is describing his analytical skills, he mentions a current merger in which his firm is acting as the adviser. Andrews has heard rumors of a possible merger between the two companies, but no releases have been made by the companies concerned. Which of the following actions by Andrews is *least likely* a violation of the Code and Standards?
- A Waiting until the next day before trading on the information to allow time for it to become public.
- B Notifying all investment managers in his firm of the new information so none of their clients are disadvantaged.
- C Placing the securities mentioned as part of the merger on the firm's restricted trading list.
- 33 Pietro, president of Local Bank, has hired the bank's market maker, Vogt, to seek a merger partner. Local is currently not listed on a stock exchange and has not reported that it is seeking strategic alternatives. Vogt has discussed the possibility of a merger with several firms, but they have all decided to wait until after the next period's financial data are available. The potential buyers believe the results will be worse than the results of prior periods and will allow them to pay less for Local Bank.
- Pietro wants to increase the likelihood of structuring a merger deal quickly. Which of the following actions would *most likely* be a violation of the Code and Standards?
- A Pietro could instruct Local Bank to issue a press release announcing that it has retained Vogt to find a merger partner.
- B Pietro could place a buy order for 2,000 shares (or four times the average weekly volume) through Vogt for his personal account.
- C After confirming with Local's chief financial officer, Pietro could instruct Local to issue a press release reaffirming the firm's prior announced earnings guidance for the full fiscal year.
- 34 ABC Investment Management acquires a new, very large account with two concentrated positions. The firm's current policy is to add new accounts for the purpose of performance calculation after the first full month of management.

Cupp is responsible for calculating the firm's performance returns. Before the end of the initial month, Cupp notices that one of the significant holdings of the new accounts is acquired by another company, causing the value of the investment to double. Because of this holding, Cupp decides to account for the new portfolio as of the date of transfer, thereby allowing ABC Investment to reap the positive impact of that month's portfolio return.

- A Cupp did not violate the Code and Standards because the GIPS standards allow composites to be updated on the date of large external cash flows.
 - B Cupp did not violate the Code and Standards because companies are allowed to determine when to incorporate new accounts into their composite calculation.
 - C Cupp violated the Code and Standards because the inclusion of the new account produces an inaccurate calculation of the monthly results according to the firm's stated policies.
- 35 Cannan has been working from home on weekends and occasionally saves correspondence with clients and completed work on her home computer. Because of worsening market conditions, Cannan is one of several employees released by her firm. While Cannan is looking for a new job, she uses the files she saved at home to request letters of recommendation from former clients. She also provides to prospective clients some of the reports as examples of her abilities.
- A Cannan violated the Code and Standards because she did not receive permission from her former employer to keep or use the files after her employment ended.
 - B Cannan did not violate the Code and Standards because the files were created and saved on her own time and computer.
 - C Cannan violated the Code and Standards because she is prohibited from saving files on her home computer.
- 36 Quinn sat for the Level III CFA exam this past weekend. He updates his resume with the following statement: "In finishing the CFA Program, I improved my skills related to researching investments and managing portfolios. I will be eligible for the CFA charter upon completion of the required work experience."
- A Quinn violated the Code and Standards by claiming he improved his skills through the CFA Program.
 - B Quinn violated the Code and Standards by incorrectly stating that he is eligible for the CFA charter.
 - C Quinn did not violate the Code and Standards with his resume update.
- 37 During a round of golf, Rodriguez, chief financial officer of Mega Retail, mentions to Hart, a local investment adviser and long-time personal friend, that Mega is having an exceptional sales quarter. Rodriguez expects the results to be almost 10% above the current estimates. The next day, Hart initiates the purchase of a large stake in the local exchange-traded retail fund for her personal account.
- A Hart violated the Code and Standards by investing in the exchange-traded fund that included Mega Retail.
 - B Hart did not violate the Code and Standards because she did not invest directly in securities of Mega Retail.
 - C Rodriguez did not violate the Code and Standards because the comments made to Hart were not intended to solicit an investment in Mega Retail.

- 38** Park is very frustrated after taking her Level II exam. While she was studying for the exam, to supplement the curriculum provided, she ordered and used study material from a third-party provider. Park believes the additional material focused her attention on specific topic areas that were not tested while ignoring other areas. She posts the following statement on the provider's discussion board: "I am very dissatisfied with your firm's CFA Program Level II material. I found the exam extremely difficult and myself unprepared for specific questions after using your product. How could your service provide such limited instructional resources on the analysis of inventories and taxes when the exam had multiple questions about them? I will not recommend your products to other candidates."
- A Park violated the Code and Standards by purchasing third-party review material.
- B Park violated the Code and Standards by providing her opinion on the difficulty of the exam.
- C Park violated the Code and Standards by providing specific information on topics tested on the exam.
- 39** Paper was recently terminated as one of a team of five managers of an equity fund. The fund had two value-focused managers and terminated one of them to reduce costs. In a letter sent to prospective employers, Paper presents, with written permission of the firm, the performance history of the fund to demonstrate his past success.
- A Paper did not violate the Code and Standards.
- B Paper violated the Code and Standards by claiming the performance of the entire fund as his own.
- C Paper violated the Code and Standards by including the historical results of his prior employer.
- 40** Townsend was recently appointed to the board of directors of a youth golf program that is the local chapter of a national not-for-profit organization. The program is beginning a new fund-raising campaign to expand the number of annual scholarships it provides. Townsend believes many of her clients make annual donations to charity. The next week in her regular newsletter to all clients, she includes a small section discussing the fund-raising campaign and her position on the organization's board.
- A Townsend did not violate the Code and Standards.
- B Townsend violated the Code and Standards by soliciting donations from her clients through the newsletter.
- C Townsend violated the Code and Standards by not getting approval of the organization before soliciting her clients.

SOLUTIONS

- 1 The correct answer is B. This question involves Standard III(B)–Fair Dealing. Smith disseminated a change in the stock recommendation to his clients but then received a request contrary to that recommendation from a client who probably had not yet received the recommendation. Prior to executing the order, Smith should take additional steps to ensure that the customer has received the change of recommendation. Answer A is incorrect because the client placed the order prior to receiving the recommendation and, therefore, does not have the benefit of Smith's most recent recommendation. Answer C is also incorrect; simply because the client request is contrary to the firm's recommendation does not mean a member can override a direct request by a client. After Smith contacts the client to ensure that the client has received the changed recommendation, if the client still wants to place a buy order for the shares, Smith is obligated to comply with the client's directive.
- 2 The correct answer is C. This question involves Standard III(A)–Loyalty, Prudence, and Care and the specific topic of soft dollars or soft commissions. Answer C is the correct choice because client brokerage commissions may not be directed to pay for the investment manager's operating expenses. Answer B describes how members and candidates should determine how to use brokerage commissions—that is, if the use is in the best interests of clients and is commensurate with the value of the services provided. Answer A describes a practice that is commonly referred to as "directed brokerage." Because brokerage is an asset of the client and is used to benefit the client, not the manager, such practice does not violate a duty of loyalty to the client. Members and candidates are obligated in all situations to disclose to clients their practices in the use of client brokerage commissions.
- 3 The correct answer is C. This question involves Standard VI(A)–Disclosure of Conflicts. The question establishes a conflict of interest in which an analyst, Jamison, is asked to write a research report on a company that is a client of the analyst's employer. In addition, two directors of the company are senior officers of Jamison's employer. Both facts establish that there are conflicts of interest that must be disclosed by Jamison in her research report. Answer B is incorrect because an analyst is not prevented from writing a report simply because of the special relationship the analyst's employer has with the company as long as that relationship is disclosed. Answer A is incorrect because whether or not Jamison expresses any opinions in the report is irrelevant to her duty to disclose a conflict of interest. Not expressing opinions does not relieve the analyst of the responsibility to disclose the special relationships between the two companies.
- 4 The correct answer is C. This question asks about compliance procedures relating to personal investments of members and candidates. The statement in answer C clearly conflicts with the recommended procedures in the *Standards of Practice Handbook*. Employers should compare personal transactions of employees with those of clients on a regular basis regardless of the existence of a requirement by any regulatory organization. Such comparisons ensure that employees' personal trades do not conflict with their duty to their clients, and the comparisons can be conducted in a confidential manner. The statement in answer A does not conflict with the procedures in the *Handbook*. Disclosure of such policies will give full information to clients regarding potential conflicts of interest on the part of those entrusted to manage their money. Answer B is incorrect because firms are encouraged to establish policies whereby employees clear their personal holdings and transactions with their employers.

- 5 The correct answer is B. This question relates to Standard III(A)–Loyalty, Prudence, and Care and Standard III(E)–Preservation of Confidentiality. In this case, the member manages funds of a private endowment. Clients, who are, in this case, the trustees of the fund, must place some trust in members and candidates. Bronson cannot disclose confidential financial information to anyone without the permission of the fund, regardless of whether the disclosure may benefit the fund. Therefore, answer A is incorrect. Answer C is incorrect because Bronson must notify the fund and obtain the fund's permission before publicizing the information.
- 6 The correct answer is C. Under Standard IV(C)–Responsibilities of Supervisors, members and candidates may delegate supervisory duties to subordinates but such delegation does not relieve members or candidates of their supervisory responsibilities. As a result, answer B is incorrect. Moreover, whether or not Miller's subordinates are subject to the Code and Standards is irrelevant to her supervisory responsibilities. Therefore, answer A is incorrect.
- 7 The correct answer is B. This question relates to Standard V(A)–Diligence and Reasonable Basis. The opinion of another financial analyst is not an adequate basis for Willier's action in changing the recommendation. Answer C is thus incorrect. So is answer A because, although it is true that members and candidates must distinguish between facts and opinions in recommendations, the question does not illustrate a violation of that nature. If the opinion overheard by Willier had sparked him to conduct additional research and investigation that justified a change of opinion, then a changed recommendation would be appropriate.
- 8 The correct answer is B. This question relates to Standard I(B)–Independence and Objectivity. When asked to change a recommendation on a company stock to gain business for the firm, the head of the brokerage unit must refuse in order to maintain his independence and objectivity in making recommendations. He must not yield to pressure by the firm's investment banking department. To avoid the appearance of a conflict of interest, the firm should discontinue issuing recommendations about the company. Answer A is incorrect; changing the recommendation in any manner that is contrary to the analyst's opinion violates the duty to maintain independence and objectivity. Answer C is incorrect because merely assigning a new analyst to decide whether the stock deserves a higher rating will not address the conflict of interest.
- 9 The correct answer is A. Standard VII(B)–Reference to CFA Institute, the CFA Designation, and the CFA Program is the subject of this question. The reference on Albert's business card implies that there is a "CFA Level II" designation; Tye merely indicates in promotional material that he is participating in the CFA Program and has completed Levels I and II. Candidates may not imply that there is some sort of partial designation earned after passing a level of the CFA exam. Therefore, Albert has violated Standard VII(B). Candidates may communicate that they are participating in the CFA Program, however, and may state the levels that they have completed. Therefore, Tye has not violated Standard VII(B).
- 10 The correct answer is B. This question relates to Standard V(B)–Communication with Clients and Prospective Clients. Scott has issued a research report stating that he expects the price of Walkton Industries stock to rise by US\$8 a share "because the dividend will increase" by US\$1.50 per share. He has made this statement knowing that the dividend will increase only if Congress enacts certain legislation, an uncertain prospect. By stating that the dividend will increase, Scott failed to separate fact from opinion.

The information regarding passage of legislation is not material nonpublic information because it is conjecture, and the question does not state whether the US representative gave Scott her opinion on the passage of the legislation in confidence. She could have been offering this opinion to anyone who asked. Therefore, statement A is incorrect. It may be acceptable to base a recommendation, in part, on an expectation of future events, even though they may be uncertain. Therefore, answer C is incorrect.

- 11 The correct answer is C. This question, which relates to Standard III(B)–Fair Dealing, tests the knowledge of the procedures that will assist members and candidates in treating clients fairly when making investment recommendations. The step listed in C will help ensure the fair treatment of clients. Answer A may have negative effects on the fair treatment of clients. The more people who know about a pending change, the greater the chance that someone will inform some clients before the information's release. The firm should establish policies that limit the number of people who are aware in advance that a recommendation is to be disseminated. Answer B, distributing recommendations to institutional clients before distributing them to individual accounts, discriminates among clients on the basis of size and class of assets and is a violation of Standard III(B).
- 12 The correct answer is B. This question deals with Standard II(A)–Material Nonpublic Information. The mosaic theory states that an analyst may use material public information and nonmaterial nonpublic information in creating a larger picture than shown by any individual piece of information and the conclusions the analyst reaches become material only after the pieces are assembled. Answers A and C are accurate statements relating to the Code and Standards but do not describe the mosaic theory.
- 13 The correct answer is C. This question involves Standard IV(B)–Additional Compensation Arrangements. The arrangement described in the question—whereby Jurgen would be compensated beyond the compensation provided by her firm, on the basis of an account's performance—is not a violation of the Standards as long as Jurgen discloses the arrangement in writing to her employer and obtains permission from her employer prior to entering into the arrangement. Answers A and B are incorrect; although the private compensation arrangement could conflict with the interests of other clients and lead to short-term performance pressures, members and candidates may enter into such agreements as long as they have disclosed the arrangements to their employer and obtained permission for the arrangement from their employer.
- 14 The correct answer is B. This question relates to Standard III(A)–Loyalty, Prudence, and Care—specifically, a member's or candidate's responsibility for voting proxies and the use of client brokerage. According to the facts stated in the question, Farnsworth did not violate Standard III(A). Although the company president asked Farnsworth to vote the shares of the Jones Corporation profit-sharing plan a certain way, Farnsworth investigated the issue and concluded, independently, the best way to vote. Therefore, even though his decision coincided with the wishes of the company president, Farnsworth is not in violation of his responsibility to be loyal and to provide care to his clients. In this case, the participants and the beneficiaries of the profit-sharing plan are the clients, not the company's management. Had Farnsworth not investigated the issue or had he yielded to the president's wishes and voted for a slate of directors that he had determined was not in the best interest of the company, Farnsworth would have violated his responsibilities to the beneficiaries of the plan. In addition, because the brokerage firm provides the lowest commissions and best execution for securities transactions, Farnsworth has met his obligations to the client

in using this brokerage firm. It does not matter that the brokerage firm also provides research information that is not useful for the account generating the commission because Farnsworth is not paying extra money of the client's for that information.

- 15 The correct answer is A. In this question, Brown is providing investment recommendations before making inquiries about the client's financial situation, investment experience, or investment objectives. Brown is thus violating Standard III(C)–Suitability. Answers B and C provide examples of information members and candidates should discuss with their clients at the outset of the relationship, but these answers do not constitute a complete list of those factors. Answer A is the best answer.
- 16 The correct answer is C. This question involves Standard I(C)–Misrepresentation. Statement I is a factual statement that discloses to clients and prospects accurate information about the terms of the investment instrument. Statement II, which guarantees a specific rate of return for a mutual fund, is an opinion stated as a fact and, therefore, violates Standard I(C). If statement II were rephrased to include a qualifying statement, such as “in my opinion, investors may earn . . .,” it would not be in violation of the Standards.
- 17 The correct answer is A. This question involves three of the Standards. Anderb, the portfolio manager, has been obtaining more favorable prices for her personal securities transactions than she gets for her clients, which is a breach of Standard III(A)–Loyalty, Prudence, and Care. In addition, she violated Standard I(D)–Misconduct by failing to adhere to company policy and by hiding her personal transactions from her firm. Anderb's supervisor, Bates, violated Standard IV(C)–Responsibilities of Supervisors; although the company had requirements for reporting personal trading, Bates failed to adequately enforce those requirements. Answer B does not represent a violation because Standard VI(B)–Priority of Transactions requires that personal trading in a security be conducted after the trading in that security of clients and the employer. The Code and Standards do not prohibit owning such investments, although firms may establish policies that limit the investment opportunities of members and candidates. Answer C does not represent a violation because the Code and Standards do not contain a prohibition against employees using the same broker for their personal accounts that they use for their client accounts. This arrangement should be disclosed to the employer so that the employer may determine whether a conflict of interest exists.
- 18 The correct answer is A because this question relates to Standard I(A)–Knowledge of the Law—specifically, global application of the Code and Standards. Members and candidates who practice in multiple jurisdictions may be subject to various securities laws and regulations. If applicable law is more strict than the requirements of the Code and Standards, members and candidates must adhere to applicable law; otherwise, members and candidates must adhere to the Code and Standards. Therefore, answer A is correct. Answer B is incorrect because members and candidates must adhere to the higher standard set by the Code and Standards if local applicable law is less strict. Answer C is incorrect because when no applicable law exists, members and candidates are required to adhere to the Code and Standards, and the Code and Standards prohibit the use of material nonpublic information.
- 19 The correct answer is B. The best course of action under Standard I(B)–Independence and Objectivity is to avoid a conflict of interest whenever possible. Therefore, for Ward to pay for all his expenses is the correct answer. Answer C details a course of action in which the conflict would be disclosed, but the solution is not as appropriate as avoiding the conflict of interest.

Answer A would not be the best course because it would not remove the appearance of a conflict of interest; even though the report would not be affected by the reimbursement of expenses, it could appear to be.

- 20 The correct answer is B. Under Standard IV(A)–Loyalty, members and candidates may undertake independent practice that may result in compensation or other benefit in competition with their employer as long as they obtain consent from their employer. Answer C is not consistent with the Standards because the Standards allow members and candidates to make arrangements or preparations to go into competitive business as long as those arrangements do not interfere with their duty to their current employer. Answer A is not consistent with the Standards because the Standards do not include a complete prohibition against undertaking independent practice.
- 21 The correct answer is B. This question involves Standard VI(A)–Disclosure of Conflicts—specifically, the holdings of an analyst’s employer in company stock. Answers A and C do not describe conflicts of interest that Smith would have to disclose. Answer A describes the use of a firm’s products, which would not be a required disclosure. In answer C, the relationship between the analyst and the company through a relative is so tangential that it does not create a conflict of interest necessitating disclosure.
- 22 The correct answer is C. This question relates to Standard I(C)–Misrepresentation. Although Michelieu’s statement about the total return of his clients’ accounts on average may be technically true, it is misleading because the majority of the gain resulted from one client’s large position taken against Michelieu’s advice. Therefore, this statement misrepresents the investment performance the member is responsible for. He has not taken steps to present a fair, accurate, and complete presentation of performance. Answer B is thus incorrect. Answer A is incorrect because although Michelieu is not guaranteeing future results, his words are still a misrepresentation of his performance history.
- 23 The correct answer is B. The best policy to prevent violation of Standard II(A)–Material Nonpublic Information is the establishment of firewalls in a firm to prevent exchange of insider information. The physical and informational barrier of a firewall between the investment banking department and the brokerage operation prevents the investment banking department from providing information to analysts on the brokerage side who may be writing recommendations on a company stock. Prohibiting recommendations of the stock of companies that are clients of the investment banking department is an alternative, but answer A states that this prohibition would be permanent, which is not the best answer. Once an offering is complete and the material nonpublic information obtained by the investment banking department becomes public, resuming publishing recommendations on the stock is not a violation of the Code and Standards because the information of the investment banking department no longer gives the brokerage operation an advantage in writing the report. Answer C is incorrect because no exchange of information should be occurring between the investment banking department and the brokerage operation, so monitoring of such exchanges is not an effective compliance procedure for preventing the use of material nonpublic information.
- 24 The correct answer is B. Under Standard III(A)–Loyalty, Prudence, and Care, members and candidates who manage a company’s pension fund owe these duties to the participants and beneficiaries of the pension plan, not the management of the company or the company’s shareholders.

- 25 The correct answer is B. Answer B gives one of the two primary reasons listed in the *Handbook* for disclosing referral fees to clients under Standard VI(C)–Referral Fees. (The other is to allow clients and employers to evaluate the full cost of the services.) Answer A is incorrect because Standard VI(C) does not require members or candidates to discount their fees when they receive referral fees. Answer C is inconsistent with Standard VI(C) because disclosure of referral fees, to be effective, should be made to prospective clients before entering into a formal client relationship with them.
- 26 The correct answer is B. Standard VI(B)–Priority of Transactions does not limit transactions of company employees that differ from current recommendations as long as the sale does not disadvantage current clients. Thus, answer A is incorrect. Answer C is incorrect because the Standard does not require the matching of personal and client trades.
- 27 Answer C is correct. Standard IV(A)–Loyalty discusses activities permissible to members and candidates when they are leaving their current employer; soliciting clients is strictly prohibited. Thus, answer A is inconsistent with the Code and Standards even with the required disclosure. Answer B is incorrect because the offer does not directly violate the Code and Standards. There may be out-of-work members and candidates who can arrange the necessary commitments without violating the Code and Standards.
- 28 Answer A is correct. The question relates to Standard III(A)–Loyalty, Prudence, and Care. Carter believes the broker offers effective execution at a fee that is comparable with those of other brokers, so he is free to use the broker for all accounts. Answer B is incorrect because the accounts that prohibit soft dollar arrangements do not want to fund the purchase of research by Carter. The new trading scheme does not incur additional commissions from clients, so it would not go against the prohibitions. Answer C is incorrect because Carter should not incur unnecessary or excessive “churning” of the portfolios (excessive trading) for the purpose of meeting the brokerage commitments of soft dollar arrangements.
- 29 Answer B is correct according to Standard VII(B)–Reference to CFA Institute, the CFA Designation, and the CFA Program. CFA Program candidates do not receive their actual scores on the exam. Topic and subtopic results are grouped into three broad categories, and the exam is graded only as “pass” or “fail.” Although a candidate may have achieved a topical score of “above 70%,” she or he cannot factually state that she or he received the highest possible score because that information is not reported. Thus, answer C is incorrect. Answer A is incorrect as long as the member or candidate actually completed the exams consecutively. Standard VII(B) does not prohibit the communication of factual information about completing the CFA Program in three consecutive years.
- 30 Answer C is correct. According to Standard III(A)–Loyalty, Prudence, and Care, the CFA Program would be considered a personal or firm expense and should not be paid for with the fund’s brokerage commissions. Soft dollar accounts should be used only to purchase research services that directly assist the investment manager in the investment decision-making process, not to assist the management of the firm or to further education. Thus, answer A is incorrect. Answer B is incorrect because the reasonableness of how the money is used is not an issue; the issue is that educational expense is not research.
- 31 Answer A is correct. Standard I(B)–Independence and Objectivity emphasizes the need for members and candidates to maintain their independence and objectivity. Best practices dictate that firms adopt a strict policy not to accept compensation for travel arrangements. At times, however, accepting paid

travel would not compromise one's independence and objectivity. Answers B and C are incorrect because the added benefits—free conference admission for additional staff members and an exclusive golf retreat for the speaker—could be viewed as inducements related to the firm's working arrangements and not solely related to the speaking engagement. Should Long wish to bring other team members or participate in the golf outing, he or his firm should be responsible for the associated fees.

- 32** Answer C is correct. The guidance to Standard II(A)—Material Nonpublic Information recommends adding securities to the firm's restricted list when the firm has or may have material nonpublic information. By adding these securities to this list, Andrews would uphold this standard. Because waiting until the next day will not ensure that news of the merger is made public, answer A is incorrect. Negotiations may take much longer between the two companies, and the merger may never happen. Andrews must wait until the information is disseminated to the market before he trades on that information. Answer B is incorrect because Andrews should not disclose the information to other managers; no trading is allowed on material nonpublic information.
- 33** Answer B is correct. Through placing a personal purchase order that is significantly greater than the average volume, Pietro is violating Standard IIB—Market Manipulation. He is attempting to manipulate an increase in the share price and thus bring a buyer to the negotiating table. The news of a possible merger and confirmation of the firm's earnings guidance may also have positive effects on the price of Local Bank, but Pietro's actions in instructing the release of the information does not represent a violation through market manipulation. Announcements of this nature are common and practical to keep investors informed. Thus, answers A and C are incorrect.
- 34** Answer C is correct. Cupp violated Standard III(D)—Performance Presentations when he deviated from the firm's stated policies solely to capture the gain from the holding being acquired. Answer A is incorrect because the firm does not claim GIPS compliance and the GIPS standards require external cash flows to be treated in a consistent manner with the firm's documented policies. Answer B is incorrect because the firm does not state that it is updating its composite policies. If such a change were to occur, all cash flows for the month would have to be reviewed to ensure their consistent treatment under the new policy.
- 35** Answer A is correct. According to Standard V(C)—Record Retention, Cannan needed the permission of her employer to maintain the files at home after her employment ended. Without that permission, she should have deleted the files. All files created as part of a member's or candidate's professional activity are the property of the firm, even those created outside normal work hours. Thus, answer B is incorrect. Answer C is incorrect because the Code and Standards do not prohibit using one's personal computer to complete work for one's employer.
- 36** Answer B is correct. According to Standard VII(B)—Reference to CFA Institute, the CFA Designation, and the CFA Program, Quinn cannot claim to have finished the CFA Program or be eligible for the CFA charter until he officially learns that he has passed the Level III exam. Until the results for the most recent exam are released, those who sat for the exam should continue to refer to themselves as "candidates." Thus, answer C is incorrect. Answer A is incorrect because members and candidates may discuss areas of practice in which they believe the CFA Program improved their personal skills.

- 37** Answer A is correct. Hart's decision to invest in the retail fund appears directly correlated with Rodriguez's statement about the successful quarter of Mega Retail and thus violates Standard II(A)–Material Nonpublic Information. Rodriguez's information would be considered material because it would influence the share price of Mega Retail and probably influence the price of the entire exchange-traded retail fund. Thus, answer B is incorrect. Answer C is also incorrect because Rodriguez shared information that was both material and nonpublic. Company officers regularly have such knowledge about their firms, which is not a violation. The sharing of such information, however, even in a conversation between friends, does violate Standard II(A).
- 38** Answer C is correct. Standard VII(A)–Conduct as Members and Candidates in the CFA Program prohibits providing information to candidates or the public that is considered confidential to the CFA Program. In revealing that questions related to the analysis of inventories and analysis of taxes were on the exam, Park has violated this standard. Answer B is incorrect because the guidance for the standard explicitly acknowledges that members and candidates are allowed to offer their opinions about the CFA Program. Answer A is incorrect because candidates are not prohibited from using outside resources.
- 39** Answer B is correct. Paper has violated Standard III(D)–Performance Presentation by not disclosing that he was part of a team of managers that achieved the results shown. If he had also included the return of the portion he directly managed, he would not have violated the standard. Thus, answer A is incorrect. Answer C is incorrect because Paper received written permission from his prior employer to include the results.
- 40** Answer A is correct. Townsend has not provided any information about her clients to the leaders or managers of the golf program; thus, she has not violated Standard III(E)–Preservation of Confidentiality. Providing contact information about her clients for a direct-mail solicitation would have been a violation. Answer B is incorrect because the notice in the newsletter does not violate Standard III(E). Answer C is incorrect because the golf program's fund-raising campaign had already begun, so discussing the opportunity to donate was appropriate.

PRACTICE PROBLEMS

- 1 With respect to the Global Investment Performance Standards, which of the following is one of the nine sections containing investment performance provisions?
 - A Real Estate.
 - B Derivatives.
 - C Legal and Ethical Considerations.
- 2 According to the Fundamentals of Compliance section of the Global Investment Performance Standards, issues that a firm must consider when claiming compliance include all of the following *except*:
 - A replicating performance.
 - B properly defining the firm.
 - C documenting firm policies and procedures used in establishing and maintaining compliance with the Standards.
- 3 G&F Advisors claims compliance with the Global Investment Performance Standards (GIPS) in its marketing materials. The compliant presentation includes a footnote which indicates that the firm has been verified by an independent third party. An additional note states that G&F is in compliance with the GIPS standards except for its private equity investments. It is *likely* that G&F violated the GIPS standards?
 - A No, because the footnotes meet the requirements of the Standards.
 - B No, because the provisions do not apply to the private equity investments.
 - C Yes, because they cannot claim compliance unless all requirements of the Standard are met.

SOLUTIONS

- 1 A is correct. Real Estate is one of the nine sections in the 2010 edition of the GIPS standards. Derivatives and Legal and Ethical Considerations are not sections of the Standards.
- 2 A is correct. Replication of performance is not included in the Fundamentals of Compliance section within the GIPS standards.
- 3 C is correct. Firms must meet all the requirements set forth in the GIPS standards and cannot claim partial compliance.

PRACTICE PROBLEMS

- 1** The table below gives current information on the interest rates for two two-year and two eight-year maturity investments. The table also gives the maturity, liquidity, and default risk characteristics of a new investment possibility (Investment 3). All investments promise only a single payment (a payment at maturity). Assume that premiums relating to inflation, liquidity, and default risk are constant across all time horizons.

Investment	Maturity (in Years)	Liquidity	Default Risk	Interest Rate (%)
1	2	High	Low	2.0
2	2	Low	Low	2.5
3	7	Low	Low	r_3
4	8	High	Low	4.0
5	8	Low	High	6.5

Based on the information in the above table, address the following:

- A** Explain the difference between the interest rates on Investment 1 and Investment 2.
- B** Estimate the default risk premium.
- C** Calculate upper and lower limits for the interest rate on Investment 3, r_3 .
- 2** A couple plans to set aside \$20,000 per year in a conservative portfolio projected to earn 7 percent a year. If they make their first savings contribution one year from now, how much will they have at the end of 20 years?
- 3** Two years from now, a client will receive the first of three annual payments of \$20,000 from a small business project. If she can earn 9 percent annually on her investments and plans to retire in six years, how much will the three business project payments be worth at the time of her retirement?
- 4** To cover the first year's total college tuition payments for his two children, a father will make a \$75,000 payment five years from now. How much will he need to invest today to meet his first tuition goal if the investment earns 6 percent annually?
- 5** A client can choose between receiving 10 annual \$100,000 retirement payments, starting one year from today, or receiving a lump sum today. Knowing that he can invest at a rate of 5 percent annually, he has decided to take the lump sum. What lump sum today will be equivalent to the future annual payments?
- 6** You are considering investing in two different instruments. The first instrument will pay nothing for three years, but then it will pay \$20,000 per year for four years. The second instrument will pay \$20,000 for three years and \$30,000 in the fourth year. All payments are made at year-end. If your required rate of return on these investments is 8 percent annually, what should you be willing to pay for:
 - A** The first instrument?
 - B** The second instrument (use the formula for a four-year annuity)?

- 7 Suppose you plan to send your daughter to college in three years. You expect her to earn two-thirds of her tuition payment in scholarship money, so you estimate that your payments will be \$10,000 a year for four years. To estimate whether you have set aside enough money, you ignore possible inflation in tuition payments and assume that you can earn 8 percent annually on your investments. How much should you set aside now to cover these payments?
- 8 A client plans to send a child to college for four years starting 18 years from now. Having set aside money for tuition, she decides to plan for room and board also. She estimates these costs at \$20,000 per year, payable at the beginning of each year, by the time her child goes to college. If she starts next year and makes 17 payments into a savings account paying 5 percent annually, what annual payments must she make?
- 9 A couple plans to pay their child's college tuition for 4 years starting 18 years from now. The current annual cost of college is C\$7,000, and they expect this cost to rise at an annual rate of 5 percent. In their planning, they assume that they can earn 6 percent annually. How much must they put aside each year, starting next year, if they plan to make 17 equal payments?
- 10 The nominal risk-free rate is *best* described as the sum of the real risk-free rate and a premium for:
- A maturity.
 - B liquidity.
 - C expected inflation.
- 11 Which of the following risk premiums is most relevant in explaining the difference in yields between 30-year bonds issued by the US Treasury and 30-year bonds issued by a small private issuer?
- A Inflation
 - B Maturity
 - C Liquidity
- 12 A bank quotes a stated annual interest rate of 4.00%. If that rate is equal to an effective annual rate of 4.08%, then the bank is compounding interest:
- A daily.
 - B quarterly.
 - C semiannually.
- 13 The value in six years of \$75,000 invested today at a stated annual interest rate of 7% compounded quarterly is *closest* to:
- A \$112,555.
 - B \$113,330.
 - C \$113,733.
- 14 A client requires £100,000 one year from now. If the stated annual rate is 2.50% compounded weekly, the deposit needed today is *closest* to:
- A £97,500.
 - B £97,532.
 - C £97,561.
- 15 For a lump sum investment of ¥250,000 invested at a stated annual rate of 3% compounded daily, the number of months needed to grow the sum to ¥1,000,000 is *closest* to:
- A 555.
 - B 563.

C 576.

- 16** Given a €1,000,000 investment for four years with a stated annual rate of 3% compounded continuously, the difference in its interest earnings compared with the same investment compounded daily is *closest* to:

A €1.
B €6.
C €455.

- 17** An investment pays €300 annually for five years, with the first payment occurring today. The present value (PV) of the investment discounted at a 4% annual rate is *closest* to:

A €1,336.
B €1,389.
C €1,625.

- 18** A perpetual preferred stock makes its first quarterly dividend payment of \$2.00 in five quarters. If the required annual rate of return is 6% compounded quarterly, the stock's present value is *closest* to:

A \$31.
B \$126.
C \$133.

- 19** A saver deposits the following amounts in an account paying a stated annual rate of 4%, compounded semiannually:

Year	End of Year Deposits (\$)
1	4,000
2	8,000
3	7,000
4	10,000

At the end of Year 4, the value of the account is *closest* to:

A \$30,432
B \$30,447
C \$31,677

- 20** An investment of €500,000 today that grows to €800,000 after six years has a stated annual interest rate *closest* to:

A 7.5% compounded continuously.
B 7.7% compounded daily.
C 8.0% compounded semiannually.

- 21** A sweepstakes winner may select either a perpetuity of £2,000 a month beginning with the first payment in one month or an immediate lump sum payment of £350,000. If the annual discount rate is 6% compounded monthly, the present value of the perpetuity is:

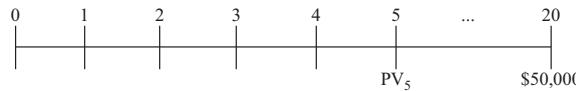
A less than the lump sum.
B equal to the lump sum.
C greater than the lump sum.

- 22** At a 5% interest rate per year compounded annually, the present value (PV) of a 10-year ordinary annuity with annual payments of \$2,000 is \$15,443.47. The PV of a 10-year annuity due with the same interest rate and payments is *closest* to:

- A \$14,708.
 B \$16,216.
 C \$17,443.
- 23** Grandparents are funding a newborn's future university tuition costs, estimated at \$50,000/year for four years, with the first payment due as a lump sum in 18 years. Assuming a 6% effective annual rate, the required deposit today is *closest* to:
 A \$60,699.
 B \$64,341.
 C \$68,201.
- 24** The present value (PV) of an investment with the following year-end cash flows (CF) and a 12% required annual rate of return is *closest* to:

Year	Cash Flow (€)
1	100,000
2	150,000
5	-10,000

- A €201,747.
 B €203,191.
 C €227,573.
- 25** A sports car, purchased for £200,000, is financed for five years at an annual rate of 6% compounded monthly. If the first payment is due in one month, the monthly payment is *closest* to:
 A £3,847.
 B £3,867.
 C £3,957.
- 26** Given a stated annual interest rate of 6% compounded quarterly, the level amount that, deposited quarterly, will grow to £25,000 at the end of 10 years is *closest* to:
 A £461.
 B £474.
 C £836.
- 27** Given the following timeline and a discount rate of 4% a year compounded annually, the present value (PV), as of the end of Year 5 (PV_5), of the cash flow received at the end of Year 20 is *closest* to:



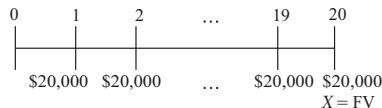
- A \$22,819.
 B \$27,763.
 C \$28,873.
- 28** A client invests €20,000 in a four-year certificate of deposit (CD) that annually pays interest of 3.5%. The annual CD interest payments are automatically reinvested in a separate savings account at a stated annual interest rate of 2% compounded monthly. At maturity, the value of the combined asset is *closest* to:

- A €21,670.
- B €22,890.
- C €22,950.

SOLUTIONS

- 1 A** Investment 2 is identical to Investment 1 except that Investment 2 has low liquidity. The difference between the interest rate on Investment 2 and Investment 1 is 0.5 percentage point. This amount represents the liquidity premium, which represents compensation for the risk of loss relative to an investment's fair value if the investment needs to be converted to cash quickly.
- B** To estimate the default risk premium, find the two investments that have the same maturity but different levels of default risk. Both Investments 4 and 5 have a maturity of eight years. Investment 5, however, has low liquidity and thus bears a liquidity premium. The difference between the interest rates of Investments 5 and 4 is 2.5 percentage points. The liquidity premium is 0.5 percentage point (from Part A). This leaves $2.5 - 0.5 = 2.0$ percentage points that must represent a default risk premium reflecting Investment 5's high default risk.
- C** Investment 3 has liquidity risk and default risk comparable to Investment 2, but with its longer time to maturity, Investment 3 should have a higher maturity premium. The interest rate on Investment 3, r_3 , should thus be above 2.5 percent (the interest rate on Investment 2). If the liquidity of Investment 3 were high, Investment 3 would match Investment 4 except for Investment 3's shorter maturity. We would then conclude that Investment 3's interest rate should be less than the interest rate on Investment 4, which is 4 percent. In contrast to Investment 4, however, Investment 3 has low liquidity. It is possible that the interest rate on Investment 3 exceeds that of Investment 4 despite 3's shorter maturity, depending on the relative size of the liquidity and maturity premiums. However, we expect r_3 to be less than 4.5 percent, the expected interest rate on Investment 4 if it had low liquidity. Thus $2.5\% < r_3 < 4.5\%$.

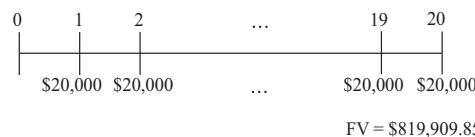
- 2 i.** Draw a time line.



ii. Identify the problem as the future value of an annuity.

iii. Use the formula for the future value of an annuity.

$$\begin{aligned} FV_N &= A \left[\frac{(1 + r)^N - 1}{r} \right] \\ &= \$20,000 \left[\frac{(1 + 0.07)^{20} - 1}{0.07} \right] \\ &= \$819,909.85 \end{aligned}$$



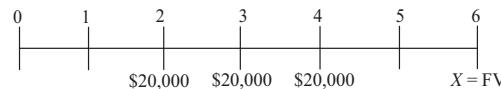
- iv. Alternatively, use a financial calculator.

Notation Used on Most Calculators	Numerical Value for This Problem
<i>N</i>	20
<i>%i</i>	7
<i>PV</i>	n/a (= 0)
FV compute	<i>X</i>
<i>PMT</i>	\$20,000

Enter 20 for *N*, the number of periods. Enter 7 for the interest rate and 20,000 for the payment size. The present value is not needed, so enter 0. Calculate the future value. Verify that you get \$819,909.85 to make sure you have mastered your calculator's keystrokes.

In summary, if the couple sets aside \$20,000 each year (starting next year), they will have \$819,909.85 in 20 years if they earn 7 percent annually.

- 3 i. Draw a time line.



- ii. Recognize the problem as the future value of a delayed annuity. Delaying the payments requires two calculations.
iii. Use the formula for the future value of an annuity (Equation 7).

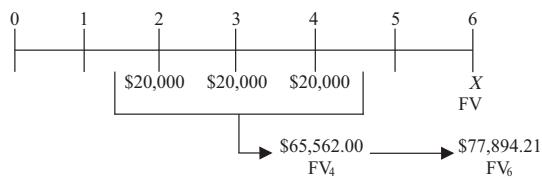
$$FV_N = A \left[\frac{(1 + r)^N - 1}{r} \right]$$

to bring the three \$20,000 payments to an equivalent lump sum of \$65,562.00 four years from today.

Notation Used on Most Calculators	Numerical Value for This Problem
<i>N</i>	3
<i>%i</i>	9
<i>PV</i>	n/a (= 0)
FV compute	<i>X</i>
<i>PMT</i>	\$20,000

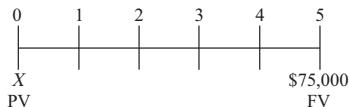
- iv. Use the formula for the future value of a lump sum (Equation 2), $FV_N = PV(1 + r)^N$, to bring the single lump sum of \$65,562.00 to an equivalent lump sum of \$77,894.21 six years from today.

Notation Used on Most Calculators	Numerical Value for This Problem
<i>N</i>	2
<i>%i</i>	9
<i>PV</i>	\$65,562.00
FV compute	<i>X</i>
<i>PMT</i>	n/a (= 0)



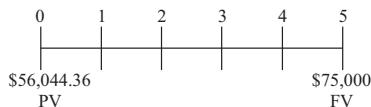
In summary, your client will have \$77,894.21 in six years if she receives three yearly payments of \$20,000 starting in Year 2 and can earn 9 percent annually on her investments.

- 4** **i.** Draw a time line.



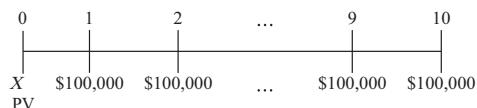
- ii.** Identify the problem as the present value of a lump sum.
iii. Use the formula for the present value of a lump sum.

$$\begin{aligned} PV &= FV_N(1 + r)^{-N} \\ &= \$75,000(1 + 0.06)^{-5} \\ &= \$56,044.36 \end{aligned}$$



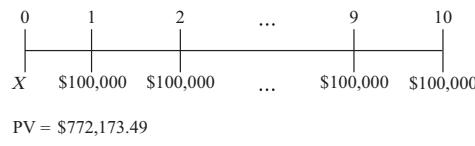
In summary, the father will need to invest \$56,044.36 today in order to have \$75,000 in five years if his investments earn 6 percent annually.

- 5** **i.** Draw a time line for the 10 annual payments.



- ii.** Identify the problem as the present value of an annuity.
iii. Use the formula for the present value of an annuity.

$$\begin{aligned} PV &= A \left[\frac{1 - \frac{1}{(1 + r)^N}}{r} \right] \\ &= \$100,000 \left[\frac{1 - \frac{1}{(1 + 0.05)^{10}}}{0.05} \right] \\ &= \$772,173.49 \end{aligned}$$



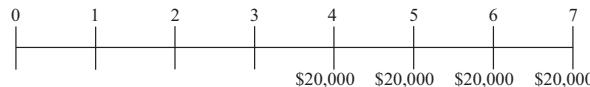
iv. Alternatively, use a financial calculator.

Notation Used on Most Calculators	Numerical Value for This Problem
<i>N</i>	10
<i>%i</i>	5
PV compute	<i>X</i>
FV	n/a (= 0)
PMT	\$100,000

In summary, the present value of 10 payments of \$100,000 is \$772,173.49 if the first payment is received in one year and the rate is 5 percent compounded annually. Your client should accept no less than this amount for his lump sum payment.

6 A To evaluate the first instrument, take the following steps:

i. Draw a time line.



ii.

$$\begin{aligned} PV_3 &= A \left[\frac{1 - \frac{1}{(1+r)^N}}{r} \right] \\ &= \$20,000 \left[\frac{1 - \frac{1}{(1+0.08)^4}}{0.08} \right] \\ &= \$66,242.54 \end{aligned}$$

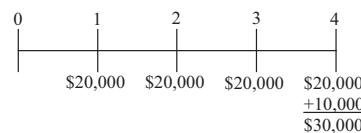
iii.

$$PV_0 = \frac{PV_3}{(1+r)^N} = \frac{\$66,242.54}{1.08^3} = \$52,585.46$$

You should be willing to pay \$52,585.46 for this instrument.

B To evaluate the second instrument, take the following steps:

i. Draw a time line.



The time line shows that this instrument can be analyzed as an ordinary annuity of \$20,000 with four payments (valued in Step ii below) and a \$10,000 payment to be received at $t = 4$ (valued in Step iii below).

ii.

$$\begin{aligned} PV &= A \left[\frac{1 - \frac{1}{(1+r)^N}}{r} \right] \\ &= \$20,000 \left[\frac{1 - \frac{1}{(1+0.08)^4}}{0.08} \right] \\ &= \$66,242.54 \end{aligned}$$

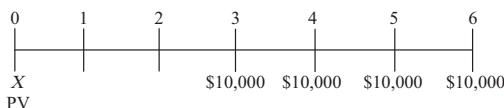
iii.

$$PV = \frac{FV_4}{(1+r)^N} = \frac{\$10,000}{(1+0.08)^4} = \$7,350.30$$

iv. Total = \$66,242.54 + \$7,350.30 = \$73,592.84

You should be willing to pay \$73,592.84 for this instrument.

7 i. Draw a time line.



ii. Recognize the problem as a delayed annuity. Delaying the payments requires two calculations.

iii. Use the formula for the present value of an annuity (Equation 11).

$$PV = A \left[\frac{1 - \frac{1}{(1+r)^N}}{r} \right]$$

to bring the four payments of \$10,000 back to a single equivalent lump sum of \$33,121.27 at $t = 2$. Note that we use $t = 2$ because the first annuity payment is then one period away, giving an ordinary annuity.

Notation Used on Most Calculators	Numerical Value for This Problem
N	4
$%i$	8
PV compute	X
PMT	\$10,000

iv. Then use the formula for the present value of a lump sum (Equation 8), $PV = FV_N(1+r)^{-N}$, to bring back the single payment of \$33,121.27 (at $t = 2$) to an equivalent single payment of \$28,396.15 (at $t = 0$).

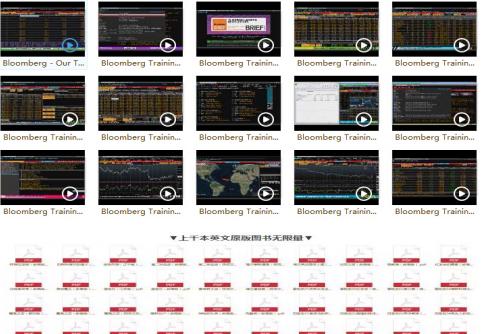
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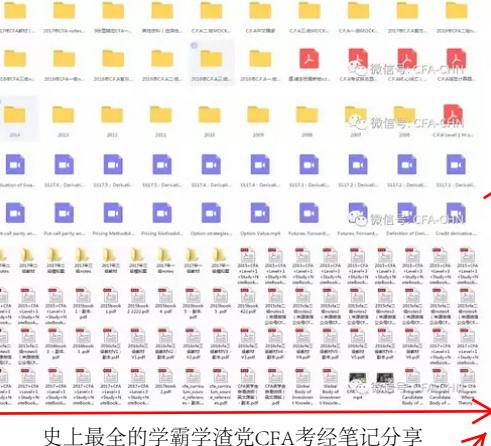
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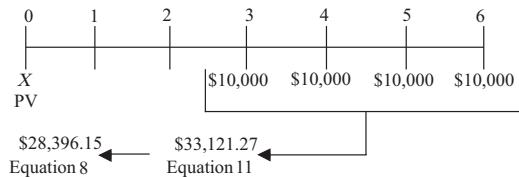


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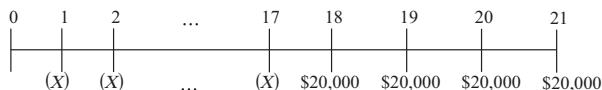
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Notation Used on Most Calculators	Numerical Value for This Problem
<i>N</i>	2
<i>%i</i>	8
PV compute	<i>X</i>
FV	\$33,121.27
PMT	n/a (= 0)



In summary, you should set aside \$28,396.15 today to cover four payments of \$10,000 starting in three years if your investments earn a rate of 8 percent annually.

- 8 i. Draw a time line.



- ii. Recognize that you need to equate the values of two annuities.
 iii. Equate the value of the four \$20,000 payments to a single payment in Period 17 using the formula for the present value of an annuity (Equation 11), with $r = 0.05$. The present value of the college costs as of $t = 17$ is \$70,919.

$$PV = \$20,000 \left[\frac{1 - \frac{1}{(1.05)^4}}{0.05} \right] = \$70,919$$

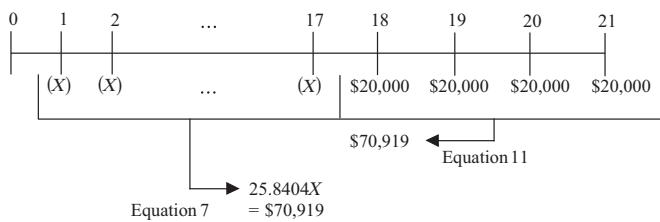
Notation Used on Most Calculators	Numerical Value for This Problem
<i>N</i>	4
<i>%i</i>	5
PV compute	<i>X</i>
FV	n/a (= 0)
PMT	\$20,000

- iv. Equate the value of the 17 investments of X to the amount calculated in Step iii, college costs as of $t = 17$, using the formula for the future value of an annuity (Equation 7). Then solve for X .

$$\$70,919 = \left[\frac{(1.05)^{17} - 1}{0.05} \right] = 25.840366X$$

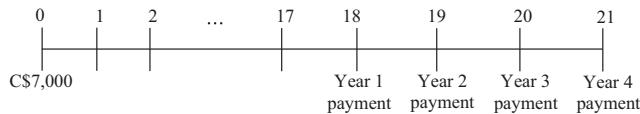
$$X = \$2,744.50$$

Notation Used on Most Calculators	Numerical Value for This Problem
N	17
$\%i$	5
PV	n/a (= 0)
FV	\$70,919
PMT compute	X

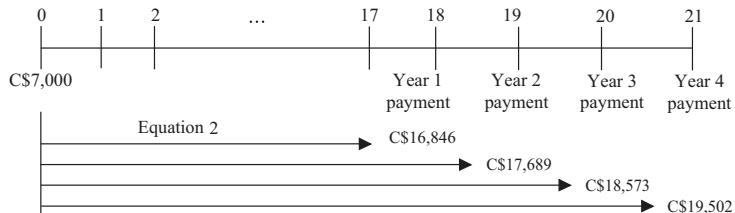


In summary, your client will have to save \$2,744.50 each year if she starts next year and makes 17 payments into a savings account paying 5 percent annually.

- 9 i. Draw a time line.



- ii. Recognize that the payments in Years 18, 19, 20, and 21 are the future values of a lump sum of C\$7,000 in Year 0.
 iii. With $r = 5\%$, use the formula for the future value of a lump sum (Equation 2), $FV_N = PV(1 + r)^N$, four times to find the payments. These future values are shown on the time line below.

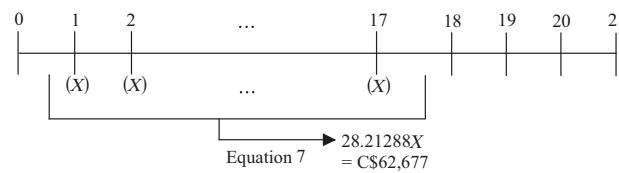


- iv. Using the formula for the present value of a lump sum ($r = 6\%$), equate the four college payments to single payments as of $t = 17$ and add them together.
 $C\$16,846(1.06)^{-1} + C\$17,689(1.06)^{-2} + C\$18,573(1.06)^{-3} + C\$19,502(1.06)^{-4} = C\$62,677$
 v. Equate the sum of C\$62,677 at $t = 17$ to the 17 payments of X , using the formula for the future value of an annuity (Equation 7). Then solve for X .

$$C\$62,677 = X \left[\frac{(1.06)^{17} - 1}{0.06} \right] = 28.21288X$$

$$X = C\$2,221.58$$

Notation Used on Most Calculators	Numerical Value for This Problem
N	17
$\%i$	6
PV	n/a (= 0)
FV	C\$62,677
PMT compute	X



In summary, the couple will need to put aside C\$2,221.58 each year if they start next year and make 17 equal payments.

- 10 C is correct. The sum of the real risk-free interest rate and the inflation premium is the nominal risk-free rate.
- 11 C is correct. US Treasury bonds are highly liquid, whereas the bonds of small issuers trade infrequently and the interest rate includes a liquidity premium. This liquidity premium reflects the relatively high costs (including the impact on price) of selling a position.
- 12 A is correct. The effective annual rate (EAR) when compounded daily is 4.08%.

$$\text{EAR} = (1 + \text{Periodic interest rate})^m - 1$$

$$\text{EAR} = (1 + 0.04/365)^{365} - 1$$

$$\text{EAR} = (1.0408) - 1 = 0.04081 \approx 4.08\%.$$

- 13 C is correct, as shown in the following (where FV is future value and PV is present value):

$$FV = PV \left(1 + \frac{r_s}{m}\right)^{mN}$$

$$FV_6 = \$75,000 \left(1 + \frac{0.07}{4}\right)^{(4 \times 6)}$$

$$FV_6 = \$113,733.21.$$

- 14 B is correct because £97,531 represents the present value (PV) of £100,000 received one year from today when today's deposit earns a stated annual rate of 2.50% and interest compounds weekly, as shown in the following equation (where FV is future value):

$$PV = FV_N \left(1 + \frac{r_s}{m}\right)^{-mN}$$

$$PV = \text{\textsterling}100,00 \left(1 + \frac{0.025}{52}\right)^{-52}$$

$PV = £97,531.58$.

- 15** A is correct. The effective annual rate (EAR) is calculated as follows:

$$\text{EAR} = (1 + \text{Periodic interest rate})^m - 1$$

$$\text{EAR} = (1 + 0.03/365)^{365} - 1$$

$$\text{EAR} = (1.03045) - 1 = 0.030453 \approx 3.0453\%.$$

Solving for N on a financial calculator results in (where FV is future value and PV is present value):

$$(1 + 0.030453)^N = \text{FV}_N/\text{PV} = ¥1,000,000/¥250,000$$

= 46.21 years, which multiplied by 12 to convert to months results in 554.5, or ≈ 555 months.

- 16** B is correct. The difference between continuous compounding and daily compounding is

$$€127,496.85 - €127,491.29 = €5.56, \text{ or } \approx €6, \text{ as shown in the following calculations.}$$

With continuous compounding, the investment earns (where PV is present value)

$$\begin{aligned} \text{PV}e^{r_s N} - \text{PV} &= €1,000,000e^{0.03(4)} - €1,000,000 \\ &= €1,127,496.85 - €1,000,000 \\ &= €127,496.85 \end{aligned}$$

With daily compounding, the investment earns:

$$\begin{aligned} €1,000,000(1 + 0.03/365)^{365(4)} - €1,000,000 &= €1,127,491.29 - €1,000,000 = \\ &= €127,491.29. \end{aligned}$$

- 17** B is correct, as shown in the following calculation for an annuity (A) due:

$$\text{PV} = A \left[\frac{1 - \frac{1}{(1+r)^N}}{r} \right] (1+r)$$

where $A = €300$, $r = 0.04$, and $N = 5$.

$$\text{PV} = €300 \left[\frac{1 - \frac{1}{(1+.04)^5}}{.04} \right] (1.04)$$

$$\text{PV} = €1,388.97, \text{ or } \approx €1,389.$$

- 18** B is correct. The value of the perpetuity one year from now is calculated as:

$\text{PV} = A/r$, where PV is present value, A is annuity, and r is expressed as a quarterly required rate of return because the payments are quarterly.

$$\text{PV} = \$2.00/(0.06/4)$$

$$\text{PV} = \$133.33.$$

The value today is (where FV is future value)

$$PV = FV_N(1 + r)^{-N}$$

$$PV = \$133.33(1 + 0.015)^{-4}$$

$$PV = \$125.62 \approx \$126.$$

- 19** B is correct. To solve for the future value of unequal cash flows, compute the future value of each payment as of Year 4 at the semiannual rate of 2%, and then sum the individual future values, as follows:

Year	End of Year Deposits (\$)	Factor	Future Value (\$)
1	4,000	$(1.02)^6$	4,504.65
2	8,000	$(1.02)^4$	8,659.46
3	7,000	$(1.02)^2$	7,282.80
4	10,000	$(1.02)^0$	10,000.00
		Sum =	30,446.91

- 20** C is correct, as shown in the following (where FV is future value and PV is present value):

If:

$$FV_N = PV \left(1 + \frac{r_s}{m}\right)^{mN}$$

Then:

$$\left(\frac{FV_N}{PV}\right)^{\frac{1}{mN}} - 1 = \frac{r_s}{m}$$

$$\left(\frac{800,000}{500,000}\right)^{\frac{1}{2 \times 6}} - 1 = \frac{r_s}{2}$$

$$r_s = 0.07988 \text{ (rounded to 8.0%).}$$

- 21** C is correct. As shown below, the present value (PV) of a £2,000 per month perpetuity is worth approximately £400,000 at a 6% annual rate compounded monthly. Thus, the present value of the annuity (A) is worth more than the lump sum offer.

$$A = £2,000$$

$$r = (6\%/12) = 0.02$$

$$PV = (A/r)$$

$$PV = (£2,000/0.02)$$

$$PV = £400,000$$

- 22** B is correct.

The present value of a 10-year annuity (A) due with payments of \$2,000 at a 5% discount rate is calculated as follows:

$$PV = A \left[\frac{1 - \frac{1}{(1+r)^N}}{r} \right] + \$2,000$$

$$PV = \$2,000 \left[\frac{1 - \frac{1}{(1+0.05)^9}}{0.05} \right] + \$2,000$$

$$PV = \$16,215.64.$$

Alternatively, the PV of a 10-year annuity due is simply the PV of the ordinary annuity multiplied by 1.05:

$$PV = \$15,443.47 \times 1.05$$

$$PV = \$16,215.64.$$

- 23** B is correct. First, find the present value (PV) of an ordinary annuity in Year 17 that represents the tuition costs:

$$\$50,000 \left[\frac{1 - \frac{1}{(1+0.06)^4}}{0.06} \right]$$

$$= \$50,000 \times 3.4651$$

$$= \$173,255.28.$$

Then, find the PV of the annuity in today's dollars (where FV is future value):

$$PV_0 = \frac{FV}{(1+0.06)^{17}}$$

$$PV_0 = \frac{\$173,255.28}{(1+0.06)^{17}}$$

$$PV_0 = \$64,340.85 \approx \$64,341.$$

- 24** B is correct, as shown in the following table.

Year	Cash Flow (€)	Formula $CF \times (1+r)^t$	PV at Year 0
1	100,000	$100,000(1.12)^{-1} =$	89,285.71
2	150,000	$150,000(1.12)^{-2} =$	119,579.08
5	-10,000	$-10,000(1.12)^{-5} =$	-5,674.27
			203,190.52

25 B is correct, calculated as follows (where A is annuity and PV is present value):

$$\begin{aligned} A &= (\text{PV of annuity}) \left/ \left[\frac{1 - \frac{1}{(1 + r_s/m)^{mN}}}{r_s/m} \right] \right. \\ &= (\text{\textsterling}200,000) \left/ \left[\frac{1 - \frac{1}{(1 + r_s/m)^{mN}}}{r_s/m} \right] \right. \\ &= (\text{\textsterling}200,000) \left/ \left[\frac{1}{(1 + 0.06/12)^{12(5)}} \right] \right. \\ &= (\text{\textsterling}200,000)/51.72556 \\ &= \text{\textsterling}3,866.56 \end{aligned}$$

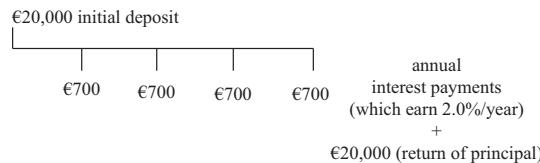
26 A is correct. To solve for an annuity (A) payment, when the future value (FV), interest rate, and number of periods is known, use the following equation:

$$\begin{aligned} FV &= A \left[\frac{\left(1 + \frac{r_s}{m}\right)^{mN} - 1}{\frac{r}{m}} \right] \\ \text{\textsterling}25,000 &= A \left[\frac{\left(1 + \frac{0.06}{4}\right)^{4 \times 10} - 1}{\frac{0.06}{4}} \right] \\ A &= \text{\textsterling}460.68 \end{aligned}$$

27 B is correct. The PV in Year 5 of a \$50,000 lump sum paid in Year 20 is \$27,763.23 (where FV is future value):

$$\begin{aligned} PV &= FV_N (1 + r)^{-N} \\ PV &= \$50,000 (1 + 0.04)^{-15} \\ PV &= \$27,763.23 \end{aligned}$$

28 B is correct, as the following cash flows show:



The four annual interest payments are based on the CD's 3.5% annual rate.

The first payment grows at 2.0% compounded monthly for three years (where FV is future value):

$$FV_N = €700 \left(1 + \frac{0.02}{12}\right)^{3 \times 12}$$

$$FV_N = 743.25$$

The second payment grows at 2.0% compounded monthly for two years:

$$FV_N = €700 \left(1 + \frac{0.02}{12}\right)^{2 \times 12}$$

$$FV_N = 728.54$$

The third payment grows at 2.0% compounded monthly for one year:

$$FV_N = €700 \left(1 + \frac{0.02}{12}\right)^{1 \times 12}$$

$$FV_N = 714.13$$

The fourth payment is paid at the end of Year 4. Its future value is €700.

The sum of all future value payments is as follows:

€20,000.00	CD
€743.25	First payment's FV
€728.54	Second payment's FV
€714.13	Third payment's FV
€700.00	Fourth payment's FV
€22,885.92	Total FV

PRACTICE PROBLEMS

- 1 The net present value (NPV) of an investment is equal to the sum of the expected cash flows discounted at the:
 - A internal rate of return.
 - B risk-free rate.
 - C opportunity cost of capital.
- 2 A \$2.2 million investment will result in the cash flows shown below:

Year	Year-End Cash Flow (millions)
1	\$1.3
2	\$1.6
3	\$1.9
4	\$0.8

Using an 8% opportunity cost of capital, the project's net present value (NPV) is *closest* to:

- A \$2.47 million.
- B \$3.40 million.
- C \$4.67 million.
- 3 A firm is considering three projects as shown below.

	Net Present Value (NPV)	Internal Rate of Return (IRR)	Hurdle Rate
Project A	\$47,000	10%	5%
Project B	\$58,000	20%	12%
Project C	\$52,000	22%	12%

If the firm can only accept one project, to maximize shareholder wealth, the firm is *most likely* to select:

- A Project A.
- B Project B.
- C Project C.
- 4 The internal rate of return (IRR) is *best* described as the:
 - A opportunity cost of capital.
 - B time-weighted rate of return.
 - C discount rate that makes the net present value equal to zero.
- 5 A three-year investment requires an initial outlay of £1,000. It is expected to provide three year-end cash flows of £200 plus a net salvage value of £700 at the end of three years. Its internal rate of return (IRR) is *closest* to:
 - A 10%.
 - B 11%.
 - C 20%.

- 6** The internal rate of return (IRR) rule indicates acceptance of a project when the IRR is:
- greater than zero.
 - less than the opportunity cost of capital.
 - greater than the opportunity cost of capital.
- 7** Suppose a company has only €1,000,000 available to invest. The three projects available are described in the table:

Year	Project A Cash Flow (€)	Project B Cash Flow (€)	Project C Cash Flow (€)
0	-1,000,000	-1,000,000	-500,000
1	1,200,000	0	0
2	0	0	0
3	0	1,600,000	850,000
Internal rate of return (IRR)	20.00%	16.96%	19.35%

If the opportunity cost of capital is 12%, which project should be accepted?

- Project A.
 - Project B.
 - Project C.
- 8** An investor buys a share of stock for \$52.68 and receives an \$0.88 dividend one year later. If the share sells for \$57.50 just after the dividend payment, the holding period return is *closest* to:
- 9.1%.
 - 9.9%.
 - 10.8%.
- 9** An investor performs the following transactions on the shares of a firm.
- At $t = 0$, she purchases a share for \$1,000.
 - At $t = 1$, she receives a dividend of \$25 and then purchases three additional shares for \$1,055 each.
 - At $t = 2$, she receives a total dividend of \$100 and then sells the four shares for \$1,100 each.

The money-weighted rate of return is *closest* to:

- 4.5%.
- 6.9%.
- 7.3%.

- 10** A fund receives investments at the beginning of each year and generates returns as shown in the table.

Year of Investment	Amount of Investment	Return during Year of Investment
1	\$1,000	15%
2	\$4,000	14%
3	\$45,000	-4%

Which return measure over the three-year period is negative?

- A Geometric mean return
 - B Time-weighted rate of return
 - C Money-weighted rate of return
- 11 At the beginning of Year 1, a fund has \$10 million under management; it earns a return of 14% for the year. The fund attracts another \$100 million at the start of Year 2 and earns a return of 8% for that year. The money-weighted rate of return is *most likely*:
- A less than the time-weighted rate of return.
 - B the same as the time-weighted rate of return.
 - C greater than the time-weighted rate of return.
- 12 An investor buys a bond for \$980. After six months, she collects a semiannual coupon of \$30 and sells the bond for \$990. Her six-month holding period yield (HPY) is *closest* to:
- A 1.0%.
 - B 4.1%.
 - C 8.3%.
- 13 A portfolio manager pays \$99,500 for a 182-day US T-bill with face value of \$100,000. The T-bill will be held to maturity. A yield of 0.5025% calculated for this T-bill when it is purchased is *most* accurately described as the:
- A bank discount yield.
 - B money market yield.
 - C holding period yield.
- 14 A 123-day T-bill with a maturity value of \$100,000 is priced at \$99,620. The bill's effective annual yield is *closest* to:
- A 0.38%.
 - B 1.12%.
 - C 1.14%.
- 15 For a T-bill purchased at \$97,000 that matures at \$100,000 in 300 days, which of the following yields is *closest* to 3.71%?
- A Money market yield
 - B Holding period yield (HPY)
 - C Effective annual yield
- 16 A 223-day T-bill with a maturity value of \$100,000 has a bank discount yield of 2.05%. The bill's holding period yield is *closest* to:
- A 1.29%.
 - B 2.08%.
 - C 2.11%.
- 17 Given a 300-day holding period yield (HPY) of 7%, the effective annual yield (EAY) is *closest* to:
- A 8.4%.
 - B 8.5%.
 - C 8.6%.

SOLUTIONS

- 1** C is correct. The NPV sums the project's expected cash flows (CF) discounted at the opportunity cost of capital. The NPV calculation is

$$\text{NPV} = \sum_{t=0}^N \frac{\text{CF}_t}{(1+r)^t}$$

where

CF_t = the expected net cash flow at time t

N = the investment's projected life

r = the discount rate or opportunity cost of capital

- 2** A is correct.

$$\text{The NPV} = -\$2.2 + \frac{\$1.3}{(1.08)} + \frac{\$1.6}{(1.08)^2} + \frac{\$1.9}{(1.08)^3} + \frac{\$0.8}{(1.08)^4} = \$2.47 \text{ million.}$$

- 3** B is correct. According to the NPV rule, shareholder wealth is maximized by selecting a project with the highest NPV. The IRR rule also signals acceptance; however, the IRR rule should not be used to rank projects. In this case, Project B adds the most value to the firm.
- 4** C is correct. The internal rate of return is computed by identifying all cash flows and solving for the rate that makes the net present value of those cash flows equal to zero.
- 5** B is correct. IRR is determined by setting the net present value equal to zero for the cash flows shown in the table.

Year	Cash Flow (£)
0	-1,000
1	200
2	200
3	900

- 6** C is correct. The IRR investment decision rule states, "Accept projects or investments for which the IRR is greater than the opportunity cost of capital."
- 7** B is correct. The projects are mutually exclusive because the amount to invest is constrained to €1,000,000. Therefore, the net present value (NPV) rule should be used to choose among them when the IRR rule and NPV rule conflict. Based on the opportunity cost of capital of 12%, the NPV of Project B is €138,848, which is higher than the NPV of €71,429 for Project A and the NPV of \$105,013 for Project C.

Project A NPV = $-\text{€}1,000,000 + \text{€}1,200,000/(1.12) = \text{€}71,429$

Project B NPV = $-\text{€}1,000,000 + \text{€}1,600,000/(1.12)^3 = \text{€}138,848$

Project C NPV = $-\text{€}500,000 + \text{€}850,000/(1.12)^3 = \text{€}105,013$

- 8** C is correct. The formula for the holding period return is

$$\frac{P_1 - P_0 + D_1}{P_0}$$

where P_0 is the initial investment, P_1 is the final value at the end of the holding period, and D_1 is the cash dividend paid at the end of the holding period. This investment results in a holding period return (HPR) of

$$\text{HPR} = \frac{\$57.50 - \$52.68 + \$0.88}{\$52.68} = 10.82\%$$

- 9** B is correct. Computation of the money-weighted return, r , requires finding the discount rate that sets the present value (outflows) equal to the present value (inflows).

Solving for r ,

$$\$1,000 + \frac{\$3,165}{(1+r)} = \frac{\$25}{(1+r)} + \frac{\$4,500}{(1+r)^2}$$

results in a value of $r = 6.91\%$

- 10** C is correct. The money-weighted rate of return considers both the timing and amounts of investments into the fund. The investment at the beginning of Year 1 will be worth $\$1,000(1.15)(1.14)(0.96) = \$1,258.56$ at the end of Year 3. The investment made at the beginning of Year 2 will be worth $\$4,000(1.14)(0.96) = \$4,000(1.14)(0.96) = \$4,377.60$ at the end of Year 3. The investment of \$45,000 at the beginning of Year 3 decreases to a value of $\$45,000(0.96) = \$43,200$ at the end of Year 3.

Solving for r ,

$$\$1,000 + \frac{\$4,000}{(1+r)} + \frac{\$45,000}{(1+r)^2} = \frac{\$1,258 + \$4,377.60 + \$43,200}{(1+r)^2}$$

results in $r = -2.08\%$

Note that B is incorrect because the time-weighted rate of return (TWR) of the fund is the same as the geometric mean return of the fund and is thus positive:

$$\text{TWR} = \sqrt[3]{(1.15)(1.14)(0.96)} - 1 = 7.97\%$$

- 11** A is correct. The money-weighted rate of return is found by setting the present value (PV) of investments into the fund equal to the PV of the fund's terminal value. Because most of the investment came during Year 2, the measure will be biased toward the performance of Year 2. Set the PV of investments equal to the PV of the fund's terminal value:

$$\$10 + \frac{100}{(1+r)} = \frac{10 \times 1.14 \times 1.08 + 100 \times 1.08}{(1+r)^2}$$

Solving for r results in $r = 8.53\%$.

The time-weighted return of the fund is $= \sqrt[2]{(1.14)(1.08)} - 1 = 10.96\%$.

- 12** B is correct. The HPY for the bond is

$$\frac{P_1 - P_0 + D_1}{P_0} = \frac{\$990 - \$980 + \$30}{\$980} = 4.08\%$$

- 13** C is correct. The 182-day holding period yield (HPY) is calculated as follows:

$$\text{HPY} = \frac{P_1 - P_0 + D_1}{P_0} = \frac{\$100,000 - \$99,500}{\$99,500} = 0.5025\%$$

- 14** C is correct. The effective annual yield (EAY) is calculated as follows (where HPY is holding period yield):

$$\text{HPY} = \frac{P_1 - P_0 + D_1}{P_0} = \frac{\$100,00 - \$99,620}{\$99,620} = 0.3814\%$$

$$\text{EAY} = (1 + \text{HPY})^{365/123} - 1 = (1 + .003814)^{365/123} - 1 = 1.1362\%$$

- 15** A is correct. The money market yield is equal to the annualized HPY, assuming a 360-day year. $r_{MM} = (\text{HPY})(360/t)$. A T-bill purchased at \$97,000 has a HPY of $[(\$100,000 - \$97,000)/\$97,000] = 3.09\%$. The money market yield for this T-bill is $(3.09\%)(360/300) = 3.71\%$. The effective annual yield for this T-bill is $(1 + 0.0309)^{365/300} - 1 = 3.77\%$.

- 16** A is correct. The holding period yield of a bill can be computed from the bank discount yield by finding the bill's discount D :

$$r_{BD} = \frac{D}{F} \times \frac{360}{t}, \text{ so } 0.0205 = \frac{D}{\$100,00} \times \frac{360}{223}$$

Solving for D results in a discount of \$1269.86. This result implies a purchase price of $\$100,000 - \$1,269.86 = \$98,730.14$.

The holding period yield (HPY) then computes as:

$$\text{HPY} = \frac{\$1,269.86}{\$98,730.14} = 1.286\%$$

B is incorrect because it is the money market yield and C is incorrect because it is the equivalent annual yield.

- 17** C is correct. The EAY is one plus the HPY, compounded forward one year, and then subtract one:

$$\text{EAY} = (1 + \text{HPY})^{365/t} - 1$$

$$(1 + 0.07)^{365/300} - 1 = 8.58\% \approx 8.6\%$$

PRACTICE PROBLEMS

- 1 Which of the following groups *best* illustrates a sample?
 - A The set of all estimates for Exxon Mobil's FY2015 EPS
 - B The FTSE Eurotop 100 as a representation of the European stock market
 - C UK shares traded on 13 August 2015 that also closed above £120/share on the London Stock Exchange
- 2 Published ratings on stocks ranging from 1 (strong sell) to 5 (strong buy) are examples of which measurement scale?
 - A Ordinal
 - B Interval
 - C Nominal
- 3 In descriptive statistics, an example of a parameter is the:
 - A median of a population.
 - B mean of a sample of observations.
 - C standard deviation of a sample of observations.
- 4 A mutual fund has the return frequency distribution shown in the following table.

Return Interval (%)	Absolute Frequency
-10.0 to -7.0	3
-7.0 to -4.0	7
-4.0 to -1.0	10
-1.0 to +2.0	12
+2.0 to +5.0	23
+5.0 to +8.0	5

Which of the following statements is correct?

- A The relative frequency of the interval “-1.0 to +2.0” is 20%.
 - B The relative frequency of the interval “+2.0 to +5.0” is 23%.
 - C The cumulative relative frequency of the interval “+5.0 to +8.0” is 91.7%.
- 5 An analyst is using the data in the following table to prepare a statistical report.

Portfolio's Deviations from Benchmark Return, 2003–2014 (%)

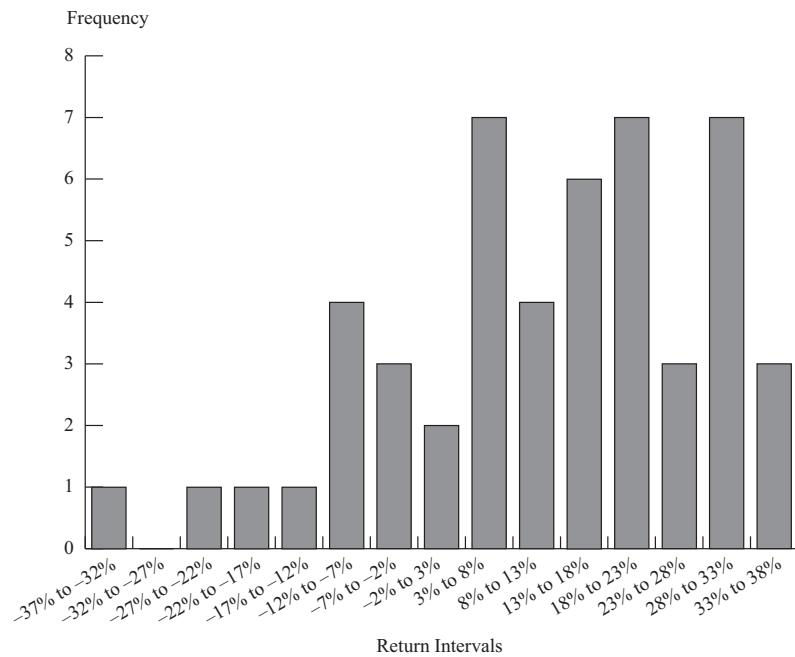
2003	2.48	2009	-9.19
2004	-2.59	2010	-5.11
2005	9.47	2011	1.33
2006	-0.55	2012	6.84
2007	-1.69	2013	3.04
2008	-0.89	2014	4.72

The cumulative relative frequency for the interval $-1.71\% \leq x < 2.03\%$ is *closest* to:

- A 0.250.
- B 0.333.
- C 0.583.

The following information relates to Questions 6–7

The following histogram shows a distribution of the S&P 500 Index annual returns from 1964 to 2013:

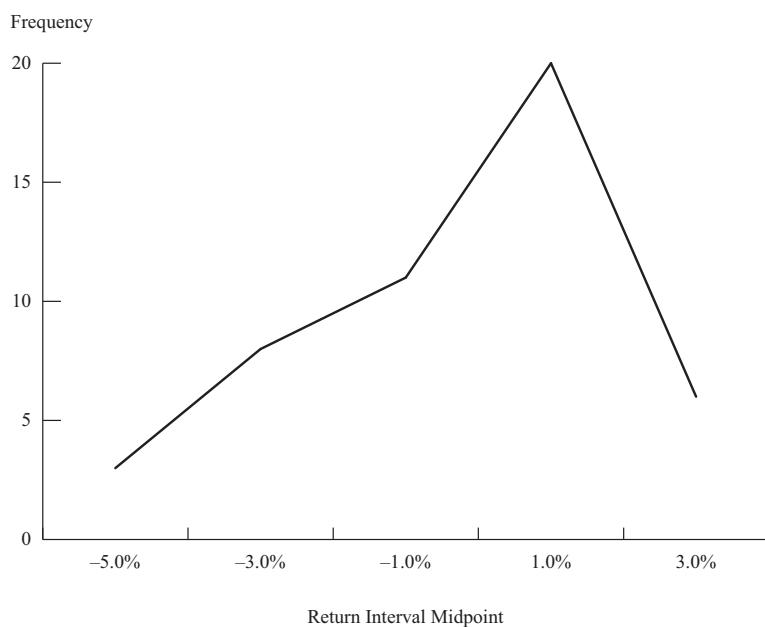


- 6 The interval containing the median return is:
 - A 3% to 8%.
 - B 8% to 13%.
 - C 13% to 18%.
- 7 Based on the previous histogram, the distribution is *best* described as having:
 - A one mode.

- B two modes.
- C three modes.

-
- 8 The following is a frequency polygon of monthly exchange rate changes in the US dollar/Japanese yen spot exchange rate from January 2010 to December 2013. A positive change represents yen appreciation (the yen buys more dollars), and a negative change represents yen depreciation (the yen buys fewer dollars).

Monthly Changes in the US Dollar/Japanese Yen Spot Exchange Rate



Based on the chart, yen appreciation:

- A occurred more than 50% of the time.
 - B was less frequent than yen depreciation.
 - C in the 0.0 to 2.0 interval occurred 20% of the time.
- 9 The annual returns for three portfolios are shown in the following table. Portfolios P and R were created in 2009, Portfolio Q in 2010.

	Annual Portfolio Returns (%)				
	2009	2010	2011	2012	2013
Portfolio P	-3.0	4.0	5.0	3.0	7.0
Portfolio Q		-3.0	6.0	4.0	8.0
Portfolio R	1.0	-1.0	4.0	4.0	3.0

The median annual return from portfolio creation to 2013 for:

- A Portfolio P is 4.5%.
- B Portfolio Q is 4.0%.

- C** Portfolio R is higher than its arithmetic mean annual return.
- 10** In 2015, an investor allocated his retirement savings in the asset classes shown in the following table.

Asset Class	Asset Allocation (%)	Asset Class Return (%)
Large-cap US equities	20.0	8.0
Small-cap US equities	40.0	12.0
Emerging market equities	25.0	-3.0
High-yield bonds	15.0	4.0

The portfolio return in 2015 is *closest to*:

- A** 5.1%.
- B** 5.3%.
- C** 6.3%.
- 11** The following table shows the annual returns for Fund Y.

Fund Y (%)	
2010	19.5
2011	-1.9
2012	19.7
2013	35.0
2014	5.7

The geometric mean for Fund Y is *closest to*:

- A** 14.9%.
- B** 15.6%.
- C** 19.5%.
- 12** A manager invests €5,000 annually in a security for four years at the prices shown in the following table.

Purchase Price of Security (€)	
Year 1	62.00
Year 2	76.00
Year 3	84.00
Year 4	90.00

The average price paid for the security is *closest to*:

- A** €76.48.
- B** €77.26.
- C** €78.00.

The following information relates to Questions 13–14

The following table shows the annual MSCI World Index total returns for 2004–2013.

2004	15.25%	2009	30.79%
2005	10.02%	2010	12.34%
2006	20.65%	2011	-5.02%
2007	9.57%	2012	16.54%
2008	-40.33%	2013	27.37%

- 13** The fourth quintile return for the MSCI World Index is *closest* to:
- A 20.65%.
 B 26.03%.
 C 27.37%.
- 14** For 2009–2013, the mean absolute deviation of the MSCI World Index total returns is *closest* to:
- A 10.20%.
 B 12.74%.
 C 16.40%.

-
- 15** Annual returns and summary statistics for three funds are listed in the following table:

Year	Annual Returns (%)		
	Fund ABC	Fund XYZ	Fund PQR
2009	-20.0	-33.0	-14.0
2010	23.0	-12.0	-18.0
2011	-14.0	-12.0	6.0
2012	5.0	-8.0	-2.0
2013	-14.0	11.0	3.0
Mean	-4.0	-10.8	-5.0
Standard deviation	17.8	15.6	10.5

- The fund that shows the highest dispersion is:
- A Fund PQR if the measure of dispersion is the range.
 B Fund XYZ if the measure of dispersion is the variance.
 C Fund ABC if the measure of dispersion is the mean absolute deviation.
- 16** Over the past 240 months, an investor's portfolio had a mean monthly return of 0.79%, with a standard deviation of monthly returns of 1.16%. According to Chebyshev's inequality, the minimum number of the 240 monthly returns that fall into the range of -0.95% to 2.53% is *closest* to:
- A 80.
 B 107.
 C 133.
- 17** The mean monthly return and the standard deviation for three industry sectors are shown in the following table.

Sector	Mean Monthly Return (%)	Standard Deviation of Return (%)
Utilities (UTIL)	2.10	1.23
Materials (MATR)	1.25	1.35
Industrials (INDU)	3.01	1.52

Based on the coefficient of variation, the riskiest sector is:

- A utilities.
- B materials.
- C industrials.

- 18 Three equity fund managers have performance records summarized in the following table:

	Mean Annual Return (%)	Standard Deviation of Return (%)
Manager 1	14.38	10.53
Manager 2	9.25	6.35
Manager 3	13.10	8.23

Given a risk-free rate of return of 2.60%, which manager performed best based on the Sharpe ratio?

- A Manager 1
- B Manager 2
- C Manager 3

The following information relates to Questions 19–21

The following table shows various statistics for Portfolios 1, 2, and 3.

	Mean Return (%)	Standard Deviation of Returns (%)	Skewness	Excess Kurtosis
Portfolio 1	7.8	15.1	0.0	0.7
Portfolio 2	10.2	20.5	0.9	-1.8
Portfolio 3	12.9	29.3	-1.5	6.2

- 19 An investment adviser bases his allocation on the Sharpe ratio. Assuming a risk-free rate of 1.5%, which portfolio is he *most likely* to recommend?

- A Portfolio 1
- B Portfolio 2
- C Portfolio 3

- 20 The skewness of Portfolio 1 indicates its mean return is *most likely*:

- A less than its median.
- B equal to its median.
- C greater than its median.

- 21** Compared with a normal distribution, the distribution of returns for Portfolio 3 *most likely*:
- A is less peaked.
 - B has a greater number of extreme returns.
 - C has fewer small deviations from its mean.
-
- 22** Two portfolios have unimodal return distributions. Portfolio 1 has a skewness of 0.77, and Portfolio 2 has a skewness of -1.11.
- Which of the following is correct?
- A For Portfolio 1, the median is less than the mean.
 - B For Portfolio 1, the mode is greater than the mean.
 - C For Portfolio 2, the mean is greater than the median.
- 23** When analyzing investment returns, which of the following statements is correct?
- A The geometric mean will exceed the arithmetic mean for a series with non-zero variance.
 - B The geometric mean measures an investment's compound rate of growth over multiple periods.
 - C The arithmetic mean accurately estimates an investment's terminal value over multiple periods.

SOLUTIONS

- 1 B is correct. The FTSE Eurotop 100 represents a sample of all European stocks. It is a subset of the population of all European stocks.
- 2 A is correct. Ordinal scales sort data into categories that are ordered with respect to some characteristic and may involve numbers to identify categories but do not assure that the differences between scale values are equal. The buy rating scale indicates that a stock ranked 5 is expected to perform better than a stock ranked 4, but it tells us nothing about the performance difference between stocks ranked 4 and 5 compared with the performance difference between stocks ranked 1 and 2, and so on.
- 3 A is correct. Any descriptive measure of a population characteristic is referred to as a parameter.
- 4 A is correct. The relative frequency is the absolute frequency of each interval divided by the total number of observations. Here, the relative frequency is calculated as: $(12/60) \times 100 = 20\%$. B is incorrect because the relative frequency of this interval is $(23/60) \times 100 = 38.33\%$. C is incorrect because the cumulative relative frequency of the last interval must equal 100%.
- 5 C is correct. The cumulative relative frequency of an interval identifies the fraction of observations that are less than the upper limit of the given interval. It is determined by summing the relative frequencies from the lowest interval up to and including the given interval. The following table shows the relative frequencies for all the intervals of the data from the previous table:

Lower Limit (%)	Upper Limit (%)	Absolute Frequency	Relative Frequency	Cumulative Relative Frequency
$-9.19 \leq$	< -5.45	1	0.083	0.083
$-5.45 \leq$	< -1.71	2	0.167	0.250
$-1.71 \leq$	< 2.03	4	0.333	0.583
$2.03 \leq$	< 5.77	3	0.250	0.833
$5.77 \leq$	≥ 9.51	2	0.167	1.000

The interval $-1.71\% \leq x < 2.03\%$ has a cumulative relative frequency of 0.583.

- 6 C is correct. Because there are 50 data points in the histogram, the median return would be the mean of the $50/2 = 25$ th and $(50 + 2)/2 = 26$ th positions. The sum of the return interval frequencies to the left of the 13% to 18% interval is 24. As a result, the 25th and 26th returns will fall in the 13% to 18% interval.
- 7 C is correct. The mode of a distribution with data grouped in intervals is the interval with the highest frequency. The three intervals of 3% to 8%, 18% to 23%, and 28% to 33% all have a high frequency of 7.
- 8 A is correct. Twenty observations lie in the interval “0.0 to 2.0,” and six observations lie in the 2.0 to 4.0 interval. Together, they represent $26/48$, or 54.17% of all observations, which is more than 50%.
- 9 C is correct. The median of Portfolio R is 0.8% higher than the mean for Portfolio R.
- 10 C is correct. The portfolio return must be calculated as the weighted mean return, where the weights are the allocations in each asset class:

$$(0.20 \times 8\%) + (0.40 \times 12\%) + (0.25 \times -3\%) + (0.15 \times 4\%) = 6.25\%, \text{ or } \approx 6.3\%.$$

- 11** A is correct. The geometric mean return for Fund Y is found as follows:

$$\begin{aligned}\text{Fund Y} &= [(1 + 0.195) \times (1 - 0.019) \times (1 + 0.197) \times (1 + 0.350) \\ &\quad \times (1 + 0.057)]^{(1/5)} - 1 \\ &= 14.9\%.\end{aligned}$$

- 12** A is correct. The harmonic mean is appropriate for determining the average price per unit. It is calculated by summing the reciprocals of the prices; then averaging that sum by dividing by the number of prices; and finally, taking the reciprocal of the average:

$$4/[(1/62.00) + (1/76.00) + (1/84.00) + (1/90.00)] = €76.48.$$

- 13** B is correct. Quintiles divide a distribution into fifths, with the fourth quintile occurring at the point at which 80% of the observations lie below it. The fourth quintile is equivalent to the 80th percentile. To find the y th percentile (P_y), we first must determine its location. The formula for the location (L_y) of a y th percentile in an array with n entries sorted in ascending order is $L_y = (n + 1) \times (y/100)$. In this case, $n = 10$ and $y = 80\%$, so

$$L_{80} = (10 + 1) \times (80/100) = 11 \times 0.8 = 8.8.$$

With the data arranged in ascending order (-40.33%, -5.02%, 9.57%, 10.02%, 12.34%, 15.25%, 16.54%, 20.65%, 27.37%, and 30.79%), the 8.8th position would be between the 8th and 9th entries, 20.65% and 27.37%, respectively. Using linear interpolation, $P_{80} = X_8 + (L_y - 8) \times (X_9 - X_8)$,

$$\begin{aligned}P_{80} &= 20.65 + (8.8 - 8) \times (27.37 - 20.65) \\ &= 20.65 + (0.8 \times 6.72) = 20.65 + 5.38 \\ &= 26.03\%.\end{aligned}$$

- 14** A is correct. The formula for mean absolute deviation (MAD) is

$$\text{MAD} = \frac{\sum_{i=1}^n |X_i - \bar{X}|}{n}$$

Column 1: Sum annual returns and divide by n to find the arithmetic mean (\bar{X}) of 16.40%.

Column 2: Calculate the absolute value of the difference between each year's return and the mean from Column 1. Sum the results and divide by n to find the MAD.

These calculations are shown in the following table:

Year	Column 1		Column 2
	Return	$ X_i - \bar{X} $	
2009	30.79%	14.39%	
2010	12.34%	4.06%	
2011	-5.02%	21.42%	
2012	16.54%	0.14%	
2013	27.37%	10.97%	
Sum:	82.02%	Sum:	50.98%

(continued)

Year	Column 1		Column 2
	Return		$ X_i - \bar{X} $
$n:$	5	$n:$	5
$\bar{X}:$	16.40%	MAD:	10.20%

- 15 C is correct. The mean absolute deviation (MAD) of Fund ABC's returns is greater than the MAD of both of the other funds.

$$\text{MAD} = \frac{\sum_{i=1}^n |X_i - \bar{X}|}{n}, \text{ where } \bar{X} \text{ is the arithmetic mean of the series.}$$

MAD for Fund ABC =

$$\frac{[-20 - (-4)] + [23 - (-4)] + [-14 - (-4)] + [5 - (-4)] + [-14 - (-4)]}{5} = 14.4\%$$

MAD for Fund XYZ =

$$\frac{[-33 - (-10.8)] + [-12 - (-10.8)] + [-12 - (-10.8)] + [-8 - (-10.8)] + [11 - (-10.8)]}{5} = 9.8\%$$

MAD for Fund PQR =

$$\frac{[-14 - (-5)] + [-18 - (-5)] + [6 - (-5)] + [-2 - (-5)] + [3 - (-5)]}{5} = 8.8\%$$

A and B are incorrect because the range and variance of the three funds are as follows:

	Fund ABC	Fund XYZ	Fund PQR
Range	43%	44%	24%
Variance	317	243	110

The numbers shown for variance are understood to be in "percent squared" terms so that when taking the square root, the result is standard deviation in percentage terms. Alternatively, by expressing standard deviation and variance in decimal form, one can avoid the issue of units; in decimal form, the variances for Fund ABC, Fund XYZ, and Fund PQR are 0.0317, 0.0243, and 0.0110, respectively.

- 16 C is correct. According to Chebyshev's inequality, the proportion of the observations within k standard deviations of the arithmetic mean is at least $1 - 1/k^2$ for all $k > 1$.

The upper limit of the range is 2.53%, which is $2.53 - 0.79 = 1.74\%$ above the mean. The lower limit is -0.95, which is $0.79 - (-0.95) = 1.74\%$ below the mean. As a result, $k = 1.74/1.16 = 1.50$ standard deviations.

Because $k = 1.50$, the proportion of observations within the interval is at least $1 - 1/1.5^2 = 1 - 0.444 = 0.556$, or 55.6%. Thus, the number of observations in the given range is at least $240 \times 55.6\%$, which is ≈ 133 .

- 17** B is correct. The coefficient of variation (CV) is the ratio of the standard deviation to the mean, where a higher CV implies greater risk per unit of return.

$$CV_{UTIL} = \frac{s}{\bar{X}} = \frac{1.23\%}{2.10\%} = 0.59$$

$$CV_{MATTR} = \frac{s}{\bar{X}} = \frac{1.35\%}{1.25\%} = 1.08$$

$$CV_{INDU} = \frac{s}{\bar{X}} = \frac{1.52\%}{3.01\%} = 0.51$$

- 18** C is correct. The Sharpe ratio (S) is the mean excess portfolio return per unit of risk, where a higher Sharpe ratio indicates better performance:

$$S_1 = \frac{\bar{R}_p - \bar{R}_F}{s_p} = \frac{14.38 - 2.60}{10.53} = 1.12$$

$$S_2 = \frac{\bar{R}_p - \bar{R}_F}{s_p} = \frac{9.25 - 2.60}{6.35} = 1.05$$

$$S_3 = \frac{\bar{R}_p - \bar{R}_F}{s_p} = \frac{13.10 - 2.60}{8.23} = 1.28$$

- 19** B is correct. The Sharpe ratio measures a portfolio's return per unit of risk and is defined as $S_1 = \frac{\bar{R}_p - \bar{R}_F}{s_p}$, where \bar{R}_p is the mean return for the portfolio, \bar{R}_F is the mean return to a risk-free asset, and s_p is the standard deviation of return on the portfolio. The Sharpe ratios for the three portfolios are as follows:

$$\text{Portfolio 1} = (7.8 - 1.5)/15.1 = 6.3/15.1 = 0.417$$

$$\text{Portfolio 2} = (10.2 - 1.5)/20.5 = 8.7/20.5 = 0.424$$

$$\text{Portfolio 3} = (12.9 - 1.5)/29.3 = 11.4/29.3 = 0.389$$

So Portfolio 2 has the highest return per unit of risk.

- 20** B is correct. Portfolio 1 has a skewness of 0.0, which indicates that the portfolio's return distribution is symmetrical and thus its mean and median are equal.
- 21** B is correct. Portfolio 3 has positive excess kurtosis (i.e., kurtosis greater than 3), which indicates that its return distribution is leptokurtic, is more peaked than normal, and has fatter tails. The fatter tails mean Portfolio 3 has a greater number of extreme returns.
- 22** A is correct. Portfolio 1 is positively skewed, so the mean is greater than the median, which is greater than the mode.
- 23** B is correct. The geometric mean compounds the periodic returns of every period, giving the investor a more accurate measure of the terminal value of an investment.

PRACTICE PROBLEMS

- 1 Suppose that 5 percent of the stocks meeting your stock-selection criteria are in the telecommunications (telecom) industry. Also, dividend-paying telecom stocks are 1 percent of the total number of stocks meeting your selection criteria. What is the probability that a stock is dividend paying, given that it is a telecom stock that has met your stock selection criteria?
- 2 You are using the following three criteria to screen potential acquisition targets from a list of 500 companies:

Criterion	Fraction of the 500 Companies Meeting the Criterion
Product lines compatible	0.20
Company will increase combined sales growth rate	0.45
Balance sheet impact manageable	0.78

If the criteria are independent, how many companies will pass the screen?

- 3 You apply both valuation criteria and financial strength criteria in choosing stocks. The probability that a randomly selected stock (from your investment universe) meets your valuation criteria is 0.25. Given that a stock meets your valuation criteria, the probability that the stock meets your financial strength criteria is 0.40. What is the probability that a stock meets both your valuation and financial strength criteria?
- 4 Suppose the prospects for recovering principal for a defaulted bond issue depend on which of two economic scenarios prevails. Scenario 1 has probability 0.75 and will result in recovery of \$0.90 per \$1 principal value with probability 0.45, or in recovery of \$0.80 per \$1 principal value with probability 0.55. Scenario 2 has probability 0.25 and will result in recovery of \$0.50 per \$1 principal value with probability 0.85, or in recovery of \$0.40 per \$1 principal value with probability 0.15.
 - A Compute the probability of each of the four possible recovery amounts: \$0.90, \$0.80, \$0.50, and \$0.40.
 - B Compute the expected recovery, given the first scenario.
 - C Compute the expected recovery, given the second scenario.
 - D Compute the expected recovery.
 - E Graph the information in a tree diagram.
- 5 You have developed a set of criteria for evaluating distressed credits. Companies that do not receive a passing score are classed as likely to go bankrupt within 12 months. You gathered the following information when validating the criteria:
 - Forty percent of the companies to which the test is administered will go bankrupt within 12 months: $P(\text{nonsurvivor}) = 0.40$.
 - Fifty-five percent of the companies to which the test is administered pass it: $P(\text{pass test}) = 0.55$.
 - The probability that a company will pass the test given that it will subsequently survive 12 months, is 0.85: $P(\text{pass test} \mid \text{survivor}) = 0.85$.
 - A What is $P(\text{pass test} \mid \text{nonsurvivor})$?

- B Using Bayes' formula, calculate the probability that a company is a survivor, given that it passes the test; that is, calculate $P(\text{survivor} \mid \text{pass test})$.
- C What is the probability that a company is a *nonsurvivor*, given that it fails the test?
- D Is the test effective?
- 6 In probability theory, exhaustive events are *best* described as events:
- A with a probability of zero.
- B that are mutually exclusive.
- C that include all potential outcomes.
- 7 Which probability estimate *most likely* varies greatly between people?
- A An *a priori* probability
- B An empirical probability
- C A subjective probability
- 8 If the probability that Zolaf Company sales exceed last year's sales is 0.167, the odds for exceeding sales are *closest* to:
- A 1 to 5.
- B 1 to 6.
- C 5 to 1.
- 9 The probability of an event given that another event has occurred is a:
- A joint probability.
- B marginal probability.
- C conditional probability.
- 10 After estimating the probability that an investment manager will exceed his benchmark return in each of the next two quarters, an analyst wants to forecast the probability that the investment manager will exceed his benchmark return over the two-quarter period in total. Assuming that each quarter's performance is independent of the other, which probability rule should the analyst select?
- A Addition rule
- B Multiplication rule
- C Total probability rule
- 11 Which of the following is a property of two dependent events?
- A The two events must occur simultaneously.
- B The probability of one event influences the probability of the other event.
- C The probability of the two events occurring is the product of each event's probability.
- 12 Which of the following *best* describes how an analyst would estimate the expected value of a firm under the scenarios of bankruptcy and survivorship? The analyst would use:
- A the addition rule.
- B conditional expected values.
- C the total probability rule for expected value.
- 13 An analyst developed two scenarios with respect to the recovery of \$100,000 principal from defaulted loans:

Scenario	Probability of Scenario (%)	Amount Recovered (\$)	Probability of Amount (%)
1	40	50,000	60
		30,000	40
2	60	80,000	90
		60,000	10

The amount of the expected recovery is *closest* to:

- A \$36,400.
 - B \$63,600.
 - C \$81,600.
- 14 US and Spanish bonds have return standard deviations of 0.64 and 0.56, respectively. If the correlation between the two bonds is 0.24, the covariance of returns is *closest* to:
- A 0.086.
 - B 0.670.
 - C 0.781.
- 15 The covariance of returns is positive when the returns on two assets tend to:
- A have the same expected values.
 - B be above their expected value at different times.
 - C be on the same side of their expected value at the same time.
- 16 Which of the following correlation coefficients indicates the weakest linear relationship between two variables?
- A -0.67
 - B -0.24
 - C 0.33
- 17 An analyst develops the following covariance matrix of returns:

	Hedge Fund	Market Index
Hedge fund	256	110
Market index	110	81

The correlation of returns between the hedge fund and the market index is *closest* to:

- A 0.005.
 - B 0.073.
 - C 0.764.
- 18 All else being equal, as the correlation between two assets approaches +1.0, the diversification benefits:
- A decrease.
 - B stay the same.
 - C increase.
- 19 Given a portfolio of five stocks, how many unique covariance terms, excluding variances, are required to calculate the portfolio return variance?
- A 10
 - B 20

C 25

- 20 The probability distribution for a company's sales is:

Probability	Sales (\$ millions)
0.05	70
0.70	40
0.25	25

The standard deviation of sales is *closest* to:

- A \$9.81 million.
 - B \$12.20 million.
 - C \$32.40 million.
- 21 Which of the following statements is *most* accurate? If the covariance of returns between two assets is 0.0023, then:
- A the assets' risk is near zero.
 - B the asset returns are unrelated.
 - C the asset returns have a positive relationship.
- 22 An analyst produces the following joint probability function for a foreign index (FI) and a domestic index (DI).

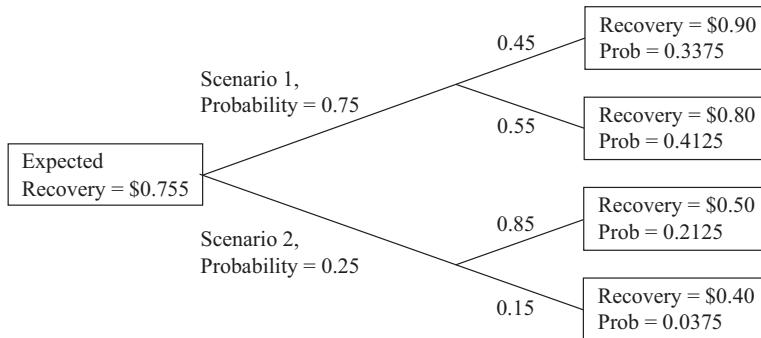
	$R_{DI} = 30\%$	$R_{DI} = 25\%$	$R_{DI} = 15\%$
$R_{FI} = 25\%$	0.25		
$R_{FI} = 15\%$		0.50	
$R_{FI} = 10\%$			0.25

The covariance of returns on the foreign index and the returns on the domestic index is *closest* to:

- A 26.39.
 - B 26.56.
 - C 28.12.
- 23 A manager will select 20 bonds out of his universe of 100 bonds to construct a portfolio. Which formula provides the number of possible portfolios?
- A Permutation formula
 - B Multinomial formula
 - C Combination formula
- 24 A firm will select two of four vice presidents to be added to the investment committee. How many different groups of two are possible?
- A 6
 - B 12
 - C 24
- 25 From an approved list of 25 funds, a portfolio manager wants to rank 4 mutual funds from most recommended to least recommended. Which formula is *most* appropriate to calculate the number of possible ways the funds could be ranked?
- A Permutation formula
 - B Multinomial formula
 - C Combination formula

SOLUTIONS

- 1 Use Equation 1 to find this conditional probability: $P(\text{stock is dividend paying} \mid \text{telecom stock that meets criteria}) = P(\text{stock is dividend paying and telecom stock that meets criteria})/P(\text{telecom stock that meets criteria}) = 0.01/0.05 = 0.20$.
- 2 According to the multiplication rule for independent events, the probability of a company meeting all three criteria is the product of the three probabilities. Labeling the event that a company passes the first, second, and third criteria, A , B , and C , respectively $P(ABC) = P(A)P(B)P(C) = (0.20)(0.45)(0.78) = 0.0702$. As a consequence, $(0.0702)(500) = 35.10$, so 35 companies pass the screen.
- 3 Use Equation 2, the multiplication rule for probabilities $P(AB) = P(A \mid B)P(B)$, defining A as the event that *a stock meets the financial strength criteria* and defining B as the event that *a stock meets the valuation criteria*. Then $P(AB) = P(A \mid B)P(B) = 0.40 \times 0.25 = 0.10$. The probability that a stock meets both the financial and valuation criteria is 0.10.
- 4 **A** *Outcomes associated with Scenario 1:* With a 0.45 probability of a \$0.90 recovery per \$1 principal value, given Scenario 1, and with the probability of Scenario 1 equal to 0.75, the probability of recovering \$0.90 is $0.45(0.75) = 0.3375$. By a similar calculation, the probability of recovering \$0.80 is $0.55(0.75) = 0.4125$.
Outcomes associated with Scenario 2: With a 0.85 probability of a \$0.50 recovery per \$1 principal value, given Scenario 2, and with the probability of Scenario 2 equal to 0.25, the probability of recovering \$0.50 is $0.85(0.25) = 0.2125$. By a similar calculation, the probability of recovering \$0.40 is $0.15(0.25) = 0.0375$.
B $E(\text{recovery} \mid \text{Scenario 1}) = 0.45(\$0.90) + 0.55(\$0.80) = \0.845
C $E(\text{recovery} \mid \text{Scenario 2}) = 0.85(\$0.50) + 0.15(\$0.40) = \0.485
D $E(\text{recovery}) = 0.75(\$0.845) + 0.25(\$0.485) = \0.755



- 5 **A** We can set up the equation using the total probability rule:

$$\begin{aligned} P(\text{pass test}) &= P(\text{pass test} \mid \text{survivor})P(\text{survivor}) \\ &\quad + P(\text{pass test} \mid \text{nonsurvivor})P(\text{nonsurvivor}) \end{aligned}$$

We know that $P(\text{survivor}) = 1 - P(\text{nonsurvivor}) = 1 - 0.40 = 0.60$. Therefore, $P(\text{pass test}) = 0.55 = 0.85(0.60) + P(\text{pass test} \mid \text{nonsurvivor})(0.40)$. Thus $P(\text{pass test} \mid \text{nonsurvivor}) = [0.55 - 0.85(0.60)]/0.40 = 0.10$.

$$\begin{aligned}
 \text{B} \quad P(\text{survivor} \mid \text{pass test}) &= [P(\text{pass test} \mid \text{survivor})/P(\text{pass test})]P(\text{survivor}) \\
 &= (0.85/0.55)0.60 = 0.927273
 \end{aligned}$$

The information that a company passes the test causes you to update your probability that it is a survivor from 0.60 to approximately 0.927.

- C** According to Bayes' formula, $P(\text{nonsurvivor} \mid \text{fail test}) = [P(\text{fail test} \mid \text{nonsurvivor})/P(\text{fail test})]P(\text{nonsurvivor}) = [P(\text{fail test} \mid \text{nonsurvivor})/0.45]0.40$.

We can set up the following equation to obtain $P(\text{fail test} \mid \text{nonsurvivor})$:

$$\begin{aligned}
 P(\text{fail test}) &= P(\text{fail test} \mid \text{nonsurvivor})P(\text{nonsurvivor}) \\
 &\quad + P(\text{fail test} \mid \text{survivor})P(\text{survivor}) \\
 0.45 &= P(\text{fail test} \mid \text{nonsurvivor})0.40 + 0.15(0.60)
 \end{aligned}$$

where $P(\text{fail test} \mid \text{survivor}) = 1 - P(\text{pass test} \mid \text{survivor}) = 1 - 0.85 = 0.15$. So $P(\text{fail test} \mid \text{nonsurvivor}) = [0.45 - 0.15(0.60)]/0.40 = 0.90$. Using this result with the formula above, we find $P(\text{nonsurvivor} \mid \text{fail test}) = (0.90/0.45)0.40 = 0.80$. Seeing that a company fails the test causes us to update the probability that it is a nonsurvivor from 0.40 to 0.80.

- D** A company passing the test greatly increases our confidence that it is a survivor. A company failing the test doubles the probability that it is a nonsurvivor. Therefore, the test appears to be useful.
- 6** C is correct. The term "exhaustive" means that the events cover all possible outcomes.
- 7** C is correct. A subjective probability draws on personal or subjective judgment that may be without reference to any particular data.
- 8** A is correct. Given odds for E of a to b , the implied probability of $E = a/(a + b)$. Stated in terms of odds a to b with $a = 1$, $b = 5$, the probability of $E = 1/(1 + 5) = 1/6 = 0.167$. This result confirms that a probability of 0.167 for beating sales is odds of 1 to 5.
- 9** C is correct. A conditional probability is the probability of an event given that another event has occurred.
- 10** B is correct. Because the events are independent, the multiplication rule is most appropriate for forecasting their joint probability. The multiplication rule for independent events states that the joint probability of both A and B occurring is $P(AB) = P(A)P(B)$.
- 11** B is correct. The probability of the occurrence of one is related to the occurrence of the other. If we are trying to forecast one event, information about a dependent event may be useful.
- 12** C is correct. The total probability rule for expected value is used to estimate an expected value based on mutually exclusive and exhaustive scenarios.
- 13** B is correct. If Scenario 1 occurs, the expected recovery is 60% (\$50,000) + 40% (\$30,000) = \$42,000, and if Scenario 2 occurs, the expected recovery is 90% (\$80,000) + 10%(\$60,000) = \$78,000. Weighting by the probability of each scenario, the expected recovery is $40\%(\$42,000) + 60\%(\$78,000) = \$63,600$. Alternatively, first calculating the probability of each amount occurring, the expected recovery is $(40\%)(60\%)(\$50,000) + (40\%)(40\%)(\$30,000) + (60\%)(90\%)(\$80,000) + (60\%)(10\%)(\$60,000) = \$63,600$.
- 14** A is correct. The covariance is the product of the standard deviations and correlation using the formula $\text{Cov}(\text{US bond returns}, \text{Spanish bond returns}) = \sigma(\text{US bonds}) \times \sigma(\text{Spanish bonds}) \times \rho(\text{US bond returns}, \text{Spanish bond returns}) = 0.64 \times 0.56 \times 0.24 = 0.086$.

- 15** C is correct. The covariance of returns is positive when the returns on both assets tend to be on the same side (above or below) their expected values at the same time, indicating an average positive relationship between returns.
- 16** B is correct. Correlations near +1 exhibit strong positive linearity, whereas correlations near -1 exhibit strong negative linearity. A correlation of 0 indicates an absence of any linear relationship between the variables. The closer the correlation is to 0, the weaker the linear relationship.
- 17** C is correct. The correlation between two random variables R_i and R_j is defined as $\rho(R_i, R_j) = \text{Cov}(R_i, R_j)/\sigma(R_i)\sigma(R_j)$. Using the subscript i to represent hedge funds and the subscript j to represent the market index, the standard deviations are $\sigma(R_i) = 256^{1/2} = 16$ and $\sigma(R_j) = 81^{1/2} = 9$. Thus, $\rho(R_i, R_j) = \text{Cov}(R_i, R_j)/\sigma(R_i)\sigma(R_j) = 110/(16 \times 9) = 0.764$.
- 18** A is correct. As the correlation between two assets approaches +1, diversification benefits decrease. In other words, an increasingly positive correlation indicates an increasingly strong positive linear relationship and fewer diversification benefits.
- 19** A is correct. A covariance matrix for five stocks has $5 \times 5 = 25$ entries. Subtracting the 5 diagonal variance terms results in 20 off-diagonal entries. Because a covariance matrix is symmetrical, only 10 entries are unique ($20/2 = 10$).
- 20** A is correct. The analyst must first calculate expected sales as $0.05 \times \$70 + 0.70 \times \$40 + 0.25 \times \$25 = \$3.50 \text{ million} + \$28.00 \text{ million} + \$6.25 \text{ million} = \$37.75 \text{ million}$.

After calculating expected sales, we can calculate the variance of sales:

$$\begin{aligned} &= \sigma^2(\text{Sales}) \\ &= P(\$70)[\$70 - E(\text{Sales})]^2 + P(\$40)[\$40 - E(\text{Sales})]^2 + P(\$25) \\ &\quad [\$25 - E(\text{Sales})]^2 \\ &= 0.05(\$70 - 37.75)^2 + 0.70(\$40 - 37.75)^2 + 0.25(\$25 - 37.75)^2 \\ &= \$52.00 \text{ million} + \$3.54 \text{ million} + \$40.64 \text{ million} = \$96.18 \text{ million}. \end{aligned}$$

The standard deviation of sales is thus $\sigma = (\$96.18)^{1/2} = \9.81 million .

- 21** C is correct. The covariance of returns is positive when the returns on both assets tend to be on the same side (above or below) their expected values at the same time.
- 22** B is correct. The covariance is 26.56, calculated as follows. First, expected returns are

$$\begin{aligned} E(R_{FI}) &= (0.25 \times 25) + (0.50 \times 15) + (0.25 \times 10) \\ &= 6.25 + 7.50 + 2.50 = 16.25 \text{ and} \\ E(R_{DI}) &= (0.25 \times 30) + (0.50 \times 25) + (0.25 \times 15) \\ &= 7.50 + 12.50 + 3.75 = 23.75. \end{aligned}$$

Covariance is

$$\begin{aligned} \text{Cov}(R_{FI}, R_{DI}) &= \sum_i \sum_j P(R_{FI,i}, R_{DI,j}) (R_{FI,i} - ER_{FI})(R_{DI,j} - ER_{DI}) \\ &= 0.25[(25 - 16.25)(30 - 23.75)] + 0.50[(15 - 16.25) \\ &\quad (25 - 23.75)] + 0.25[(10 - 16.25)(15 - 23.75)] \\ &= 13.67 + (-0.78) + 13.67 = 26.56. \end{aligned}$$

23 C is correct. The combination formula provides the number of ways that r objects can be chosen from a total of n objects, when the order in which the r objects are listed does not matter. The order of the bonds within the portfolio does not matter.

24 A is correct. The answer is found using the combination formula

$${}_n C_r = \binom{n}{r} = \frac{n!}{(n-r)!r!}$$

Here, $n = 4$ and $r = 2$, so the answer is $4! / [(4 - 2)!2!] = 24 / (2) \times (2) = 6$. This result can be verified by assuming there are four vice presidents, VP1–VP4. The six possible additions to the investment committee are VP1 and VP2, VP1 and VP3, VP1 and VP4, VP2 and VP3, VP2 and VP4, and VP3 and VP4.

25 A is correct. The permutation formula is used to choose r objects from a total of n objects when order matters. Because the portfolio manager is trying to rank the four funds from most recommended to least recommended, the order of the funds matters; therefore, the permutation formula is most appropriate.

PRACTICE PROBLEMS

- 1 A European put option on stock conveys the right to sell the stock at a pre-specified price, called the exercise price, at the maturity date of the option. The value of this put at maturity is (exercise price – stock price) or \$0, whichever is greater. Suppose the exercise price is \$100 and the underlying stock trades in ticks of \$0.01. At any time before maturity, the terminal value of the put is a random variable.
 - A Describe the distinct possible outcomes for terminal put value. (Think of the put's maximum and minimum values and its minimum price increments.)
 - B Is terminal put value, at a time before maturity, a discrete or continuous random variable?
 - C Letting Y stand for terminal put value, express in standard notation the probability that terminal put value is less than or equal to \$24. No calculations or formulas are necessary.
- 2 Define the term "binomial random variable." Describe the types of problems for which the binomial distribution is used.
- 3 Over the last 10 years, a company's annual earnings increased year over year seven times and decreased year over year three times. You decide to model the number of earnings increases for the next decade as a binomial random variable.
 - A What is your estimate of the probability of success, defined as an increase in annual earnings?For Parts B, C, and D of this problem, assume the estimated probability is the actual probability for the next decade.
 - B What is the probability that earnings will increase in exactly 5 of the next 10 years?
 - C Calculate the expected number of yearly earnings increases during the next 10 years.
 - D Calculate the variance and standard deviation of the number of yearly earnings increases during the next 10 years.
 - E The expression for the probability function of a binomial random variable depends on two major assumptions. In the context of this problem, what must you assume about annual earnings increases to apply the binomial distribution in Part B? What reservations might you have about the validity of these assumptions?
- 4 You are examining the record of an investment newsletter writer who claims a 70 percent success rate in making investment recommendations that are profitable over a one-year time horizon. You have the one-year record of the newsletter's seven most recent recommendations. Four of those recommendations were profitable. If all the recommendations are independent and the newsletter writer's skill is as claimed, what is the probability of observing four or fewer profitable recommendations out of seven in total?
- 5 You are forecasting sales for a company in the fourth quarter of its fiscal year. Your low-end estimate of sales is €14 million, and your high-end estimate is €15 million. You decide to treat all outcomes for sales between these two values as equally likely, using a continuous uniform distribution.

- A What is the expected value of sales for the fourth quarter?
- B What is the probability that fourth-quarter sales will be less than or equal to €14,125,000?
- 6 State the approximate probability that a normal random variable will fall within the following intervals:
- A Mean plus or minus one standard deviation.
 - B Mean plus or minus two standard deviations.
 - C Mean plus or minus three standard deviations.
- 7 Find the area under the normal curve up to $z = 0.36$; that is, find $P(Z \leq 0.36)$. Interpret this value.
- 8 In futures markets, profits or losses on contracts are settled at the end of each trading day. This procedure is called marking to market or daily resettlement. By preventing a trader's losses from accumulating over many days, marking to market reduces the risk that traders will default on their obligations. A futures markets trader needs a liquidity pool to meet the daily mark to market. If liquidity is exhausted, the trader may be forced to unwind his position at an unfavorable time.

Suppose you are using financial futures contracts to hedge a risk in your portfolio. You have a liquidity pool (cash and cash equivalents) of λ dollars per contract and a time horizon of T trading days. For a given size liquidity pool, λ , Kolb, Gay, and Hunter (1985) developed an expression for the probability stating that you will exhaust your liquidity pool within a T -day horizon as a result of the daily mark to market. Kolb et al. assumed that the expected change in futures price is 0 and that futures price changes are normally distributed. With σ representing the standard deviation of daily futures price changes, the standard deviation of price changes over a time horizon to day T is $\sigma\sqrt{T}$, given continuous compounding. With that background, the Kolb et al. expression is

$$\text{Probability of exhausting liquidity pool} = 2[1 - N(x)]$$

where $x = \lambda / (\sigma\sqrt{T})$. Here x is a standardized value of λ . $N(x)$ is the standard normal cumulative distribution function. For some intuition about $1 - N(x)$ in the expression, note that the liquidity pool is exhausted if losses exceed the size of the liquidity pool at any time up to and including T ; the probability of that event happening can be shown to be proportional to an area in the right tail of a standard normal distribution, $1 - N(x)$.

Using the Kolb et al. expression, answer the following questions:

- A Your hedging horizon is five days, and your liquidity pool is \$2,000 per contract. You estimate that the standard deviation of daily price changes for the contract is \$450. What is the probability that you will exhaust your liquidity pool in the five-day period?
- B Suppose your hedging horizon is 20 days, but all the other facts given in Part A remain the same. What is the probability that you will exhaust your liquidity pool in the 20-day period?
- 9 A client has a portfolio of common stocks and fixed-income instruments with a current value of £1,350,000. She intends to liquidate £50,000 from the portfolio at the end of the year to purchase a partnership share in a business. Furthermore, the client would like to be able to withdraw the £50,000 without reducing the initial capital of £1,350,000. The following table shows four alternative asset allocations.

Mean and Standard Deviation for Four Allocations (in Percent)

	A	B	C	D
Expected annual return	16	12	10	9
Standard deviation of return	24	17	12	11

Address the following questions (assume normality for Parts B and C):

- A** Given the client's desire not to invade the £1,350,000 principal, what is the shortfall level, R_L ? Use this shortfall level to answer Part B.
 - B** According to the safety-first criterion, which of the allocations is the best?
 - C** What is the probability that the return on the safety-first optimal portfolio will be less than the shortfall level, R_L ?
- 10.**
- A** Define Monte Carlo simulation and explain its use in finance.
 - B** Compared with analytical methods, what are the strengths and weaknesses of Monte Carlo simulation for use in valuing securities?
- 11** A standard lookback call option on stock has a value at maturity equal to (Value of the stock at maturity – Minimum value of stock during the life of the option prior to maturity) or \$0, whichever is greater. If the minimum value reached prior to maturity was \$20.11 and the value of the stock at maturity is \$23, for example, the call is worth $\$23 - \$20.11 = \$2.89$. Briefly discuss how you might use Monte Carlo simulation in valuing a lookback call option.
- 12** Which of the following is a continuous random variable?
- A** The value of a futures contract quoted in increments of \$0.05
 - B** The total number of heads recorded in 1 million tosses of a coin
 - C** The rate of return on a diversified portfolio of stocks over a three-month period
- 13** X is a discrete random variable with possible outcomes $X = \{1,2,3,4\}$. Three functions $f(x)$, $g(x)$, and $h(x)$ are proposed to describe the probabilities of the outcomes in X .

Probability Function			
$X = x$	$f(x) = P(X = x)$	$g(x) = P(X = x)$	$h(x) = P(X = x)$
1	-0.25	0.20	0.20
2	0.25	0.25	0.25
3	0.50	0.50	0.30
4	0.25	0.05	0.35

The conditions for a probability function are satisfied by:

- A** $f(x)$.
 - B** $g(x)$.
 - C** $h(x)$.
- 14** The cumulative distribution function for a discrete random variable is shown in the following table.

Cumulative Distribution Function	
$X = x$	$F(x) = P(X \leq x)$
1	0.15
2	0.25
3	0.50
4	0.60
5	0.95
6	1.00

The probability that X will take on a value of either 2 or 4 is *closest* to:

- A 0.20.
 - B 0.35.
 - C 0.85.
- 15 Which of the following events can be represented as a Bernoulli trial?
- A The flip of a coin
 - B The closing price of a stock
 - C The picking of a random integer between 1 and 10
- 16 A stock is priced at \$100.00 and follows a one-period binomial process with an up move that equals 1.05 and a down move that equals 0.97. If 1 million Bernoulli trials are conducted, and the average terminal stock price is \$102.00, the probability of an up move (p) is *closest* to:
- A 0.375.
 - B 0.500.
 - C 0.625.
- 17 A call option on a stock index is valued using a three-step binomial tree with an up move that equals 1.05 and a down move that equals 0.95. The current level of the index is \$190, and the option exercise price is \$200. If the option value is positive when the stock price exceeds the exercise price at expiration and \$0 otherwise, the number of terminal nodes with a positive payoff is:
- A one.
 - B two.
 - C three.
- 18 A random number between zero and one is generated according to a continuous uniform distribution. What is the probability that the first number generated will have a value of exactly 0.30?
- A 0%
 - B 30%
 - C 70%
- 19 Which parameter equals zero in a normal distribution?
- A Kurtosis
 - B Skewness
 - C Standard deviation
- 20 An analyst develops the following capital market projections.

	Stocks	Bonds
Mean Return	10%	2%
Standard Deviation	15%	5%

Assuming the returns of the asset classes are described by normal distributions, which of the following statements is correct?

- A** Bonds have a higher probability of a negative return than stocks.
 - B** On average, 99% of stock returns will fall within two standard deviations of the mean.
 - C** The probability of a bond return less than or equal to 3% is determined using a Z -score of 0.25.
- 21** A client holding a £2,000,000 portfolio wants to withdraw £90,000 in one year without invading the principal. According to Roy's safety-first criterion, which of the following portfolio allocations is optimal?
- | | Allocation A | Allocation B | Allocation C |
|-------------------------------|---------------------|---------------------|---------------------|
| Expected annual return | 6.5% | 7.5% | 8.5% |
| Standard deviation of returns | 8.35% | 10.21% | 14.34% |
- A** Allocation A
 - B** Allocation B
 - C** Allocation C
- 22** In contrast to normal distributions, lognormal distributions:
- A** are skewed to the left.
 - B** have outcomes that cannot be negative.
 - C** are more suitable for describing asset returns than asset prices.
- 23** The lognormal distribution is a more accurate model for the distribution of stock prices than the normal distribution because stock prices are:
- A** symmetrical.
 - B** unbounded.
 - C** non-negative.
- 24** The price of a stock at $t = 0$ is \$208.25 and at $t = 1$ is \$186.75. The continuously compounded rate of return for the stock from $t = 0$ to $t = 1$ is closest to:
- A** -10.90%.
 - B** -10.32%.
 - C** 11.51%.

SOLUTIONS

- 1 A** The put's minimum value is \$0. The put's value is \$0 when the stock price is at or above \$100 at the maturity date of the option. The put's maximum value is $\$100 - \$100 = \$0$ (the exercise price) – \$0 (the lowest possible stock price). The put's value is \$100 when the stock is worthless at the option's maturity date. The put's minimum price increments are \$0.01. The possible outcomes of terminal put value are thus \$0.00, \$0.01, \$0.02, ..., \$100.
- B** The price of the underlying has minimum price fluctuations of \$0.01: These are the minimum price fluctuations for terminal put value. For example, if the stock finishes at \$98.20, the payoff on the put is $\$100 - \$98.20 = \$1.80$. We can specify that the nearest values to \$1.80 are \$1.79 and \$1.81. With a continuous random variable, we cannot specify the nearest values. So, we must characterize terminal put value as a discrete random variable.
- C** The probability that terminal put value is less than or equal to \$24 is $P(Y \leq 24)$ or $F(24)$, in standard notation, where F is the cumulative distribution function for terminal put value.
- 2** A binomial random variable is defined as the number of successes in n Bernoulli trials (a trial that produces one of two outcomes). The binomial distribution is used to make probability statements about a record of successes and failures or about anything with binary (twofold) outcomes.
- 3 A** The probability of an earnings increase (success) in a year is estimated as $7/10 = 0.70$ or 70 percent, based on the record of the past 10 years.
- B** The probability that earnings will increase in 5 out of the next 10 years is about 10.3 percent. Define a binomial random variable X , counting the number of earnings increases over the next 10 years. From Part A, the probability of an earnings increase in a given year is $p = 0.70$ and the number of trials (years) is $n = 10$. Equation 1 gives the probability that a binomial random variable has x successes in n trials, with the probability of success on a trial equal to p .

$$P(X = x) = \binom{n}{x} p^x (1-p)^{n-x} = \frac{n!}{(n-x)!x!} p^x (1-p)^{n-x}$$

For this example,

$$\begin{aligned} \binom{10}{5} 0.7^5 0.3^{10-5} &= \frac{10!}{(10-5)!5!} 0.7^5 0.3^{10-5} \\ &= 252 \times 0.16807 \times 0.00243 = 0.102919 \end{aligned}$$

We conclude that the probability that earnings will increase in exactly 5 of the next 10 years is 0.1029, or approximately 10.3 percent.

- C** The expected number of yearly increases is $E(X) = np = 10 \times 0.70 = 7$.
- D** The variance of the number of yearly increases over the next 10 years is $\sigma^2 = np(1-p) = 10 \times 0.70 \times 0.30 = 2.1$. The standard deviation is 1.449 (the positive square root of 2.1).
- E** You must assume that 1) the probability of an earnings increase (success) is constant from year to year and 2) earnings increases are independent trials. If current and past earnings help forecast next year's earnings, Assumption 2 is violated. If the company's business is subject to economic or industry cycles, neither assumption is likely to hold.

- 4** The observed success rate is $4/7 = 0.571$, or 57.1 percent. The probability of four or fewer successes is $F(4) = p(4) + p(3) + p(2) + p(1) + p(0)$, where $p(4)$, $p(3)$, $p(2)$, $p(1)$, and $p(0)$ are respectively the probabilities of 4, 3, 2, 1, and 0 successes, according to the binomial distribution with $n = 7$ and $p = 0.70$. We have

$$p(4) = (7!/4!3!)(0.70^4)(0.30^3) = 35(0.006483) = 0.226895$$

$$p(3) = (7!/3!4!)(0.70^3)(0.30^4) = 35(0.002778) = 0.097241$$

$$p(2) = (7!/2!5!)(0.70^2)(0.30^5) = 21(0.001191) = 0.025005$$

$$p(1) = (7!/1!6!)(0.70^1)(0.30^6) = 7(0.000510) = 0.003572$$

$$p(0) = (7!/0!7!)(0.70^0)(0.30^7) = 1(0.000219) = 0.000219$$

Summing all these probabilities, you conclude that $F(4) = 0.226895 + 0.097241 + 0.025005 + 0.003572 + 0.000219 = 0.352931$, or 35.3 percent.

- 5 A** The expected value of fourth-quarter sales is €14,500,000, calculated as $(€14,000,000 + €15,000,000)/2$. With a continuous uniform random variable, the mean or expected value is the midpoint between the smallest and largest values. (See Example 7.)
- B** The probability that fourth-quarter sales will be less than €14,125,000 is 0.125 or 12.5 percent, calculated as $(€14,125,000 - €14,000,000)/(€15,000,000 - €14,000,000)$.
- 6 A** Approximately 68 percent of all outcomes of a normal random variable fall within plus or minus one standard deviation of the mean.
- B** Approximately 95 percent of all outcomes of a normal random variable fall within plus or minus two standard deviations of the mean.
- C** Approximately 99 percent of all outcomes of a normal random variable fall within plus or minus three standard deviations of the mean.
- 7** The area under the normal curve for $z = 0.36$ is 0.6406 or 64.06 percent. The following table presents an excerpt from the tables of the standard normal cumulative distribution function in the back of this volume. To locate $z = 0.36$, find 0.30 in the fourth row of numbers, then look at the column for 0.06 (the second decimal place of 0.36). The entry is 0.6406.

$P(Z \leq x) = N(x)$ for $x \geq 0$ or $P(Z \leq z) = N(z)$ for $z \geq 0$

x or z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.00	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.10	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.20	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.30	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.40	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.50	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224

The interpretation of 64.06 percent for $z = 0.36$ is that 64.06 percent of observations on a standard normal random variable are smaller than or equal to the value 0.36. (So $100\% - 64.06\% = 35.94\%$ of the values are greater than 0.36.)

8 A The probability of exhausting the liquidity pool is 4.7 percent. First calculate $x = \lambda / (\sigma\sqrt{T}) = \$2,000 / (\$450\sqrt{5}) = 1.987616$. We can round this value to 1.99 to use the standard normal tables in the back of this book. Using those tables, we find that $N(1.99) = 0.9767$. Thus, the probability of exhausting the liquidity pool is $2[1 - N(1.99)] = 2(1 - 0.9767) = 0.0466$ or about 4.7 percent.

B The probability of exhausting the liquidity pool is now 32.2 percent. The calculation follows the same steps as those in Part A. We calculate $x = \lambda / (\sigma\sqrt{T}) = \$2,000 / (\$450\sqrt{20}) = 0.993808$. We can round this value to 0.99 to use the standard normal tables in the back of this book. Using those tables, we find that $N(0.99) = 0.8389$. Thus, the probability of exhausting the liquidity pool is $2[1 - N(0.99)] = 2(1 - 0.8389) = 0.3222$ or about 32.2 percent. This is a substantial probability that you will run out of funds to meet mark to market.

In their paper, Kolb et al. call the probability of exhausting the liquidity pool the probability of ruin, a traditional name for this type of calculation.

- 9 A** Because £50,000/£1,350,000 is 3.7 percent, for any return less than 3.7 percent the client will need to invade principal if she takes out £50,000. So $R_L = 3.7$ percent.
- B** To decide which of the allocations is safety-first optimal, select the alternative with the highest ratio $[E(R_P) - R_L]/\sigma_P$:

$$\text{Allocation A: } 0.5125 = (16 - 3.7)/24$$

$$\text{Allocation B: } 0.488235 = (12 - 3.7)/17$$

$$\text{Allocation C: } 0.525 = (10 - 3.7)/12$$

$$\text{Allocation D: } 0.481818 = (9 - 3.7)/11$$

Allocation C, with the largest ratio (0.525), is the best alternative according to the safety-first criterion.

C To answer this question, note that $P(R_C < 3.7) = N(-0.525)$. We can round 0.525 to 0.53 for use with tables of the standard normal cdf. First, we calculate $N(-0.53) = 1 - N(0.53) = 1 - 0.7019 = 0.2981$ or about 30 percent. The safety-first optimal portfolio has a roughly 30 percent chance of not meeting a 3.7 percent return threshold.

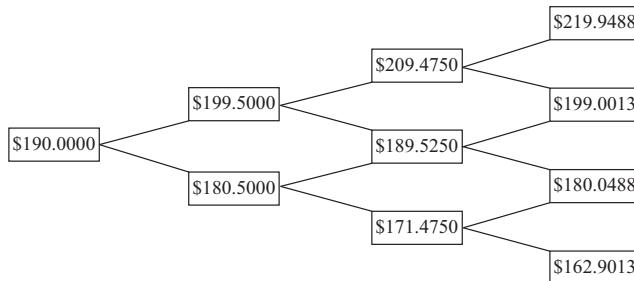
- 10 A** Elements that should appear in a definition of Monte Carlo simulation are that it makes use of a computer; that it is used to represent the operation of a complex system, or in some applications, to find an approximate solution to a problem; and that it involves the generation of a large number of random samples from a specified probability distribution. The exact wording can vary, but one definition follows:

Monte Carlo simulation in finance involves the use of a computer to represent the operation of a complex financial system. In some important applications, Monte Carlo simulation is used to find an approximate solution to a complex financial problem. An integral part of Monte Carlo simulation is the generation of a large number of random samples from a probability distribution.

B *Strengths.* Monte Carlo simulation can be used to price complex securities for which no analytic expression is available, particularly European-style options.

Weaknesses. Monte Carlo simulation provides only statistical estimates, not exact results. Analytic methods, when available, provide more insight into cause-and-effect relationships than does Monte Carlo simulation.

- 11 In the text, we described how we could use Monte Carlo simulation to value an Asian option, a complex European-style option. Just as we can calculate the average value of the stock over a simulation trial to value an Asian option, we can also calculate the minimum value of the stock over a simulation trial. Then, for a given simulation trial, we can calculate the terminal value of the call, given the minimum value of the stock for the simulation trial. We can then discount back this terminal value to the present to get the value of the call today ($t = 0$). The average of these $t = 0$ values over all simulation trials is the Monte Carlo simulated value of the lookback call option.
- 12 C is correct. The rate of return is a random variable because the future outcomes are uncertain, and it is continuous because it can take on an unlimited number of outcomes.
- 13 B is correct. The function $g(x)$ satisfies the conditions of a probability function. All of the values of $g(x)$ are between 0 and 1, and the values of $g(x)$ all sum to 1.
- 14 A is correct. The probability that X will take on a value of 4 or less is: $F(4) = P(X \leq 4) = p(1) + p(2) + p(3) + p(4) = 0.60$. The probability that X will take on a value of 3 or less is: $F(3) = P(X \leq 3) = p(1) + p(2) + p(3) = 0.50$. So, the probability that X will take on a value of 4 is: $F(4) - F(3) = p(4) = 0.10$. The probability of $X = 2$ can be found using the same logic: $F(2) - F(1) = p(2) = 0.25 - 0.15 = 0.10$. The probability of X taking on a value of 2 or 4 is: $p(2) + p(4) = 0.10 + 0.10 = 0.20$.
- 15 A is correct. A trial, such as a coin flip, will produce one of two outcomes. Such a trial is a Bernoulli trial.
- 16 C is correct. The probability of an up move (p) can be found by solving the equation: $(p)uS + (1 - p)dS = (p)105 + (1 - p)97 = 102$. Solving for p gives $8p = 5$, so that $p = 0.625$.
- 17 A is correct. Only the top node value of \$219.9488 exceeds \$200.



- 18 A is correct. The probability of generating a random number equal to any fixed point under a continuous uniform distribution is zero.
- 19 B is correct. A normal distribution has a skewness of zero (it is symmetrical around the mean). A non-zero skewness implies asymmetry in a distribution.
- 20 A is correct. The chance of a negative return falls in the area to the left of 0% under a standard normal curve. By standardizing the returns and standard deviations of the two assets, the likelihood of either asset experiencing a negative return may be determined: $Z\text{-score} (\text{standardized value}) = (X - \mu)/\sigma$

$$Z\text{-score for a bond return of } 0\% = (0 - 2)/5 = -0.40.$$

Z-score for a stock return of 0% = $(0 - 10)/15 = -0.67$.

For bonds, a 0% return falls 0.40 standard deviations below the mean return of 2%. In contrast, for stocks, a 0% return falls 0.67 standard deviations below the mean return of 10%. A standard deviation of 0.40 is less than a standard deviation of 0.67. Negative returns thus occupy more of the left tail of the bond distribution than the stock distribution. Thus, bonds are more likely than stocks to experience a negative return.

- 21** B is correct. Allocation B has the highest safety-first ratio. The threshold return level R_L for the portfolio is $\£90,000/\£2,000,000 = 4.5\%$, thus any return less than $R_L = 4.5\%$ will invade the portfolio principal. To compute the allocation that is safety-first optimal, select the alternative with the highest ratio:

$$\frac{[E(R_P - R_L)]}{\sigma_P}$$

$$\text{Allocation A} = \frac{6.5 - 4.5}{8.35} = 0.240$$

$$\text{Allocation B} = \frac{7.5 - 4.5}{10.21} = 0.294$$

$$\text{Allocation C} = \frac{8.5 - 4.5}{14.34} = 0.279$$

- 22** B is correct. By definition, lognormal random variables cannot have negative values.
- 23** C is correct. A lognormal distributed variable has a lower bound of zero. The lognormal distribution is also right skewed, which is a useful property in describing asset prices.
- 24** A is correct. The continuously compounded return from $t = 0$ to $t = 1$ is $r_{0,1} = \ln(S_1/S_0) = \ln(186.75/208.25) = -0.10897 = -10.90\%$.

PRACTICE PROBLEMS

- 1 Peter Biggs wants to know how growth managers performed last year. Biggs assumes that the population cross-sectional standard deviation of growth manager returns is 6 percent and that the returns are independent across managers.
 - A How large a random sample does Biggs need if he wants the standard deviation of the sample means to be 1 percent?
 - B How large a random sample does Biggs need if he wants the standard deviation of the sample means to be 0.25 percent?
- 2 Petra Munzi wants to know how value managers performed last year. Munzi estimates that the population cross-sectional standard deviation of value manager returns is 4 percent and assumes that the returns are independent across managers.
 - A Munzi wants to build a 95 percent confidence interval for the mean return. How large a random sample does Munzi need if she wants the 95 percent confidence interval to have a total width of 1 percent?
 - B Munzi expects a cost of about \$10 to collect each observation. If she has a \$1,000 budget, will she be able to construct the confidence interval she wants?
- 3 Assume that the equity risk premium is normally distributed with a population mean of 6 percent and a population standard deviation of 18 percent. Over the last four years, equity returns (relative to the risk-free rate) have averaged -2.0 percent. You have a large client who is very upset and claims that results this poor should *never* occur. Evaluate your client's concerns.
 - A Construct a 95 percent confidence interval around the population mean for a sample of four-year returns.
 - B What is the probability of a -2.0 percent or lower average return over a four-year period?
- 4 Compare the standard normal distribution and Student's *t*-distribution.
- 5 Find the reliability factors based on the *t*-distribution for the following confidence intervals for the population mean (*df* = degrees of freedom, *n* = sample size):
 - A A 99 percent confidence interval, *df* = 20.
 - B A 90 percent confidence interval, *df* = 20.
 - C A 95 percent confidence interval, *n* = 25.
 - D A 95 percent confidence interval, *n* = 16.
- 6 Assume that monthly returns are normally distributed with a mean of 1 percent and a sample standard deviation of 4 percent. The population standard deviation is unknown. Construct a 95 percent confidence interval for the sample mean of monthly returns if the sample size is 24.
- 7 Ten analysts have given the following fiscal year earnings forecasts for a stock:

Forecast (X_i)	Number of Analysts (n_i)
1.40	1
1.43	1
1.44	3

Forecast (X_i)	Number of Analysts (n_i)
1.45	2
1.47	1
1.48	1
1.50	1

Because the sample is a small fraction of the number of analysts who follow this stock, assume that we can ignore the finite population correction factor. Assume that the analyst forecasts are normally distributed.

- A What are the mean forecast and standard deviation of forecasts?
- B Provide a 95 percent confidence interval for the population mean of the forecasts.
- 8 Thirteen analysts have given the following fiscal-year earnings forecasts for a stock:

Forecast (X_i)	Number of Analysts (n_i)
0.70	2
0.72	4
0.74	1
0.75	3
0.76	1
0.77	1
0.82	1

Because the sample is a small fraction of the number of analysts who follow this stock, assume that we can ignore the finite population correction factor.

- A What are the mean forecast and standard deviation of forecasts?
- B What aspect of the data makes us uncomfortable about using t -tables to construct confidence intervals for the population mean forecast?
- 9 Explain the differences between constructing a confidence interval when sampling from a normal population with a known population variance and sampling from a normal population with an unknown variance.
- 10 An exchange rate has a given expected future value and standard deviation.
 - A Assuming that the exchange rate is normally distributed, what are the probabilities that the exchange rate will be at least 2 or 3 standard deviations away from its mean?
 - B Assume that you do not know the distribution of exchange rates. Use Chebyshev's inequality (that at least $1 - 1/k^2$ proportion of the observations will be within k standard deviations of the mean for any positive integer k greater than 1) to calculate the maximum probabilities that the exchange rate will be at least 2 or 3 standard deviations away from its mean.
- 11 Although he knows security returns are not independent, a colleague makes the claim that because of the central limit theorem, if we diversify across a large number of investments, the portfolio standard deviation will eventually approach zero as n becomes large. Is he correct?
- 12 Why is the central limit theorem important?
- 13 What is wrong with the following statement of the central limit theorem?



Central Limit Theorem. "If the random variables $X_1, X_2, X_3, \dots, X_n$ are a random sample of size n from any distribution with finite mean μ and variance σ^2 , then the distribution of \bar{X} will be approximately normal, with a standard deviation of σ/\sqrt{n} ."

- 14 Suppose we take a random sample of 30 companies in an industry with 200 companies. We calculate the sample mean of the ratio of cash flow to total debt for the prior year. We find that this ratio is 23 percent. Subsequently, we learn that the population cash flow to total debt ratio (taking account of all 200 companies) is 26 percent. What is the explanation for the discrepancy between the sample mean of 23 percent and the population mean of 26 percent?
- A Sampling error.
 - B Bias.
 - C A lack of consistency.
- 15 Alcorn Mutual Funds is placing large advertisements in several financial publications. The advertisements prominently display the returns of 5 of Alcorn's 30 funds for the past 1-, 3-, 5-, and 10-year periods. The results are indeed impressive, with all of the funds beating the major market indexes and a few beating them by a large margin. Is the Alcorn family of funds superior to its competitors?
- 16 Julius Spence has tested several predictive models in order to identify under-valued stocks. Spence used about 30 company-specific variables and 10 market-related variables to predict returns for about 5,000 North American and European stocks. He found that a final model using eight variables applied to telecommunications and computer stocks yields spectacular results. Spence wants you to use the model to select investments. Should you? What steps would you take to evaluate the model?
- 17 The *best* approach for creating a stratified random sample of a population involves:
- A drawing an equal number of simple random samples from each subpopulation.
 - B selecting every k th member of the population until the desired sample size is reached.
 - C drawing simple random samples from each subpopulation in sizes proportional to the relative size of each subpopulation.
- 18 A population has a non-normal distribution with mean μ and variance σ^2 . The sampling distribution of the sample mean computed from samples of large size from that population will have:
- A the same distribution as the population distribution.
 - B its mean approximately equal to the population mean.
 - C its variance approximately equal to the population variance.
- 19 A sample mean is computed from a population with a variance of 2.45. The sample size is 40. The standard error of the sample mean is *closest* to:
- A 0.039.
 - B 0.247.
 - C 0.387.
- 20 An estimator with an expected value equal to the parameter that it is intended to estimate is described as:

- A efficient.
 - B unbiased.
 - C consistent.
- 21 If an estimator is consistent, an increase in sample size will increase the:
- A accuracy of estimates.
 - B efficiency of the estimator.
 - C unbiasedness of the estimator.
- 22 For a two-sided confidence interval, an increase in the degree of confidence will result in:
- A a wider confidence interval.
 - B a narrower confidence interval.
 - C no change in the width of the confidence interval.
- 23 As the *t*-distribution's degrees of freedom decrease, the *t*-distribution *most likely*:
- A exhibits tails that become fatter.
 - B approaches a standard normal distribution.
 - C becomes asymmetrically distributed around its mean value.
- 24 For a sample size of 17, with a mean of 116.23 and a variance of 245.55, the width of a 90% confidence interval using the appropriate *t*-distribution is *closest to*:
- A 13.23.
 - B 13.27.
 - C 13.68.
- 25 For a sample size of 65 with a mean of 31 taken from a normally distributed population with a variance of 529, a 99% confidence interval for the population mean will have a lower limit *closest* to:
- A 23.64.
 - B 25.41.
 - C 30.09.
- 26 An increase in sample size is *most likely* to result in a:
- A wider confidence interval.
 - B decrease in the standard error of the sample mean.
 - C lower likelihood of sampling from more than one population.
- 27 A report on long-term stock returns focused exclusively on all currently publicly traded firms in an industry is *most likely* susceptible to:
- A look-ahead bias.
 - B survivorship bias.
 - C intergenerational data mining.
- 28 Which sampling bias is *most likely* investigated with an out-of-sample test?
- A Look-ahead bias
 - B Data-mining bias
 - C Sample selection bias
- 29 Which of the following characteristics of an investment study *most likely* indicates time-period bias?
- A The study is based on a short time-series.

- B** Information not available on the test date is used.
- C** A structural change occurred prior to the start of the study's time series.

SOLUTIONS

- 1 A** The standard deviation or standard error of the sample mean is $\sigma_{\bar{X}} = \sigma/\sqrt{n}$. Substituting in the values for $\sigma_{\bar{X}}$ and σ , we have $1\% = 6\%/\sqrt{n}$, or $\sqrt{n} = 6$. Squaring this value, we get a random sample of $n = 36$.
- B** As in Part A, the standard deviation of sample mean is $\sigma_{\bar{X}} = \sigma/\sqrt{n}$. Substituting in the values for $\sigma_{\bar{X}}$ and σ , we have $0.25\% = 6\%/\sqrt{n}$, or $\sqrt{n} = 24$. Squaring this value, we get a random sample of $n = 576$, which is substantially larger than for Part A of this question.
- 2 A** Assume the sample size will be large and thus the 95 percent confidence interval for the mean of a sample of manager returns is $\bar{X} \pm 1.96s_{\bar{X}}$, where $s_{\bar{X}} = s/\sqrt{n}$. Munzi wants the distance between the upper limit and lower limit in the confidence interval to be 1 percent, which is

$$(\bar{X} + 1.96s_{\bar{X}}) - (\bar{X} - 1.96s_{\bar{X}}) = 1\%$$

Simplifying this equation, we get $2(1.96s_{\bar{X}}) = 1\%$. Finally, we have $3.92s_{\bar{X}} = 1\%$, which gives us the standard deviation of the sample mean, $s_{\bar{X}} = 0.255\%$. The distribution of sample means is $s_{\bar{X}} = s/\sqrt{n}$. Substituting in the values for $s_{\bar{X}}$ and s , we have $0.255\% = 4\%/\sqrt{n}$, or $\sqrt{n} = 15.69$. Squaring this value, we get a random sample of $n = 246$.

- B** With her budget, Munzi can pay for a sample of up to 100 observations, which is far short of the 246 observations needed. Munzi can either proceed with her current budget and settle for a wider confidence interval or she can raise her budget (to around \$2,460) to get the sample size for a 1 percent width in her confidence interval.
- 3 A** This is a small-sample problem in which the sample comes from a normal population with a known standard deviation; thus we use the *z*-distribution in the solution. For a 95 percent confidence interval (and 2.5 percent in each tail), the critical *z*-value is 1.96. For returns that are normally distributed, a 95 percent confidence interval is of the form

$$\mu + 1.96 \frac{\sigma}{\sqrt{n}}$$

The lower limit is $X_l = \mu - 1.96 \frac{\sigma}{\sqrt{n}} = 6\% - 1.96 \frac{18\%}{\sqrt{4}} = 6\% - 1.96(9\%) = -11.64\%$.

The upper limit is $X_u = \mu + 1.96 \frac{\sigma}{\sqrt{n}} = 6\% + 1.96 \frac{18\%}{\sqrt{4}} = 6\% + 1.96(9\%) = 23.64\%$.

There is a 95 percent probability that four-year average returns will be between -11.64 percent and $+23.64$ percent.

- B** The critical *z*-value associated with the -2.0 percent return is

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \frac{-2\% - 6\%}{18\%/\sqrt{4}} = \frac{-8\%}{9\%} = -0.89$$

Using a normal table, the probability of a z -value less than -0.89 is $P(Z < -0.89) = 0.1867$. Unfortunately, although your client is unhappy with the investment result, a four-year average return of -2.0 percent or lower should occur 18.67 percent of the time.

- 4 (Refer to Figure 1 to help visualize the answer to this question.) Basically, only one standard normal distribution exists, but many t -distributions exist—one for every different number of degrees of freedom. The normal distribution and the t -distribution for a large number of degrees of freedom are practically the same. The lower the degrees of freedom, the flatter the t -distribution becomes. The t -distribution has less mass (lower probabilities) in the center of the distribution and more mass (higher probabilities) out in both tails. Therefore, the confidence intervals based on t -values will be wider than those based on the normal distribution. Stated differently, the probability of being within a given number of standard deviations (such as within ± 1 standard deviation or ± 2 standard deviations) is lower for the t -distribution than for the normal distribution.
- 5 **A** For a 99 percent confidence interval, the reliability factor we use is $t_{0.005}$; for $df = 20$, this factor is 2.845.
- B** For a 90 percent confidence interval, the reliability factor we use is $t_{0.05}$; for $df = 20$, this factor is 1.725.
- C** Degrees of freedom equals $n - 1$, or in this case $25 - 1 = 24$. For a 95 percent confidence interval, the reliability factor we use is $t_{0.025}$; for $df = 24$, this factor is 2.064.
- D** Degrees of freedom equals $16 - 1 = 15$. For a 95 percent confidence interval, the reliability factor we use is $t_{0.025}$; for $df = 15$, this factor is 2.131.
- 6 Because this is a small sample from a normal population and we have only the sample standard deviation, we use the following model to solve for the confidence interval of the population mean:

$$\bar{X} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$$

where we find $t_{0.025}$ (for a 95 percent confidence interval) for $df = n - 1 = 24 - 1 = 23$; this value is 2.069. Our solution is $1\% \pm 2.069(4\%) / \sqrt{24} = 1\% \pm 2.069(0.8165) = 1\% \pm 1.69$. The 95 percent confidence interval spans the range from -0.69 percent to $+2.69$ percent.

- 7 The following table summarizes the calculations used in the answers.

Forecast (X_i)	Number of Analysts (n_i)	$X_i n_i$	$(X_i - \bar{X})$	$(X_i - \bar{X})^2$	$(X_i - \bar{X})^2 n_i$
1.40	1	1.40	-0.05	0.0025	0.0025
1.43	1	1.43	-0.02	0.0004	0.0004
1.44	3	4.32	-0.01	0.0001	0.0003
1.45	2	2.90	0.00	0.0000	0.0000
1.47	1	1.47	0.02	0.0004	0.0004
1.48	1	1.48	0.03	0.0009	0.0009
1.50	1	1.50	0.05	0.0025	0.0025
Sums	10	14.50			0.0070

A With $n = 10$, $\bar{X} = \sum_{i=1}^{10} X_i/n = 14.50/10 = 1.45$. The variance is $s^2 = \left[\sum_{i=1}^{10} (X_i - \bar{X})^2 \right] / (n-1) = 0.0070/9 = 0.0007778$. The sample standard deviation is $s = \sqrt{0.0007778} = 0.02789$.

B The confidence interval for the mean can be estimated by using $\bar{X} \pm t_{\alpha/2}(s/\sqrt{n})$. For 9 degrees of freedom, the reliability factor, $t_{0.025}$, equals 2.262 and the confidence interval is

$$\begin{aligned} 1.45 &\pm 2.262 \times 0.02789 / \sqrt{10} = 1.45 \pm 2.262(0.00882) \\ &= 1.45 \pm 0.02 \end{aligned}$$

The confidence interval for the population mean ranges from 1.43 to 1.47.

- 8** The following table summarizes the calculations used in the answers.

Forecast (X_i)	Number of Analysts (n_i)	$X_i n_i$	$(X_i - \bar{X})$	$(X_i - \bar{X})^2$	$(X_i - \bar{X})^2 n_i$
0.70	2	1.40	-0.04	0.0016	0.0032
0.72	4	2.88	-0.02	0.0004	0.0016
0.74	1	0.74	0.00	0.0000	0.0000
0.75	3	2.25	0.01	0.0001	0.0003
0.76	1	0.76	0.02	0.0004	0.0004
0.77	1	0.77	0.03	0.0009	0.0009
0.82	1	0.82	0.08	0.0064	0.0064
Sums	13	9.62			0.0128

A With $n = 13$, $\bar{X} = \sum_{i=1}^{13} X_i/n = 9.62/13 = 0.74$. The variance is $s^2 = \left[\sum_{i=1}^{13} (X_i - \bar{X})^2 \right] / (n-1) = 0.0128/12 = 0.001067$. The sample standard deviation is $s = \sqrt{0.001067} = 0.03266$.

B The sample is small, and the distribution appears to be bimodal. We cannot compute a confidence interval for the population mean because we have probably sampled from a distribution that is not normal.

- 9** If the population variance is known, the confidence interval is

$$\bar{X} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

The confidence interval for the population mean is centered at the sample mean, \bar{X} . The population standard deviation is σ , and the sample size is n . The population standard deviation divided by the square root of n is the standard error of the estimate of the mean. The value of z depends on the desired degree of confidence. For a 95 percent confidence interval, $z_{0.025} = 1.96$ and the confidence interval estimate is

$$\bar{X} \pm 1.96 \frac{\sigma}{\sqrt{n}}$$

If the population variance is not known, we make two changes to the technique used when the population variance is known. First, we must use the sample standard deviation instead of the population standard deviation. Second, we use the *t*-distribution instead of the normal distribution. The critical *t*-value will depend on degrees of freedom $n - 1$. If the sample size is large, we have the alternative of using the *z*-distribution with the sample standard deviation.

- 10 A** The probabilities can be taken from a normal table, in which the critical *z*-values are 2.00 or 3.00 and we are including the probabilities in both tails. The probabilities that the exchange rate will be at least 2 or 3 standard deviations away from the mean are

$$P(|X - \mu| \geq 2\sigma) = 0.0456$$

$$P(|X - \mu| \geq 3\sigma) = 0.0026$$

- B** With Chebyshev's inequality, the maximum probability of the exchange rate being at least k standard deviations from the mean is $P(|X - \mu| \geq k\sigma) \leq (1/k)^2$. The maximum probabilities of the rate being at least 2 or 3 standard deviations away from the mean are

$$P(|X - \mu| \geq 2\sigma) \leq (1/2)^2 = 0.2500$$

$$P(|X - \mu| \geq 3\sigma) \leq (1/3)^2 = 0.1111$$

The probability of the rate being outside 2 or 3 standard deviations of the mean is much smaller with a known normal distribution than when the distribution is unknown and we are relying on Chebyshev's inequality.

- 11** No. First the conclusion on the limit of zero is wrong; second, the support cited for drawing the conclusion (i.e., the central limit theorem) is not relevant in this context.
- 12** In many instances, the distribution that describes the underlying population is not normal or the distribution is not known. The central limit theorem states that if the sample size is large, regardless of the shape of the underlying population, the distribution of the sample mean is approximately normal. Therefore, even in these instances, we can still construct confidence intervals (and conduct tests of inference) as long as the sample size is large (generally $n \geq 30$).
- 13** The statement makes the following mistakes:
- Given the conditions in the statement, the distribution of \bar{X} will be approximately normal only for large sample sizes.
 - The statement omits the important element of the central limit theorem that the distribution of \bar{X} will have mean μ .
- 14** A is correct. The discrepancy arises from sampling error. Sampling error exists whenever one fails to observe every element of the population, because a sample statistic can vary from sample to sample. As stated in the reading, the sample mean is an unbiased estimator, a consistent estimator, and an efficient estimator of the population mean. Although the sample mean is an unbiased estimator of the population mean—the expected value of the sample mean equals the population mean—because of sampling error, we do not expect the sample mean to exactly equal the population mean in any one sample we may take.

- 15 No, we cannot say that Alcorn Mutual Funds as a group is superior to competitors. Alcorn Mutual Funds' advertisement may easily mislead readers because the advertisement does not show the performance of all its funds. In particular, Alcorn Mutual Funds is engaging in sample selection bias by presenting the investment results from its best-performing funds only.
- 16 Spence may be guilty of data mining. He has used so many possible combinations of variables on so many stocks, it is not surprising that he found some instances in which a model worked. In fact, it would have been more surprising if he had not found any. To decide whether to use his model, you should do two things: First, ask that the model be tested on out-of-sample data—that is, data that were not used in building the model. The model may not be successful with out-of-sample data. Second, examine his model to make sure that the relationships in the model make economic sense, have a story, and have a future.
- 17 C is correct. Stratified random sampling involves dividing a population into subpopulations based on one or more classification criteria. Then, simple random samples are drawn from each subpopulation in sizes proportional to the relative size of each subpopulation. These samples are then pooled to form a stratified random sample.
- 18 B is correct. Given a population described by any probability distribution (normal or non-normal) with finite variance, the central limit theorem states that the sampling distribution of the sample mean will be approximately normal, with the mean approximately equal to the population mean, when the sample size is large.
- 19 B is correct. Taking the square root of the known population variance to determine the population standard deviation (σ) results in:

$$\sigma = \sqrt{2.45} = 1.565$$

The formula for the standard error of the sample mean (σ_x), based on a known sample size (n), is:

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

Therefore,

$$\sigma_x = \frac{1.565}{\sqrt{40}} = 0.247$$

- 20 B is correct. An unbiased estimator is one for which the expected value equals the parameter it is intended to estimate.
- 21 A is correct. A consistent estimator is one for which the probability of estimates close to the value of the population parameter increases as sample size increases. More specifically, a consistent estimator's sampling distribution becomes concentrated on the value of the parameter it is intended to estimate as the sample size approaches infinity.
- 22 A is correct. As the degree of confidence increases (e.g., from 95% to 99%), a given confidence interval will become wider. A confidence interval is a range for which one can assert with a given probability $1 - \alpha$, called the degree of confidence, that it will contain the parameter it is intended to estimate.

- 23** A is correct. A standard normal distribution has tails that approach zero faster than the *t*-distribution. As degrees of freedom increase, the tails of the *t*-distribution become less fat and the *t*-distribution begins to look more like a standard normal distribution. But as degrees of freedom decrease, the tails of the *t*-distribution become fatter.
- 24** B is correct. The confidence interval is calculated using the following equation:

$$\bar{X} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$$

Sample standard deviation (*s*) = $\sqrt{245.55} = 15.670$.

For a sample size of 17, degrees of freedom equal 16, so $t_{0.05} = 1.746$.

The confidence interval is calculated as

$$116.23 \pm 1.746 \frac{15.67}{\sqrt{17}} = 116.23 \pm 6.6357$$

Therefore, the interval spans 109.5943 to 122.8656, meaning its width is equal to approximately 13.271. (This interval can be alternatively calculated as 6.6357×2).

- 25** A is correct. To solve, use the structure of Confidence interval = Point estimate \pm Reliability factor \times Standard error, which, for a normally distributed population with known variance, is represented by the following formula:

$$\bar{X} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

For a 99% confidence interval, use $z_{0.005} = 2.58$.

Also, $\sigma = \sqrt{529} = 23$.

Therefore, the lower limit = $31 - 2.58 \frac{23}{\sqrt{65}} = 23.6398$.

- 26** B is correct. All else being equal, as the sample size increases, the standard error of the sample mean decreases and the width of the confidence interval also decreases.

- 27** B is correct. A report that uses a current list of stocks does not account for firms that failed, merged, or otherwise disappeared from the public equity market in previous years. As a consequence, the report is biased. This type of bias is known as survivorship bias.

- 28** B is correct. An out-of-sample test is used to investigate the presence of data-mining bias. Such a test uses a sample that does not overlap the time period of the sample on which a variable, strategy, or model was developed.

- 29** A is correct. A short time series is likely to give period-specific results that may not reflect a longer time period.

PRACTICE PROBLEMS

- 1 Identify the appropriate test statistic or statistics for conducting the following hypothesis tests. (Clearly identify the test statistic and, if applicable, the number of degrees of freedom. For example, “We conduct the test using an x -statistic with y degrees of freedom.”)
 - A $H_0: \mu = 0$ versus $H_a: \mu \neq 0$, where μ is the mean of a normally distributed population with unknown variance. The test is based on a sample of 15 observations.
 - B $H_0: \mu = 0$ versus $H_a: \mu \neq 0$, where μ is the mean of a normally distributed population with unknown variance. The test is based on a sample of 40 observations.
 - C $H_0: \mu \leq 0$ versus $H_a: \mu > 0$, where μ is the mean of a normally distributed population with known variance σ^2 . The sample size is 45.
 - D $H_0: \sigma^2 = 200$ versus $H_a: \sigma^2 \neq 200$, where σ^2 is the variance of a normally distributed population. The sample size is 50.
 - E $H_0: \sigma_1^2 = \sigma_2^2$ versus $H_a: \sigma_1^2 \neq \sigma_2^2$, where σ_1^2 is the variance of one normally distributed population and σ_2^2 is the variance of a second normally distributed population. The test is based on two independent random samples.
 - F $H_0: (\text{Population mean 1}) - (\text{Population mean 2}) = 0$ versus $H_a: (\text{Population mean 1}) - (\text{Population mean 2}) \neq 0$, where the samples are drawn from normally distributed populations with unknown variances. The observations in the two samples are correlated.
 - G $H_0: (\text{Population mean 1}) - (\text{Population mean 2}) = 0$ versus $H_a: (\text{Population mean 1}) - (\text{Population mean 2}) \neq 0$, where the samples are drawn from normally distributed populations with unknown but assumed equal variances. The observations in the two samples (of size 25 and 30, respectively) are independent.
- 2 For each of the following hypothesis tests concerning the population mean, μ , state the rejection point condition or conditions for the test statistic (e.g., $t > 1.25$); n denotes sample size.
 - A $H_0: \mu = 10$ versus $H_a: \mu \neq 10$, using a t -test with $n = 26$ and $\alpha = 0.05$
 - B $H_0: \mu = 10$ versus $H_a: \mu \neq 10$, using a t -test with $n = 40$ and $\alpha = 0.01$
 - C $H_0: \mu \leq 10$ versus $H_a: \mu > 10$, using a t -test with $n = 40$ and $\alpha = 0.01$
 - D $H_0: \mu \leq 10$ versus $H_a: \mu > 10$, using a t -test with $n = 21$ and $\alpha = 0.05$
 - E $H_0: \mu \geq 10$ versus $H_a: \mu < 10$, using a t -test with $n = 19$ and $\alpha = 0.10$
 - F $H_0: \mu \geq 10$ versus $H_a: \mu < 10$, using a t -test with $n = 50$ and $\alpha = 0.05$
- 3 For each of the following hypothesis tests concerning the population mean, μ , state the rejection point condition or conditions for the test statistic (e.g., $z > 1.25$); n denotes sample size.
 - A $H_0: \mu = 10$ versus $H_a: \mu \neq 10$, using a z -test with $n = 50$ and $\alpha = 0.01$
 - B $H_0: \mu = 10$ versus $H_a: \mu \neq 10$, using a z -test with $n = 50$ and $\alpha = 0.05$
 - C $H_0: \mu = 10$ versus $H_a: \mu \neq 10$, using a z -test with $n = 50$ and $\alpha = 0.10$
 - D $H_0: \mu \leq 10$ versus $H_a: \mu > 10$, using a z -test with $n = 50$ and $\alpha = 0.05$

- 4 Willco is a manufacturer in a mature cyclical industry. During the most recent industry cycle, its net income averaged \$30 million per year with a standard deviation of \$10 million ($n = 6$ observations). Management claims that Willco's performance during the most recent cycle results from new approaches and that we can dismiss profitability expectations based on its average or normalized earnings of \$24 million per year in prior cycles.
- A With μ as the population value of mean annual net income, formulate null and alternative hypotheses consistent with testing Willco management's claim.
- B Assuming that Willco's net income is at least approximately normally distributed, identify the appropriate test statistic.
- C Identify the rejection point or points at the 0.05 level of significance for the hypothesis tested in Part A.
- D Determine whether or not to reject the null hypothesis at the 0.05 significance level.

The following information relates to Questions 5–6

Performance in Forecasting Quarterly Earnings per Share

	Number of Forecasts	Mean Forecast Error (Predicted – Actual)	Standard Deviations of Forecast Errors
Analyst A	101	0.05	0.10
Analyst B	121	0.02	0.09

- 5 Investment analysts often use earnings per share (EPS) forecasts. One test of forecasting quality is the zero-mean test, which states that optimal forecasts should have a mean forecasting error of 0. (Forecasting error = Predicted value of variable – Actual value of variable.)
- You have collected data (shown in the table above) for two analysts who cover two different industries: Analyst A covers the telecom industry; Analyst B covers automotive parts and suppliers.
- A With μ as the population mean forecasting error, formulate null and alternative hypotheses for a zero-mean test of forecasting quality.
- B For Analyst A, using both a t -test and a z -test, determine whether to reject the null at the 0.05 and 0.01 levels of significance.
- C For Analyst B, using both a t -test and a z -test, determine whether to reject the null at the 0.05 and 0.01 levels of significance.
- 6 Reviewing the EPS forecasting performance data for Analysts A and B, you want to investigate whether the larger average forecast errors of Analyst A are due to chance or to a higher underlying mean value for Analyst A. Assume that the forecast errors of both analysts are normally distributed and that the samples are independent.
- A Formulate null and alternative hypotheses consistent with determining whether the population mean value of Analyst A's forecast errors (μ_1) are larger than Analyst B's (μ_2).

- B** Identify the test statistic for conducting a test of the null hypothesis formulated in Part A.
- C** Identify the rejection point or points for the hypothesis tested in Part A, at the 0.05 level of significance.
- D** Determine whether or not to reject the null hypothesis at the 0.05 level of significance.
-

- 7** The table below gives data on the monthly returns on the S&P 500 and small-cap stocks for the period January 1960 through December 1999 and provides statistics relating to their mean differences.

Measure	S&P 500 Return (%)	Small-Cap Stock Return (%)	Differences (S&P 500– Small-Cap Stock)
<i>January 1960–December 1999, 480 months</i>			
Mean	1.0542	1.3117	-0.258
Standard deviation	4.2185	5.9570	3.752
<i>January 1960–December 1979, 240 months</i>			
Mean	0.6345	1.2741	-0.640
Standard deviation	4.0807	6.5829	4.096
<i>January 1980–December 1999, 240 months</i>			
Mean	1.4739	1.3492	0.125
Standard deviation	4.3197	5.2709	3.339

Let μ_d stand for the population mean value of difference between S&P 500 returns and small-cap stock returns. Use a significance level of 0.05 and suppose that mean differences are approximately normally distributed.

- A** Formulate null and alternative hypotheses consistent with testing whether any difference exists between the mean returns on the S&P 500 and small-cap stocks.
- B** Determine whether or not to reject the null hypothesis at the 0.05 significance level for the January 1960 to December 1999 period.
- C** Determine whether or not to reject the null hypothesis at the 0.05 significance level for the January 1960 to December 1979 subperiod.
- D** Determine whether or not to reject the null hypothesis at the 0.05 significance level for the January 1980 to December 1999 subperiod.
- 8** During a 10-year period, the standard deviation of annual returns on a portfolio you are analyzing was 15 percent a year. You want to see whether this record is sufficient evidence to support the conclusion that the portfolio's underlying variance of return was less than 400, the return variance of the portfolio's benchmark.
- A** Formulate null and alternative hypotheses consistent with the verbal description of your objective.
- B** Identify the test statistic for conducting a test of the hypotheses in Part A.
- C** Identify the rejection point or points at the 0.05 significance level for the hypothesis tested in Part A.
- D** Determine whether the null hypothesis is rejected or not rejected at the 0.05 level of significance.

- 9** You are investigating whether the population variance of returns on the S&P 500/BARRA Growth Index changed subsequent to the October 1987 market crash. You gather the following data for 120 months of returns before October 1987 and for 120 months of returns after October 1987. You have specified a 0.05 level of significance.

Time Period	n	Mean Monthly Return (%)	Variance of Returns
Before October 1987	120	1.416	22.367
After October 1987	120	1.436	15.795

- A** Formulate null and alternative hypotheses consistent with the verbal description of the research goal.
B Identify the test statistic for conducting a test of the hypotheses in Part A.
C Determine whether or not to reject the null hypothesis at the 0.05 level of significance. (Use the F-tables in the back of this volume.)
- 10** In the step “stating a decision rule” in testing a hypothesis, which of the following elements must be specified?
- A** Critical value
B Power of a test
C Value of a test statistic
- 11** Which of the following statements is correct with respect to the null hypothesis?
- A** It is considered to be true unless the sample provides evidence showing it is false.
B It can be stated as “not equal to” provided the alternative hypothesis is stated as “equal to.”
C In a two-tailed test, it is rejected when evidence supports equality between the hypothesized value and population parameter.
- 12** Which of the following statements regarding a one-tailed hypothesis test is correct?
- A** The rejection region increases in size as the level of significance becomes smaller.
B A one-tailed test more strongly reflects the beliefs of the researcher than a two-tailed test.
C The absolute value of the rejection point is larger than that of a two-tailed test at the same level of significance.
- 13** The value of a test statistic is *best* described as the basis for deciding whether to:
- A** reject the null hypothesis.
B accept the null hypothesis.
C reject the alternative hypothesis.
- 14** Which of the following is a Type I error?
- A** Rejecting a true null hypothesis
B Rejecting a false null hypothesis
C Failing to reject a false null hypothesis
- 15** A Type II error is *best* described as:
- A** rejecting a true null hypothesis.
B failing to reject a false null hypothesis.

- C failing to reject a false alternative hypothesis.
- 16** The level of significance of a hypothesis test is *best* used to:
- calculate the test statistic.
 - define the test's rejection points.
 - specify the probability of a Type II error.
- 17** You are interested in whether excess risk-adjusted return (alpha) is correlated with mutual fund expense ratios for US large-cap growth funds. The following table presents the sample.

Mutual Fund	1	2	3	4	5	6	7	8	9
Alpha (X)	-0.52	-0.13	-0.60	-1.01	-0.26	-0.89	-0.42	-0.23	-0.60
Expense Ratio (Y)	1.34	0.92	1.02	1.45	1.35	0.50	1.00	1.50	1.45

- Formulate null and alternative hypotheses consistent with the verbal description of the research goal.
 - Identify the test statistic for conducting a test of the hypotheses in Part A.
 - Justify your selection in Part B.
 - Determine whether or not to reject the null hypothesis at the 0.05 level of significance.
- 18** All else equal, is specifying a smaller significance level in a hypothesis test likely to increase the probability of a:

	Type I error?	Type II error?
A	No	No
B	No	Yes
C	Yes	No

- 19** The probability of correctly rejecting the null hypothesis is the:
- p -value.
 - power of a test.
 - level of significance.
- 20** When making a decision in investments involving a statistically significant result, the:
- economic result should be presumed meaningful.
 - statistical result should take priority over economic considerations.
 - economic logic for the future relevance of the result should be further explored.
- 21** Which of the following statements is correct with respect to the p -value?
- It is a less precise measure of test evidence than rejection points.
 - It is the largest level of significance at which the null hypothesis is rejected.
 - It can be compared directly with the level of significance in reaching test conclusions.
- 22** Which of the following represents a correct statement about the p -value?
- The p -value offers less precise information than does the rejection points approach.
 - A larger p -value provides stronger evidence in support of the alternative hypothesis.

- C A *p*-value less than the specified level of significance leads to rejection of the null hypothesis.
- 23 Which of the following tests of a hypothesis concerning the population mean is *most* appropriate?
- A A *z*-test if the population variance is unknown and the sample is small
 - B A *z*-test if the population is normally distributed with a known variance
 - C A *t*-test if the population is non-normally distributed with unknown variance and a small sample
- 24 For a small sample with unknown variance, which of the following tests of a hypothesis concerning the population mean is most appropriate?
- A A *t*-test if the population is normally distributed
 - B A *t*-test if the population is non-normally distributed
 - C A *z*-test regardless of the normality of the population distribution
- 25 For a small sample from a normally distributed population with unknown variance, the *most* appropriate test statistic for the mean is the:
- A *z*-statistic.
 - B *t*-statistic.
 - C χ^2 statistic.
- 26 A pooled estimator is used when testing a hypothesis concerning the:
- A equality of the variances of two normally distributed populations.
 - B difference between the means of two at least approximately normally distributed populations with unknown but assumed equal variances.
 - C difference between the means of two at least approximately normally distributed populations with unknown and assumed unequal variances.
- 27 When evaluating mean differences between two dependent samples, the *most* appropriate test is a:
- A chi-square test.
 - B paired comparisons test.
 - C *z*-test.
- 28 A chi-square test is *most* appropriate for tests concerning:
- A a single variance.
 - B differences between two population means with variances assumed to be equal.
 - C differences between two population means with variances assumed to not be equal.
- 29 Which of the following should be used to test the difference between the variances of two normally distributed populations?
- A *t*-test
 - B *F*-test
 - C Paired comparisons test
- 30 In which of the following situations would a non-parametric test of a hypothesis *most likely* be used?
- A The sample data are ranked according to magnitude.
 - B The sample data come from a normally distributed population.
 - C The test validity depends on many assumptions about the nature of the population.

SOLUTIONS

- 1 A** The appropriate test statistic is a t -statistic with $n - 1 = 15 - 1 = 14$ degrees of freedom. A t -statistic is theoretically correct when the sample comes from a normally distributed population with unknown variance. When the sample size is also small, there is no practical alternative.
- B** The appropriate test statistic is a t -statistic with $40 - 1 = 39$ degrees of freedom. A t -statistic is theoretically correct when the sample comes from a normally distributed population with unknown variance. When the sample size is large (generally, 30 or more is a “large” sample), it is also possible to use a z -statistic, whether the population is normally distributed or not. A test based on a t -statistic is more conservative than a z -statistic test.
- C** The appropriate test statistic is a z -statistic because the sample comes from a normally distributed population with known variance. (The known population standard deviation is used to compute the standard error of the mean using Equation 2 in the text.)
- D** The appropriate test statistic is chi-square (χ^2) with $50 - 1 = 49$ degrees of freedom.
- E** The appropriate test statistic is the F -statistic (the ratio of the sample variances).
- F** The appropriate test statistic is a t -statistic for a paired observations test (a paired comparisons test), because the samples are correlated.
- G** The appropriate test statistic is a t -statistic using a pooled estimate of the population variance. The t -statistic has $25 + 30 - 2 = 53$ degrees of freedom. This statistic is appropriate because the populations are normally distributed with unknown variances; because the variances are assumed equal, the observations can be pooled to estimate the common variance. The requirement of independent samples for using this statistic has been met.
- 2 A** With degrees of freedom (df) $n - 1 = 26 - 1 = 25$, the rejection point conditions for this two-sided test are $t > 2.060$ and $t < -2.060$. Because the significance level is 0.05, $0.05/2 = 0.025$ of the probability is in each tail. The tables give one-sided (one-tailed) probabilities, so we used the 0.025 column. Read across df = 25 to the $\alpha = 0.025$ column to find 2.060, the rejection point for the right tail. By symmetry, -2.060 is the rejection point for the left tail.
- B** With df = 39, the rejection point conditions for this two-sided test are $t > 2.708$ and $t < -2.708$. This is a two-sided test, so we use the $0.01/2 = 0.005$ column. Read across df = 39 to the $\alpha = 0.005$ column to find 2.708, the rejection point for the right tail. By symmetry, -2.708 is the rejection point for the left tail.
- C** With df = 39, the rejection point condition for this one-sided test is $t > 2.426$. Read across df = 39 to the $\alpha = 0.01$ column to find 2.426, the rejection point for the right tail. Because we have a “greater than” alternative, we are concerned with only the right tail.
- D** With df = 20, the rejection point condition for this one-sided test is $t > 1.725$. Read across df = 20 to the $\alpha = 0.05$ column to find 1.725, the rejection point for the right tail. Because we have a “greater than” alternative, we are concerned with only the right tail.

- E** With $df = 18$, the rejection point condition for this one-sided test is $t < -1.330$. Read across $df = 18$ to the $\alpha = 0.10$ column to find 1.330, the rejection point for the right tail. By symmetry, the rejection point for the left tail is -1.330 .
- F** With $df = 49$, the rejection point condition for this one-sided test is $t < -1.677$. Read across $df = 49$ to the $\alpha = 0.05$ column to find 1.677, the rejection point for the right tail. By symmetry, the rejection point for the left tail is -1.677 .
- 3** Recall that with a z -test (in contrast to the t -test), we do not employ degrees of freedom. The standard normal distribution is a single distribution applicable to all z -tests. You should refer to “Rejection Points for a z -Test” in Section 3.1 to answer these questions.
- A** This is a two-sided test at a 0.01 significance level. In Part C of “Rejection Points for a z -Test,” we find that the rejection point conditions are $z > 2.575$ and $z < -2.575$.
- B** This is a two-sided test at a 0.05 significance level. In Part B of “Rejection Points for a z -Test,” we find that the rejection point conditions are $z > 1.96$ and $z < -1.96$.
- C** This is a two-sided test at a 0.10 significance level. In Part A of “Rejection Points for a z -Test,” we find that the rejection point conditions are $z > 1.645$ and $z < -1.645$.
- D** This is a one-sided test at a 0.05 significance level. In Part B of “Rejection Points for a z -Test,” we find that the rejection point condition for a test with a “greater than” alternative hypothesis is $z > 1.645$.
- 4** **A** As stated in the text, we often set up the “hoped for” or “suspected” condition as the alternative hypothesis. Here, that condition is that the population value of Willco’s mean annual net income exceeds \$24 million. Thus we have $H_0: \mu \leq 24$ versus $H_a: \mu > 24$.
- B** Given that net income is normally distributed with unknown variance, the appropriate test statistic is t with $n - 1 = 6 - 1 = 5$ degrees of freedom.
- C** In the t -distribution table in the back of the book, in the row for $df = 5$ under $\alpha = 0.05$, we read the rejection point (critical value) of 2.015. We will reject the null if $t > 2.015$.
- D** The t -test is given by Equation 4:

$$t_5 = \frac{\bar{X} - \mu_0}{s/\sqrt{n}} = \frac{30 - 24}{10/\sqrt{6}} = \frac{6}{4.082483} = 1.469694$$

or 1.47. Because 1.47 does not exceed 2.015, we do not reject the null hypothesis. The difference between the sample mean of \$30 million and the hypothesized value of \$24 million under the null is not statistically significant.

- 5** **A** $H_0: \mu = 0$ versus $H_a: \mu \neq 0$.
- B** The t -test is based on $t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}$ with $n - 1 = 101 - 1 = 100$ degrees of freedom. At the 0.05 significance level, we reject the null if $t > 1.984$ or if $t < -1.984$. At the 0.01 significance level, we reject the null if $t > 2.626$ or if $t < -2.626$. For Analyst A, we have $t = (0.05 - 0)/(0.10/\sqrt{101}) = 0.05/0.00995 = 5.024938$ or 5.025. We clearly reject the null hypothesis at both the 0.05 and 0.01 levels.

The calculation of the z -statistic with unknown variance, as in this case, is the same as the calculation of the t -statistic. The rejection point conditions for a two-tailed test are as follows: $z > 1.96$ and $z < -1.96$ at the 0.05 level; and $z > 2.575$ and $z < -2.575$ at the 0.01 level. Note that the z -test is a less conservative test than the t -test, so when the z -test is used, the null is easier to reject. Because $z = 5.025$ is greater than 2.575, we reject the null at the 0.01 level; we also reject the null at the 0.05 level.

In summary, Analyst A's EPS forecasts appear to be biased upward—they tend to be too high.

- C For Analyst B, the t -test is based on t with $121 - 1 = 120$ degrees of freedom. At the 0.05 significance level, we reject the null if $t > 1.980$ or if $t < -1.980$. At the 0.01 significance level, we reject the null if $t > 2.617$ or if $t < -2.617$. We calculate $t = (0.02 - 0) / (0.09 / \sqrt{121}) = 0.02 / 0.008182 = 2.444444$ or 2.44. Because $2.44 > 1.98$, we reject the null at the 0.05 level. However, 2.44 is not larger than 2.617, so we do not reject the null at the 0.01 level.
- For a z -test, the rejection point conditions are the same as given in Part B, and we come to the same conclusions as with the t -test. Because $2.44 > 1.96$, we reject the null at the 0.05 significance level; however, because 2.44 is not greater than 2.575, we do not reject the null at the 0.01 level.

The mean forecast error of Analyst B is only \$0.02; but because the test is based on a large number of observations, it is sufficient evidence to reject the null of mean zero forecast errors at the 0.05 level.

- 6 A** Stating the suspected condition as the alternative hypothesis, we have

$$H_0: \mu_1 - \mu_2 \leq 0 \text{ versus } H_a: \mu_1 - \mu_2 > 0$$

where

- μ_1 = the population mean value of Analyst A's forecast errors
 μ_2 = the population mean value of Analyst B's forecast errors

- B We have two normally distributed populations with unknown variances. Based on the samples, it is reasonable to assume that the population variances are equal. The samples are assumed to be independent; this assumption is reasonable because the analysts cover quite different industries. The appropriate test statistic is t using a pooled estimate of the common variance. The number of degrees of freedom is

$$n_1 + n_2 - 2 = 101 + 121 - 2 = 222 - 2 = 220.$$

- C For $df = 200$ (the closest value to 220), the rejection point for a one-sided test at the 0.05 significance level is 1.653.
- D We first calculate the pooled estimate of variance:

$$\begin{aligned} s_p^2 &= \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} = \frac{(101 - 1)(0.10)^2 + (121 - 1)(0.09)^2}{101 + 121 - 2} \\ &= \frac{1.972}{220} = 0.008964 \end{aligned}$$

Then

$$\begin{aligned} t &= \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\left(\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2} \right)^{1/2}} = \frac{(0.05 - 0.02) - 0}{\left(\frac{0.008964}{101} + \frac{0.008964}{121} \right)^{1/2}} \\ &= \frac{0.03}{0.01276} = 2.351018 \end{aligned}$$

or 2.35. Because $2.35 > 1.653$, we reject the null hypothesis in favor of the alternative hypothesis that the population mean forecast error of Analyst A is greater than that of Analyst B.

- 7 A** We test $H_0: \mu_d = 0$ versus $H_a: \mu_d \neq 0$.
- B** This is a paired comparisons t -test with $n - 1 = 480 - 1 = 479$ degrees of freedom. At the 0.05 significance level, we reject the null hypothesis if either $t > 1.96$ or $t < -1.96$. We use $df = \infty$ in the t -distribution table under $\alpha = 0.025$ because we have a very large sample and a two-sided test.

$$t = \frac{\bar{d} - \mu_{d0}}{s\bar{d}} = \frac{-0.258 - 0}{3.752/\sqrt{480}} = \frac{-0.258}{0.171255} = -1.506529 \text{ or } -1.51$$

At the 0.05 significance level, because neither rejection point condition is met, we do not reject the null hypothesis that the mean difference between the returns on the S&P 500 and small-cap stocks during the entire sample period was 0.

- C** This t -test now has $n - 1 = 240 - 1 = 239$ degrees of freedom. At the 0.05 significance level, we reject the null hypothesis if either $t > 1.972$ or $t < -1.972$, using $df = 200$ in the t -distribution tables.

$$t = \frac{\bar{d} - \mu_{d0}}{s\bar{d}} = \frac{-0.640 - 0}{4.096/\sqrt{240}} = \frac{-0.640}{0.264396} = -2.420615 \text{ or } -2.42$$

Because $-2.42 < -1.972$, we reject the null hypothesis at the 0.05 significance level. During this subperiod, small-cap stocks significantly outperformed the S&P 500.

- D** This t -test has $n - 1 = 240 - 1 = 239$ degrees of freedom. At the 0.05 significance level, we reject the null hypothesis if either $t > 1.972$ or $t < -1.972$, using $df = 200$ in the t -distribution tables.

$$t = \frac{\bar{d} - \mu_{d0}}{s\bar{d}} = \frac{0.125 - 0}{3.339/\sqrt{240}} = \frac{0.125}{0.215532} = 0.579962 \text{ or } 0.58$$

At the 0.05 significance level, because neither rejection point condition is met, we do not reject the null hypothesis that for the January 1980–December 1999 period, the mean difference between the returns on the S&P 500 and small-cap stocks was zero.

- 8 A** We have a “less than” alternative hypothesis, where σ^2 is the variance of return on the portfolio. The hypotheses are $H_0: \sigma^2 \geq 400$ versus $H_a: \sigma^2 < 400$, where 400 is the hypothesized value of variance, σ_0^2 .
- B** The test statistic is chi-square with $10 - 1 = 9$ degrees of freedom.
- C** The rejection point is found across degrees of freedom of 9, under the 0.95 column (95 percent of probability above the value). It is 3.325. We will reject the null hypothesis if we find that $\chi^2 < 3.325$.

D The test statistic is calculated as

$$\chi^2 = \frac{(n - 1)s^2}{\sigma_0^2} = \frac{9 \times 15^2}{400} = \frac{2,025}{400} = 5.0625 \text{ or } 5.06$$

Because 5.06 is not less than 3.325, we do not reject the null hypothesis.

9 A We have a “not equal to” alternative hypothesis:

$$H_0: \sigma_{\text{Before}}^2 = \sigma_{\text{After}}^2 \text{ versus } H_a: \sigma_{\text{Before}}^2 \neq \sigma_{\text{After}}^2$$

B To test a null hypothesis of the equality of two variances, we use an *F*-test:

$$F = \frac{s_1^2}{s_2^2}$$

C The “before” sample variance is larger, so following a convention for calculating *F*-statistics, the “before” sample variance goes in the numerator. $F = 22.367/15.795 = 1.416$, with $120 - 1 = 119$ numerator and denominator degrees of freedom. Because this is a two-tailed test, we use *F*-tables for the 0.025 level ($df = 0.05/2$). Using the tables in the back of the volume, the closest value to 119 is 120 degrees of freedom. At the 0.05 level, the rejection point is 1.43. (Using the Insert/Function/Statistical feature on a Microsoft Excel spreadsheet, we would find $\text{FINV}(0.025, 119, 119) = 1.434859$ as the critical *F*-value.) Because 1.416 is not greater than 1.43, we do not reject the null hypothesis that the “before” and “after” variances are equal.

10 A is correct. The critical value in a decision rule is the rejection point for the test. It is the point with which the test statistic is compared to determine whether to reject the null hypothesis, which is part of the fourth step in hypothesis testing.

11 A is correct. The null hypothesis is the hypothesis to be tested. The null hypothesis is considered to be true unless the evidence indicates that it is false, in which case the alternative hypothesis is accepted.

12 B is correct. One-tailed tests in which the alternative is “greater than” or “less than” represent the beliefs of the researcher more firmly than a “not equal to” alternative hypothesis.

13 A is correct. Calculated using a sample, a test statistic is a quantity whose value is the basis for deciding whether to reject the null hypothesis.

14 A is correct. The definition of a Type I error is when a true null hypothesis is rejected.

15 B is correct. A Type II error occurs when a false null hypothesis is not rejected.

16 B is correct. The level of significance is used to establish the rejection points of the hypothesis test.

17 A We have a “not equal to” alternative hypothesis:

$$H_0: \rho = 0 \text{ versus } H_a: \rho \neq 0$$

B We would use the nonparametric Spearman rank correlation coefficient to conduct the test.

C Mutual fund expense ratios are bounded from above and below, and in practice there is at least a lower bound on alpha (as any return cannot be less than -100 percent). These variables are markedly non-normally distributed, and the assumptions of a parametric test are not likely to be fulfilled. Thus a nonparametric test appears to be appropriate.

- D** The calculation of the Spearman rank correlation coefficient is given in the following table.

Mutual Fund	1	2	3	4	5	6	7	8	9
Alpha (X)	-0.52	-0.13	-0.60	-1.01	-0.26	-0.89	-0.42	-0.23	-0.60
Expense Ratio (Y)	1.34	0.92	1.02	1.45	1.35	0.50	1.00	1.50	1.45
X Rank	5	1	6.5	9	3	8	4	2	6.5
Y Rank	5	8	6	2.5	4	9	7	1	2.5
d_i	0	-7	0.5	6.5	-1	-1	-3	1	4
d_i^2	0	49	0.25	42.25	1	1	9	1	16

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)} = 1 - \frac{6(119.50)}{9(81 - 1)} = 0.0042$$

We use Table 11 to tabulate the rejection points for a test on the Spearman rank correlation. Given a sample size of 9 in a two-tailed test at a 0.05 significance level, the upper-tail rejection point is 0.6833 (we use the 0.025 column). Thus we reject the null hypothesis if the Spearman rank correlation coefficient is less than -0.6833 or greater than 0.6833. Because r_s is equal to 0.0042, we do not reject the null hypothesis.

- 18** B is correct. Specifying a smaller significance level decreases the probability of a Type I error (rejecting a true null hypothesis), but increases the probability of a Type II error (not rejecting a false null hypothesis). As the level of significance decreases, the null hypothesis is less frequently rejected.
- 19** B is correct. The power of a test is the probability of rejecting the null hypothesis when it is false.
- 20** C is correct. When a statistically significant result is also economically meaningful, one should further explore the logic of why the result might work in the future.
- 21** C is correct. When directly comparing the p -value with the level of significance, it can be used as an alternative to using rejection points to reach conclusions on hypothesis tests. If the p -value is smaller than the specified level of significance, the null hypothesis is rejected. Otherwise, the null hypothesis is not rejected.
- 22** C is correct. The p -value is the smallest level of significance at which the null hypothesis can be rejected for a given value of the test statistic. The null hypothesis is rejected when the p -value is less than the specified significance level.
- 23** B is correct. The z -test is theoretically the correct test to use in those limited cases when testing the population mean of a normally distributed population with known variance.
- 24** A is correct. A t -test is used if the sample is small and drawn from a normally or approximately normally distributed population.
- 25** B is correct. A t -statistic is the most appropriate for hypothesis tests of the population mean when the variance is unknown and the sample is small but the population is normally distributed.
- 26** B is correct. The assumption that the variances are equal allows for the combining of both samples to obtain a pooled estimate of the common variance.
- 27** B is correct. A paired comparisons test is appropriate to test the mean differences of two samples believed to be dependent.

PRACTICE PROBLEMS

- 1 Technical analysis relies most importantly on:
 - A price and volume data.
 - B accurate financial statements.
 - C fundamental analysis to confirm conclusions.
- 2 Which of the following is *not* an assumption of technical analysis?
 - A Security markets are efficient.
 - B The security under analysis is freely traded.
 - C Market trends and patterns tend to repeat themselves.
- 3 Drawbacks of technical analysis include which of the following?
 - A It identifies changes in trends only after the fact.
 - B Deviations from intrinsic value can persist for long periods.
 - C It usually requires detailed knowledge of the financial instrument under analysis.
- 4 Why is technical analysis especially useful in the analysis of commodities and currencies?
 - A Valuation models cannot be used to determine fundamental intrinsic value for these securities.
 - B Government regulators are more likely to intervene in these markets.
 - C These types of securities display clearer trends than equities and bonds do.
- 5 A daily bar chart provides:
 - A a logarithmically scaled horizontal axis.
 - B a horizontal axis that represents changes in price.
 - C high and low prices during the day and the day's opening and closing prices.
- 6 A candlestick chart is similar to a bar chart *except* that the candlestick chart:
 - A represents upward movements in price with X's.
 - B also graphically shows the range of the period's highs and lows.
 - C has a body that is light or dark depending on whether the security closed higher or lower than its open.
- 7 In analyzing a price chart, high or increasing volume *most likely* indicates which of the following?
 - A Predicts a reversal in the price trend.
 - B Predicts that a trendless period will follow.
 - C Confirms a rising or declining trend in prices.
- 8 In constructing a chart, using a logarithmic scale on the vertical axis is likely to be *most useful* for which of the following applications?
 - A The price of gold for the past 100 years.
 - B The share price of a company over the past month.
 - C Yields on 10-year US Treasuries for the past 5 years.
- 9 A downtrend line is constructed by drawing a line connecting:
 - A the lows of the price chart.

- B the highs of the price chart.
C the highest high to the lowest low of the price chart.
- 10 Exhibit 1 depicts GreatWall Information Industry Co., Ltd., ordinary shares, traded on the Shenzhen Stock Exchange, for late 2008 through late 2009 in renminbi (RMB).

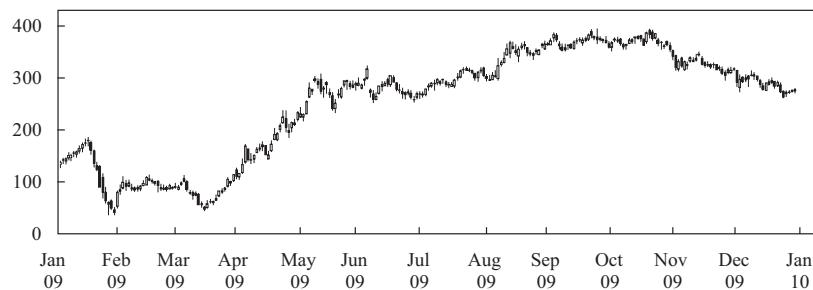
**Exhibit 1 Candlestick Chart: GreatWall Information Industry Co., Ltd. Price Data, November 2008–September 2009
(Price Measured in RMB × 10)**



Based on Exhibit 1, the uptrend was *most likely* broken at a price level nearest to:

- A 7 RMB.
B 8.5 RMB.
C 10 RMB.
- 11 The “change in polarity” principle states which of the following?
- A Once an uptrend is broken, it becomes a downtrend.
B Once a resistance level is breached, it becomes a support level.
C The short-term moving average has crossed over the longer-term moving average.
- 12 Exhibit 2 depicts Barclays ordinary shares, traded on the London Stock Exchange, for 2009 in British pence.

Exhibit 2 Candlestick Chart: Barclays plc Price Data, January 2009–January 2010 (Price Measured in British Pence)



Based on Exhibit 2, Barclays appears to show resistance at a level nearest to:

- A 50p.
 - B 275p.
 - C 390p.
- 13 Exhibit 3 depicts Archer Daniels Midland Company common shares, traded on the New York Stock Exchange, for 1996 to 2001 in US dollars.

Exhibit 3 Candlestick Chart: Archer Daniels Midland Company, February 1996–February 2001

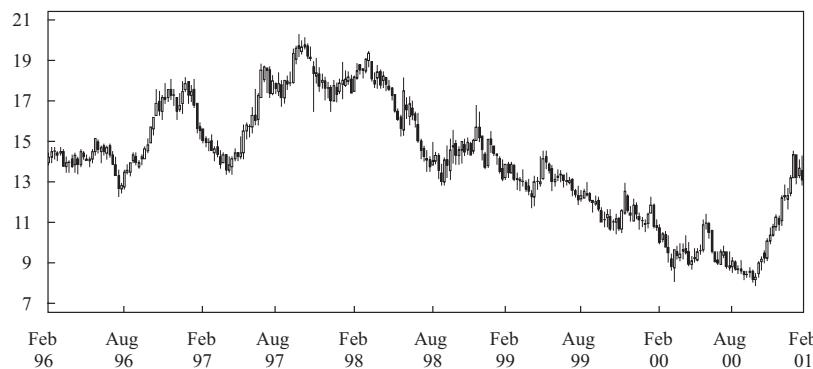


Exhibit 3 illustrates *most* clearly which type of pattern?

- A Triangle.
 - B Triple top.
 - C Head and shoulders.
- 14 In an inverted head and shoulders pattern, if the neckline is at €100, the shoulders at €90, and the head at €75, the price target is *closest* to which of the following?
- A €50.
 - B €110.
 - C €125.
- 15 Which flow-of-funds indicator is considered bearish for equities?

- A A large increase in the number of IPOs.
B Higher-than-average cash balances in mutual funds.
C An upturn in margin debt but one that is still below the long-term average.
- 16 A TRIN with a value of less than 1.0 indicates:
A the market is in balance.
B there is more volume in rising shares.
C there is more volume in declining shares.
- 17 Bollinger Bands are constructed by plotting:
A a MACD line and a signal line.
B a moving-average line with an uptrend line above and downtrend line below.
C a moving-average line with upper and lower lines that are at a set number of standard deviations apart.
- 18 Which of the following is *not* a momentum oscillator?
A MACD.
B Stochastic oscillator.
C Bollinger Bands.
- 19 Which of the following is a continuation pattern?
A Triangle.
B Triple top.
C Head and shoulders.
- 20 Which of the following is a reversal pattern?
A Pennant.
B Rectangle.
C Double bottom.
- 21 Which of the following is generally true of the head and shoulders pattern?
A Volume is important in interpreting the data.
B The neckline, once breached, becomes a support level.
C Head and shoulders patterns are generally followed by an uptrend in the security's price.
- 22 Nikolai Kondratieff concluded in the 1920s that since the 1780s, Western economies have generally followed a cycle of how many years?
A 18.
B 54.
C 76.
- 23 Based on the decennial pattern of cycles, how would the return of the Dow Jones Industrial Average (DJIA) in the year 2015 compare with the return in 2020?
A The return would be better.
B The return would be worse.
C The answer cannot be determined because the theory does not apply to both of those years.
- 24 According to the US presidential cycle theory, the DJIA has the best performance during which year?
A The presidential election year itself.
B The first year following a presidential election.

- C The third year following a presidential election.
- 25 What is a major problem with long-term cycle theories?
- A The sample size is small.
 - B The data are usually hard to observe.
 - C They occur over such a long period that they are difficult to discern.
- 26 In 1938, R. N. Elliott proposed a theory that equity markets move:
- A in stochastic waves.
 - B in cycles following Fibonacci ratios.
 - C in waves dependent on other securities.
- 27 All of the following are names of Elliott cycles *except*:
- A presidential.
 - B supercycle.
 - C grand supercycle.
- 28 To identify intermarket relationships, technicians commonly use:
- A stochastic oscillators.
 - B Fibonacci ratios.
 - C relative strength analysis.

SOLUTIONS

- 1 A is correct. Almost all technical analysis relies on these data inputs.
- 2 A is correct. Technical analysis works because markets are *not* efficient and rational and because human beings tend to behave similarly in similar circumstances. The result is market trends and patterns that repeat themselves and are somewhat predictable.
- 3 A is correct. Trends generally must be in place for some time before they are recognizable. Thus, some time may be needed for a change in trend to be identified.
- 4 A is correct. Commodities and currencies do not have underlying financial statements or an income stream; thus, fundamental analysis is useless in determining theoretical values for them or whether they are over- or undervalued.
- 5 C is correct. The top and bottom of the bars indicate the highs and lows for the day; the line on the left indicates the opening price and the line on the right indicates the closing price.
- 6 C is correct. Dark and light shading is a unique feature of candlestick charts.
- 7 C is correct. Rising volume shows conviction by many market participants, which is likely to lead to a continuation of the trend.
- 8 A is correct. The price of gold in nominal dollars was several orders of magnitude cheaper 100 years ago than it is today (roughly US\$20 then versus US\$1,100 today). Such a wide range of prices lends itself well to being graphically displayed on a logarithmic scale.
- 9 B is correct. A downtrend line is constructed by drawing a line connecting the highs of the price chart.
- 10 B is correct. It is demonstrated in the following chart:

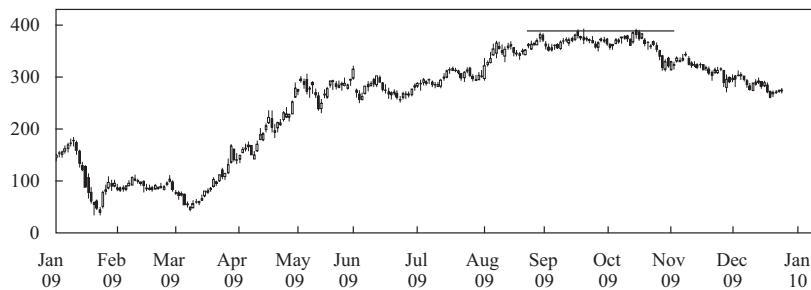
**Exhibit 1 Candlestick Chart: GreatWall Information Industry Co., Ltd. Price Data, November 2008–September 2009
(Price Measured in RMB × 10)**



11 B is correct.

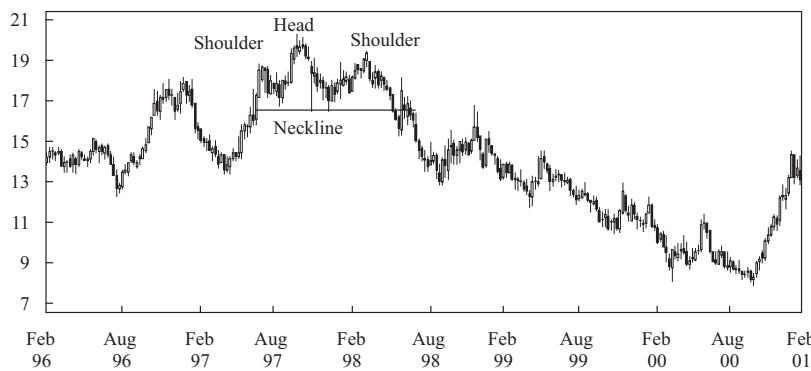
12 C is correct. As shown in the following chart, Barclays shares traded up to 390p on three occasions, each several weeks apart, and declined thereafter each time.

Exhibit 2 Candlestick Chart: Barclays plc Price Data, January 2009–January 2010 (Price Measured in British Pence)



13 C is correct. The left shoulder formed at around US\$18.50, the head formed at around US\$20.50, and the second shoulder formed at around US\$19.

Exhibit 3 Candlestick Chart: Archer Daniels Midland Company, February 1996–February 2001



14 C is correct. Target = Neckline + (Neckline – Head): €100 + (€100 – €75) = €125

15 A is correct. A large increase in the number of IPOs increases the supply of equity and if overall demand remains the same, puts downward pressure on equities. Also, companies tend to issue shares of equity when the managers believe they will receive a premium price, which is also an indicator of a market top.

16 B is correct. A value below 1.0 is a bullish sign; it means more volume is in rising shares than in declining ones. The TRIN is calculated as: (Advancing issues/Declining issues)/(Volume of advancing issues/Volume of declining issues).

- 17 C is correct. Bollinger Bands consist of a moving average and a higher line representing the moving average plus a set number of standard deviations from average price (for the same number of periods as used to calculate the moving average) and a lower line that is a moving average minus the same number of standard deviations.
- 18 C is correct. Bollinger Bands are price-based indicators, *not* momentum oscillators, which are constructed so that they oscillate between a high and a low or around 0 or 100.
- 19 A is correct. Triangles are one of several continuation patterns.
- 20 C is correct. It is one of several reversal patterns.
- 21 A is correct. Volume is necessary to confirm the various market rallies and reversals during the formation of the head and shoulders pattern.
- 22 B is correct.
- 23 A is correct. The decennial pattern theory states that years ending with a 5 will have the best performance of any of the 10 years in a decade and that those ending with a zero will have the worst.
- 24 C is correct. A possible reason for the superior performance in the third year is that the US presidential election occurs, together with a number of other elections, in a four-year cycle, so the politicians desiring to be reelected inject money into the economy in the third year to improve their chances of winning the following year.
- 25 A is correct. Long-term cycles require many years to complete; thus, not many cycles are available to observe.
- 26 B is correct.
- 27 A is correct. This is the term for a separate cycle theory.
- 28 C is correct. Relative strength analysis is often used to compare two asset classes or two securities.

PRACTICE PROBLEMS

- 1 Movement along the demand curve for good X occurs due to a change in:
 - A income.
 - B the price of good X .
 - C the price of a substitute for good X .
- 2 A wireless phone manufacturer introduced a next-generation phone that received a high level of positive publicity. Despite running several high-speed production assembly lines, the manufacturer is still falling short in meeting demand for the phone nine months after introduction. Which of the following statements is the *most* plausible explanation for the demand/supply imbalance?
 - A The phone price is low relative to the equilibrium price.
 - B Competitors introduced next-generation phones at a similar price.
 - C Consumer incomes grew faster than the manufacturer anticipated.

The following information relates to Questions 3–6

The market demand function for four-year private universities is given by the equation

$$Q_{pr}^d = 84 - 3.1P_{pr} + 0.8I + 0.9P_{pu}$$

where Q_{pr}^d is the number of applicants to private universities per year in thousands, P_{pr} is the average price of private universities (in thousands of USD), I is the household monthly income (in thousands of USD), and P_{pu} is the average price of public (government-supported) universities (in thousands of USD). Assume that P_{pr} is equal to 38, I is equal to 100, and P_{pu} is equal to 18.

- 3 The price elasticity of demand for private universities is *closest* to:
 - A -3.1.
 - B -1.9.
 - C 0.6.
- 4 The income elasticity of demand for private universities is *closest* to:
 - A 0.5.
 - B 0.8.
 - C 1.3.
- 5 The cross-price elasticity of demand for private universities with respect to the price of public universities is *closest* to:
 - A 0.3.
 - B 3.1.
 - C 3.9.
- 6 If the cross-price elasticity between two goods is negative, the two goods are classified as:
 - A normal.

- B** substitutes.
 - C** complements.
-

- 7 In the case of a normal good with a decrease in own price, which of the following statements is *most likely* true?
 - A** Both the substitution and income effects lead to an increase in the quantity purchased.
 - B** The substitution effect leads to an increase in the quantity purchased, while the income effect has no impact.
 - C** The substitution effect leads to an increase in the quantity purchased, while the income effect leads to a decrease.
- 8 For a Giffen good, the:
 - A** demand curve is positively sloped.
 - B** substitution effect overwhelms the income effect.
 - C** income and substitution effects are in the same direction.
- 9 Normal profit is best described as:
 - A** zero economic profit.
 - B** total revenue minus all explicit costs.
 - C** the sum of accounting profit plus economic profit.
- 10 The marketing director for a Swiss specialty equipment manufacturer estimates the firm can sell 200 units and earn total revenue of CHF500,000. However, if 250 units are sold, revenue will total CHF600,000. The marginal revenue per unit associated with marketing 250 units instead of 200 units is *closest* to:
 - A** CHF 2,000.
 - B** CHF 2,400.
 - C** CHF 2,500.
- 11 An agricultural firm operating in a perfectly competitive market supplies wheat to manufacturers of consumer food products and animal feeds. If the firm were able to expand its production and unit sales by 10% the *most likely* result would be:
 - A** a 10% increase in total revenue.
 - B** a 10% increase in average revenue.
 - C** an increase in total revenue of less than 10%.
- 12 An operator of a ski resort is considering offering price reductions on weekday ski passes. At the normal price of €50 per day, 300 customers are expected to buy passes each weekday. At a discounted price of €40 per day 450 customers are expected to buy passes each weekday. The marginal revenue per customer earned from offering the discounted price is *closest* to:
 - A** €20.
 - B** €40.
 - C** €50.
- 13 The marginal revenue per unit sold for a firm doing business under conditions of perfect competition will *most likely* be:
 - A** equal to average revenue.
 - B** less than average revenue.
 - C** greater than average revenue.

The following information relates to Questions 14–16

A firm's director of operations gathers the following information about the firm's cost structure at different levels of output:

Exhibit 1

Quantity (Q)	Total Fixed Cost (TFC)	Total Variable Cost (TVC)
0	200	0
1	200	100
2	200	150
3	200	200
4	200	240
5	200	320

- 14 Refer to the data in Exhibit 1. When quantity produced is equal to 4 units, the average fixed cost (*AFC*) is *closest* to:
- A 50.
B 60.
C 110.
- 15 Refer to the data in Exhibit 1. When the firm increases production from 4 to 5 units, the marginal cost (*MC*) is *closest* to:
- A 40.
B 64.
C 80.
- 16 Refer to the data in Exhibit 1. The level of unit production resulting in the lowest average total cost (*ATC*) is *closest* to:
- A 3.
B 4.
C 5.
- 17 The short-term breakeven point of production for a firm operating under perfect competition will *most likely* occur when:
- A price is equal to average total cost.
B marginal revenue is equal to marginal cost.
C marginal revenue is equal to average variable costs.
- 18 The short-term shutdown point of production for a firm operating under perfect competition will *most likely* occur when:
- A price is equal to average total cost.
B marginal revenue is equal to marginal cost.
C marginal revenue is less than average variable costs.

- 19 When total revenue is greater than total variable costs but less than total costs, in the short term a firm will *most likely*:
- A exit the market.
 - B stay in the market.
 - C shut down production.
- 20 A profit maximum is *least likely* to occur when:
- A average total cost is minimized.
 - B marginal revenue equals marginal cost.
 - C the difference between total revenue and total cost is maximized.
- 21 A firm that increases its quantity produced without any change in per-unit cost is experiencing:
- A economies of scale.
 - B diseconomies of scale.
 - C constant returns to scale.
- 22 A firm is operating beyond minimum efficient scale in a perfectly competitive industry. To maintain long-term viability the *most likely* course of action for the firm is to:
- A operate at the current level of production.
 - B increase its level of production to gain economies of scale.
 - C decrease its level of production to the minimum point on the long-run average total cost curve.
- 23 Under conditions of perfect competition, in the long run firms will *most likely* earn:
- A normal profits.
 - B positive economic profits.
 - C negative economic profits.

The following information relates to Questions 24 and 25

The manager of a small manufacturing firm gathers the following information about the firm's labor utilization and production:

Exhibit 2

Labor (L)	Total Product (TP)
0	0
1	150
2	320
3	510

Exhibit 2 (Continued)

Labor (<i>L</i>)	Total Product (<i>TP</i>)
4	660
5	800

24 Refer to the data in Exhibit 2. The number of workers resulting in the highest level of average product of labor is *closest* to:

- A 3.
- B 4.
- C 5.

25 Refer to the data in Exhibit 2. The marginal product of labor demonstrates increasing returns for the firm if the number of workers is *closest* to but not more than:

- A 2.
- B 3.
- C 4.

SOLUTIONS

- 1 B is correct. The demand curve shows quantity demanded as a function of own price only.
- 2 A is correct. The situation described is one of excess demand because, in order for markets to clear at the given level of quantity supplied, the company would need to raise prices.
- 3 B is correct. From the demand function:

Solve for Q_{pr}^d :

$$\Delta Q_{pr}^d / \Delta P_{pr} = -3.1 \text{ (the coefficient in front of own price)}$$

$$\begin{aligned} Q_{pr}^d &= 84 - 3.1P_{pr} + 0.8I + 0.9P_{pu} \\ &= 84 - 3.1(38) + 0.8(100) + 0.9(18) \\ &= 62.4 \end{aligned}$$

At $P_{pr} = 38$,

$$\begin{aligned} \text{price elasticity of demand} &= (\Delta Q_{pr}^d / \Delta P_{pr})(P_{pr} / Q_{pr}^d) \\ &= (-3.1)(38/62.4) \\ &= -1.9 \end{aligned}$$

- 4 C is correct. From the demand function:

Solve for Q_{pr}^d :

$$\Delta Q_{pr}^d / \Delta I = 0.8 \text{ (coefficient in front of the income variable)}$$

$$\begin{aligned} Q_{pr}^d &= 84 - 3.1P_{pr} + 0.8I + 0.9P_{pu} \\ &= 84 - 3.1(38) + 0.8(100) + 0.9(18) \\ &= 62.4 \end{aligned}$$

At $I = 100$,

$$\begin{aligned} \text{the income elasticity of demand} &= (\Delta Q_{pr}^d / \Delta I)(I / Q_{pr}^d) \\ &= (0.8)(100/62.4) \\ &= 1.3 \end{aligned}$$

- 5 A is correct. From the demand function:

Solve for Q_{pr}^d :

$$\Delta Q_{pr}^d / \Delta P_{pu} = 0.9 \text{ (the coefficient in front of } P_{pu})$$

$$\begin{aligned} Q_{pr}^d &= 84 - 3.1P_{pr} + 0.8I + 0.9P_{pu} \\ &= 84 - 3.1(38) + 0.8(100) + 0.9(18) \\ &= 62.4 \end{aligned}$$

At $P = 38$, and $P_{pu} = 18$,

$$\begin{aligned}\text{the cross-price elasticity of demand} &= \left(\Delta Q_{pr}^d / \Delta P_{pu} \right) \left(P_{pu} / Q_{pr}^d \right) \\ &= (0.9)(18/62.4) \\ &= 0.3\end{aligned}$$

- 6 C is correct. With complements, consumption goes up or down together. With a negative cross-price elasticity, as the price of one good goes up, the demand for both falls.
- 7 A is correct. In the case of normal goods, the income and substitution effects are reinforcing, leading to an increase in the amount purchased after a drop in price.
- 8 A is correct. The income effect overwhelms the substitution effect such that an increase in the price of the good results in greater demand for the good, resulting in a positively sloped demand curve.
- 9 A is correct. Normal profit is the level of accounting profit such that implicit opportunity costs are just covered; thus, it is equal to a level of accounting profit such that economic profit is zero.
- 10 A is correct. Marginal revenue per unit is defined as the change in total revenue divided by the change in quantity sold. $MR = \Delta TR / \Delta Q$. In this case, change in total revenue equals CHF100,000, and change in total units sold equals 50. $CHF100,000 / 50 = CHF2,000$.
- 11 A is correct. In a perfectly competitive market, an increase in supply by a single firm will not affect price. Therefore, an increase in units sold by the firm will be matched proportionately by an increase in revenue.
- 12 A is correct. Marginal revenue per unit is defined as the change in total revenues divided by the change in quantity sold. $MR = \Delta TR / \Delta Q$. In this case, change in total revenue per day equals €3,000 $[(450 \times €40) - (300 \times €50)]$, and change in units sold equals 150 $(450 - 300)$. $€3,000 / 150 = €20$.
- 13 A is correct. Under perfect competition, a firm is a price taker at any quantity supplied to the market, and $AR = MR = \text{Price}$.
- 14 A is correct. Average fixed cost is equal to total fixed cost divided by quantity produced: $AFC = TFC/Q = 200/4 = 50$.
- 15 C is correct. Marginal cost is equal to the change in total cost divided by the change in quantity produced. $MC = \Delta TC / \Delta Q = 80/1 = 80$.
- 16 C is correct. Average total cost is equal to total cost divided by quantity produced. At 5 units produced the average total cost is 104. $ATC = TC/Q = 520/5 = 104$.
- 17 A is correct. Under perfect competition, price equals marginal revenue. A firm breaks even when marginal revenue equals average total cost.
- 18 C is correct. The firm should shut down production when marginal revenue is less than average variable cost.
- 19 B is correct. When total revenue is enough to cover variable costs but not total fixed costs in full, the firm can survive in the short run but would be unable to maintain financial solvency in the long run.
- 20 A is correct. The quantity at which average total cost is minimized does not necessarily correspond to a profit maximum.
- 21 C is correct. Output increases in the same proportion as input increases occur at constant returns to scale.

- 22** C is correct. The firm operating at greater than long-run efficient scale is subject to diseconomies of scale. It should plan to decrease its level of production.
- 23** A is correct. Competition should drive prices down to long-run marginal cost, resulting in only normal profits being earned.
- 24** A is correct. Three workers produce the highest average product equal to 170.
 $AP = 510/3 = 170$.
- 25** B is correct. Marginal product is equal to the change in total product divided by the change in labor. The increase in MP from 2 to 3 workers is 190: $MP = \Delta TP/\Delta L = (510 - 320)/(3 - 2) = 190/1 = 190$.

PRACTICE PROBLEMS

- 1 A market structure characterized by many sellers with each having some pricing power and product differentiation is *best* described as:
 - A oligopoly.
 - B perfect competition.
 - C monopolistic competition.
- 2 A market structure with relatively few sellers of a homogeneous or standardized product is *best* described as:
 - A oligopoly.
 - B monopoly.
 - C perfect competition.
- 3 Market competitors are *least likely* to use advertising as a tool of differentiation in an industry structure identified as:
 - A monopoly.
 - B perfect competition.
 - C monopolistic competition.
- 4 Upsilon Natural Gas, Inc. is a monopoly enjoying very high barriers to entry. Its marginal cost is \$40 and its average cost is \$70. A recent market study has determined the price elasticity of demand is 1.5. The company will *most likely* set its price at:
 - A \$40.
 - B \$70.
 - C \$120.
- 5 The demand schedule in a perfectly competitive market is given by $P = 93 - 1.5Q$ (for $Q \leq 62$) and the long-run cost structure of each company is:

Total cost:	$256 + 2Q + 4Q^2$
Average cost:	$256/Q + 2 + 4Q$
Marginal cost:	$2 + 8Q$

New companies will enter the market at any price greater than:

- A 8.
- B 66.
- C 81.
- 6 Companies *most likely* have a well-defined supply function when the market structure is:
 - A oligopoly.
 - B perfect competition.
 - C monopolistic competition.
- 7 Aquarius, Inc. is the dominant company and the price leader in its market. One of the other companies in the market attempts to gain market share by undercutting the price set by Aquarius. The market share of Aquarius will *most likely*:
 - A increase.
 - B decrease.

- C stay the same.
- 8 SigmaSoft and ThetaTech are the dominant makers of computer system software. The market has two components: a large mass-market component in which demand is price sensitive, and a smaller performance-oriented component in which demand is much less price sensitive. SigmaSoft's product is considered to be technically superior. Each company can choose one of two strategies:
- *Open architecture (Open)*: Mass market focus allowing other software vendors to develop products for its platform.
 - *Proprietary (Prop)*: Allow only its own software applications to run on its platform.

Depending upon the strategy each company selects, their profits would be:

	SigmaSoft – Open 400 ThetaTech – Open 600		SigmaSoft – Prop 650 ThetaTech – Open 700
SigmaSoft – Open 800 ThetaTech – Prop 300		SigmaSoft – Prop 600 ThetaTech – Prop 400	

The Nash equilibrium for these companies is:

- A proprietary for SigmaSoft and proprietary for ThetaTech.
 - B open architecture for SigmaSoft and proprietary for ThetaTech.
 - C proprietary for SigmaSoft and open architecture for ThetaTech.
- 9 A company doing business in a monopolistically competitive market will *most likely* maximize profits when its output quantity is set such that:
- A average cost is minimized.
 - B marginal revenue equals average cost.
 - C marginal revenue equals marginal cost.
- 10 Oligopolistic pricing strategy *most likely* results in a demand curve that is:
- A kinked.
 - B vertical.
 - C horizontal.
- 11 Collusion is *less likely* in a market when:
- A the product is homogeneous.
 - B companies have similar market shares.
 - C the cost structures of companies are similar.
- 12 If companies earn economic profits in a perfectly competitive market, over the long run the supply curve will *most likely*:
- A shift to the left.
 - B shift to the right.

C remain unchanged.

- 13 Over time, the market share of the dominant company in an oligopolistic market will *most likely*:

A increase.
B decrease.
C remain the same.

- 14 A government entity that regulates an authorized monopoly will *most likely* base regulated prices on:

A marginal cost.
B long run average cost.
C first degree price discrimination.

- 15 An analyst gathers the following market share data for an industry:

Company	Sales (in millions of €)
ABC	300
Brown	250
Coral	200
Delta	150
Erie	100
All others	50

The industry's four-company concentration ratio is *closest* to:

A 71%.
B 86%.
C 95%.

- 16 An analyst gathered the following market share data for an industry comprised of five companies:

Company	Market Share (%)
Zeta	35
Yusef	25
Xenon	20
Waters	10
Vlastos	10

The industry's three-firm Herfindahl–Hirschmann Index is *closest* to:

A 0.185.
B 0.225.
C 0.235.

- 17 One disadvantage of the Herfindahl–Hirschmann Index is that the index:

A is difficult to compute.
B fails to reflect low barriers to entry.
C fails to reflect the effect of mergers in the industry.

- 18 In an industry comprised of three companies, which are small-scale manufacturers of an easily replicable product unprotected by brand recognition or patents, the *most* representative model of company behavior is:

- A oligopoly.
 - B perfect competition.
 - C monopolistic competition.
- 19 Deep River Manufacturing is one of many companies in an industry that make a food product. Deep River units are identical up to the point they are labeled. Deep River produces its labeled brand, which sells for \$2.20 per unit, and “house brands” for seven different grocery chains which sell for \$2.00 per unit. Each grocery chain sells both the Deep River brand and its house brand. The *best* characterization of Deep River’s market is:
- A oligopoly.
 - B perfect competition.
 - C monopolistic competition.

SOLUTIONS

- 1 C is correct. Monopolistic competition is characterized by many sellers, differentiated products, and some pricing power.
- 2 A is correct. Few sellers of a homogeneous or standardized product characterizes an oligopoly.
- 3 B is correct. The product produced in a perfectly competitive market cannot be differentiated by advertising or any other means.
- 4 C is correct. Profits are maximized when $MR = MC$. For a monopoly, $MR = P[1 - 1/E_p]$. Setting this equal to MC and solving for P :
$$\$40 = P[1 - (1/1.5)] = P \times 0.333$$
$$P = \$120$$
- 5 B is correct. The long-run competitive equilibrium occurs where $MC = AC = P$ for each company. Equating MC and AC implies $2 + 8Q = 256/Q + 2 + 4Q$. Solving for Q gives $Q = 8$. Equating MC with price gives $P = 2 + 8Q = 66$. Any price above 66 yields an economic profit because $P = MC > AC$, so new companies will enter the market.
- 6 B is correct. A company in a perfectly competitive market must accept whatever price the market dictates. The marginal cost schedule of a company in a perfectly competitive market determines its supply function.
- 7 A is correct. As prices decrease, smaller companies will leave the market rather than sell below cost. The market share of Aquarius, the price leader, will increase.
- 8 C is correct. In the Nash model, each company considers the other's reaction in selecting its strategy. In equilibrium, neither company has an incentive to change its strategy. ThetaTech is better off with open architecture regardless of what SigmaSoft decides. Given this choice, SigmaSoft is better off with a proprietary platform. Neither company will change its decision unilaterally.
- 9 C is correct. The profit maximizing choice is the level of output where marginal revenue equals marginal cost.
- 10 A is correct. The oligopolist faces two different demand structures, one for price increases and another for price decreases. Competitors will lower prices to match a price reduction, but will not match a price increase. The result is a kinked demand curve.
- 11 B is correct. When companies have similar market shares, competitive forces tend to outweigh the benefits of collusion.
- 12 B is correct. The economic profit will attract new entrants to the market and encourage existing companies to expand capacity.
- 13 B is correct. The dominant company's market share tends to decrease as profits attract entry by other companies.
- 14 B is correct. This allows the investors to receive a normal return for the risk they are taking in the market.
- 15 B is correct. The top four companies in the industry comprise 86 percent of industry sales: $(300 + 250 + 200 + 150)/(300 + 250 + 200 + 150 + 100 + 50) = 900/1050 = 86\%$.
- 16 B is correct. The three-firm Herfindahl–Hirschmann Index is $0.35^2 + 0.25^2 + 0.20^2 = 0.225$.

- 17 B is correct. The Herfindahl–Hirschmann Index does not reflect low barriers to entry that may restrict the market power of companies currently in the market.
- 18 B is correct. The credible threat of entry holds down prices and multiple incumbents are offering undifferentiated products.
- 19 C is correct. There are many competitors in the market, but some product differentiation exists, as the price differential between Deep River's brand and the house brands indicates.

PRACTICE PROBLEMS

- 1 Which of the following statements is the *most* appropriate description of gross domestic product (GDP)?
 - A The total income earned by all households, firms, and the government whose value can be verified.
 - B The total amount spent on all final goods and services produced within the economy over a given time period.
 - C The total market value of resalable and final goods and services produced within the economy over a given time period.
- 2 The component *least likely* to be included in a measurement of gross domestic product (GDP) is:
 - A the value of owner occupied rent.
 - B the annual salary of a local police officer.
 - C environmental damage caused by production.
- 3 Which of the following conditions is *least likely* to increase a country's GDP?
 - A An increase in net exports.
 - B Increased investment in capital goods.
 - C Increased government transfer payments.
- 4 Which of the following would be included in Canadian GDP for a given year? The market value of:
 - A wine grown in Canada by US citizens.
 - B electronics made in Japan and sold in Canada.
 - C movies produced outside Canada by Canadian film makers.
- 5 Suppose a painting is produced and sold in 2010 for £5,000. The expenses involved in producing the painting amounted to £2,000. According to the sum-of-value-added method of calculating GDP, the value added by the final step of creating the painting was:
 - A £2,000.
 - B £3,000.
 - C £5,000.
- 6 A GDP deflator less than 1 indicates that an economy has experienced:
 - A inflation.
 - B deflation.
 - C stagflation.
- 7 The *most* accurate description of nominal GDP is:
 - A a measure of total expenditures at current prices.
 - B the value of goods and services at constant prices.
 - C a measure to compare one nation's economy to another.
- 8 From the beginning to the ending years of a decade, the annual value of final goods and services for country X increased from €100 billion to €300 billion. Over that time period, the GDP deflator increased from 111 to 200. Over the decade, real GDP for country X increased by approximately:
 - A 50%.

- B 67%.
C 200%.
- 9 If the GDP deflator values for 2008 and 2010 were 190 and 212.8, respectively, which of the following *best* describes the annual growth rate of the overall price level?
A 5.8%.
B 6%.
C 12%.
- 10 The numerator of the GDP price deflator reflects:
A the value of base year output at current prices.
B the value of current year output at current prices.
C the value of current year output at base year prices.
- 11 Consider the following data for 2010 for a hypothetical country:

Account name	Amount (\$ trillions)
Consumption	15.0
Capital consumption allowance	1.5
Government spending	3.8
Imports	1.7
Gross private domestic investment	4.0
Exports	1.5

Based only on the data given, the gross domestic product and national income are respectively *closest* to:

- A 21.1 and 20.6.
B 22.6 and 21.1.
C 22.8 and 20.8.
- 12 In calculating personal income for a given year, which of the following would *not* be subtracted from national income?
A Indirect business taxes.
B Undistributed corporate profits.
C Unincorporated business net income.
- 13 Equality between aggregate expenditure and aggregate output implies that the government's fiscal deficit must equal:
A Private saving – Investment – Net exports.
B Private saving – Investment + Net exports.
C Investment – Private saving + Net exports.
- 14 Because of a sharp decline in real estate values, the household sector has increased the fraction of disposable income that it saves. If output and investment spending remain unchanged, which of the following is *most likely*?
A A decrease in the government deficit.
B A decrease in net exports and increased capital inflow.
C An increase in net exports and increased capital outflow.
- 15 Which curve represents combinations of income and the real interest rate at which planned expenditure equals income?
A The IS curve.

- B The LM curve.
- C The aggregate demand curve.
- 16 An increase in government spending would shift the:
- A IS curve and the LM curve.
- B IS curve and the aggregate demand curve.
- C LM curve and the aggregate demand curve.
- 17 An increase in the nominal money supply would shift the:
- A IS curve and the LM curve.
- B IS curve and the aggregate demand curve.
- C LM curve and the aggregate demand curve.
- 18 An increase in the price level would shift the:
- A IS curve.
- B LM curve.
- C aggregate demand curve.
- 19 As the price level declines along the aggregate demand curve, the interest rate is *most likely* to:
- A decline.
- B increase.
- C remain unchanged.
- 20 The full employment, or natural, level of output is *best* described as:
- A the maximum level obtainable with existing resources.
- B the level at which all available workers have jobs consistent with their skills.
- C a level with a modest, stable pool of unemployed workers transitioning to new jobs.
- 21 Which of the following *best* describes the aggregate supply curve in the short-run (e.g., 1 to 2 years)? The short run aggregate supply curve is:
- A flat because output is more flexible than prices in the short run.
- B vertical because wages and other input prices fully adjust to the price level.
- C upward sloping because input prices do not fully adjust to the price level in the short run.
- 22 If wages were automatically adjusted for changes in the price level, the short-run aggregate supply curve would *most likely* be:
- A flatter.
- B steeper.
- C unchanged.
- 23 The *least likely* cause of a decrease in aggregate demand is:
- A higher taxes.
- B a weak domestic currency.
- C a fall in capacity utilization.
- 24 Which of the following is *most likely* to cause the long-run aggregate supply curve to shift to the left?
- A Higher nominal wages.
- B A decline in productivity.
- C A increase in corporate taxes.
- 25 Increased household wealth will *most likely* cause an increase in:

- A household saving.
 - B investment expenditures.
 - C consumption expenditures.
- 26 The *most likely* outcome when both aggregate supply and aggregate demand increase is:
- A a rise in inflation.
 - B higher employment.
 - C an increase in nominal GDP.
- 27 Which of the following is *least likely* to be caused by a shift in aggregate demand?
- A Stagflation.
 - B A recessionary gap.
 - C An inflationary gap.
- 28 Following a sharp increase in the price of energy, the overall price level is *most likely* to rise in the short run:
- A and remain elevated indefinitely unless the central bank tightens.
 - B but be unchanged in the long run unless the money supply is increased.
 - C and continue to rise until all prices have increased by the same proportion.
- 29 Among developed economies, which of the following sources of economic growth is *most likely* to explain superior growth performance?
- A Technology.
 - B Capital stock.
 - C Labor supply.
- 30 Which of the following can be measured directly?
- A Potential GDP.
 - B Labor productivity.
 - C Total factor productivity.
- 31 The sustainable growth rate is *best* estimated as:
- A the weighted average of capital and labor growth rates.
 - B growth in the labor force plus growth of labor productivity.
 - C growth in total factor productivity plus growth in the capital-to-labor ratio.
- 32 In the neoclassical or Solow growth model, an increase in total factor productivity reflects an increase in:
- A returns to scale.
 - B output for given inputs.
 - C the sustainable growth rate.

The following information relates to Questions 33–34

An economic forecasting firm has estimated the following equation from historical data based on the neoclassical growth model:

$$\text{Potential output growth} = 1.5 + 0.72 \times \text{Growth of labor} + 0.28 \times \text{Growth of capital}$$

- 33 The intercept (1.5) in this equation is *best* interpreted as:
- A the long-run sustainable growth rate.
 - B the growth rate of total factor productivity.
 - C above trend historical growth that is unlikely to be sustained.
- 34 The coefficient on the growth rate of labor (0.72) in this equation is *best* interpreted as:
- A the labor force participation rate.
 - B the marginal productivity of labor.
 - C the share of income earned by labor.
-
- 35 Convergence of incomes over time between emerging market countries and developed countries is *most likely* due to:
- A total factor productivity.
 - B diminishing marginal productivity of capital.
 - C the exhaustion of non-renewable resources.

SOLUTIONS

- 1 B is correct. GDP is the total amount spent on all final goods and services produced within the economy over a specific period of time.
- 2 C is correct. By-products of production processes that have no explicit market value are not included in GDP.
- 3 C is correct. Government transfer payments, such as unemployment compensation or welfare benefits, are excluded from GDP.
- 4 A is correct. Canadian GDP is the total market value of all final goods and services produced in a given time period within Canada. The wine was produced in Canada and counts towards Canadian GDP.
- 5 B is correct. This is the value added by the artist: £5,000 – £2,000 = £3,000.
- 6 B is correct. The GDP Deflator = Nominal GDP/Real GDP. To get a ratio less than 1, real GDP exceeds nominal GDP, which indicates that prices have decreased and, accordingly, deflation has occurred.
- 7 A is correct. Nominal GDP is defined as the value of goods and services measured at current prices. Expenditure is used synonymously with the value of goods and services since aggregate expenditures must equal aggregate output of an economy.
- 8 B is correct. Real GDP in the first year was €100 billion/1.11 = €90 and in the last year it was €300 billion/2.00 = €150. Thus, ($\frac{150}{90} - 1$) = 67%.
- 9 A is correct: $(\frac{212.8}{190})^{1/2} - 1 = 0.0583$ or 5.8%.
- 10 B is correct.

$$\text{GDP deflator} = \frac{\text{Value of current year output at current year prices}}{\text{Value of current year output at base year prices}} \times 100$$

- 11 B is correct. $\text{GDP} = \text{Consumption} + \text{Gross private domestic investment} + \text{Government Spending} + \text{Exports} - \text{Imports} = 15 + 4 + 3.8 + 1.5 - 1.7 = 22.6$.
 $\text{National income} = \text{GDP} - \text{CCA} = 22.6 - 1.5 = 21.1$
- 12 C is correct. Unincorporated business net income is also known as proprietor's income and is included in personal income.
- 13 A is correct. The fundamental relationship among saving, investment, the fiscal balance, and the trade balance is $S = I + (G - T) + (X - M)$. This form of the relationship shows that private saving must fund investment expenditures, the government fiscal balance, and net exports (= net capital outflows). Rearranging gives $G - T = (S - I) - (X - M)$. The government's fiscal deficit ($G - T$) must be equal to the private sector's saving/investment balance ($S - I$) minus net exports.
- 14 C is correct. The fundamental relationship among saving, investment, the fiscal balance, and the trade balance is $S = I + (G - T) + (X - M)$. Given the levels of output and investment spending, an increase in saving (reduction in consumption) must be offset by either an increase in the fiscal deficit or an increase in net exports. Increasing the fiscal deficit is not one of the choices, so an increase in net exports and corresponding increase in net capital outflows (increased lending to foreigners and/or increased purchases of assets from foreigners) is the correct response.
- 15 A is correct. The IS curve represents combinations of income and the real interest rate at which planned expenditure equals income.

- 16** B is correct. The IS curve represents combinations of income and the real interest rate at which planned expenditure equals income. Equivalently, it represents combinations such that

$$S(Y) = I(r) + (G - T) + (X - M)$$

where $S(Y)$ indicates that planned saving is a (increasing) function of income and $I(r)$ indicates that planned investment is a (decreasing) function of the real interest rate. To maintain this relationship, an increase in government spending (G) requires an increase in saving at any given level of the interest rate (r). This implies an increase in income (Y) at each interest rate level—a rightward shift of the IS curve. Unless the LM curve is vertical, the IS and LM curves will intersect at a higher level of aggregate expenditure/income. Since the LM curve embodies a constant price level, this implies an increase in aggregate expenditure at each price level—a rightward shift of the Aggregate Demand curve.

- 17** C is correct. The LM curve represents combinations of income and the interest rate at which the demand for real money balances equals the supply. For a given price level, an increase in the nominal money supply is also an increase in the real money supply. To increase the demand for real money balances, either the interest must decline or income must increase. Therefore, at each level of the interest rate, income (= expenditure) must increase—a rightward shift of the LM curve. Since the IS curve is downward sloping (higher income requires a lower interest rate), a rightward shift in the LM curve means that the IS and LM curves will intersect at a higher level of aggregate expenditure/income. This implies a higher level of aggregate expenditure at each price level—a rightward shift of the Aggregate Demand curve.
- 18** B is correct. The LM curve represents combinations of income and the interest rate at which the demand for real money balances equals the supply. For a given nominal money supply, an increase in the price level implies a decrease in the real money supply. To decrease the demand for real money balances, either the interest must increase or income must decrease. Therefore, at each level of the interest rate, income (= expenditure) must decrease—a leftward shift of the LM curve.
- 19** A is correct. A decrease in the price level increases the real money supply and shifts the LM curve to the right. Since the IS curve is downward sloping, the IS and LM curves will intersect at a higher level of income and a lower interest rate.
- 20** C is correct. At the full employment, or natural, level of output the economy is operating at an efficient and unconstrained level of production. Companies have enough spare capacity to avoid bottlenecks, and there is a modest, stable pool of unemployed workers (job seekers equal job vacancies) looking for and transitioning into new jobs.
- 21** C is correct. Due to long-term contracts and other rigidities, wages and other input costs do not fully adjust to changes in the price level in the short-run. Given input prices, firms respond to output price changes by expanding or contracting output to maximize profit. Hence, the SRAS is upward sloping.
- 22** B is correct. The slope of the short-run aggregate supply curve reflects the extent to which wages and other input costs adjust to the overall price level. Automatic adjustment of wages would mitigate the impact of price changes on profitability. Hence, firms would not adjust output as much in response to changing output prices—the SRAS curve would be steeper.

- 23** B is correct. A weak domestic currency will result in an increase in aggregate demand at each price level—a rightward shift in the AD curve. A weaker currency will cause a country's exports to be cheaper in global markets. Conversely, imports will be more expensive for domestic buyers. Hence, the net exports component of aggregate demand will increase.
- 24** B is correct. Productivity measures the efficiency of labor and is the amount of output produced by workers in a given period of time. A decline in productivity implies decreased efficiency. A decline in productivity increases labor costs, decreases profitability and results in lower output at each output price level—a leftward shift in both the short-run and long-run aggregate supply curves.
- 25** C is correct. The wealth effect explains the impact of increases or decreases in household wealth on economic activity. Household wealth includes financial and real assets. As asset values increase, consumers save less and spend more out of current income since they will still be able to meet their wealth accumulation goals. Therefore, an increase in household wealth results in a rightward shift in the aggregate demand curve.
- 26** B is correct. Higher aggregate demand (AD) and higher aggregate supply (AS) raise real GDP and lower unemployment, meaning employment levels increase.
- 27** A is correct. Stagflation occurs when output is declining and prices are rising. This is most likely due to a decline in aggregate supply—a leftward shift of the SRAS curve. Depending on the source of the shift, the LRAS may shift too.
- 28** B is correct. An increase in energy prices will shift the short-run aggregate supply curve (SRAS) to the left, reducing output and increasing prices. If there is no change in the aggregate demand curve, in particular if the central bank does not expand the money supply, slack in the economy will put downward pressure on input prices, shifting the SRAS back to its original position. In the long run, the price level will be unchanged.
- 29** A is correct. Technology is the most important factor affecting economic growth for developed countries. Technological advances are very important because they allow an economy to overcome the limits imposed by diminishing marginal returns.
- 30** B is correct. Labor productivity can be directly measured as output/hour.
- 31** B is correct. Output growth is equal to the growth rate of the labor force plus the growth rate of labor productivity, i.e. output per worker. Unlike total factor productivity, output per worker is observable, so this is the most practical way to approach estimation of sustainable growth.
- 32** B is correct. Total factor productivity (TFP) is a scale factor primarily reflecting technology. An increase in TFP means that output increases for any level of factor inputs.
- 33** B is correct. The estimated equation is the standard Solow growth accounting equation. The intercept is the growth rate of total factor productivity.
- 34** C is correct. In the standard Solow growth accounting equation, the coefficient on each factor's growth rate is its share of income.
- 35** B is correct. Diminishing marginal productivity of capital means that as a country accumulates more capital per worker the incremental boost to output declines. Thus, all else the same, economies grow more slowly as they become more capital intensive. Given the relative scarcity and hence high marginal productivity of capital in developing countries, they tend to grow more rapidly than developed countries. This leads to convergence in income levels over time.

PRACTICE PROBLEMS

- 1 The characteristic business cycle patterns of trough, expansion, peak, and contraction are:
 - A periodic.
 - B recurrent.
 - C of similar duration.
- 2 During the contraction phase of a business cycle, it is *most likely* that:
 - A inflation indicators are stable.
 - B aggregate economic activity is decreasing.
 - C investor preference for government securities declines.
- 3 An economic peak is *most* closely associated with:
 - A accelerating inflation.
 - B stable unemployment.
 - C declining capital spending.
- 4 Based on typical labor utilization patterns across the business cycle, productivity (output per hours worked) is *most likely* to be highest:
 - A at the peak of a boom.
 - B into a maturing expansion
 - C at the bottom of a recession.
- 5 In a recession, companies are *most likely* to adjust their stock of physical capital by:
 - A selling it at fire sale prices.
 - B not maintaining equipment.
 - C quickly canceling orders for new construction equipment.
- 6 The inventory/sales ratio is *most likely* to be rising:
 - A as a contraction unfolds.
 - B partially into a recovery.
 - C near the top of an economic cycle.
- 7 The Austrian economic school attributes the primary cause of the business cycle to:
 - A misguided government intervention.
 - B the creative destruction of technological progress.
 - C sticky price and wage expectations that exaggerate trends.
- 8 Monetarists favor a limited role for the government because they argue:
 - A government policy responses may lag.
 - B firms take time to adjust to systemic shocks to the economy.
 - C resource use is efficient with marginal revenue and cost equal.
- 9 The discouraged worker category is defined to include people who:
 - A are overqualified for their job.
 - B could look for a job but choose not to.
 - C currently look for work without finding it.

- 10** The unemployment rate is considered a lagging indicator because:
- new job types must be defined to count their workers.
 - multi-worker households change jobs at a slower pace.
 - businesses are slow to hire and fire due to related costs.
- 11** The category of persons who would be *most likely* to be harmed by an increase in the rate of inflation is:
- homeowners with fixed 30-year mortgages.
 - retirees relying on a fixed annuity payment.
 - workers employed under contracts with escalator clauses.
- 12** The term that describes when inflation declines but nonetheless remains at a positive level is:
- deflation.
 - stagflation.
 - disinflation.
- 13** Deflation is *most likely* to be associated with:
- a shortage of government revenue.
 - substantial macroeconomic contraction.
 - explicit monetary policy to combat inflation.
- 14** The *least likely* consequence of a period of hyperinflation is the:
- reduced velocity of money.
 - increased supply of money.
 - possibility of social unrest.

The following information relates to Questions 15–16

Exhibit 1 Consumption Baskets and Prices Over Two Months

Date	November 2010		December 2010	
	Goods	Quantity	Price	Quantity
Sugar	70 kg	€ 0.90 / kg	120 kg	€ 1.00 / kg
Cotton	60 kg	€ 0.60 / kg	50 kg	€ 0.80 / kg

- 15** Assuming the base period for 2010 consumption is November and the initial price index is set at 100, then the inflation rate after calculating the December price index as a Laspeyres index is *closest* to:
- 19.2%.
 - 36.4%.
 - 61.6%.
- 16** For the December consumption basket in Exhibit 1, the value of the Paasche index is *closest* to:
- 116.

- B 148.
C 160.
-

- 17 The characteristic of national consumer price indexes which is *most* typically shared across major economies worldwide is:
- A the geographic areas covered in their surveys.
B the weights they place on covered goods and services.
C their use in the determination of macroeconomic policy.
- 18 Of the following statements regarding the Producer Price Index (PPI), which is the *least likely*? The PPI:
- A can influence the future CPI.
B category weights can vary more widely than analogous CPI terms.
C is used more frequently than CPI as a benchmark for adjusting labor contract payments.
- 19 The inflation rate *most likely* relied on to determine public economic policy is:
- A core inflation.
B headline inflation.
C index of food and energy prices.
- 20 What is the *most* important effect of labor productivity in a cost-push inflation scenario?
- A Rising productivity indicates a strong economy and a bias towards inflation.
B The productivity level determines the economy's status relative to its "natural rate of unemployment."
C As productivity growth proportionately exceeds wage increases, product price increases are less likely.
- 21 Which of the following statements is the *best* description of the characteristics of economic indicators?
- A Leading indicators are important because they track the entire economy.
B Lagging indicators in measuring past conditions do not require revisions.
C A combination of leading and coincident indicators can offer effective forecasts.
- 22 When the spread between 10-year US Treasury yields and the federal funds rate narrows and at the same time the prime rate stays unchanged, this mix of indicators *most likely* forecasts future economic:
- A growth.
B decline.
C stability.
- 23 If relative to prior values of their respective indicators, the inventory–sales ratio has risen, unit labor cost is stable, and real personal income has decreased, it is *most likely* that a peak in the business cycle:
- A has occurred.
B is just about to occur.
C will occur sometime into the future.

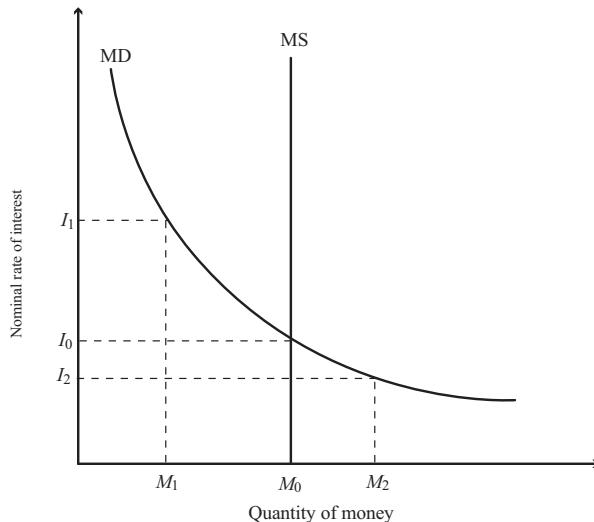
SOLUTIONS

- 1 B is correct. The stages of the business cycle occur repeatedly over time.
- 2 B is correct. The net trend during contraction is negative.
- 3 A is correct. Inflation is rising at peaks.
- 4 C is correct. At the end of a recession, firms will run “lean production” to generate maximum output with the fewest number of workers.
- 5 B is correct. Physical capital adjustments to downturns come through aging of equipment plus lack of maintenance.
- 6 C is correct. Near the top of a cycle, sales begin to slow before production is cut, leading to an increase in inventories relative to sales.
- 7 A is correct. Austrian economists see monetary policy mistakes as leading to booms and busts.
- 8 A is correct. Monetarists caution policy effects can occur long after the need for which they were implemented is no longer an issue.
- 9 B is correct. Discouraged workers are defined as persons who have stopped looking for work and are outside the labor force.
- 10 C is correct. This effect makes unemployment rise more slowly as recessions start and fall more slowly as recoveries begin.
- 11 B is correct. With inflation, a fixed amount of money buys fewer goods and services, thus reducing purchasing power.
- 12 C is correct. Disinflation is known as a reduction of inflation from a higher to lower, but still above zero, level.
- 13 B is correct. Deflation is connected to a vicious cycle of reduced spending and higher unemployment.
- 14 A is correct. In hyperinflation, consumers accelerate their spending to beat prices increases and money circulates more rapidly.
- 15 A is correct. The Laspeyres index is calculated with these inputs:
 - November consumption bundle: $70 \times 0.9 + 60 \times 0.6 = 99$
 - December consumption bundle: $70 \times 1 + 60 \times 0.8 = 118$
 - December price index: $(118/99) \times 100 = 119.19$
 - Inflation rate: $(119.19/100) - 1 = 0.1919 = 19.19\%$
- 16 A is correct. The Paasche index uses the current product mix of consumption combined with the variation of prices. So for December, its value is
$$(120 \times 1 + 50 \times 0.8) / (120 \times 0.9 + 50 \times 0.6) = (160/138) \times 100 = 115.9$$
- 17 C is correct. Central banks typically use consumer price indexes to monitor inflation and evaluate their monetary policies.
- 18 C is correct. The CPI is typically used for this purpose, while the PPI is more closely connected to business contracts.
- 19 A is correct. Core inflation is less volatile since it excludes food and energy prices and therefore will not be as likely to lead to policy overreactions when serving as a target.
- 20 C is correct. For productivity, or output per hour, the faster that it can grow, the further that wages can rise without putting pressure on business costs per unit of output.

- 21 C is correct. While no single indicator is definitive, a mix of them—which can be affected by various economic determinants—can offer the strongest signal of performance.
- 22 B is correct. The narrowing spread of this leading indicator foretells a drop in short-term rates and a fall in economic activity. The prime rate is a lagging indicator and typically moves after the economy turns.
- 23 A is correct. Both inventory–sales and unit labor costs are lagging indicators that decline somewhat after a peak. Real personal income is a coincident indicator that by its decline shows a slowdown in business activity.

PRACTICE PROBLEMS

- 1 As the reserve requirement increases, the money multiplier:
 - A increases.
 - B decreases.
 - C remains the same.
- 2 Which is the *most* accurate statement regarding the demand for money?
 - A Precautionary money demand is directly related to GDP.
 - B Transactions money demand is inversely related to returns on bonds.
 - C Speculative demand is inversely related to the perceived risk of other assets.
- 3 The following exhibit shows the supply and demand for money:



There is an excess supply of money when the nominal rate of interest is:

- A I_0 .
- B I_1 .
- C I_2 .
- 4 According to the theory of money neutrality, money supply growth does *not* affect variables such as real output and employment in:
 - A the long run.
 - B the short run.
 - C the long and short run.
- 5 Which of the following *best* describes a fundamental assumption when monetary policy is used to influence the economy?
 - A Financial markets are efficient.
 - B Money is not neutral in the short run.
 - C Official rates do not affect exchange rates.
- 6 Monetarists are *most likely* to believe:

- A there is a causal relationship running from inflation to money.
- B inflation can be affected by changing the money supply growth rate.
- C rapid financial innovation in the market increases the effectiveness of monetary policy.
- 7 The proposition that the real interest rate is relatively stable is *most closely* associated with:
- A the Fisher effect.
- B money neutrality.
- C the quantity theory of money.
- 8 Which of the following equations is a consequence of the Fisher effect?
- A Nominal interest rate = Real interest rate + Expected rate of inflation.
- B Real interest rate = Nominal interest rate + Expected rate of inflation.
- C Nominal interest rate = Real interest rate + Market risk premium.
- 9 Central banks would typically be *most* concerned with costs of:
- A low levels of inflation that are anticipated.
- B moderate levels of inflation that are anticipated.
- C moderate levels of inflation that are not anticipated.
- 10 Monetary policy is *least likely* to include:
- A setting an inflation rate target.
- B changing an official interest rate.
- C enacting a transfer payment program.
- 11 Which role is a central bank *least likely* to assume?
- A Lender of last resort.
- B Sole supervisor of banks.
- C Supplier of the currency.
- 12 Which is the *most* accurate statement regarding central banks and monetary policy?
- A Central bank activities are typically intended to maintain price stability.
- B Monetary policies work through the economy via four independent channels.
- C Commercial and interbank interest rates move inversely to official interest rates.
- 13 When a central bank announces a decrease in its official policy rate, the desired impact is an increase in:
- A investment.
- B interbank borrowing rates.
- C the national currency's value in exchange for other currencies.
- 14 Which action is a central bank *least likely* to take if it wants to encourage businesses and households to borrow for investment and consumption purposes?
- A Sell long-dated government securities.
- B Purchase long-dated government treasuries.
- C Purchase mortgage bonds or other securities.
- 15 A central bank that decides the desired levels of interest rates and inflation and the horizon over which the inflation objective is to be achieved is *most accurately* described as being:

- A target independent and operationally independent.
B target independent but not operationally independent.
C operationally independent but not target independent.
- 16 A country that maintains a target exchange rate is *most likely* to have which outcome when its inflation rate rises above the level of the inflation rate in the target country?
A An increase in short-term interest rates.
B An increase in the domestic money supply.
C An increase in its foreign currency reserves.
- 17 A central bank's repeated open market purchases of government bonds:
A decreases the money supply.
B is prohibited in most countries.
C is consistent with an expansionary monetary policy.
- 18 In theory, setting the policy rate equal to the neutral interest rate should promote:
A stable inflation.
B balanced budgets.
C greater employment.
- 19 A prolonged period of an official interest rate of zero without an increase in economic growth *most likely* suggests:
A quantitative easing must be limited to be successful.
B there may be limits to the effectiveness of monetary policy.
C targeting reserve levels is more important than targeting interest rates.
- 20 Raising the reserve requirement is *most likely* an example of which type of monetary policy?
A Neutral.
B Expansionary.
C Contractionary.
- 21 Which of the following is a limitation on the ability of central banks to stimulate growth in periods of deflation?
A Ricardian equivalence.
B The interaction of monetary and fiscal policy.
C The fact that interest rates have a minimum value (0%).
- 22 The *least likely* limitation to the effectiveness of monetary policy is that central banks cannot:
A accurately determine the neutral rate of interest.
B regulate the willingness of financial institutions to lend.
C control amounts that economic agents deposit into banks.
- 23 Which of the following is the *most likely* example of a tool of fiscal policy?
A Public financing of a power plant.
B Regulation of the payment system.
C Central bank's purchase of government bonds.
- 24 The *least likely* goal of a government's fiscal policy is to:
A redistribute income and wealth.
B influence aggregate national output.

- C ensure the stability of the purchasing power of its currency.
- 25 Given an independent central bank, monetary policy actions are *more likely* than fiscal policy actions to be:
- A implementable quickly.
 - B effective when a specific group is targeted.
 - C effective when combating a deflationary economy.
- 26 Which statement regarding fiscal policy is *most* accurate?
- A To raise business capital spending, personal income taxes should be reduced.
 - B Cyclically adjusted budget deficits are appropriate indicators of fiscal policy.
 - C An increase in the budget surplus is associated with expansionary fiscal policy.
- 27 The *least likely* explanation for why fiscal policy cannot stabilize aggregate demand completely is that:
- A private sector behavior changes over time.
 - B policy changes are implemented very quickly.
 - C fiscal policy focuses more on inflation than on unemployment.
- 28 Which of the following *best* represents a contractionary fiscal policy?
- A Public spending on a high-speed railway.
 - B A temporary suspension of payroll taxes.
 - C A freeze in discretionary government spending.
- 29 A “pay-as-you-go” rule, which requires that any tax cut or increase in entitlement spending be offset by an increase in other taxes or reduction in other entitlement spending, is an example of which fiscal policy stance?
- A Neutral.
 - B Expansionary.
 - C Contractionary.
- 30 Quantitative easing, the purchase of government or private securities by the central banks from individuals and/or institutions, is an example of which monetary policy stance?
- A Neutral.
 - B Expansionary.
 - C Contractionary.
- 31 The *most likely* argument against high national debt levels is that:
- A the debt is owed internally to fellow citizens.
 - B they create disincentives for economic activity.
 - C they may finance investment in physical and human capital.
- 32 Which statement regarding fiscal deficits is *most* accurate?
- A Higher government spending may lead to higher interest rates and lower private sector investing.
 - B Central bank actions that grow the money supply to address deflationary conditions decrease fiscal deficits.
 - C According to the Ricardian equivalence, deficits have a multiplicative effect on consumer spending.
- 33 Which policy alternative is *most likely* to be effective for growing both the public and private sectors?

- A** Easy fiscal/easy monetary policy.
- B** Easy fiscal/tight monetary policy.
- C** Tight fiscal/tight monetary policy.

SOLUTIONS

- 1 B is correct. There is an inverse relationship between the money multiplier and the reserve requirement. The money multiplier is equal to 1 divided by the reserve requirement.
- 2 A is correct. Precautionary money demand is directly related to GDP. Precautionary money balances are held to provide a buffer against unforeseen events that might require money. Precautionary balances tend to rise with the volume and value of transactions in the economy, and therefore rise with GDP.
- 3 B is correct. When the interest rate on bonds is I_1 there is an excess supply of money (equal to $M_0 - M_1 > 0$). Economic agents would seek to buy bonds with their excess money balances, which would force the price of bonds up and the interest rate down to I_0 .
- 4 A is correct. According to the theory of money neutrality, an increase in the money supply ultimately leads to an increase in the price level and leaves real variables unaffected in the long run.
- 5 B is correct. If money were neutral in the short run, monetary policy would not be effective in influencing the economy.
- 6 B is correct. By definition, monetarists believe prices may be controlled by manipulating the money supply.
- 7 A is correct. The Fisher effect is based on the idea that the real interest rate is relatively stable. Changes in the nominal interest rate result from changes in expected inflation.
- 8 A is correct. The Fisher effect implies that changes in the nominal interest rate reflect changes in expected inflation, which is consistent with Nominal interest rate = Real interest rate + Expected rate of inflation.
- 9 C is correct. Low levels of inflation has higher economic costs than moderate levels, all else equal; unanticipated inflation has greater costs than anticipated inflation.
- 10 C is correct. Transfer payment programs represent fiscal, not monetary policy.
- 11 B is correct. The supervision of banks is not a role that all central banks assume. When it is a central bank's role, responsibility may be shared with one or more entities.
- 12 A is correct. Central bank activities are typically intended to maintain price stability. Concerning choice B, note that the transmission channels of monetary policy are not independent.
- 13 A is correct. Investment is expected to move inversely with the official policy rate.
- 14 A is correct. Such action would tend to constrict the money supply and increase interest rates, all else equal.
- 15 A is correct. The central bank described is target independent because it set its own targets (e.g., the target inflation rate) and operationally independent because it decides how to achieve its targets (e.g., the time horizon).
- 16 A is correct. Interest rates are expected to rise to protect the exchange rate target.
- 17 C is correct. The purchase of government bonds via open market operations increases banking reserves and the money supply; it is consistent with an expansionary monetary policy.

- 18** A is correct. The neutral rate of interest is that rate of interest that neither stimulates nor slows down the underlying economy. The neutral rate should be consistent with stable long-run inflation.
- 19** B is correct. A central bank would decrease an official interest rate to stimulate the economy. The setting in which an official interest rate is lowered to zero (the lowest value that could be targeted) without stimulating economic growth suggests that there are limits to monetary policy.
- 20** C is correct. Raising reserve requirements should slow money supply growth.
- 21** C is correct. Deflation poses a challenge to conventional monetary policy because once the central bank has cut nominal interest rates to zero to stimulate the economy, they cannot cut them further.
- 22** A is correct. The inability to determine exactly the neutral rate of interest does not necessarily limit the power of monetary policy.
- 23** A is correct. Public financing of a power plant could be described as a fiscal policy tool to stimulate investment.
- 24** C is correct. Ensuring stable purchasing power is a goal of monetary rather than fiscal policy. Fiscal policy involves the use of government spending and tax revenue to affect the overall level of aggregate demand in an economy and hence the level of economic activity.
- 25** A is correct. Monetary actions may face fewer delays to taking action than fiscal policy, especially when the central bank is independent.
- 26** B is correct. Cyclically adjusted budget deficits are appropriate indicators of fiscal policy. These are defined as the deficit that would exist if the economy was at full employment (or full potential output).
- 27** B is correct. Fiscal policy is subject to recognition, action, and impact lags.
- 28** C is correct. A freeze in discretionary government spending is an example of a contractionary fiscal policy.
- 29** A is correct. A “pay-as-you-go” rule is a neutral policy because any increases in spending or reductions in revenues would be offset. Accordingly, there would be no net impact on the budget deficit/surplus.
- 30** B is correct. Quantitative easing is an example of an expansionary monetary policy stance. It attempts to spur aggregate demand by drastically increasing the money supply.
- 31** B is correct. The belief is that high levels of debt to GDP may lead to higher future tax rates which may lead to disincentives to economic activity.
- 32** A is correct. Government borrowing may compete with private sector borrowing for investment purposes.
- 33** A is correct. If both fiscal and monetary policies are “easy,” then the joint impact will be highly expansionary, leading to a rise in aggregate demand, low interest rates, and growing private and public sectors.

PRACTICE PROBLEMS

- 1 Which of the following statements *best* describes the benefits of international trade?
 - A Countries gain from exchange and specialization.
 - B Countries receive lower prices for their exports and pay higher prices for imports.
 - C Absolute advantage is required for a country to benefit from trade in the long term.
- 2 Which of the following statements *best* describes the costs of international trade?
 - A Countries without an absolute advantage in producing a good cannot benefit significantly from international trade.
 - B Resources may need to be allocated into or out of an industry and less-efficient companies may be forced to exit an industry, which in turn may lead to higher unemployment.
 - C Loss of manufacturing jobs in developed countries as a result of import competition means that developed countries benefit far less than developing countries from trade.
- 3 Suppose the cost of producing tea relative to copper is lower in Tealand than in Copperland. With trade, the copper industry in Copperland would *most likely*:
 - A expand.
 - B contract.
 - C remain stable.
- 4 A country has a comparative advantage in producing a good if:
 - A it is able to produce the good at a lower cost than its trading partner.
 - B its opportunity cost of producing the good is less than that of its trading partner.
 - C its opportunity cost of producing the good is more than that of its trading partner.
- 5 Suppose Mexico exports vegetables to Brazil and imports flashlights used for mining from Brazil. The output per worker per day in each country is as follows:

	Flashlights	Vegetables
Mexico	20	60
Brazil	40	80

Which country has a comparative advantage in the production of vegetables and what is the *most* relevant opportunity cost?

- A Brazil: 2 vegetables per flashlight.
 - B Mexico: 1.5 vegetables per flashlight.
 - C Mexico: $\frac{1}{3}$ flashlight per vegetable.
- 6 Suppose three countries produce rulers and pencils with output per worker per day in each country as follows:

	Rulers	Pencils
Mexico	20	40
Brazil	30	90
China	40	160

Which country has the greatest comparative advantage in the production of rulers?

- A China.
 - B Brazil.
 - C Mexico.
- 7 In the Ricardian trade model, comparative advantage is determined by:
- A technology.
 - B the capital-to-labor ratio.
 - C the level of labor productivity.
- 8 In the Ricardian trade model, a country captures more of the gains from trade if:
- A it produces all products while its trade partner specializes in one good.
 - B the terms of trade are closer to its autarkic prices than to its partner's autarkic prices.
 - C the terms of trade are closer to its partner's autarkic prices than to its autarkic prices.
- 9 Germany has much more capital per worker than Portugal. In autarky each country produces and consumes both machine tools and wine. Production of machine tools is relatively capital intensive whereas winemaking is labor intensive. According to the Heckscher–Ohlin model, when trade opens:
- A Germany should export machine tools and Portugal should export wine.
 - B Germany should export wine and Portugal should export machine tools.
 - C Germany should produce only machine tools and Portugal should produce only wine.
- 10 According to the Heckscher–Ohlin model, when trade opens:
- A the scarce factor gains relative to the abundant factor in each country.
 - B the abundant factor gains relative to the scarce factor in each country.
 - C income is redistributed between countries but not within each country.
- 11 Which type of trade restriction would *most likely* increase domestic government revenue?
- A Tariff.
 - B Import quota.
 - C Export subsidy.
- 12 Which of the following trade restrictions is likely to result in the greatest welfare loss for the importing country?
- A A tariff.
 - B An import quota.
 - C A voluntary export restraint.
- 13 A large country can:
- A benefit by imposing a tariff.

- B benefit with an export subsidy.
C not benefit from any trade restriction.
- 14 If Brazil and South Africa have free trade with each other, a common trade policy against all other countries, but no free movement of factors of production between them, then Brazil and South Africa are part of a:
A customs union.
B common market.
C free trade area (FTA).
- 15 Which of the following factors *best* explains why regional trading agreements are more popular than larger multilateral trade agreements?
A Minimal displacement costs.
B Trade diversions benefit members.
C Quicker and easier policy coordination.
- 16 The sale of mineral rights would be captured in which of the following balance of payments components?
A Capital account.
B Current account.
C Financial account.
- 17 Patent fees and legal services are recorded in which of the following balance of payments components?
A Capital account.
B Current account.
C Financial account.
- 18 During the most recent quarter, a steel company in South Korea had the following transactions
 - Bought iron ore from Australia for AUD50 million.
 - Sold finished steel to the United States for USD65 million.
 - Borrowed AUD50 million from a bank in Sydney.
 - Received a USD10 million dividend from US subsidiary.
 - Paid KRW550 million to a Korean shipping company.Which of the following would be reflected in South Korea's current account balance for the quarter?
A The loan.
B The shipping.
C The dividend.
- 19 Which of the following *most likely* contributes to a current account deficit?
A High taxes.
B Low private savings.
C Low private investment.
- 20 Which of the following chronic deficit conditions is *least* alarming to the deficit country's creditors?
A High consumption.
B High private investment.
C High government spending.

- 21** Which of the following international trade organizations regulates cross-border exchange among nations on a global scale?
- A World Bank Group (World Bank).
 - B World Trade Organization (WTO).
 - C International Monetary Fund (IMF).
- 22** Which of the following international trade organizations has a mission to help developing countries fight poverty and enhance environmentally sound economic growth?
- A World Bank Group (World Bank).
 - B World Trade Organization (WTO).
 - C International Monetary Fund (IMF).
- 23** Which of the following organizations helps to keep global systemic risk under control by preventing contagion in scenarios such as the 2010 Greek sovereign debt crisis?
- A World Bank Group (World Bank).
 - B World Trade Organization (WTO).
 - C International Monetary Fund (IMF).
- 24** Which of the following international trade bodies was the only multilateral body governing international trade from 1948 to 1995?
- A World Trade Organization (WTO).
 - B International Trade Organization (ITO).
 - C General Agreement on Tariffs and Trade (GATT).

SOLUTIONS

- 1 A is correct. Countries gain from exchange when trade enables each country to receive a higher price for exported goods and/or pay a lower price for imported goods. This leads to more efficient resource allocation and allows consumption of a larger variety of goods.
- 2 B is correct. Resources may need to be reallocated into or out of an industry, depending on whether that industry is an exporting sector or an import-competing sector of that economy. As a result of this adjustment process, less-efficient companies may be forced to exit the industry, which in turn may lead to higher unemployment and the need for retraining in order for displaced workers to find jobs in expanding industries.
- 3 A is correct. The copper industry in Copperland would benefit from trade. Because the cost of producing copper relative to producing tea is lower in Copperland than in Tealand, Copperland will export copper and the industry will expand.
- 4 B is correct. Comparative advantage is present when the opportunity cost of producing a good is less than that of a trading partner.
- 5 C is correct. While Brazil has an absolute advantage in the production of both flashlights and vegetables, Mexico has a comparative advantage in the production of vegetables. The opportunity cost of vegetables in Mexico is $\frac{1}{2}$ per flashlight, while the opportunity cost of vegetables in Brazil is $\frac{1}{3}$ per flashlight.
- 6 C is correct. Mexico has the lowest opportunity cost to produce an extra ruler. The opportunity cost is 2 pencils per ruler in Mexico, 3 pencils per ruler in Brazil, and 4 pencils per ruler in China.
- 7 A is correct. In the Ricardian model, comparative advantage is determined by technology differences between countries. Technology determines output per worker in each industry in each country. Differences in technology between countries cause output per worker in each industry to differ between countries. These ratios determine the pattern of comparative advantage.
- 8 C is correct. A country gains if trade increases the price of its exports relative to its imports as compared to its autarkic prices, i.e. the final terms of trade are more favorable than its autarkic prices. If the relative price of exports and imports remains the same after trade opens, then the country will consume the same basket of goods before and after trade opens, and it gains nothing from the ability to trade. In that case, its trade partner will capture all of the gains. Of course, the opposite is true if the roles are reversed. More generally, a country captures more of the gains from trade the more the final terms of trade differ from its autarkic prices.
- 9 A is correct. In the Heckscher–Ohlin model a country has a comparative advantage in goods whose production is intensive in the factor with which it is relatively abundantly endowed. In this case, capital is relatively abundant in Germany so Germany has a comparative advantage in producing the capital-intensive product: machine tools. Portugal is relatively labor abundant, hence should produce and export the labor-intensive product: wine.
- 10 B is correct. As a country opens up to trade, it has a favorable impact on the abundant factor, and a negative impact on the scarce factor. This is because trade causes the output mix to change and therefore changes the relative demand for the factors of production. Increased output of the export product increases demand for the factor that is used intensively in its production, while

reduced output of the import product decreases demand for the factor used intensively in its production. Because the export (import) product uses the abundant (scarce) factor intensively, the abundant factor gains relative to the scarce factor in each country.

- 11 A is correct. The imposition of a tariff will most likely increase domestic government revenue. A tariff is a tax on imports collected by the importing country's government.
- 12 C is correct. With a voluntary export restraint, the price increase induced by restricting the quantity of imports (= quota rent for equivalent quota = tariff revenue for equivalent tariff) accrues to foreign exporters and/or the foreign government.
- 13 A is correct. By definition, a large country is big enough to affect the world price of its imports and exports. A large country can benefit by imposing a tariff if its terms of trade improve by enough to outweigh the welfare loss arising from inefficient allocation of resources.
- 14 A is correct. A customs union extends a free trade area (FTA) by not only allowing free movement of goods and services among members, but also creating common trade policy against non-members. Unlike a more integrated common market, a customs union does not allow free movement of factors of production among members.
- 15 C is correct. Regional trading agreements are politically less contentious and quicker to establish than multilateral trade negotiations (for example, under the World Trade Organization). Policy coordination and harmonization is easier among a smaller group of countries.
- 16 A is correct. The capital account measures capital transfers and sale and purchase of non-produced, non-financial assets such as mineral rights and intangible assets.
- 17 B is correct. The current account measures the flows of goods and services (including income from foreign investments). Patent fees and legal services are both captured in the services sub-account of the current account.
- 18 C is correct. The current account includes income received on foreign investments. The Korean company effectively "exported" the use of its capital during the quarter to its US subsidiary, and the dividend represents payment for those services.
- 19 B is correct. A current account deficit tends to result from low private saving, high private investment, a government deficit, or a combination of the three. Of the choices, only low private savings contributes toward a current account deficit.
- 20 B is correct. A current account deficit tends to result from low private saving, high private investment, low government savings, or a combination of the three. Of these choices, only high investments can increase productive resources and improve future ability to repay creditors.
- 21 B is correct. The WTO provides the legal and institutional foundation of the multinational trading system and is the only international organization that regulates cross-border trade relations among nations on a global scale. The WTO's mission is to foster free trade by providing a major institutional and regulatory framework of global trade rules. Without such global trading rules, today's global transnational corporations would be hard to conceive.

- 22** A is correct. The World Bank's mission is to help developing countries fight poverty and enhance environmentally sound economic growth. The World Bank helps to create the basic economic infrastructure essential for creation and maintenance of domestic financial markets and a well-functioning financial industry in developing countries.
- 23** C is correct. From an investment perspective, the IMF helps to keep country-specific market risk and global systemic risk under control. The Greek sovereign debt crisis in 2010, which threatened to destabilize the entire European banking system, is a recent example. The IMF's mission is to ensure the stability of the international monetary system, the system of exchange rates and international payments which enables countries to buy goods and services from each other.
- 24** C is correct. The GATT was the only multilateral body governing international trade from 1948 to 1995. It operated for almost half a century as a quasi-institutionalized, provisional system of multilateral treaties and included several rounds of negotiations.

PRACTICE PROBLEMS

- 1 An exchange rate:
 - A is most commonly quoted in real terms.
 - B is the price of one currency in terms of another.
 - C between two currencies ensures they are fully convertible.
- 2 A decrease in the real exchange rate (quoted in terms of domestic currency per unit of foreign currency) is *most likely* to be associated with an increase in which of the following?
 - A Foreign price level.
 - B Domestic price level.
 - C Nominal exchange rate.
- 3 In order to minimize the foreign exchange exposure on a euro-denominated receivable due from a German company in 100 days, a British company would *most likely* initiate a:
 - A spot transaction.
 - B forward contract.
 - C real exchange rate contract.
- 4 Which of the following counterparties is *most likely* to be considered a sell-side foreign-exchange market participant?
 - A A large corporation that borrows in foreign currencies.
 - B A sovereign wealth fund that influences cross-border capital flows.
 - C A multinational bank that trades foreign exchange with its diverse client base.
- 5 What will be the effect on a direct exchange rate quote if the domestic currency appreciates?
 - A Increase
 - B Decrease
 - C No change
- 6 An executive from Switzerland checked into a hotel room in Spain and was told by the hotel manager that 1 EUR will buy 1.2983 CHF. From the executive's perspective, an indirect exchange rate quote would be:
 - A 0.7702 EUR per CHF.
 - B 0.7702 CHF per EUR.
 - C 1.2983 EUR per CHF.
- 7 Over the past month, the Swiss Franc (CHF) has depreciated 12 percent against pound sterling (GBP). How much has the pound sterling appreciated against the Swiss Franc?
 - A 12%
 - B Less than 12%
 - C More than 12%
- 8 An exchange rate between two currencies has increased to 1.4500. If the base currency has appreciated by 8% against the price currency, the initial exchange rate between the two currencies was *closest* to:
 - A 1.3250
 - B 1.3333
 - C 1.3500

- A 1.3340.
- B 1.3426.
- C 1.5660.

The following information relates to Questions 9–10

A dealer provides the following quotes:

Ratio	Spot rate
CNY/HKD	0.8422
CNY/ZAR	0.9149
CNY/SEK	1.0218

- 9 The spot ZAR/HKD cross-rate is *closest* to:
- A 0.9205.
 - B 1.0864.
 - C 1.2978.
- 10 Another dealer is quoting the ZAR/SEK cross-rate at 1.1210. The arbitrage profit that can be earned is *closest* to:
- A ZAR 3671 per million SEK traded.
 - B SEK 4200 per million ZAR traded.
 - C ZAR 4200 per million SEK traded.
-
- 11 A BRL/MXN spot rate is listed by a dealer at 0.1378. The 6-month forward rate is 0.14193. The 6-month forward points are *closest* to:
- A -41.3.
 - B +41.3.
 - C +299.7.
- 12 A three-month forward exchange rate in CAD/USD is listed by a dealer at 1.0123. The dealer also quotes 3-month forward points as a percentage at 6.8%. The CAD/USD spot rate is *closest* to:
- A 0.9478.
 - B 1.0550.
 - C 1.0862.
- 13 If the base currency in a forward exchange rate quote is trading at a forward discount, which of the following statements is *most* accurate?
- A The forward points will be positive.
 - B The forward percentage will be negative.
 - C The base currency is expected to appreciate versus the price currency.
- 14 A forward premium indicates:
- A an expected increase in demand for the base currency.
 - B the interest rate is higher in the base currency than in the price currency.

- C the interest rate is higher in the price currency than in the base currency.
- 15 The JPY/AUD spot exchange rate is 82.42, the JPY interest rate is 0.15%, and the AUD interest rate is 4.95%. If the interest rates are quoted on the basis of a 360-day year, the 90-day forward points in JPY/AUD would be *closest* to:
- A -377.0.
 - B -97.7.
 - C 98.9.
- 16 Which of the following is *not* a condition of an ideal currency regime?
- A Fully convertible currencies.
 - B Fully independent monetary policy.
 - C Independently floating exchange rates.
- 17 In practice, both a fixed parity regime and a target zone regime allow the exchange rate to float within a band around the parity level. The *most likely* rationale for the band is that the band allows the monetary authority to:
- A be less active in the currency market.
 - B earn a spread on its currency transactions.
 - C exercise more discretion in monetary policy.
- 18 A fixed exchange rate regime in which the monetary authority is legally required to hold foreign exchange reserves backing 100% of its domestic currency issuance is best described as:
- A dollarization.
 - B a currency board.
 - C a monetary union.
- 19 A country with a trade deficit will *most likely*:
- A have an offsetting capital account surplus.
 - B save enough to fund its investment spending.
 - C buy assets from foreigners to fund the imbalance.
- 20 A large industrialized country has recently devalued its currency in an attempt to correct a persistent trade deficit. Which of the following domestic industries is *most likely* to benefit from the devaluation?
- A Luxury cars.
 - B Branded prescription drugs.
 - C Restaurants and live entertainment venues.
- 21 A country with a persistent trade surplus is being pressured to let its currency appreciate. Which of the following *best* describes the adjustment that must occur if currency appreciation is to be effective in reducing the trade surplus?
- A Domestic investment must decline relative to saving.
 - B Foreigners must increase investment relative to saving.
 - C Global capital flows must shift toward the domestic market.

SOLUTIONS

- 1 B is correct. The exchange rate is the number of units of the price currency that 1 unit of the base currency will buy. Equivalently, it is the number of units of the price currency required to buy 1 unit of the base currency.
- 2 B is correct. The real exchange rate (quoted in terms of domestic currency per unit of foreign currency) is given by:

$$\text{Real exchange rate}_{(d/f)} = S_{d/f} \times (P_f/P_d)$$

An increase in the domestic price level (P_d) *decreases* the real exchange rate because it implies an *increase* in the relative purchasing power of the domestic currency.

- 3 B is correct. The receivable is due in 100 days. To reduce the risk of currency exposure, the British company would initiate a forward contract to sell euros/buy pounds at an exchange rate agreed to today. The agreed-upon rate is called the forward exchange rate.
- 4 C is correct. The sell side generally consists of large banks that sell foreign exchange and related instruments to buy-side clients. These banks act as market makers, quoting exchange rates at which they will buy (the bid price) or sell (the offer price) the base currency.
- 5 B is correct. In the case of a direct exchange rate, the domestic currency is the price currency (the numerator) and the foreign currency is the base currency (the denominator). If the domestic currency appreciates, then fewer units of the domestic currency are required to buy 1 unit of the foreign currency and the exchange rate (domestic per foreign) declines. For example, if sterling (GBP) appreciates against the euro (EUR), then euro–sterling (GBP/EUR) might decline from 0.8650 to 0.8590.
- 6 A is correct. An indirect quote takes the foreign country as the price currency and the domestic country as the base currency. To get CHF—which is the executive’s domestic currency—as the base currency, the quote must be stated as EUR/CHF. Using the hotel manager’s information, the indirect exchange rate is $(1/1.2983) = 0.7702$.
- 7 C is correct. The appreciation of sterling against the Swiss franc is simply the inverse of the 12% depreciation of the Swiss franc against Sterling: $[1/(1 - 0.12)] - 1 = (1/0.88) - 1 = 0.1364$, or 13.64%.
- 8 B is correct. The percentage appreciation of the base currency can be calculated by dividing the appreciated exchange rate by the initial exchange rate. In this case, the unknown is the initial exchange rate. The initial exchange is the value of X that satisfies the formula:

$$1.4500/X = 1.08$$

Solving for X leads to $1.45/1.08 = 1.3426$.

- 9 A is correct. To get to the ZAR/HKD cross-rate, it is necessary to take the inverse of the CNY/ZAR spot rate and then multiply by the CNY/HKD exchange rate:

$$\begin{aligned}\text{ZAR/HKD} &= (\text{CNY/ZAR})^{-1} \times (\text{CNY/HKD}) \\ &= (1 / 0.9149) \times 0.8422 = 0.9205\end{aligned}$$

- 10** C is correct. The ZAR/SEK cross-rate from the original dealer is $(1.0218/0.9149) = 1.1168$, which is lower than the quote from the second dealer. To earn an arbitrage profit, a currency trader would buy SEK (sell ZAR) from the original dealer and sell SEK (buy ZAR) to the second dealer. On 1 million SEK the profit would be

$$\text{SEK } 1,000,000 \times (1.1210 - 1.1168) = \text{ZAR } 4200$$

- 11** B is correct. The number of forward points equals the forward rate minus the spot rate, or $0.14193 - 0.1378 = 0.00413$, multiplied by 10,000: $10,000 \times 0.00413 = 41.3$ points. By convention, forward points are scaled so that ± 1 forward point corresponds to a change of ± 1 in the last decimal place of the spot exchange rate.
- 12** A is correct. Given the forward rate and forward points as a percentage, the unknown in the calculation is the spot rate. The calculation is as follows:

$$\text{Spot rate} \times (1 + \text{Forward points as a percentage}) = \text{Forward rate}$$

$$\text{Spot rate} \times (1 + 0.068) = 1.0123$$

$$\text{Spot} = 1.0123/1.068 = 0.9478$$

- 13** B is correct. The base currency trading at a forward discount means that 1 unit of the base currency costs less for forward delivery than for spot delivery; i.e., the forward exchange rate is less than the spot exchange rate. The forward points, expressed either as an absolute number of points or as a percentage, are negative.
- 14** C is correct. To eliminate arbitrage opportunities, the spot exchange rate (S), the forward exchange rate (F), the interest rate in the base currency (i_b), and the interest rate in the price currency (i_p) must satisfy:

$$\frac{F}{S} = \left(\frac{1 + i_p}{1 + i_b} \right)$$

According to this formula, the base currency will trade at forward premium ($F > S$) if, and only if, the interest rate in the price currency is higher than the interest rate in the base currency ($i_p > i_b$).

- 15** B is correct. The forward exchange rate is given by

$$F_{JPY/AUD} = S_{JPY/AUD} \left(\frac{1 + i_{JPY}\tau}{1 + i_{AUD}\tau} \right) = 82.42 \left(\frac{1 + .0015 \left(\frac{90}{360} \right)}{1 + .0495 \left(\frac{90}{360} \right)} \right) \\ = 82.42 \times .98815 = 81.443$$

The forward points are $100 \times (F - S) = 100 \times (81.443 - 82.42) = 100 \times (-0.977) = -97.7$. Note that because the spot exchange rate is quoted with two decimal places, the forward points are scaled by 100.

- 16** C is correct. An ideal currency regime would have credibly fixed exchange rates among all currencies. This would eliminate currency-related uncertainty with respect to the prices of goods and services as well as real and financial assets.
- 17** C is correct. Fixed exchange rates impose severe limitations on the exercise of independent monetary policy. With a rigidly fixed exchange rate, domestic interest rates, monetary aggregates (e.g., money supply), and credit conditions are dictated by the requirement to buy/sell the currency at the rigid parity. Even

a narrow band around the parity level allows the monetary authority to exercise some discretionary control over these conditions. In general, the wider the band, the more independent control the monetary authority can exercise.

- 18 B is correct. With a currency board, the monetary authority is legally required to exchange domestic currency for a specified foreign currency at a fixed exchange rate. It cannot issue domestic currency without receiving foreign currency in exchange, and it must hold that foreign currency as a 100% reserve against the domestic currency issued. Thus, the country's monetary base (bank reserves plus notes and coins in circulation) is fully backed by foreign exchange reserves.
- 19 A is correct. A trade deficit must be exactly matched by an offsetting capital account surplus to fund the deficit. A capital account surplus reflects borrowing from foreigners (an increase in domestic liabilities) and/or selling assets to foreigners (a decrease in domestic assets). A capital account surplus is often referred to as a "capital inflow" because the net effect is foreign investment in the domestic economy.
- 20 A is correct. A devaluation of the domestic currency means domestic producers are cutting the price faced by their foreign customers. The impact on their unit sales and their revenue depends on the elasticity of demand. Expensive luxury goods exhibit high price elasticity. Hence, luxury car producers are likely to experience a sharp increase in sales and revenue due to the devaluation.
- 21 C is correct. The trade surplus cannot decline unless the capital account deficit also declines. Regardless of the mix of assets bought and sold, foreigners must buy more assets from (or sell fewer assets to) domestic issuers/investors.

PRACTICE PROBLEMS

- 1 Providing information about the performance and financial position of companies so that users can make economic decisions *best* describes the role of:
 - A auditing.
 - B financial reporting.
 - C financial statement analysis.
- 2 A company's current financial position would *best* be evaluated using the:
 - A balance sheet.
 - B income statement.
 - C statement of cash flows.
- 3 A company's profitability for a period would *best* be evaluated using the:
 - A balance sheet.
 - B income statement.
 - C statement of cash flows.
- 4 Accounting policies, methods, and estimates used in preparing financial statements are *most likely* found in the:
 - A auditor's report.
 - B management commentary.
 - C notes to the financial statements.
- 5 Information about management and director compensation would *least likely* be found in the:
 - A auditor's report.
 - B proxy statement.
 - C notes to the financial statements.
- 6 Information about a company's objectives, strategies, and significant risks would *most likely* be found in the:
 - A auditor's report.
 - B management commentary.
 - C notes to the financial statements.
- 7 What type of audit opinion is preferred when analyzing financial statements?
 - A Qualified.
 - B Adverse.
 - C Unqualified.
- 8 Ratios are an input into which step in the financial statement analysis framework?
 - A Process data.
 - B Collect input data.
 - C Analyze/interpret the processed data.

SOLUTIONS

- 1 B is correct. This is the role of financial reporting. The role of financial statement analysis is to evaluate the financial reports.
- 2 A is correct. The balance sheet portrays the current financial position. The income statement and statement of cash flows present different aspects of performance.
- 3 B is correct. Profitability is the performance aspect measured by the income statement. The balance sheet portrays the current financial position. The statement of cash flows presents a different aspect of performance.
- 4 C is correct. The notes disclose choices in accounting policies, methods, and estimates.
- 5 A is correct. Information about management and director compensation is not found in the auditor's report. Disclosure of management compensation is required in the proxy statement, and some aspects of management compensation are disclosed in the notes to the financial statements.
- 6 B is correct. These are components of management commentary.
- 7 C is correct. An unqualified opinion is a "clean" opinion and indicates that the financial statements present the company's performance and financial position fairly in accordance with a specified set of accounting standards.
- 8 C is correct. Ratios are an output of the process data step but are an input into the analyze/interpret data step.

PRACTICE PROBLEMS

- 1 Which of the following items would most likely be classified as an operating activity?
 - A Issuance of debt.
 - B Acquisition of a competitor.
 - C Sale of automobiles by an automobile dealer.
- 2 Which of the following items would most likely be classified as a financing activity?
 - A Issuance of debt.
 - B Payment of income taxes.
 - C Investments in the stock of a supplier.
- 3 Which of the following elements represents an economic resource?
 - A Asset.
 - B Liability.
 - C Owners' equity.
- 4 Which of the following elements represents a residual claim?
 - A Asset.
 - B Liability.
 - C Owners' equity.
- 5 An analyst has projected that a company will have assets of €2,000 at year-end and liabilities of €1,200. The analyst's projection of total owners' equity should be *closest* to:
 - A €800.
 - B €2,000.
 - C €3,200.
- 6 An analyst has collected the following information regarding a company in advance of its year-end earnings announcement (in millions):

Estimated net income	\$ 200
Beginning retained earnings	\$ 1,400
Estimated distributions to owners	\$ 100

The analyst's estimate of ending retained earnings (in millions) should be *closest* to:

- A \$1,300.
 - B \$1,500.
 - C \$1,700.
- 7 An analyst has compiled the following information regarding Rubsam, Inc.

Liabilities at year-end	€ 1,000
Contributed capital at year-end	€ 500
Beginning retained earnings	€ 600
Revenue during the year	€ 5,000
Expenses during the year	€ 4,300

There have been no distributions to owners. The analyst's *most likely* estimate of total assets at year-end should be *closest* to:

- A €2,100.
 - B €2,300.
 - C €2,800.
- 8 A group of individuals formed a new company with an investment of \$500,000. The *most likely* effect of this transaction on the company's accounting equation at the time of the formation is an increase in cash and:
- A an increase in revenue.
 - B an increase in liabilities.
 - C an increase in contributed capital.
- 9 HVG, LLC paid \$12,000 of cash to a real estate company upon signing a lease on 31 December 2005. The payment represents a \$4,000 security deposit and \$4,000 of rent for each of January 2006 and February 2006. Assuming that the correct accounting is to reflect both January and February rent as prepaid, the *most likely* effect on HVG's accounting equation in December 2005 is:
- A no net change in assets.
 - B a decrease in assets of \$8,000.
 - C a decrease in assets of \$12,000.
- 10 TRR Enterprises sold products to customers on 30 June 2006 for a total price of €10,000. The terms of the sale are that payment is due in 30 days. The cost of the products was €8,000. The *most likely* net change in TRR's total assets on 30 June 2006 related to this transaction is:
- A €0.
 - B €2,000.
 - C €10,000.
- 11 On 30 April 2006, Pinto Products received a cash payment of \$30,000 as a deposit on production of a custom machine to be delivered in August 2006. This transaction would *most likely* result in which of the following on 30 April 2006?
- A No effect on liabilities.
 - B A decrease in assets of \$30,000.
 - C An increase in liabilities of \$30,000.
- 12 Squires & Johnson, Ltd., recorded €250,000 of depreciation expense in December 2005. The *most likely* effect on the company's accounting equation is:
- A no effect on assets.
 - B a decrease in assets of €250,000.
 - C an increase in liabilities of €250,000.
- 13 An analyst who is interested in assessing a company's financial position is *most likely* to focus on which financial statement?
- A Balance sheet.

- B Income statement.
C Statement of cash flows.
- 14 The statement of cash flows presents the flows into which three groups of business activities?
A Operating, Nonoperating, and Financing.
B Operating, Investing, and Financing.
C Operating, Nonoperating, and Investing.
- 15 Which of the following statements about cash received prior to the recognition of revenue in the financial statements is *most* accurate? The cash is recorded as:
A deferred revenue, an asset.
B accrued revenue, a liability.
C deferred revenue, a liability.
- 16 When, at the end of an accounting period, a revenue has been recognized in the financial statements but no billing has occurred and no cash has been received, the accrual is to:
A unbilled (accrued) revenue, an asset.
B deferred revenue, an asset.
C unbilled (accrued) revenue, a liability.
- 17 When, at the end of an accounting period, cash has been paid with respect to an expense, the business should then record:
A an accrued expense, an asset.
B a prepaid expense, an asset.
C an accrued expense, a liability.
- 18 When, at the end of an accounting period, cash has not been paid with respect to an expense that has been incurred, the business should then record:
A an accrued expense, an asset.
B a prepaid expense, an asset.
C an accrued expense, a liability.
- 19 The collection of all business transactions sorted by account in an accounting system is referred to as:
A a trial balance.
B a general ledger.
C a general journal.
- 20 If a company reported fictitious revenue, it could try to cover up its fraud by:
A decreasing assets.
B increasing liabilities.
C creating a fictitious asset.

SOLUTIONS

- 1 C is correct. Sales of products, a primary business activity, are classified as an operating activity. Issuance of debt would be a financing activity. Acquisition of a competitor and the sale of surplus equipment would both be classified as investing activities.
- 2 A is correct. Issuance of debt would be classified as a financing activity. B is incorrect because payment of income taxes would be classified as an operating activity. C is incorrect because investments in common stock would be generally classified as investing activities.
- 3 A is correct. An asset is an economic resource of an entity that will either be converted into cash or consumed.
- 4 C is correct. Owners' equity is a residual claim on the resources of a business.
- 5 A is correct. Assets must equal liabilities plus owners' equity and, therefore, $\text{€}2,000 = \text{€}1,200 + \text{Owners' equity}$. Owners' equity must be $\text{€}800$.
- 6 B is correct.

Beginning retained earnings	\$1,400
+ Net income	200
- Distributions to owners	<u>(100)</u>
= Ending retained earnings	\$1,500

- 7 C is correct.

$$\text{Assets} = \text{Liabilities} + \text{Contributed capital} + \text{Beginning retained earnings} - \text{Distributions to owners} + \text{Revenues} - \text{Expenses}$$

Liabilities	\$1,000
+ Contributed capital	500
+ Beginning retained earnings	600
- Distributions to owners	(0)
+ Revenues	5,000
- Expenses	<u>(4,300)</u>
= Assets	\$2,800

- 8 C is correct. This is a contribution of capital by the owners. Assets would increase by \$500,000 and contributed capital would increase by \$500,000, maintaining the balance of the accounting equation.
- 9 A is correct. The payment of January rent represents prepaid rent (an asset), which will be adjusted at the end of January to record rent expense. Cash (an asset) decreases by \$12,000. Deposits (an asset) increase by \$4,000. Prepaid rent (an asset) increases by \$8,000. There is no net change in assets.
- 10 B is correct. The sale of products without receipt of cash results in an increase in accounts receivable (an asset) of €10,000. The balance in inventory (an asset) decreases by €8,000. The net increase in assets is €2,000. This would be balanced by an increase in revenue of €10,000 and an increase in expenses (costs of goods sold) of €8,000.

- 11 C is correct. The receipt of cash in advance of delivering goods or services results in unearned revenue, which is a liability. The company has an obligation to deliver \$30,000 in goods in the future. This balances the increase in cash (an asset) of \$30,000.
- 12 B is correct. Depreciation is an expense and increases accumulated depreciation. Accumulated depreciation is a contra account which reduces property, plant, and equipment (an asset) by €250,000. Assets decrease by €250,000, and expenses increase by €250,000.
- 13 A is correct. The balance sheet shows the financial position of a company at a particular point in time. The balance sheet is also known as a “statement of financial position.”
- 14 B is correct. The three sections of the statement of cash flows are operating, investing, and financing activities.
- 15 C is correct. Cash received prior to revenue recognition increases cash and deferred or unearned revenue. This is a liability until the company provides the promised goods or services.
- 16 A is correct. When cash is to be received after revenue has been recognized but no billing has actually occurred, an unbilled (accrued) revenue is recorded. Such accruals would usually occur when an accounting period ends prior to a company billing its customer. This type of accrual can be contrasted with a simple credit sale, which is reflected as an increase in revenue and an increase in accounts receivable. No accrual is necessary.
- 17 B is correct. Payment of expenses in advance is called a prepaid expense which is classified as an asset.
- 18 C is correct. When an expense is incurred and no cash has been paid, expenses are increased and a liability (“accrued expense”) is established for the same amount.
- 19 B is correct. The general ledger is the collection of all business transactions sorted by account in an accounting system. The general journal is the collection of all business activities sorted by date.
- 20 C is correct. In order to balance the accounting equation, the company would either need to increase assets or decrease liabilities. Creating a fictitious asset would be one way of attempting to cover up the fraud.

PRACTICE PROBLEMS

- 1 Expenses on the income statement may be grouped by:
 - A nature, but not by function.
 - B function, but not by nature.
 - C either function or nature.
- 2 An example of an expense classification by function is:
 - A tax expense.
 - B interest expense.
 - C cost of goods sold.
- 3 Denali Limited, a manufacturing company, had the following income statement information:

Revenue	\$4,000,000
Cost of goods sold	\$3,000,000
Other operating expenses	\$500,000
Interest expense	\$100,000
Tax expense	\$120,000

Denali's gross profit is equal to

- A \$280,000.
- B \$500,000.
- C \$1,000,000.
- 4 Under IFRS, income includes increases in economic benefits from:
 - A increases in liabilities not related to owners' contributions.
 - B enhancements of assets not related to owners' contributions.
 - C increases in owners' equity related to owners' contributions.
- 5 Fairplay had the following information related to the sale of its products during 2009, which was its first year of business:

Revenue	\$1,000,000
Returns of goods sold	\$100,000
Cash collected	\$800,000
Cost of goods sold	\$700,000

Under the accrual basis of accounting, how much net revenue would be reported on Fairplay's 2009 income statement?

- A \$200,000.
- B \$900,000.
- C \$1,000,000.
- 6 If the outcome of a long-term contract can be measured reliably, the preferred accounting method under both IFRS and US GAAP is:
 - A the cost recovery method.
 - B the completed contract method.
 - C the percentage-of-completion method.

- 7 At the beginning of 2009, Florida Road Construction entered into a contract to build a road for the government. Construction will take four years. The following information as of 31 December 2009 is available for the contract:

Total revenue according to contract	\$10,000,000
Total expected cost	\$8,000,000
Cost incurred during 2009	\$1,200,000

Assume that the company estimates percentage complete based on costs incurred as a percentage of total estimated costs. Under the completed contract method, how much revenue will be reported in 2009?

- A None.
 - B \$300,000.
 - C \$1,500,000.
- 8 During 2009, Argo Company sold 10 acres of prime commercial zoned land to a builder for \$5,000,000. The builder gave Argo a \$1,000,000 down payment and will pay the remaining balance of \$4,000,000 to Argo in 2010. Argo purchased the land in 2002 for \$2,000,000. Using the installment method, how much profit will Argo report for 2009?
- A \$600,000.
 - B \$1,000,000.
 - C \$3,000,000.
- 9 Using the same information as in Question 8, how much profit will Argo report for 2009 using the cost recovery method?
- A None.
 - B \$600,000.
 - C \$1,000,000.
- 10 Under IFRS, revenue from barter transactions should be measured based on the fair value of revenue from:
- A similar barter transactions with unrelated parties.
 - B similar non-barter transactions with related parties.
 - C similar non-barter transactions with unrelated parties.
- 11 Apex Consignment sells items over the internet for individuals on a consignment basis. Apex receives the items from the owner, lists them for sale on the internet, and receives a 25 percent commission for any items sold. Apex collects the full amount from the buyer and pays the net amount after commission to the owner. Unsold items are returned to the owner after 90 days. During 2009, Apex had the following information:
- Total sales price of items sold during 2009 on consignment was €2,000,000.
 - Total commissions retained by Apex during 2009 for these items was €500,000.
- How much revenue should Apex report on its 2009 income statement?
- A €500,000.
 - B €2,000,000.
 - C €1,500,000.
- 12 During 2009, Accent Toys Plc., which began business in October of that year, purchased 10,000 units of a toy at a cost of £10 per unit in October. The toy sold well in October. In anticipation of heavy December sales, Accent purchased

5,000 additional units in November at a cost of £11 per unit. During 2009, Accent sold 12,000 units at a price of £15 per unit. Under the first in, first out (FIFO) method, what is Accent's cost of goods sold for 2009?

- A £120,000.
- B £122,000.
- C £124,000.

13 Using the same information as in Question 12, what would Accent's cost of goods sold be under the weighted average cost method?

- A £120,000.
- B £122,000.
- C £124,000.

14 Which inventory method is least likely to be used under IFRS?

- A First in, first out (FIFO).
- B Last in, first out (LIFO).
- C Weighted average.

15 At the beginning of 2009, Glass Manufacturing purchased a new machine for its assembly line at a cost of \$600,000. The machine has an estimated useful life of 10 years and estimated residual value of \$50,000. Under the straight-line method, how much depreciation would Glass take in 2010 for financial reporting purposes?

- A \$55,000.
- B \$60,000.
- C \$65,000.

16 Using the same information as in Question 15, how much depreciation would Glass take in 2009 for financial reporting purposes under the double-declining balance method?

- A \$60,000.
- B \$110,000.
- C \$120,000.

17 Which combination of depreciation methods and useful lives is most conservative in the year a depreciable asset is acquired?

- A Straight-line depreciation with a short useful life.
- B Declining balance depreciation with a long useful life.
- C Declining balance depreciation with a short useful life.

18 Under IFRS, a loss from the destruction of property in a fire would most likely be classified as:

- A continuing operations.
- B discontinued operations.
- C other comprehensive income.

19 For 2009, Flamingo Products had net income of \$1,000,000. At 1 January 2009, there were 1,000,000 shares outstanding. On 1 July 2009, the company issued 100,000 new shares for \$20 per share. The company paid \$200,000 in dividends to common shareholders. What is Flamingo's basic earnings per share for 2009?

- A \$0.80.
- B \$0.91.
- C \$0.95.

- 20** Cell Services Inc. (CSI) had 1,000,000 average shares outstanding during all of 2009. During 2009, CSI also had 10,000 options outstanding with exercise prices of \$10 each. The average stock price of CSI during 2009 was \$15. For purposes of computing diluted earnings per share, how many shares would be used in the denominator?
- A 1,003,333.
B 1,006,667.
C 1,010,000.

SOLUTIONS

- 1 C is correct. IAS No. 1 states that expenses may be categorized by either nature or function.
- 2 C is correct. Cost of goods sold is a classification by function. The other two expenses represent classifications by nature.
- 3 C is correct. Gross margin is revenue minus cost of goods sold. Answer A represents net income and B represents operating income.
- 4 B is correct. Under IFRS, income includes increases in economic benefits from increases in assets, enhancement of assets, and decreases in liabilities.
- 5 B is correct. Net revenue is revenue for goods sold during the period less any returns and allowances, or \$1,000,000 minus \$100,000 = \$900,000.
- 6 C is correct. The preferred method is the percentage-of-completion method. The completed contract method should be used under US GAAP only when the outcome cannot be measured reliably. A method similar to, but not referred to as, the cost recovery method is used under IFRS when the outcome cannot be measured reliably.
- 7 A is correct. Under the completed contract method, no revenue would be reported until the project is completed.
- 8 A is correct. The installment method apportions the cash receipt between cost recovered and profit using the ratio of profit to sales value (i.e., $\$3,000,000 \div \$5,000,000 = 60$ percent). Argo will, therefore, recognize \$600,000 in profit for 2009 ($\$1,000,000$ cash received \times 60 percent).
- 9 A is correct. Under the cost recovery method, the company would not recognize any profit until the cash amounts paid by the buyer exceeded Argo's cost of \$2,000,000.
- 10 C is correct. Revenue for barter transactions should be measured based on the fair value of revenue from similar non-barter transactions with unrelated parties.
- 11 A is correct. Apex is not the owner of the goods and should only report its net commission as revenue.
- 12 B is correct. Under the first in, first out (FIFO) method, the first 10,000 units sold came from the October purchases at £10, and the next 2,000 units sold came from the November purchases at £11.
- 13 C is correct. Under the weighted average cost method:

October purchases	10,000 units	\$100,000
November purchases	5,000 units	\$55,000
Total	15,000 units	\$155,000

$\$155,000 / 15,000$ units = $\$10.3333 \times 12,000$ units = $\$124,000$.

- 14 B is correct. The last in, first out (LIFO) method is not permitted under IFRS. The other two methods are permitted.
- 15 A is correct. Straight-line depreciation would be $(\$600,000 - \$50,000) / 10$, or \$55,000.

- 16** C is correct. Double-declining balance depreciation would be $\$600,000 \times 20\%$ (twice the straight-line rate). The residual value is not subtracted from the initial book value to calculate depreciation. However, the book value (carrying amount) of the asset will not be reduced below the estimated residual value.
- 17** C is correct. This would result in the highest amount of depreciation in the first year and hence the lowest amount of net income relative to the other choices.
- 18** A is correct. A fire may be infrequent, but it would still be part of continuing operations and reported in the profit and loss statement. Discontinued operations relate to a decision to dispose of an operating division.
- 19** C is correct. The weighted average number of shares outstanding for 2009 is 1,050,000. Basic earnings per share would be \$1,000,000 divided by 1,050,000, or \$0.95.
- 20** A is correct. With stock options, the treasury stock method must be used. Under that method, the company would receive \$100,000 ($10,000 \times \10) and would repurchase 6,667 shares ($\$100,000 / \15). The shares for the denominator would be:

Shares outstanding	1,000,000
Options exercises	10,000
Treasury shares purchased	(6,667)
Denominator	1,003,333

PRACTICE PROBLEMS

- 1 Resources controlled by a company as a result of past events are:
 - A equity.
 - B assets.
 - C liabilities.
- 2 Equity equals:
 - A Assets – Liabilities.
 - B Liabilities – Assets.
 - C Assets + Liabilities.
- 3 Distinguishing between current and non-current items on the balance sheet and presenting a subtotal for current assets and liabilities is referred to as:
 - A a classified balance sheet.
 - B an unclassified balance sheet.
 - C a liquidity-based balance sheet.
- 4 All of the following are current assets *except*:
 - A cash.
 - B goodwill.
 - C inventories.
- 5 Debt due within one year is considered:
 - A current.
 - B preferred.
 - C convertible.
- 6 Money received from customers for products to be delivered in the future is recorded as:
 - A revenue and an asset.
 - B an asset and a liability.
 - C revenue and a liability.
- 7 The carrying value of inventories reflects:
 - A their historical cost.
 - B their current value.
 - C the lower of historical cost or net realizable value.
- 8 When a company pays its rent in advance, its balance sheet will reflect a reduction in:
 - A assets and liabilities.
 - B assets and shareholders' equity.
 - C one category of assets and an increase in another.
- 9 Accrued expenses (accrued liabilities) are:
 - A expenses that have been paid.
 - B created when another liability is reduced.
 - C expenses that have been reported on the income statement but not yet paid.
- 10 The initial measurement of goodwill is *most likely* affected by:

- A an acquisition's purchase price.
B the acquired company's book value.
C the fair value of the acquirer's assets and liabilities.
- 11 Defining total asset turnover as revenue divided by average total assets, all else equal, impairment write-downs of long-lived assets owned by a company will *most likely* result in an increase for that company in:
A the debt-to-equity ratio but not the total asset turnover.
B the total asset turnover but not the debt-to-equity ratio.
C both the debt-to-equity ratio and the total asset turnover.
- 12 For financial assets classified as trading securities, how are unrealized gains and losses reflected in shareholders' equity?
A They are not recognized.
B They flow through income into retained earnings.
C They are a component of accumulated other comprehensive income.
- 13 For financial assets classified as available for sale, how are unrealized gains and losses reflected in shareholders' equity?
A They are not recognized.
B They flow through retained earnings.
C They are a component of accumulated other comprehensive income.
- 14 For financial assets classified as held to maturity, how are unrealized gains and losses reflected in shareholders' equity?
A They are not recognized.
B They flow through retained earnings.
C They are a component of accumulated other comprehensive income.
- 15 The non-controlling (minority) interest in consolidated subsidiaries is presented on the balance sheet:
A as a long-term liability.
B separately, but as a part of shareholders' equity.
C as a mezzanine item between liabilities and shareholders' equity.
- 16 The item "retained earnings" is a component of:
A assets.
B liabilities.
C shareholders' equity.
- 17 When a company buys shares of its own stock to be held in treasury, it records a reduction in:
A both assets and liabilities.
B both assets and shareholders' equity.
C assets and an increase in shareholders' equity.
- 18 Which of the following would an analyst *most likely* be able to determine from a common-size analysis of a company's balance sheet over several periods?
A An increase or decrease in sales.
B An increase or decrease in financial leverage.
C A more efficient or less efficient use of assets.
- 19 An investor concerned whether a company can meet its near-term obligations is *most likely* to calculate the:

- A current ratio.
 - B return on total capital.
 - C financial leverage ratio.
- 20 The most stringent test of a company's liquidity is its:
- A cash ratio.
 - B quick ratio.
 - C current ratio.
- 21 An investor worried about a company's long-term solvency would *most likely* examine its:
- A current ratio.
 - B return on equity.
 - C debt-to-equity ratio.
- 22 Using the information presented in Exhibit 4, the quick ratio for SAP Group at 31 December 2009 is *closest* to:
- A 1.01.
 - B 1.44.
 - C 1.54.
- 23 Using the information presented in Exhibit 12, the financial leverage ratio for SAP Group at 31 December 2009 is *closest* to:
- A 0.08.
 - B 0.58.
 - C 1.58.

SOLUTIONS

- 1 B is correct. Assets are resources controlled by a company as a result of past events.
- 2 A is correct. Assets = Liabilities + Equity and, therefore, Assets – Liabilities = Equity.
- 3 A is correct. A classified balance sheet is one that classifies assets and liabilities as current or non-current and provides a subtotal for current assets and current liabilities. A liquidity-based balance sheet broadly presents assets and liabilities in order of liquidity.
- 4 B is correct. Goodwill is a long-term asset, and the others are all current assets.
- 5 A is correct. Current liabilities are those liabilities, including debt, due within one year. Preferred refers to a class of stock. Convertible refers to a feature of bonds (or preferred stock) allowing the holder to convert the instrument into common stock.
- 6 B is correct. The cash received from customers represents an asset. The obligation to provide a product in the future is a liability called “unearned income” or “unearned revenue.” As the product is delivered, revenue will be recognized and the liability will be reduced.
- 7 C is correct. Under IFRS, inventories are carried at historical cost, unless net realizable value of the inventory is less. Under US GAAP, inventories are carried at the lower of cost or market.
- 8 C is correct. Paying rent in advance will reduce cash and increase prepaid expenses, both of which are assets.
- 9 C is correct. Accrued liabilities are expenses that have been reported on a company’s income statement but have not yet been paid.
- 10 A is correct. Initially, goodwill is measured as the difference between the purchase price paid for an acquisition and the fair value of the acquired, not acquiring, company’s net assets (identifiable assets less liabilities).
- 11 C is correct. Impairment write-downs reduce equity in the denominator of the debt-to-equity ratio but do not affect debt, so the debt-to-equity ratio is expected to increase. Impairment write-downs reduce total assets but do not affect revenue. Thus, total asset turnover is expected to increase.
- 12 B is correct. For financial assets classified as trading securities, unrealized gains and losses are reported on the income statement and flow to shareholders’ equity as part of retained earnings.
- 13 C is correct. For financial assets classified as available for sale, unrealized gains and losses are not recorded on the income statement and instead are part of *other* comprehensive income. Accumulated other comprehensive income is a component of Shareholders’ equity
- 14 A is correct. Financial assets classified as held to maturity are measured at amortised cost. Gains and losses are recognized only when realized.
- 15 B is correct. The non-controlling interest in consolidated subsidiaries is shown separately as part of shareholders’ equity.
- 16 C is correct. The item “retained earnings” is a component of shareholders’ equity.

- 17** B is correct. Share repurchases reduce the company's cash (an asset). Shareholders' equity is reduced because there are fewer shares outstanding and treasury stock is an offset to owners' equity.
- 18** B is correct. Common-size analysis (as presented in the reading) provides information about composition of the balance sheet and changes over time. As a result, it can provide information about an increase or decrease in a company's financial leverage.
- 19** A is correct. The current ratio provides a comparison of assets that can be turned into cash relatively quickly and liabilities that must be paid within one year. The other ratios are more suited to longer-term concerns.
- 20** A is correct. The cash ratio determines how much of a company's near-term obligations can be settled with existing amounts of cash and marketable securities.
- 21** C is correct. The debt-to-equity ratio, a solvency ratio, is an indicator of financial risk.
- 22** B is correct. The quick ratio ($[\text{Cash} + \text{Marketable securities} + \text{Receivables}] \div \text{Current liabilities}$) is 1.44 ($[= 1,884 + 486 + 2,546] \div 3,416$). Given the placement of other financial assets between cash and receivables, it is reasonable to assume these are highly liquid and are probably marketable securities.
- 23** C is correct. The financial leverage ratio ($\text{Total assets} \div \text{Total equity}$) is 1.58 ($= 13,374 \div 8,491$).

PRACTICE PROBLEMS

- 1 The three major classifications of activities in a cash flow statement are:
 - A inflows, outflows, and net flows.
 - B operating, investing, and financing.
 - C revenues, expenses, and net income.
- 2 The sale of a building for cash would be classified as what type of activity on the cash flow statement?
 - A Operating.
 - B Investing.
 - C Financing.
- 3 Which of the following is an example of a financing activity on the cash flow statement under US GAAP?
 - A Payment of interest.
 - B Receipt of dividends.
 - C Payment of dividends.
- 4 A conversion of a face value \$1 million convertible bond for \$1 million of common stock would most likely be:
 - A reported as a \$1 million investing cash inflow and outflow.
 - B reported as a \$1 million financing cash outflow and inflow.
 - C reported as supplementary information to the cash flow statement.
- 5 Interest paid is classified as an operating cash flow under:
 - A US GAAP but may be classified as either operating or investing cash flows under IFRS.
 - B IFRS but may be classified as either operating or investing cash flows under US GAAP.
 - C US GAAP but may be classified as either operating or financing cash flows under IFRS.
- 6 Cash flows from taxes on income must be separately disclosed under:
 - A IFRS only.
 - B US GAAP only.
 - C both IFRS and US GAAP.
- 7 Which of the following components of the cash flow statement may be prepared under the indirect method under both IFRS and US GAAP?
 - A Operating.
 - B Investing.
 - C Financing.
- 8 Which of the following is *most likely* to appear in the operating section of a cash flow statement under the indirect method?
 - A Net income.
 - B Cash paid to suppliers.
 - C Cash received from customers.

- 9 Red Road Company, a consulting company, reported total revenues of \$100 million, total expenses of \$80 million, and net income of \$20 million in the most recent year. If accounts receivable increased by \$10 million, how much cash did the company receive from customers?
- A \$90 million.
B \$100 million.
C \$110 million.
- 10 Green Glory Corp., a garden supply wholesaler, reported cost of goods sold for the year of \$80 million. Total assets increased by \$55 million, including an increase of \$5 million in inventory. Total liabilities increased by \$45 million, including an increase of \$2 million in accounts payable. The cash paid by the company to its suppliers is most likely *closest* to:
- A \$73 million.
B \$77 million.
C \$83 million.
- 11 Purple Fleur S.A., a retailer of floral products, reported cost of goods sold for the year of \$75 million. Total assets increased by \$55 million, but inventory declined by \$6 million. Total liabilities increased by \$45 million, and accounts payable increased by \$2 million. The cash paid by the company to its suppliers is most likely *closest* to:
- A \$67 million.
B \$79 million.
C \$83 million.
- 12 White Flag, a women's clothing manufacturer, reported salaries expense of \$20 million. The beginning balance of salaries payable was \$3 million, and the ending balance of salaries payable was \$1 million. How much cash did the company pay in salaries?
- A \$18 million.
B \$21 million.
C \$22 million.
- 13 An analyst gathered the following information from a company's 2010 financial statements (in \$ millions):

Year ended 31 December	2009	2010
Net sales	245.8	254.6
Cost of goods sold	168.3	175.9
Accounts receivable	73.2	68.3
Inventory	39.0	47.8
Accounts payable	20.3	22.9

Based only on the information above, the company's 2010 statement of cash flows in the direct format would include amounts (in \$ millions) for cash received from customers and cash paid to suppliers, respectively, that are *closest* to:

	cash received from customers	cash paid to suppliers
A	249.7	169.7
B	259.5	174.5
C	259.5	182.1

- 14 Golden Cumulus Corp., a commodities trading company, reported interest expense of \$19 million and taxes of \$6 million. Interest payable increased by \$3 million, and taxes payable decreased by \$4 million over the period. How much cash did the company pay for interest and taxes?
- A \$22 million for interest and \$10 million for taxes.
 B \$16 million for interest and \$2 million for taxes.
 C \$16 million for interest and \$10 million for taxes.
- 15 An analyst gathered the following information from a company's 2010 financial statements (in \$ millions):

Balances as of Year Ended 31 December	2009	2010
Retained earnings	120	145
Accounts receivable	38	43
Inventory	45	48
Accounts payable	36	29

In 2010, the company declared and paid cash dividends of \$10 million and recorded depreciation expense in the amount of \$25 million. The company considers dividends paid a financing activity. The company's 2010 cash flow from operations (in \$ millions) was *closest to*

- A 25.
 B 45.
 C 75.
- 16 Silverago Incorporated, an international metals company, reported a loss on the sale of equipment of \$2 million in 2010. In addition, the company's income statement shows depreciation expense of \$8 million and the cash flow statement shows capital expenditure of \$10 million, all of which was for the purchase of new equipment. Using the following information from the comparative balance sheets, how much cash did the company receive from the equipment sale?

Balance Sheet Item	12/31/2009	12/31/2010	Change
Equipment	\$100 million	\$105 million	\$5 million
Accumulated depreciation—equipment	\$40 million	\$46 million	\$6 million

- A \$1 million.
 B \$2 million.
 C \$3 million.
- 17 Jaderong Plinkett Stores reported net income of \$25 million. The company has no outstanding debt. Using the following information from the comparative balance sheets (in millions), what should the company report in the financing section of the statement of cash flows in 2010?

Balance Sheet Item	12/31/2009	12/31/2010	Change
Common stock	\$100	\$102	\$2
Additional paid-in capital common stock	\$100	\$140	\$40
Retained earnings	\$100	\$115	\$15
Total stockholders' equity	\$300	\$357	\$57

- A Issuance of common stock of \$42 million; dividends paid of \$10 million.
 B Issuance of common stock of \$38 million; dividends paid of \$10 million.
 C Issuance of common stock of \$42 million; dividends paid of \$40 million.
- 18 Based on the following information for Star Inc., what are the total net adjustments that the company would make to net income in order to derive operating cash flow?

Income Statement Item	Year Ended		
	12/31/2010		
Net income		\$20 million	
Depreciation		\$2 million	
Balance Sheet Item	12/31/2009	12/31/2010	Change
Accounts receivable	\$25 million	\$22 million	(\$3 million)
Inventory	\$10 million	\$14 million	\$4 million
Accounts payable	\$8 million	\$13 million	\$5 million

- A Add \$2 million.
 B Add \$6 million.
 C Subtract \$6 million.
- 19 The first step in cash flow statement analysis should be to:
- A evaluate consistency of cash flows.
 B determine operating cash flow drivers.
 C identify the major sources and uses of cash.
- 20 Which of the following would be valid conclusions from an analysis of the cash flow statement for Telefónica Group presented in Exhibit 3?
- A The primary use of cash is financing activities.
 B The primary source of cash is operating activities.
 C Telefónica classifies interest received as an operating activity.
- 21 Which is an appropriate method of preparing a common-size cash flow statement?
- A Show each item of revenue and expense as a percentage of net revenue.
 B Show each line item on the cash flow statement as a percentage of net revenue.
 C Show each line item on the cash flow statement as a percentage of total cash outflows.
- 22 Which of the following is an appropriate method of computing free cash flow to the firm?

- A Add operating cash flows to capital expenditures and deduct after-tax interest payments.
 - B Add operating cash flows to after-tax interest payments and deduct capital expenditures.
 - C Deduct both after-tax interest payments and capital expenditures from operating cash flows.
- 23 An analyst has calculated a ratio using as the numerator the sum of operating cash flow, interest, and taxes and as the denominator the amount of interest. What is this ratio, what does it measure, and what does it indicate?
- A This ratio is an interest coverage ratio, measuring a company's ability to meet its interest obligations and indicating a company's solvency.
 - B This ratio is an effective tax ratio, measuring the amount of a company's operating cash flow used for taxes and indicating a company's efficiency in tax management.
 - C This ratio is an operating profitability ratio, measuring the operating cash flow generated accounting for taxes and interest and indicating a company's liquidity.

SOLUTIONS

- 1 B is correct. Operating, investing, and financing are the three major classifications of activities in a cash flow statement. Revenues, expenses, and net income are elements of the income statement. Inflows, outflows, and net flows are items of information in the statement of cash flows.
- 2 B is correct. Purchases and sales of long-term assets are considered investing activities. Note that if the transaction had involved the exchange of a building for other than cash (for example, for another building, common stock of another company, or a long-term note receivable), it would have been considered a significant non-cash activity.
- 3 C is correct. Payment of dividends is a financing activity under US GAAP. Payment of interest and receipt of dividends are included in operating cash flows under US GAAP. Note that IFRS allow companies to include receipt of interest and dividends as either operating or investing cash flows and to include payment of interest and dividends as either operating or financing cash flows.
- 4 C is correct. Non-cash transactions, if significant, are reported as supplementary information, not in the investing or financing sections of the cash flow statement.
- 5 C is correct. Interest expense is always classified as an operating cash flow under US GAAP but may be classified as either an operating or financing cash flow under IFRS.
- 6 C is correct. Taxes on income are required to be separately disclosed under IFRS and US GAAP. The disclosure may be in the cash flow statement or elsewhere.
- 7 A is correct. The operating section may be prepared under the indirect method. The other sections are always prepared under the direct method.
- 8 A is correct. Under the indirect method, the operating section would begin with net income and adjust it to arrive at operating cash flow. The other two items would appear in the operating section under the direct method.
- 9 A is correct. Revenues of \$100 million minus the increase in accounts receivable of \$10 million equal \$90 million cash received from customers. The increase in accounts receivable means that the company received less in cash than it reported as revenue.
- 10 C is correct. Cost of goods sold of \$80 million plus the increase in inventory of \$5 million equals purchases from suppliers of \$85 million. The increase in accounts payable of \$2 million means that the company paid \$83 million in cash (\$85 million minus \$2 million) to its suppliers.
- 11 A is correct. Cost of goods sold of \$75 million less the decrease in inventory of \$6 million equals purchases from suppliers of \$69 million. The increase in accounts payable of \$2 million means that the company paid \$67 million in cash (\$69 million minus \$2 million).
- 12 C is correct. Beginning salaries payable of \$3 million plus salaries expense of \$20 million minus ending salaries payable of \$1 million equals \$22 million. Alternatively, the expense of \$20 million plus the \$2 million decrease in salaries payable equals \$22 million.
- 13 C is correct. Cash received from customers = Sales + Decrease in accounts receivable = $254.6 + 4.9 = 259.5$. Cash paid to suppliers = Cost of goods sold + Increase in inventory – Increase in accounts payable = $175.9 + 8.8 - 2.6 = 182.1$.

- 14 C is correct. Interest expense of \$19 million less the increase in interest payable of \$3 million equals interest paid of \$16 million. Tax expense of \$6 million plus the decrease in taxes payable of \$4 million equals taxes paid of \$10 million.
- 15 B is correct. All dollar amounts are in millions. Net income (NI) for 2010 is \$35. This amount is the increase in retained earnings, \$25, plus the dividends paid, \$10. Depreciation of \$25 is added back to net income, and the increases in accounts receivable, \$5, and in inventory, \$3, are subtracted from net income because they are uses of cash. The decrease in accounts payable is also a use of cash and, therefore, a subtraction from net income. Thus, cash flow from operations is $\$25 + \$10 + \$25 - \$5 - \$3 - \$7 = \$45$.
- 16 A is correct. Selling price (cash inflow) minus book value equals gain or loss on sale; therefore, gain or loss on sale plus book value equals selling price (cash inflow). The amount of loss is given—\$2 million. To calculate the book value of the equipment sold, find the historical cost of the equipment and the accumulated depreciation on the equipment.
- Beginning balance of equipment of \$100 million plus equipment purchased of \$10 million minus ending balance of equipment of \$105 million equals the historical cost of equipment sold, or \$5 million.
 - Beginning accumulated depreciation of \$40 million plus depreciation expense for the year of \$8 million minus ending balance of accumulated depreciation of \$46 million equals accumulated depreciation on the equipment sold, or \$2 million.
 - Therefore, the book value of the equipment sold was \$5 million minus \$2 million, or \$3 million.
 - Because the loss on the sale of equipment was \$2 million, the amount of cash received must have been \$1 million.
- 17 A is correct. The increase of \$42 million in common stock and additional paid-in capital indicates that the company issued stock during the year. The increase in retained earnings of \$15 million indicates that the company paid \$10 million in cash dividends during the year, determined as beginning retained earnings of \$100 million plus net income of \$25 million minus ending retained earnings of \$115 million, which equals \$10 million in cash dividends.
- 18 B is correct. To derive operating cash flow, the company would make the following adjustments to net income: Add depreciation (a non-cash expense) of \$2 million; add the decrease in accounts receivable of \$3 million; add the increase in accounts payable of \$5 million; and subtract the increase in inventory of \$4 million. Total additions would be \$10 million, and total subtractions would be \$4 million, which gives net additions of \$6 million.
- 19 C is correct. An overall assessment of the major sources and uses of cash should be the first step in evaluating a cash flow statement.
- 20 B is correct. The primary source of cash is operating activities. The primary use of cash is investing activities. Interest received for Telefónica is classified as an investing activity.
- 21 B is correct. An appropriate method to prepare a common-size cash flow statement is to show each line item on the cash flow statement as a percentage of net revenue. An alternative way to prepare a statement of cash flows is to show each item of cash inflow as a percentage of total inflows and each item of cash outflows as a percentage of total outflows.

- 22** B is correct. Free cash flow to the firm can be computed as operating cash flows plus after-tax interest expense less capital expenditures.
- 23** A is correct. This ratio is an interest coverage ratio, measuring a company's ability to meet its interest obligations and indicating a company's solvency. This coverage ratio is based on cash flow information; another common coverage ratio uses a measure based on the income statement (earnings before interest, taxes, depreciation, and amortisation).

PRACTICE PROBLEMS

- 1 Comparison of a company's financial results to other peer companies for the same time period is called:
 - A technical analysis.
 - B time-series analysis.
 - C cross-sectional analysis.
- 2 In order to assess a company's ability to fulfill its long-term obligations, an analyst would *most likely* examine:
 - A activity ratios.
 - B liquidity ratios.
 - C solvency ratios.
- 3 Which ratio would a company *most likely* use to measure its ability to meet short-term obligations?
 - A Current ratio.
 - B Payables turnover.
 - C Gross profit margin.
- 4 Which of the following ratios would be *most* useful in determining a company's ability to cover its lease and interest payments?
 - A ROA.
 - B Total asset turnover.
 - C Fixed charge coverage.
- 5 An analyst is interested in assessing both the efficiency and liquidity of Spherion PLC. The analyst has collected the following data for Spherion:

	FY3	FY2	FY1
Days of inventory on hand	32	34	40
Days sales outstanding	28	25	23
Number of days of payables	40	35	35

Based on this data, what is the analyst *least likely* to conclude?

- A Inventory management has contributed to improved liquidity.
 - B Management of payables has contributed to improved liquidity.
 - C Management of receivables has contributed to improved liquidity.
- 6 An analyst is evaluating the solvency and liquidity of Apex Manufacturing and has collected the following data (in millions of euro):

	FY5 (€)	FY4 (€)	FY3 (€)
Total debt	2,000	1,900	1,750
Total equity	4,000	4,500	5,000

Which of the following would be the analyst's *most likely* conclusion?

- The company is becoming increasingly less solvent, as evidenced by the increase in its debt-to-equity ratio from 0.35 to 0.50 from FY3 to FY5.

- B** The company is becoming less liquid, as evidenced by the increase in its debt-to-equity ratio from 0.35 to 0.50 from FY3 to FY5.
- C** The company is becoming increasingly more liquid, as evidenced by the increase in its debt-to-equity ratio from 0.35 to 0.50 from FY3 to FY5.
- 7** With regard to the data in Problem 6, what would be the *most* reasonable explanation of the financial data?
- A** The decline in the company's equity results from a decline in the market value of this company's common shares.
- B** The €250 increase in the company's debt from FY3 to FY5 indicates that lenders are viewing the company as increasingly creditworthy.
- C** The decline in the company's equity indicates that the company may be incurring losses, paying dividends greater than income, and/or repurchasing shares.
- 8** An analyst observes a decrease in a company's inventory turnover. Which of the following would *most likely* explain this trend?
- A** The company installed a new inventory management system, allowing more efficient inventory management.
- B** Due to problems with obsolescent inventory last year, the company wrote off a large amount of its inventory at the beginning of the period.
- C** The company installed a new inventory management system but experienced some operational difficulties resulting in duplicate orders being placed with suppliers.
- 9** Which of the following would *best* explain an increase in receivables turnover?
- A** The company adopted new credit policies last year and began offering credit to customers with weak credit histories.
- B** Due to problems with an error in its old credit scoring system, the company had accumulated a substantial amount of uncollectible accounts and wrote off a large amount of its receivables.
- C** To match the terms offered by its closest competitor, the company adopted new payment terms now requiring net payment within 30 days rather than 15 days, which had been its previous requirement.
- 10** Brown Corporation had average days of sales outstanding of 19 days in the most recent fiscal year. Brown wants to improve its credit policies and collection practices and decrease its collection period in the next fiscal year to match the industry average of 15 days. Credit sales in the most recent fiscal year were \$300 million, and Brown expects credit sales to increase to \$390 million in the next fiscal year. To achieve Brown's goal of decreasing the collection period, the change in the average accounts receivable balance that must occur is *closest* to:
- A** +\$0.41 million.
- B** -\$0.41 million.
- C** -\$1.22 million.
- 11** An analyst observes the following data for two companies:

	Company A (\$)	Company B (\$)
Revenue	4,500	6,000
Net income	50	1,000
Current assets	40,000	60,000
Total assets	100,000	700,000

	Company A (\$)	Company B (\$)
Current liabilities	10,000	50,000
Total debt	60,000	150,000
Shareholders' equity	30,000	500,000

Which of the following choices *best* describes reasonable conclusions that the analyst might make about the two companies' ability to pay their current and long-term obligations?

- A Company A's current ratio of 4.0 indicates it is more liquid than Company B, whose current ratio is only 1.2, but Company B is more solvent, as indicated by its lower debt-to-equity ratio.
- B Company A's current ratio of 0.25 indicates it is less liquid than Company B, whose current ratio is 0.83, and Company A is also less solvent, as indicated by a debt-to-equity ratio of 200 percent compared with Company B's debt-to-equity ratio of only 30 percent.
- C Company A's current ratio of 4.0 indicates it is more liquid than Company B, whose current ratio is only 1.2, and Company A is also more solvent, as indicated by a debt-to-equity ratio of 200 percent compared with Company B's debt-to-equity ratio of only 30 percent.

The following information relates to Questions 12–15

The data in Exhibit 1 appear in the five-year summary of a major international company. A business combination with another major manufacturer took place in FY13.

Exhibit 1

	FY10	FY11	FY12	FY13	FY14
Financial statements	GBP m				
Income statements					
Revenue	4,390	3,624	3,717	8,167	11,366
Profit before interest and taxation (EBIT)	844	700	704	933	1,579
Net interest payable	-80	-54	-98	-163	-188
Taxation	-186	-195	-208	-349	-579
Minorities	-94	-99	-105	-125	-167
Profit for the year	484	352	293	296	645
Balance sheets					
Fixed assets	3,510	3,667	4,758	10,431	11,483
Current asset investments, cash at bank and in hand	316	218	290	561	682
Other current assets	558	514	643	1,258	1,634
Total assets	4,384	4,399	5,691	12,250	13,799
Interest bearing debt (long term)	-602	-1,053	-1,535	-3,523	-3,707

(continued)

Exhibit 1 (Continued)

	FY10	FY11	FY12	FY13	FY14
Other creditors and provisions (current)	−1,223	−1,054	−1,102	−2,377	−3,108
Total liabilities	−1,825	−2,107	−2,637	−5,900	−6,815
Net assets	2,559	2,292	3,054	6,350	6,984
Shareholders' funds	2,161	2,006	2,309	5,572	6,165
Equity minority interests	398	286	745	778	819
Capital employed	2,559	2,292	3,054	6,350	6,984
Cash flow					
Working capital movements	−53	5	71	85	107
Net cash inflow from operating activities	864	859	975	1,568	2,292

- 12** The company's total assets at year-end FY9 were GBP 3,500 million. Which of the following choices *best* describes reasonable conclusions an analyst might make about the company's efficiency?
- A** Comparing FY14 with FY10, the company's efficiency improved, as indicated by a total asset turnover ratio of 0.86 compared with 0.64.
 - B** Comparing FY14 with FY10, the company's efficiency deteriorated, as indicated by its current ratio.
 - C** Comparing FY14 with FY10, the company's efficiency deteriorated due to asset growth faster than turnover revenue growth.
- 13** Which of the following choices *best* describes reasonable conclusions an analyst might make about the company's solvency?
- A** Comparing FY14 with FY10, the company's solvency improved, as indicated by an increase in its debt-to-assets ratio from 0.14 to 0.27.
 - B** Comparing FY14 with FY10, the company's solvency deteriorated, as indicated by a decrease in interest coverage from 10.6 to 8.4.
 - C** Comparing FY14 with FY10, the company's solvency improved, as indicated by the growth in its profits to GBP 645 million.
- 14** Which of the following choices *best* describes reasonable conclusions an analyst might make about the company's liquidity?
- A** Comparing FY14 with FY10, the company's liquidity improved, as indicated by an increase in its debt-to-assets ratio from 0.14 to 0.27.
 - B** Comparing FY14 with FY10, the company's liquidity deteriorated, as indicated by a decrease in interest coverage from 10.6 to 8.4.
 - C** Comparing FY14 with FY10, the company's liquidity improved, as indicated by an increase in its current ratio from 0.71 to 0.75.
- 15** Which of the following choices *best* describes reasonable conclusions an analyst might make about the company's profitability?
- A** Comparing FY14 with FY10, the company's profitability improved, as indicated by an increase in its debt-to-assets ratio from 0.14 to 0.27.

- B Comparing FY14 with FY10, the company's profitability deteriorated, as indicated by a decrease in its net profit margin from 11.0 percent to 5.7 percent.
- C Comparing FY14 with FY10, the company's profitability improved, as indicated by the growth in its shareholders' equity to GBP 6,165 million.

- 16** Assuming no changes in other variables, which of the following would decrease ROA?

- A A decrease in the effective tax rate.
- B A decrease in interest expense.
- C An increase in average assets.

- 17** An analyst compiles the following data for a company:

	FY13	FY14	FY15
ROE	19.8%	20.0%	22.0%
Return on total assets	8.1%	8.0%	7.9%
Total asset turnover	2.0	2.0	2.1

Based only on the information above, the *most* appropriate conclusion is that, over the period FY13 to FY15, the company's:

- A net profit margin and financial leverage have decreased.
- B net profit margin and financial leverage have increased.
- C net profit margin has decreased but its financial leverage has increased.

- 18** A decomposition of ROE for Integra SA is as follows:

	FY12	FY11
ROE	18.90%	18.90%
Tax burden	0.70	0.75
Interest burden	0.90	0.90
EBIT margin	10.00%	10.00%
Asset turnover	1.50	1.40
Leverage	2.00	2.00

Which of the following choices *best* describes reasonable conclusions an analyst might make based on this ROE decomposition?

- A Profitability and the liquidity position both improved in FY12.
- B The higher average tax rate in FY12 offset the improvement in profitability, leaving ROE unchanged.
- C The higher average tax rate in FY12 offset the improvement in efficiency, leaving ROE unchanged.

- 19** A decomposition of ROE for Company A and Company B is as follows:

	Company A		Company B	
	FY15	FY14	FY15	FY14
ROE	26.46%	18.90%	26.33%	18.90%
Tax burden	0.7	0.75	0.75	0.75
Interest burden	0.9	0.9	0.9	0.9

(continued)

	Company A		Company B	
	FY15	FY14	FY15	FY14
EBIT margin	7.00%	10.00%	13.00%	10.00%
Asset turnover	1.5	1.4	1.5	1.4
Leverage	4	2	2	2

An analyst is *most likely* to conclude that:

- A Company A's ROE is higher than Company B's in FY15, and one explanation consistent with the data is that Company A may have purchased new, more efficient equipment.
 - B Company A's ROE is higher than Company B's in FY15, and one explanation consistent with the data is that Company A has made a strategic shift to a product mix with higher profit margins.
 - C The difference between the two companies' ROE in FY15 is very small and Company A's ROE remains similar to Company B's ROE mainly due to Company A increasing its financial leverage.
- 20 What does the P/E ratio measure?
- A The "multiple" that the stock market places on a company's EPS.
 - B The relationship between dividends and market prices.
 - C The earnings for one common share of stock.
- 21 A creditor *most likely* would consider a decrease in which of the following ratios to be positive news?
- A Interest coverage (times interest earned).
 - B Debt-to-total assets.
 - C Return on assets.
- 22 When developing forecasts, analysts should *most likely*:
- A develop possibilities relying exclusively on the results of financial analysis.
 - B use the results of financial analysis, analysis of other information, and judgment.
 - C aim to develop extremely precise forecasts using the results of financial analysis.

SOLUTIONS

- 1 C is correct. Cross-sectional analysis involves the comparison of companies with each other for the same time period. Technical analysis uses price and volume data as the basis for investment decisions. Time-series or trend analysis is the comparison of financial data across different time periods.
- 2 C is correct. Solvency ratios are used to evaluate the ability of a company to meet its long-term obligations. An analyst is more likely to use activity ratios to evaluate how efficiently a company uses its assets. An analyst is more likely to use liquidity ratios to evaluate the ability of a company to meet its short-term obligations.
- 3 A is correct. The current ratio is a liquidity ratio. It compares the net amount of current assets expected to be converted into cash within the year with liabilities falling due in the same period. A current ratio of 1.0 would indicate that the company would have just enough current assets to pay current liabilities.
- 4 C is correct. The fixed charge coverage ratio is a coverage ratio that relates known fixed charges or obligations to a measure of operating profit or cash flow generated by the company. Coverage ratios, a category of solvency ratios, measure the ability of a company to cover its payments related to debt and leases.
- 5 C is correct. The analyst is *unlikely* to reach the conclusion given in Statement C because days of sales outstanding increased from 23 days in FY1 to 25 days in FY2 to 28 days in FY3, indicating that the time required to collect receivables has increased over the period. This is a negative factor for Spherion's liquidity. By contrast, days of inventory on hand dropped over the period FY1 to FY3, a positive for liquidity. The company's increase in days payable, from 35 days to 40 days, shortened its cash conversion cycle, thus also contributing to improved liquidity.
- 6 A is correct. The company is becoming increasingly less solvent, as evidenced by its debt-to-equity ratio increasing from 0.35 to 0.50 from FY3 to FY5. The amount of a company's debt and equity do not provide direct information about the company's liquidity position.

Debt to equity:

FY5: $2,000/4,000 = 0.5000$

FY4: $1,900/4,500 = 0.4222$

FY3: $1,750/5,000 = 0.3500$
- 7 C is correct. The decline in the company's equity indicates that the company may be incurring losses, paying dividends greater than income, or repurchasing shares. Recall that Beginning equity + New shares issuance – Shares repurchased + Comprehensive income – Dividends = Ending equity. The book value of a company's equity is not affected by changes in the market value of its common stock. An increased amount of lending does not necessarily indicate that lenders view a company as increasingly creditworthy. Creditworthiness is not evaluated based on how much a company has increased its debt but rather on its willingness and ability to pay its obligations. (Its financial strength is indicated by its solvency, liquidity, profitability, efficiency, and other aspects of credit analysis.)
- 8 C is correct. The company's problems with its inventory management system causing duplicate orders would likely result in a higher amount of inventory and would, therefore, result in a decrease in inventory turnover. A more efficient inventory management system and a write off of inventory at the beginning of

the period would both likely decrease the average inventory for the period (the denominator of the inventory turnover ratio), thus increasing the ratio rather than decreasing it.

- 9 B is correct. A write off of receivables would decrease the average amount of accounts receivable (the denominator of the receivables turnover ratio), thus increasing this ratio. Customers with weaker credit are more likely to make payments more slowly or to pose collection difficulties, which would likely increase the average amount of accounts receivable and thus decrease receivables turnover. Longer payment terms would likely increase the average amount of accounts receivable and thus decrease receivables turnover.
- 10 A is correct. The average accounts receivable balances (actual and desired) must be calculated to determine the desired change. The average accounts receivable balance can be calculated as an average day's credit sales times the DSO. For the most recent fiscal year, the average accounts receivable balance is \$15.62 million [$= (\$300,000,000/365) \times 19$]. The desired average accounts receivable balance for the next fiscal year is \$16.03 million ($= (\$390,000,000/365) \times 15$). This is an increase of \$0.41 million ($= 16.03 \text{ million} - 15.62 \text{ million}$). An alternative approach is to calculate the turnover and divide sales by turnover to determine the average accounts receivable balance. Turnover equals 365 divided by DSO. Turnover is 19.21 ($= 365/19$) for the most recent fiscal year and is targeted to be 24.33 ($= 365/15$) for the next fiscal year. The average accounts receivable balances are \$15.62 million ($= \$300,000,000/19.21$), and \$16.03 million ($= \$390,000,000/24.33$). The change is an increase in receivables of \$0.41 million
- 11 A is correct. Company A's current ratio of 4.0 ($= \$40,000/\$10,000$) indicates it is more liquid than Company B, whose current ratio is only 1.2 ($= \$60,000/\$50,000$). Company B is more solvent, as indicated by its lower debt-to-equity ratio of 30 percent ($= \$150,000/\$500,000$) compared with Company A's debt-to-equity ratio of 200 percent ($= \$60,000/\$30,000$).
- 12 C is correct. The company's efficiency deteriorated, as indicated by the decline in its total asset turnover ratio from 1.11 $\{= 4,390/[(4,384 + 3,500)/2]\}$ for FY10 to 0.87 $\{= 11,366/[(12,250 + 13,799)/2]\}$ for FY14. The decline in the total asset turnover ratio resulted from an increase in average total assets from GBP3,942 [$= (4,384 + 3,500)/2$] for FY10 to GBP13,024.5 for FY14, an increase of 230 percent, compared with an increase in revenue from GBP4,390 in FY10 to GBP11,366 in FY14, an increase of only 159 percent. The current ratio is not an indicator of efficiency.
- 13 B is correct. Comparing FY14 with FY10, the company's solvency deteriorated, as indicated by a decrease in interest coverage from 10.6 ($= 844/80$) in FY10 to 8.4 ($= 1,579/188$) in FY14. The debt-to-asset ratio increased from 0.14 ($= 602/4,384$) in FY10 to 0.27 ($= 3,707/13,799$) in FY14. This is also indicative of deteriorating solvency. In isolation, the amount of profits does not provide enough information to assess solvency.
- 14 C is correct. Comparing FY14 with FY10, the company's liquidity improved, as indicated by an increase in its current ratio from 0.71 [$= (316 + 558)/1,223$] in FY10 to 0.75 [$= (682 + 1,634)/3,108$] in FY14. Note, however, comparing only current investments with the level of current liabilities shows a decline in liquidity from 0.26 ($= 316/1,223$) in FY10 to 0.22 ($= 682/3,108$) in FY14. Debt-to-assets ratio and interest coverage are measures of solvency not liquidity.

- 15** B is correct. Comparing FY14 with FY10, the company's profitability deteriorated, as indicated by a decrease in its net profit margin from 11.0 percent (= 484/4,390) to 5.7 percent (= 645/11,366). Debt-to-assets ratio is a measure of solvency not an indicator of profitability. Growth in shareholders' equity, in isolation, does not provide enough information to assess profitability.
- 16** C is correct. Assuming no changes in other variables, an increase in average assets (an increase in the denominator) would decrease ROA. A decrease in either the effective tax rate or interest expense, assuming no changes in other variables, would increase ROA.
- 17** C is correct. The company's net profit margin has decreased and its financial leverage has increased. $ROA = \text{Net profit margin} \times \text{Total asset turnover}$. ROA decreased over the period despite the increase in total asset turnover; therefore, the net profit margin must have decreased.
 $\text{ROE} = \text{Return on assets} \times \text{Financial leverage}$. ROE increased over the period despite the drop in ROA; therefore, financial leverage must have increased.
- 18** C is correct. The increase in the average tax rate in FY12, as indicated by the decrease in the value of the tax burden (the tax burden equals one minus the average tax rate), offset the improvement in efficiency indicated by higher asset turnover leaving ROE unchanged. The EBIT margin, measuring profitability, was unchanged in FY12 and no information is given on liquidity.
- 19** C is correct. The difference between the two companies' ROE in 2010 is very small and is mainly the result of Company A's increase in its financial leverage, indicated by the increase in its Assets/Equity ratio from 2 to 4. The impact of efficiency on ROE is identical for the two companies, as indicated by both companies' asset turnover ratios of 1.5. Furthermore, if Company A had purchased newer equipment to replace older, depreciated equipment, then the company's asset turnover ratio (computed as sales/assets) would have declined, assuming constant sales. Company A has experienced a significant decline in its operating margin, from 10 percent to 7 percent which, all else equal, would not suggest that it is selling more products with higher profit margins.
- 20** A is correct. The P/E ratio measures the "multiple" that the stock market places on a company's EPS.
- 21** B is correct. In general, a creditor would consider a decrease in debt to total assets as positive news. A higher level of debt in a company's capital structure increases the risk of default and will, in general, result in higher borrowing costs for the company to compensate lenders for assuming greater credit risk. A decrease in either interest coverage or return on assets is likely to be considered negative news.
- 22** B is correct. The results of an analyst's financial analysis are integral to the process of developing forecasts, along with the analysis of other information and judgment of the analysts. Forecasts are not limited to a single point estimate but should involve a range of possibilities.

PRACTICE PROBLEMS

- 1 Inventory cost is *least likely* to include:
 - A production-related storage costs.
 - B costs incurred as a result of normal waste of materials.
 - C transportation costs of shipping inventory to customers.
- 2 Mustard Seed PLC adheres to IFRS. It recently purchased inventory for €100 million and spent €5 million for storage prior to selling the goods. The amount it charged to inventory expense (€ millions) was *closest* to:
 - A €95.
 - B €100.
 - C €105.
- 3 Carrying inventory at a value above its historical cost would *most likely* be permitted if:
 - A the inventory was held by a producer of agricultural products.
 - B financial statements were prepared using US GAAP.
 - C the change resulted from a reversal of a previous write-down.
- 4 Eric's Used Book Store prepares its financial statements in accordance with IFRS. Inventory was purchased for £1 million and later marked down to £550,000. One of the books, however, was later discovered to be a rare collectible item, and the inventory is now worth an estimated £3 million. The inventory is *most likely* reported on the balance sheet at:
 - A £550,000.
 - B £1,000,000.
 - C £3,000,000.
- 5 Fernando's Pasta purchased inventory and later wrote it down. The current net realisable value is higher than the value when written down. Fernando's inventory balance will *most likely* be:
 - A higher if it complies with IFRS.
 - B higher if it complies with US GAAP.
 - C the same under US GAAP and IFRS.

For questions 6–17, assume the companies use a periodic inventory system.

- 6 Cinnamon Corp. started business in 2007 and uses the weighted average cost method. During 2007, it purchased 45,000 units of inventory at €10 each and sold 40,000 units for €20 each. In 2008, it purchased another 50,000 units at €11 each and sold 45,000 units for €22 each. Its 2008 cost of sales (€ thousands) was *closest* to:
 - A €490.
 - B €491.

C €495.

- 7 Zimt AG started business in 2007 and uses the FIFO method. During 2007, it purchased 45,000 units of inventory at €10 each and sold 40,000 units for €20 each. In 2008, it purchased another 50,000 units at €11 each and sold 45,000 units for €22 each. Its 2008 ending inventory balance (€ thousands) was *closest* to:
- A €105.
B €109.
C €110.
- 8 Zimt AG uses the FIFO method, and Nutmeg Inc. uses the LIFO method. Compared to the cost of replacing the inventory, during periods of rising prices, the cost of sales reported by:
- A Zimt is too low.
B Nutmeg is too low.
C Nutmeg is too high.
- 9 Zimt AG uses the FIFO method, and Nutmeg Inc. uses the LIFO method. Compared to the cost of replacing the inventory, during periods of rising prices the ending inventory balance reported by:
- A Zimt is too high.
B Nutmeg is too low.
C Nutmeg is too high.
- 10 Like many technology companies, TechnoTools operates in an environment of declining prices. Its reported profits will tend to be *highest* if it accounts for inventory using the:
- A FIFO method.
B LIFO method.
C weighted average cost method.
- 11 Compared to using the weighted average cost method to account for inventory, during a period in which prices are generally rising, the current ratio of a company using the FIFO method would *most likely* be:
- A lower.
B higher.
C dependent upon the interaction with accounts payable.
- 12 Zimt AG wrote down the value of its inventory in 2007 and reversed the write-down in 2008. Compared to the ratios that would have been calculated if the write-down had never occurred, Zimt's reported 2007:
- A current ratio was too high.
B gross margin was too high.
C inventory turnover was too high.
- 13 Zimt AG wrote down the value of its inventory in 2007 and reversed the write-down in 2008. Compared to the results the company would have reported if the write-down had never occurred, Zimt's reported 2008:
- A profit was overstated.
B cash flow from operations was overstated.
C year-end inventory balance was overstated.
- 14 Compared to a company that uses the FIFO method, during periods of rising prices a company that uses the LIFO method will *most likely* appear more:

- A liquid.
 - B efficient.
 - C profitable.
- 15 Nutmeg, Inc. uses the LIFO method to account for inventory. During years in which inventory unit costs are generally rising and in which the company purchases more inventory than it sells to customers, its reported gross profit margin will *most likely* be:
- A lower than it would be if the company used the FIFO method.
 - B higher than it would be if the company used the FIFO method.
 - C about the same as it would be if the company used the FIFO method.
- 16 Compared to using the FIFO method to account for inventory, during periods of rising prices, a company using the LIFO method is *most likely* to report higher:
- A net income.
 - B cost of sales.
 - C income taxes.
- 17 Carey Company adheres to US GAAP, whereas Jonathan Company adheres to IFRS. It is *least likely* that:
- A Carey has reversed an inventory write-down.
 - B Jonathan has reversed an inventory write-down.
 - C Jonathan and Carey both use the FIFO inventory accounting method.
-

The following information relates to Questions 18–25

Hans Annan, CFA, a food and beverage analyst, is reviewing Century Chocolate's inventory policies as part of his evaluation of the company. Century Chocolate, based in Switzerland, manufactures chocolate products and purchases and resells other confectionery products to complement its chocolate line. Annan visited Century Chocolate's manufacturing facility last year. He learned that cacao beans, imported from Brazil, represent the most significant raw material and that the work-in-progress inventory consists primarily of three items: roasted cacao beans, a thick paste produced from the beans (called chocolate liquor), and a sweetened mixture that needs to be "conched" to produce chocolate. On the tour, Annan learned that the conching process ranges from a few hours for lower-quality products to six days for the highest-quality chocolates. While there, Annan saw the facility's climate-controlled area where manufactured finished products (cocoa and chocolate) and purchased finished goods are stored prior to shipment to customers. After touring the facility, Annan had a discussion with Century Chocolate's CFO regarding the types of costs that were included in each inventory category.

Annan has asked his assistant, Joanna Kern, to gather some preliminary information regarding Century Chocolate's financial statements and inventories. He also asked Kern to calculate the inventory turnover ratios for Century Chocolate and another chocolate manufacturer for the most recent five years. Annan does not know Century Chocolate's most direct competitor, so he asks Kern to do some research and select the most appropriate company for the ratio comparison.

Kern reports back that Century Chocolate prepares its financial statements in accordance with IFRS. She tells Annan that the policy footnote states that raw materials and purchased finished goods are valued at purchase cost whereas work in progress and manufactured finished goods are valued at production cost. Raw material inventories and purchased finished goods are accounted for using the FIFO (first-in, first-out) method, and the weighted average cost method is used for other inventories. An allowance is established when the net realisable value of any inventory item is lower than the value calculated above.

Kern provides Annan with the selected financial statements and inventory data for Century Chocolate shown in Exhibits 1 through 5. The ratio exhibit Kern prepared compares Century Chocolate's inventory turnover ratios to those of Gordon's Goodies, a US-based company. Annan returns the exhibit and tells Kern to select a different competitor that reports using IFRS rather than US GAAP. During this initial review, Annan asks Kern why she has not indicated whether Century Chocolate uses a perpetual or a periodic inventory system. Kern replies that she learned that Century Chocolate uses a perpetual system but did not include this information in her report because inventory values would be the same under either a perpetual or periodic inventory system. Annan tells Kern she is wrong and directs her to research the matter.

While Kern is revising her analysis, Annan reviews the most recent month's Cocoa Market Review from the International Cocoa Organization. He is drawn to the statement that "the ICCO daily price, averaging prices in both futures markets, reached a 29-year high in US\$ terms and a 23-year high in SDRs terms (the SDR unit comprises a basket of major currencies used in international trade: US\$, euro, pound sterling and yen)." Annan makes a note that he will need to factor the potential continuation of this trend into his analysis.

Exhibit 1 Century Chocolate Income Statements (CHF Millions)

For Years Ended 31 December	2009	2008
Sales	95,290	93,248
Cost of sales	-41,043	-39,047
Marketing, administration, and other expenses	-35,318	-42,481
Profit before taxes	18,929	11,720
Taxes	-3,283	-2,962
Profit for the period	15,646	8,758

Exhibit 2 Century Chocolate Balance Sheets (CHF Millions)

31 December	2009	2008
Cash, cash equivalents, and short-term investments	6,190	8,252
Trade receivables and related accounts, net	11,654	12,910
Inventories, net	8,100	7,039
Other current assets	2,709	2,812
Total current assets	28,653	31,013
Property, plant, and equipment, net	18,291	19,130
Other non-current assets	45,144	49,875
Total assets	92,088	100,018

Exhibit 2 (Continued)

31 December	2009	2008
Trade and other payables	10,931	12,299
Other current liabilities	17,873	25,265
Total current liabilities	28,804	37,564
Non-current liabilities	15,672	14,963
Total liabilities	44,476	52,527
Equity		
Share capital	332	341
Retained earnings and other reserves	47,280	47,150
Total equity	47,612	47,491
Total liabilities and shareholders' equity	92,088	100,018

**Exhibit 3 Century Chocolate Supplementary Footnote Disclosures:
Inventories (CHF Millions)**

31 December	2009	2008
Raw Materials	2,154	1,585
Work in Progress	1,061	1,027
Finished Goods	5,116	4,665
Total inventories before allowance	8,331	7,277
Allowance for write-downs to net realisable value	-231	-238
Total inventories net of allowance	8,100	7,039

Exhibit 4 Century Chocolate Inventory Record for Purchased Lemon Drops

Date		Cartons	Per Unit Amount (CHF)
	Beginning inventory	100	22
4 Feb 09	Purchase	40	25
3 Apr 09	Sale	50	32
23 Jul 09	Purchase	70	30
16 Aug 09	Sale	100	32
9 Sep 09	Sale	35	32
15 Nov 09	Purchase	100	28

Exhibit 5 Century Chocolate Net Realisable Value Information for Black Licorice Jelly Beans

	2009	2008
FIFO cost of inventory at 31 December (CHF)	314,890	374,870
Ending inventory at 31 December (Kilograms)	77,750	92,560
Cost per unit (CHF)	4.05	4.05
Net Realisable Value (CHF per Kilograms)	4.20	3.95

- 18** The costs *least likely* to be included by the CFO as inventory are:
- A** storage costs for the chocolate liquor.
 - B** excise taxes paid to the government of Brazil for the cacao beans.
 - C** storage costs for chocolate and purchased finished goods awaiting shipment to customers.
- 19** What is the *most likely* justification for Century Chocolate's choice of inventory valuation method for its purchased finished goods?
- A** It is the preferred method under IFRS.
 - B** It allocates the same per unit cost to both cost of sales and inventory.
 - C** Ending inventory reflects the cost of goods purchased most recently.
- 20** In Kern's comparative ratio analysis, the 2009 inventory turnover ratio for Century Chocolate is *closest* to:
- A** 5.07.
 - B** 5.42.
 - C** 5.55.
- 21** The *most accurate* statement regarding Annan's reasoning for requiring Kern to select a competitor that reports under IFRS for comparative purposes is that under US GAAP:
- A** fair values are used to value inventory.
 - B** the LIFO method is permitted to value inventory.
 - C** the specific identification method is permitted to value inventory.
- 22** Annan's statement regarding the perpetual and periodic inventory systems is most significant when which of the following costing systems is used?
- A** LIFO.
 - B** FIFO.
 - C** Specific identification.
- 23** Using the inventory record for purchased lemon drops shown in Exhibit 4, the cost of sales for 2009 will be *closest* to:
- A** CHF 3,550.
 - B** CHF 4,550.
 - C** CHF 4,850.
- 24** Ignoring any tax effect, the 2009 net realisable value reassessment for the black licorice jelly beans will *most likely* result in:
- A** an increase in gross profit of CHF 7,775.
 - B** an increase in gross profit of CHF 11,670.

- C no impact on cost of sales because under IFRS, write-downs cannot be reversed.
- 25** If the trend noted in the ICCO report continues and Century Chocolate plans to maintain constant or increasing inventory quantities, the *most likely* impact on Century Chocolate's financial statements related to its raw materials inventory will be:
- A a cost of sales that more closely reflects current replacement values.
 - B a higher allocation of the total cost of goods available for sale to cost of sales.
 - C a higher allocation of the total cost of goods available for sale to ending inventory.
-

The following information relates to Questions 26–31

John Martinson, CFA, is an equity analyst with a large pension fund. His supervisor, Linda Packard, asks him to write a report on Karp Inc. Karp prepares its financial statements in accordance with US GAAP. Packard is particularly interested in the effects of the company's use of the LIFO method to account for its inventory. For this purpose, Martinson collects the financial data presented in Exhibits 1 and 2.

Exhibit 1 Balance Sheet Information (US\$ Millions)

As of 31 December	2009	2008
Cash and cash equivalents	172	157
Accounts receivable	626	458
Inventories	620	539
Other current assets	125	65
Total current assets	1,543	1,219
Property and equipment, net	3,035	2,972
Total assets	4,578	4,191
Total current liabilities	1,495	1,395
Long-term debt	644	604
Total liabilities	2,139	1,999
Common stock and paid in capital	1,652	1,652
Retained earnings	787	540
Total shareholders' equity	2,439	2,192
Total liabilities and shareholders' equity	4,578	4,191

Exhibit 2 Income Statement Information (US\$ Millions)

For the Year Ended 31 December	2009	2008
Sales	4,346	4,161
Cost of goods sold	2,211	2,147
Depreciation and amortisation expense	139	119
Selling, general, and administrative expense	1,656	1,637
Interest expense	31	18
Income tax expense	62	48
Net income	247	192

Martinson finds the following information in the notes to the financial statements:

- The LIFO reserves as of 31 December 2009 and 2008 are \$155 million and \$117 million respectively, and
 - The effective income tax rate applicable to Karp for 2009 and earlier periods is 20 percent.
- 26 If Karp had used FIFO instead of LIFO, the amount of inventory reported as of 31 December 2009 would have been *closest* to:
- \$465 million.
 - \$658 million.
 - \$775 million.
- 27 If Karp had used FIFO instead of LIFO, the amount of cost of goods sold reported by Karp for the year ended 31 December 2009 would have been *closest* to:
- \$2,056 million.
 - \$2,173 million.
 - \$2,249 million.
- 28 If Karp had used FIFO instead of LIFO, its reported net income for the year ended 31 December 2009 would have been higher by an amount *closest* to:
- \$30 million.
 - \$38 million.
 - \$155 million.
- 29 If Karp had used FIFO instead of LIFO, Karp's retained earnings as of 31 December 2009 would have been higher by an amount *closest* to:
- \$117 million.
 - \$124 million.
 - \$155 million.
- 30 If Karp had used FIFO instead of LIFO, which of the following ratios computed as of 31 December 2009 would *most likely* have been lower?
- Cash ratio.
 - Current ratio.
 - Gross profit margin.
- 31 If Karp had used FIFO instead of LIFO, its debt to equity ratio computed as of 31 December 2009 would have:

- A increased.
 B decreased.
 C remained unchanged.
-

The following information relates to Questions 32–37

Robert Groff, an equity analyst, is preparing a report on Crux Corp. As part of his report, Groff makes a comparative financial analysis between Crux and its two main competitors, Rolby Corp. and Mikko Inc. Crux and Mikko report under US GAAP and Rolby reports under IFRS.

Groff gathers information on Crux, Rolby, and Mikko. The relevant financial information he compiles is in Exhibit 1. Some information on the industry is in Exhibit 2.

Exhibit 1 Selected Financial Information (US\$ Millions)

	Crux	Rolby	Mikko
Inventory valuation method	LIFO	FIFO	LIFO
<u>From the Balance Sheets</u>			
As of 31 December 2009			
Inventory, gross	480	620	510
Valuation allowance	20	25	14
Inventory, net	460	595	496
Total debt	1,122	850	732
Total shareholders' equity	2,543	2,403	2,091
As of 31 December 2008			
Inventory, gross	465	602	401
Valuation allowance	23	15	12
Inventory, net	442	587	389
<u>From the Income Statements</u>			
Year Ended 31 December 2009			
Revenues	4,609	5,442	3,503
Cost of goods sold ^a	3,120	3,782	2,550
Net income	229	327	205
^a Charges included in cost of goods sold for inventory write-downs*	13	15	15

* This does not match the change in the inventory valuation allowance because the valuation allowance is reduced to reflect the valuation allowance attached to items sold and increased for additional necessary write-downs.

LIFO Reserve

As of 31 December 2009	55	0	77
As of 31 December 2008	72	0	50

(continued)

As of 31 December 2007	96	0	43
Tax Rate			
Effective tax rate	30%	30%	30%

Exhibit 2 Industry Information

	2009	2008	2007
Raw materials price index	112	105	100
Finished goods price index	114	106	100

To compare the financial performance of the three companies, Groff decides to convert LIFO figures into FIFO figures, and adjust figures to assume no valuation allowance is recognized by any company.

After reading Groff's draft report, his supervisor, Rachel Borghi, asks him the following questions:

- Question 1 Which company's gross profit margin would best reflect current costs of the industry?
- Question 2 Would Rolby's valuation method show a higher gross profit margin than Crux's under an inflationary, a deflationary, or a stable price scenario?
- Question 3 Which group of ratios usually appears more favorable with an inventory write-down?
- 32 Crux's inventory turnover ratio computed as of 31 December 2009, after the adjustments suggested by Groff, is *closest* to:
- A 5.67.
 - B 5.83.
 - C 6.13.
- 33 Rolby's net profit margin for the year ended 31 December 2009, after the adjustments suggested by Groff, is *closest* to:
- A 6.01%.
 - B 6.20%.
 - C 6.28%.
- 34 Compared with its unadjusted debt-to-equity ratio, Mikko's debt-to-equity ratio as of 31 December 2009, after the adjustments suggested by Groff, is:
- A lower.
 - B higher.
 - C the same.
- 35 The *best* answer to Borghi's Question 1 is:
- A Crux's.
 - B Rolby's.
 - C Mikko's.
- 36 The *best* answer to Borghi's Question 2 is:

- A Stable.
 B Inflationary.
 C Deflationary.
- 37 The *best* answer to Borghi's Question 3 is:
- A Activity ratios.
 B Solvency ratios.
 C Profitability ratios.
-

The following information relates to Questions 38–45

ZP Corporation is a (hypothetical) multinational corporation headquartered in Japan that trades on numerous stock exchanges. ZP prepares its consolidated financial statements in accordance with US GAAP. Excerpts from ZP's 2009 annual report are shown in Exhibits 1–3.

Exhibit 1 Consolidated Balance Sheets (¥ Millions)

31 December	2008	2009
Current Assets		
Cash and cash equivalents	¥542,849	¥814,760
⋮	⋮	⋮
Inventories	608,572	486,465
⋮	⋮	⋮
Total current assets	4,028,742	3,766,309
⋮	⋮	⋮
Total assets	¥10,819,440	¥9,687,346
⋮	⋮	⋮
Total current liabilities	¥3,980,247	¥3,529,765
⋮	⋮	⋮
Total long-term liabilities	2,663,795	2,624,002
Minority interest in consolidated subsidiaries	218,889	179,843
Total shareholders' equity	3,956,509	3,353,736
Total liabilities and shareholders' equity	¥10,819,440	¥9,687,346

Exhibit 2 Consolidated Statements of Income (¥ Millions)

For the years ended 31 December	2007	2008	2009
Net revenues			
Sales of products	¥7,556,699	¥8,273,503	¥6,391,240
Financing operations	425,998	489,577	451,950
	<hr/> 7,982,697	<hr/> 8,763,080	<hr/> 6,843,190
Cost and expenses			
Cost of products sold	6,118,742	6,817,446	5,822,805
Cost of financing operations	290,713	356,005	329,128
Selling, general and administrative	827,005	832,837	844,927
	<hr/>	<hr/>	<hr/>
Operating income (loss)	746,237	756,792	-153,670
	<hr/>	<hr/>	<hr/>
Net income	¥548,011	¥572,626	-¥145,646

Exhibit 3 Selected Disclosures in the 2009 Annual Report**Management's Discussion and Analysis of Financial Condition and Results of Operations**

Cost reduction efforts were offset by increased prices of raw materials, other production materials and parts ... Inventories decreased during fiscal 2009 by ¥122.1 billion, or 20.1%, to ¥486.5 billion. This reflects the impacts of decreased sales volumes and fluctuations in foreign currency translation rates.

Management & Corporate Information**Risk Factors****Industry and Business Risks**

The worldwide market for our products is highly competitive. ZP faces intense competition from other manufacturers in the respective markets in which it operates. Competition has intensified due to the worldwide deterioration in economic conditions. In addition, competition is likely to further intensify because of continuing globalization, possibly resulting in industry reorganization. Factors affecting competition include product quality and features, the amount of time required for innovation and development, pricing, reliability, safety, economy in use, customer service and financing terms. Increased competition may lead to lower unit sales and excess production capacity and excess inventory. This may result in a further downward price pressure.

ZP's ability to adequately respond to the recent rapid changes in the industry and to maintain its competitiveness will be fundamental to its future success in maintaining and expanding its market share in existing and new markets.

Exhibit 3 (Continued)**Notes to Consolidated Financial Statements****2. Summary of significant accounting policies:**

Inventories. Inventories are valued at cost, not in excess of market. Cost is determined on the “average-cost” basis, except for the cost of finished products carried by certain subsidiary companies which is determined “last-in, first-out” (“LIFO”) basis. Inventories valued on the LIFO basis totaled ¥94,578 million and ¥50,037 million at December 31, 2008 and 2009, respectively. Had the “first-in, first-out” basis been used for those companies using the LIFO basis, inventories would have been ¥10,120 million and ¥19,660 million higher than reported at December 31, 2008 and 2009, respectively.

9. Inventories:

Inventories consist of the following:

31 December (¥ Millions)	2008	2009
Finished goods	¥ 403,856	¥ 291,977
Raw materials	99,869	85,966
Work in process	79,979	83,890
Supplies and other	24,868	24,632
	¥ 608,572	¥ 486,465

- 38 The MD&A indicated that the prices of raw material, other production materials, and parts increased. Based on the inventory valuation methods described in Note 2, which inventory classification would *least accurately* reflect current prices?
- A Raw materials.
 - B Finished goods.
 - C Work in process.
- 39 The 2008 inventory value as reported on the 2009 Annual Report if the company had used the FIFO inventory valuation method instead of the LIFO inventory valuation method for a portion of its inventory would be *closest* to:
- A ¥104,698 million.
 - B ¥506,125 million.
 - C ¥618,692 million.
- 40 What is the *least likely* reason why ZP may need to change its accounting policies regarding inventory at some point after 2009?
- A The US SEC is likely to require companies to use the same inventory valuation method for all inventories.
 - B The US SEC is likely to prohibit the use of one of the methods ZP currently uses for inventory valuation.
 - C One of the inventory valuation methods used for US tax purposes may be repealed as an acceptable method.

- 41 If ZP had prepared its financial statement in accordance with IFRS, the inventory turnover ratio (using average inventory) for 2009 would be:
- A lower.
 - B higher.
 - C the same.
- 42 Inventory levels decreased from 2008 to 2009 for all of the following reasons *except*:
- A LIFO liquidation.
 - B decreased sales volume.
 - C fluctuations in foreign currency translation rates.
- 43 Which observation is *most likely* a result of looking only at the information reported in Note 9?
- A Increased competition has led to lower unit sales.
 - B There have been significant price increases in supplies.
 - C Management expects a further downturn in sales during 2010.
- 44 Note 2 indicates that, "Inventories valued on the LIFO basis totaled ¥94,578 million and ¥50,037 million at December 31, 2008 and 2009, respectively." Based on this, the LIFO reserve should *most likely*:
- A increase.
 - B decrease.
 - C remain the same.
- 45 The Industry and Business Risk excerpt states that, "Increased competition may lead to lower unit sales and excess production capacity and excess inventory. This may result in a further downward price pressure." The downward price pressure could lead to inventory that is valued above current market prices or net realisable value. Any write-downs of inventory are *least likely* to have a significant effect on the inventory valued using:
- A weighted average cost.
 - B first-in, first-out (FIFO).
 - C last-in, first-out (LIFO).
-

SOLUTIONS

- 1 C is correct. Transportation costs incurred to ship inventory to customers are an expense and may not be capitalized in inventory. (Transportation costs incurred to bring inventory to the business location can be capitalized in inventory.) Storage costs required as part of production, as well as costs incurred as a result of normal waste of materials, can be capitalized in inventory. (Costs incurred as a result of abnormal waste must be expensed.)
- 2 B is correct. Inventory expense includes costs of purchase, costs of conversion, and other costs incurred in bringing the inventories to their present location and condition. It does not include storage costs not required as part of production.
- 3 A is correct. IFRS allow the inventories of producers and dealers of agricultural and forest products, agricultural produce after harvest, and minerals and mineral products to be carried at net realisable value even if above historical cost. (US GAAP treatment is similar.)
- 4 B is correct. Under IFRS, the reversal of write-downs is required if net realisable value increases. The inventory will be reported on the balance sheet at £1,000,000. The inventory is reported at the lower of cost or net realisable value. Under US GAAP, inventory is carried at the lower of cost or market value. After a write-down, a new cost basis is determined and additional revisions may only reduce the value further. The reversal of write-downs is not permitted.
- 5 A is correct. IFRS require the reversal of inventory write-downs if net realisable values increase; US GAAP do not permit the reversal of write-downs.
- 6 B is correct. Cinnamon uses the weighted average cost method, so in 2008, 5,000 units of inventory were 2007 units at €10 each and 50,000 were 2008 purchases at €11. The weighted average cost of inventory during 2008 was thus $(5,000 \times 10) + (50,000 \times 11) = 50,000 + 550,000 = €600,000$, and the weighted average cost was approximately $€10.91 = €600,000 / 55,000$. Cost of sales was $€10.91 \times 45,000$, which is approximately €490,950.
- 7 C is correct. Zimt uses the FIFO method, and thus the first 5,000 units sold in 2008 depleted the 2007 inventory. Of the inventory purchased in 2008, 40,000 units were sold and 10,000 remain, valued at €11 each, for a total of €110,000.
- 8 A is correct. Zimt uses the FIFO method, so its cost of sales represents units purchased at a (no longer available) lower price. Nutmeg uses the LIFO method, so its cost of sales is approximately equal to the current replacement cost of inventory.
- 9 B is correct. Nutmeg uses the LIFO method, and thus some of the inventory on the balance sheet was purchased at a (no longer available) lower price. Zimt uses the FIFO method, so the carrying value on the balance sheet represents the most recently purchased units and thus approximates the current replacement cost.
- 10 B is correct. In a declining price environment, the newest inventory is the lowest-cost inventory. In such circumstances, using the LIFO method (selling the newer, cheaper inventory first) will result in lower cost of sales and higher profit.
- 11 B is correct. In a rising price environment, inventory balances will be higher for the company using the FIFO method. Accounts payable are based on amounts due to suppliers, not the amounts accrued based on inventory accounting.

- 12 C is correct. The write-down reduced the value of inventory and increased cost of sales in 2007. The higher numerator and lower denominator mean that the inventory turnover ratio as reported was too high. Gross margin and the current ratio were both too low.
- 13 A is correct. The reversal of the write-down shifted cost of sales from 2008 to 2007. The 2007 cost of sales was higher because of the write-down, and the 2008 cost of sales was lower because of the reversal of the write-down. As a result, the reported 2008 profits were overstated. Inventory balance in 2008 is the same because the write-down and reversal cancel each other out. Cash flow from operations is not affected by the non-cash write-down, but the higher profits in 2008 likely resulted in higher taxes and thus lower cash flow from operations.
- 14 B is correct. LIFO will result in lower inventory and higher cost of sales. Gross margin (a profitability ratio) will be lower, the current ratio (a liquidity ratio) will be lower, and inventory turnover (an efficiency ratio) will be higher.
- 15 A is correct. LIFO will result in lower inventory and higher cost of sales in periods of rising costs compared to FIFO. Consequently, LIFO results in a lower gross profit margin than FIFO.
- 16 B is correct. The LIFO method increases cost of sales, thus reducing profits and the taxes thereon.
- 17 A is correct. US GAAP do not permit inventory write-downs to be reversed.
- 18 C is correct. The storage costs for inventory awaiting shipment to customers are not costs of purchase, costs of conversion, or other costs incurred in bringing the inventories to their present location and condition and are not included in inventory. The storage costs for the chocolate liquor occur during the production process and are thus part of the conversion costs. Excise taxes are part of the purchase cost.
- 19 C is correct. The carrying amount of inventories under FIFO will more closely reflect current replacement values because inventories are assumed to consist of the most recently purchased items. FIFO is an acceptable, but not preferred, method under IFRS. Weighted average cost, not FIFO, is the cost formula that allocates the same per unit cost to both cost of sales and inventory.
- 20 B is correct. Inventory turnover = Cost of sales/Average inventory = $41,043/7,569.5 = 5.42$. Average inventory is $(8,100 + 7,039)/2 = 7,569.5$.
- 21 B is correct. For comparative purposes, the choice of a competitor that reports under IFRS is requested because LIFO is permitted under US GAAP.
- 22 A is correct. The carrying amount of the ending inventory may differ because the perpetual system will apply LIFO continuously throughout the year, liquidating layers as sales are made. Under the periodic system, the sales will start from the last layer in the year. Under FIFO, the sales will occur from the same layers regardless of whether a perpetual or periodic system is used. Specific identification identifies the actual products sold and remaining in inventory, and there will be no difference under a perpetual or periodic system.
- 23 B is correct. The cost of sales is closest to CHF 4,550. Under FIFO, the inventory acquired first is sold first. Using Exhibit 4, a total of 310 cartons were available for sale ($100 + 40 + 70 + 100$) and 185 cartons were sold ($50 + 100 + 35$), leaving 125 in ending inventory. The FIFO cost would be as follows:
- 100 (beginning inventory) $\times 22 = 2,200$
- 40 (4 February 2009) $\times 25 = 1,000$
- 45 (23 July 2009) $\times 30 = 1,350$

$$\text{Cost of sales} = 2,200 + 1,000 + 1,350 = \text{CHF } 4,550$$

- 24** A is correct. Gross profit will most likely increase by CHF 7,775. The net realisable value has increased and now exceeds the cost. The write-down from 2008 can be reversed. The write-down in 2008 was 9,256 [92,560 × (4.05 – 3.95)]. IFRS require the reversal of any write-downs for a subsequent increase in value of inventory previously written down. The reversal is limited to the lower of the subsequent increase or the original write-down. Only 77,750 kilograms remain in inventory; the reversal is 77,750 × (4.05 – 3.95) = 7,775. The amount of any reversal of a write-down is recognised as a reduction in cost of sales. This reduction results in an increase in gross profit.
- 25** C is correct. Using the FIFO method to value inventories when prices are rising will allocate more of the cost of goods available for sale to ending inventories (the most recent purchases, which are at higher costs, are assumed to remain in inventory) and less to cost of sales (the oldest purchases, which are at lower costs, are assumed to be sold first).
- 26** C is correct. Karp's inventory under FIFO equals Karp's inventory under LIFO plus the LIFO reserve. Therefore, as of 31 December 2009, Karp's inventory under FIFO equals:

$$\begin{aligned}\text{Inventory (FIFO method)} &= \text{Inventory (LIFO method)} + \text{LIFO} \\ &\quad \text{reserve} \\ &= \$620 \text{ million} + 155 \text{ million} \\ &= \$775 \text{ million}\end{aligned}$$

- 27** B is correct. Karp's cost of goods sold (COGS) under FIFO equals Karp's cost of goods sold under LIFO minus the increase in the LIFO reserve. Therefore, for the year ended 31 December 2009, Karp's cost of goods sold under FIFO equals:

$$\begin{aligned}\text{COGS (FIFO method)} &= \text{COGS (LIFO method)} - \text{Increase in LIFO} \\ &\quad \text{reserve} \\ &= \$2,211 \text{ million} - (155 \text{ million} - 117 \text{ million}) \\ &= \$2,173 \text{ million}\end{aligned}$$

- 28** A is correct. Karp's net income (NI) under FIFO equals Karp's net income under LIFO plus the after-tax increase in the LIFO reserve. For the year ended 31 December 2009, Karp's net income under FIFO equals:

$$\begin{aligned}\text{NI (FIFO method)} &= \text{NI (LIFO method)} + \text{Increase in LIFO reserve} \times \\ &\quad (1 - \text{Tax rate}) \\ &= \$247 \text{ million} + 38 \text{ million} \times (1 - 20\%) \\ &= \$277.4 \text{ million}\end{aligned}$$

Therefore, the increase in net income is:

$$\begin{aligned}\text{Increase in NI} &= \text{NI (FIFO method)} - \text{NI (LIFO method)} \\ &= \$277 \text{ million} - 247 \text{ million} \\ &= \$30.4 \text{ million}\end{aligned}$$

- 29** B is correct. Karp's retained earnings (RE) under FIFO equals Karp's retained earnings under LIFO plus the after-tax LIFO reserve. Therefore, for the year ended 31 December 2009, Karp's retained earnings under FIFO equals:

$$\begin{aligned}\text{RE (FIFO method)} &= \text{RE (LIFO method)} + \text{LIFO reserve} \times (1 - \text{Tax} \\ &\quad \text{rate}) \\ &= \$787 \text{ million} + 155 \text{ million} \times (1 - 20\%) \\ &= \$911 \text{ million}\end{aligned}$$

Therefore, the increase in retained earnings is:

$$\begin{aligned}\text{Increase in RE} &= \text{RE (FIFO method)} - \text{RE (LIFO method)} \\ &= \$911 \text{ million} - 787 \text{ million} \\ &= \$124 \text{ million}\end{aligned}$$

- 30** A is correct. The cash ratio (cash and cash equivalents ÷ current liabilities) would be lower because cash would have been less under FIFO. Karp's income before taxes would have been higher under FIFO, and consequently taxes paid by Karp would have also been higher and cash would have been lower. There is no impact on current liabilities. Both Karp's current ratio and gross profit margin would have been higher if FIFO had been used. The current ratio would have been higher because inventory under FIFO increases by a larger amount than the cash decreases for taxes paid. Because the cost of goods sold under FIFO is lower than under LIFO, the gross profit margin would have been higher.
- 31** B is correct. If Karp had used FIFO instead of LIFO, the debt-to-equity ratio would have decreased. No change in debt would have occurred, but shareholders' equity would have increased as a result of higher retained earnings.
- 32** B is correct. Crux's adjusted inventory turnover ratio must be computed using cost of goods sold (COGS) under FIFO and excluding charges for increases in valuation allowances.

$$\begin{aligned}\text{COGS (adjusted)} &= \text{COGS (LIFO method)} - \text{Charges included in} \\ &\quad \text{cost of goods sold for inventory write-downs} - \text{Change} \\ &\quad \text{in LIFO reserve} \\ &= \$3,120 \text{ million} - 13 \text{ million} - (55 \text{ million} - 72 \text{ million}) \\ &= \$3,124 \text{ million}\end{aligned}$$

Note: Minus the change in LIFO reserve is equivalent to plus the decrease in LIFO reserve. The adjusted inventory turnover ratio is computed using average inventory under FIFO.

$$\text{Ending inventory (FIFO)} = \text{Ending inventory (LIFO)} + \text{LIFO reserve}$$

$$\text{Ending inventory 2009 (FIFO)} = \$480 + 55 = \$535$$

$$\text{Ending inventory 2008 (FIFO)} = \$465 + 72 = \$537$$

$$\text{Average inventory} = (\$535 + 537)/2 = \$536$$

Therefore, adjusted inventory turnover ratio equals:

$$\text{Inventory turnover ratio} = \text{COGS}/\text{Average inventory} = \$3,124/\$536 = 5.83$$

- 33** B is correct. Rolby's adjusted net profit margin must be computed using net income (NI) under FIFO and excluding charges for increases in valuation allowances.

$$\begin{aligned}\text{NI (adjusted)} &= \text{NI (FIFO method)} + \text{Charges, included in cost of goods} \\ &\quad \text{sold for inventory write-downs, after tax} \\ &= \$327 \text{ million} + 15 \text{ million} \times (1 - 30\%) \\ &= \$337.5 \text{ million}\end{aligned}$$

Therefore, adjusted net profit margin equals:

$$\text{Net profit margin} = \text{NI}/\text{Revenues} = \$337.5/\$5,442 = 6.20\%$$

- 34** A is correct. Mikko's adjusted debt-to-equity ratio is lower because the debt (numerator) is unchanged and the adjusted shareholders' equity (denominator) is higher. The adjusted shareholders' equity corresponds to shareholders' equity

under FIFO, excluding charges for increases in valuation allowances. Therefore, adjusted shareholders' equity is higher than reported (unadjusted) shareholders' equity.

- 35 C is correct. Mikko's and Crux's gross margin ratios would better reflect the current gross margin of the industry than Rolby because both use LIFO. LIFO recognizes as cost of goods sold the cost of the most recently purchased units, therefore, it better reflects replacement cost. However, Mikko's gross margin ratio best reflects the current gross margin of the industry because Crux's LIFO reserve is decreasing. This could reflect a LIFO liquidation by Crux which would distort gross profit margin.
- 36 B is correct. The FIFO method shows a higher gross profit margin than the LIFO method in an inflationary scenario, because FIFO allocates to cost of goods sold the cost of the oldest units available for sale. In an inflationary environment, these units are the ones with the lowest cost.
- 37 A is correct. An inventory write-down increases cost of sales and reduces profit and reduces the carrying value of inventory and assets. This has a negative effect on profitability and solvency ratios. However, activity ratios appear positively affected by a write-down because the asset base, whether total assets or inventory (denominator), is reduced. The numerator, sales, in total asset turnover is unchanged, and the numerator, cost of sales, in inventory turnover is increased. Thus, turnover ratios are higher and appear more favorable as the result of the write-down.
- 38 B is correct. Finished goods least accurately reflect current prices because some of the finished goods are valued under the "last-in, first-out" ("LIFO") basis. The costs of the newest units available for sale are allocated to cost of goods sold, leaving the oldest units (at lower costs) in inventory. ZP values raw materials and work in process using the weighted average cost method. While not fully reflecting current prices, some inflationary effect will be included in the inventory values.
- 39 C is correct. FIFO inventory = Reported inventory + LIFO reserve = ¥608,572 + 10,120 = ¥618,692. The LIFO reserve is disclosed in Note 2 of the notes to consolidated financial statements.
- 40 A is correct. The SEC does not require companies to use the same inventory valuation method for all inventories, so this is the *least likely* reason to change accounting policies regarding inventory. The SEC is currently evaluating whether all US companies should be required to adopt IFRS. If the SEC requires companies to adopt IFRS, the LIFO method of inventory valuation would no longer be allowed.
- 41 A is correct. The inventory turnover ratio would be lower. The average inventory would be higher under FIFO and cost of products sold would be lower by the increase in LIFO reserve. LIFO is not permitted under IFRS.

Inventory turnover ratio = Cost of products sold ÷ Average inventory

2009 inventory turnover ratio as reported = 10.63 = ¥5,822,805 / [(608,572 + 486,465) / 2].

2009 inventory turnover ratio adjusted to FIFO as necessary = 10.34 = [¥5,822,805 - (19,660 - 10,120)] / [(608,572 + 10,120 + 486,465 + 19,660) / 2].

- 42 A is correct. No LIFO liquidation occurred during 2009; the LIFO reserve increased from ¥10,120 million in 2008 to ¥19,660 million in 2009. Management stated in the MD&A that the decrease in inventories reflected the impacts of decreased sales volumes and fluctuations in foreign currency translation rates.

- 43** C is correct. Finished goods and raw materials inventories are lower in 2009 when compared to 2008. Reduced levels of inventory typically indicate an anticipated business contraction.
- 44** B is correct. The decrease in LIFO inventory in 2009 would typically indicate that more inventory units were sold than produced or purchased. Accordingly, one would expect a liquidation of some of the older LIFO layers and the LIFO reserve to decrease. In actuality, the LIFO reserve *increased* from ¥10,120 million in 2008 to ¥19,660 million in 2009. This is not to be expected and is likely caused by the increase in prices of raw materials, other production materials, and parts of foreign currencies as noted in the MD&A. An analyst should seek to confirm this explanation.
- 45** B is correct. If prices have been decreasing, write-downs under FIFO are least likely to have a significant effect because the inventory is valued at closer to the new, lower prices. Typically, inventories valued using LIFO are less likely to incur inventory write-downs than inventories valued using weighted average cost or FIFO. Under LIFO, the *oldest* costs are reflected in the inventory carrying value on the balance sheet. Given increasing inventory costs, the inventory carrying values under the LIFO method are already conservatively presented at the oldest and lowest costs. Thus, it is far less likely that inventory write-downs will occur under LIFO; and if a write-down does occur, it is likely to be of a lesser magnitude.

PRACTICE PROBLEMS

- 1 JOOVI Inc. has recently purchased and installed a new machine for its manufacturing plant. The company incurred the following costs:

Purchase price	\$12,980
Freight and insurance	\$1,200
Installation	\$700
Testing	\$100
Maintenance staff training costs	\$500

The total cost of the machine to be shown on JOOVI's balance sheet is *closest* to:

- A \$14,180.
- B \$14,980.
- C \$15,480.

- 2 BAURU, S.A., a Brazilian corporation, borrows capital from a local bank to finance the construction of its manufacturing plant. The loan has the following conditions:

Borrowing date	1 January 2009
Amount borrowed	500 million Brazilian real (BRL)
Annual interest rate	14 percent
Term of the loan	3 years
Payment method	Annual payment of interest only. Principal amortization is due at the end of the loan term.

The construction of the plant takes two years, during which time BAURU earned BRL 10 million by temporarily investing the loan proceeds. Which of the following is the amount of interest related to the plant construction (in BRL million) that can be capitalized in BAURU's balance sheet?

- A 130.
- B 140.
- C 210.

- 3 After reading the financial statements and footnotes of a company that follows IFRS, an analyst identified the following intangible assets:

- product patent expiring in 40 years;
- copyright with no expiration date; and
- goodwill acquired 2 years ago in a business combination.

Which of these assets is an intangible asset with a finite useful life?

	Product Patent	Copyright	Goodwill
A	Yes	Yes	No
B	Yes	No	No
C	No	Yes	Yes

- 4 Intangible assets with finite useful lives *mostly* differ from intangible assets with infinite useful lives with respect to accounting treatment of:

- A revaluation.
 B impairment.
 C amortization.
- 5 A financial analyst is studying the income statement effect of two alternative depreciation methods for a recently acquired piece of equipment. She gathers the following information about the equipment's expected production life and use:
- | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total |
|---------------------|---------------|---------------|---------------|---------------|---------------|--------------|
| Units of production | 2,000 | 2,000 | 2,000 | 2,000 | 2,500 | 10,500 |
- Compared with the units-of-production method of depreciation, if the company uses the straight-line method to depreciate the equipment, its net income in Year 1 will *most likely* be:
- A lower.
 B higher.
 C the same.
- 6 Juan Martinez, CFO of VIRMIN, S.A., is selecting the depreciation method to use for a new machine. The machine has an expected useful life of six years. Production is expected to be relatively low initially but to increase over time. The method chosen for tax reporting must be the same as the method used for financial reporting. If Martinez wants to minimize tax payments in the first year of the machine's life, which of the following depreciation methods is Martinez *most likely* to use?
- A Straight-line method.
 B Units-of-production method.
 C Double-declining balance method.

The following information relates to Questions 7–8

Miguel Rodriguez of MARIO S.A., an Uruguayan corporation, is computing the depreciation expense of a piece of manufacturing equipment for the fiscal year ended 31 December 2009. The equipment was acquired on 1 January 2009. Rodriguez gathers the following information (currency in Uruguayan pesos, UYP):

Cost of the equipment	UYP 1,200,000
Estimated residual value	UYP 200,000
Expected useful life	8 years
Total productive capacity	800,000 units
Production in FY 2009	135,000 units
Expected production for the next 7 years	95,000 units each year

- 7 If MARIO uses the straight-line method, the amount of depreciation expense on MARIO's income statement related to the manufacturing equipment is *closest* to:
- A 125,000.
 B 150,000.

- C** 168,750.
- 8** If MARIO uses the units-of-production method, the amount of depreciation expense (in UYP) on MARIO's income statement related to the manufacturing equipment is *closest* to:
- A** 118,750.
B 168,750.
C 202,500.
-
- 9** Which of the following amortization methods is *most likely* to evenly distribute the cost of an intangible asset over its useful life?
- A** Straight-line method.
B Units-of-production method.
C Double-declining balance method.
- 10** Which of the following will cause a company to show a lower amount of amortization of intangible assets in the first year after acquisition?
- A** A higher residual value.
B A higher amortization rate.
C A shorter useful life.
- 11** An analyst in the finance department of BOOLDO S.A., a French corporation, is computing the amortization of a customer list, an intangible asset, for the fiscal year ended 31 December 2009. She gathers the following information about the asset:

Acquisition cost	€2,300,000
Acquisition date	1 January 2008
Expected residual value at time of acquisition	€500,000

The customer list is expected to result in extra sales for three years after acquisition. The present value of these expected extra sales exceeds the cost of the list.

- If the analyst uses the straight-line method, the amount of accumulated amortization related to the customer list as of 31 December 2009 is *closest* to:
- A** €600,000.
B €1,200,000.
C €1,533,333.
- 12** A financial analyst is analyzing the amortization of a product patent acquired by MAKETTI S.p.A., an Italian corporation. He gathers the following information about the patent:

Acquisition cost	€5,800,000
Acquisition date	1 January 2009
Patent expiration date	31 December 2015
Total plant capacity of patented product	40,000 units per year
Production of patented product in fiscal year ended 31 December 2009	20,000 units
Expected production of patented product during life of the patent	175,000 units

If the analyst uses the units-of-production method, the amortization expense on the patent for fiscal year 2009 is *closest* to:

- A** €414,286.
B €662,857.
C €828,571.
- 13** MARU S.A. de C.V., a Mexican corporation that follows IFRS, has elected to use the revaluation model for its property, plant, and equipment. One of MARU's machines was purchased for 2,500,000 Mexican pesos (MXN) at the beginning of the fiscal year ended 31 March 2010. As of 31 March 2010, the machine has a fair value of MXN 3,000,000. Should MARU show a profit for the revaluation of the machine?
- A** Yes.
B No, because this revaluation is recorded directly in equity.
C No, because value increases resulting from revaluation can never be recognized as a profit.
- 14** An analyst is studying the impairment of the manufacturing equipment of WLP Corp., a UK-based corporation that follows IFRS. He gathers the following information about the equipment:

Fair value	£16,800,000
Costs to sell	£800,000
Value in use	£14,500,000
Net carrying amount	£19,100,000

The amount of the impairment loss on WLP Corp.'s income statement related to its manufacturing equipment is *closest* to:

- A** £2,300,000.
B £3,100,000.
C £4,600,000.
- 15** A financial analyst at BETTO S.A. is analyzing the result of the sale of a vehicle for 85,000 Argentine pesos (ARP) on 31 December 2009. The analyst compiles the following information about the vehicle:

Acquisition cost of the vehicle	ARP 100,000
Acquisition date	1 January 2007
Estimated residual value at acquisition date	ARP 10,000
Expected useful life	9 years
Depreciation method	Straight-line

The result of the sale of the vehicle is *most likely*:

- A** a loss of ARP 15,000.
B a gain of ARP 15,000.
C a gain of ARP 18,333.
- 16** CROCO S.p.A sells an intangible asset with a historical acquisition cost of €12 million and an accumulated depreciation of €2 million and reports a loss on the sale of €3.2 million. Which of the following amounts is *most likely* the sale price of the asset?
- A** €6.8 million
B €8.8 million
C €13.2 million

- 17 According to IFRS, all of the following pieces of information about property, plant, and equipment must be disclosed in a company's financial statements and footnotes *except for*:
- A useful lives.
 - B acquisition dates.
 - C amount of disposals.
- 18 According to IFRS, all of the following pieces of information about intangible assets must be disclosed in a company's financial statements and footnotes *except for*:
- A fair value.
 - B impairment loss.
 - C amortization rate.
- 19 Which of the following characteristics is *most likely* to differentiate investment property from property, plant, and equipment?
- A It is tangible.
 - B It earns rent.
 - C It is long-lived.
- 20 If a company uses the fair value model to value investment property, changes in the fair value of the asset are *least likely* to affect:
- A net income.
 - B net operating income.
 - C other comprehensive income.
- 21 Investment property is *most likely* to:
- A earn rent.
 - B be held for resale.
 - C be used in the production of goods and services.
- 22 A company is *most likely* to:
- A use a fair value model for some investment property and a cost model for other investment property.
 - B change from the fair value model when transactions on comparable properties become less frequent.
 - C change from the fair value model when the company transfers investment property to property, plant, and equipment.

The following information relates to Questions 23–28

Melanie Hart, CFA, is a transportation analyst. Hart has been asked to write a research report on Altai Mountain Rail Company (AMRC). Like other companies in the railroad industry, AMRC's operations are capital intensive, with significant investments in such long-lived tangible assets as property, plant, and equipment. In November of 2008, AMRC's board of directors hired a new team to manage the company. In reviewing the company's 2009 annual report, Hart is concerned about some of the accounting choices that the new management has made. These choices differ from those of the previous management and from common industry practice. Hart has highlighted the following statements from the company's annual report:

- Statement 1 "In 2009, AMRC spent significant amounts on track replacement and similar improvements. AMRC expensed rather than capitalised a significant proportion of these expenditures."
- Statement 2 "AMRC uses the straight-line method of depreciation for both financial and tax reporting purposes to account for plant and equipment."
- Statement 3 "In 2009, AMRC recognized an impairment loss of €50 million on a fleet of locomotives. The impairment loss was reported as 'other income' in the income statement and reduced the carrying amount of the assets on the balance sheet."
- Statement 4 "AMRC acquires the use of many of its assets, including a large portion of its fleet of rail cars, under long-term lease contracts. In 2009, AMRC acquired the use of equipment with a fair value of €200 million under 20-year lease contracts. These leases were classified as operating leases. Prior to 2009, most of these lease contracts were classified as finance leases."

Exhibits 1 and 2 contain AMRC's 2009 consolidated income statement and balance sheet. AMRC prepares its financial statements in accordance with International Financial Reporting Standards.

Exhibit 1 Consolidated Statement of Income

For the Years Ended 31 December	2009		2008	
	€ Millions	% Revenues	€ Millions	% Revenues
Operating revenues	2,600	100.0	2,300	100.0
Operating expenses				
Depreciation	(200)	(7.7)	(190)	(8.3)
Lease payments	(210)	(8.1)	(195)	(8.5)
Other operating expense	(1,590)	(61.1)	(1,515)	(65.9)
Total operating expenses	(2,000)	(76.9)	(1,900)	(82.6)
Operating income	600	23.1	400	17.4
Other income	(50)	(1.9)	—	0.0
Interest expense	(73)	(2.8)	(69)	(3.0)
Income before taxes	477	18.4	331	14.4
Income taxes	(189)	(7.3)	(125)	(5.4)
Net income	288	11.1	206	9.0

Exhibit 2 Consolidated Balance Sheet

As of 31 December	2009		2008	
	€ Millions	% Assets	€ Millions	% Assets
Assets				
Current assets	500	9.4	450	8.5
Property & equipment:				
Land	700	13.1	700	13.2
Plant & equipment	6,000	112.1	5,800	109.4

(continued)

Exhibit 2 (Continued)

As of 31 December	2009		2008	
Assets	€ Millions	% Assets	€ Millions	% Assets
Total property & equipment	6,700	125.2	6,500	122.6
Accumulated depreciation	(1,850)	(34.6)	(1,650)	(31.1)
Net property & equipment	4,850	90.6	4,850	91.5
Total assets	5,350	100.0	5,300	100.0
Liabilities and Shareholders' Equity				
Current liabilities	480	9.0	430	8.1
Long-term debt	1,030	19.3	1,080	20.4
Other long-term provisions and liabilities	1,240	23.1	1,440	27.2
Total liabilities	2,750	51.4	2,950	55.7
Shareholders' equity				
Common stock and paid-in-surplus	760	14.2	760	14.3
Retained earnings	1,888	35.5	1,600	30.2
Other comprehensive losses	(48)	(0.9)	(10)	(0.2)
Total shareholders' equity	2,600	48.6	2,350	44.3
Total liabilities & shareholders' equity	5,350	100.0	5,300	100.0

- 23** With respect to Statement 1, which of the following is the *most likely* effect of management's decision to expense rather than capitalise these expenditures?
- A 2009 net profit margin is higher than if the expenditures had been capitalised.
 - B 2009 total asset turnover is lower than if the expenditures had been capitalised.
 - C Future profit growth will be higher than if the expenditures had been capitalised.
- 24** With respect to Statement 2, what would be the *most likely* effect in 2010 if AMRC were to switch to an accelerated depreciation method for both financial and tax reporting?
- A Net profit margin would increase.
 - B Total asset turnover would decrease.
 - C Cash flow from operating activities would increase.
- 25** With respect to Statement 3, what is the *most likely* effect of the impairment loss?
- A Net income in years prior to 2009 was likely understated.
 - B Net profit margins in years after 2009 will likely exceed the 2009 net profit margin.
 - C Cash flow from operating activities in 2009 was likely lower due to the impairment loss.
- 26** Based on Exhibits 1 and 2, the *best estimate* of the average remaining useful life of the company's plant and equipment at the end of 2009 is:
- A 20.75 years.
 - B 24.25 years.

- C 30.00 years.
- 27 With respect to Statement 4, if AMRC had used its old classification method for its leases instead of its new classification method, its 2009 total asset turnover ratio would *most likely* be:
- A lower.
 - B higher.
 - C the same.
- 28 With respect to Statement 4 and Exhibit 1, if AMRC had used its old classification method for its leases instead of its new classification method, the *most likely* effect on its 2009 ratios would be a:
- A higher net profit margin.
 - B higher fixed asset turnover.
 - C higher total liabilities-to-total assets ratio.
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The following information relates to Questions 29–35

Brian Jordan is interviewing for a junior equity analyst position at Orion Investment Advisors. As part of the interview process, Mary Benn, Orion's Director of Research, provides Jordan with information about two hypothetical companies, Alpha and Beta, and asks him to comment on the information on their financial statements and ratios. Both companies prepare their financial statements in accordance with International Financial Reporting Standards (IFRS) and are identical in all respects except for their accounting choices.

Jordan is told that at the beginning of the current fiscal year, both companies purchased a major new computer system and began building new manufacturing plants for their own use. Alpha capitalised and Beta expensed the cost of the computer system; Alpha capitalised and Beta expensed the interest costs associated with the construction of the manufacturing plants. In mid-year, both companies leased new office headquarters. Alpha classified the lease as an operating lease, and Beta classified it as a finance lease.

Benn asks Jordan, "What was the impact of these decisions on each company's current fiscal year financial statements and ratios?"

Jordan responds, "Alpha's decision to capitalise the cost of its new computer system instead of expensing it results in lower net income, lower total assets, and higher cash flow from operating activities in the current fiscal year. Alpha's decision to capitalise its interest costs instead of expensing them results in a lower fixed asset turnover ratio and a higher interest coverage ratio. Alpha's decision to classify its lease as an operating lease instead of a finance lease results in higher net income, higher cash flow from operating activities, and stronger solvency and activity ratios compared to Beta."

Jordan is told that Alpha uses the straight-line depreciation method and Beta uses an accelerated depreciation method; both companies estimate the same useful lives for long-lived assets. Many companies in their industry use the units-of-production method.

Benn asks Jordan, "What are the financial statement implications of each depreciation method, and how do you determine a company's need to reinvest in its productive capacity?"

Jordan replies, "All other things being equal, the straight-line depreciation method results in the least variability of net profit margin over time, while an accelerated depreciation method results in a declining trend in net profit margin over time. The units-of-production can result in a net profit margin trend that is quite variable. I use a three-step approach to estimate a company's need to reinvest in its productive capacity. First, I estimate the average age of the assets by dividing net property, plant, and equipment by annual depreciation expense. Second, I estimate the average remaining useful life of the assets by dividing accumulated depreciation by depreciation expense. Third, I add the estimates of the average remaining useful life and the average age of the assets in order to determine the total useful life."

Jordan is told that at the end of the current fiscal year, Alpha revalued a manufacturing plant; this increased its reported carrying amount by 15 percent. There was no previous downward revaluation of the plant. Beta recorded an impairment loss on a manufacturing plant; this reduced its carrying by 10 percent.

Benn asks Jordan "What was the impact of these decisions on each company's current fiscal year financial ratios?"

Jordan responds, "Beta's impairment loss increases its debt to total assets and fixed asset turnover ratios, and lowers its cash flow from operating activities. Alpha's revaluation increases its debt to capital and return on assets ratios, and reduces its return on equity."

At the end of the interview, Benn thanks Jordan for his time and states that a hiring decision will be made shortly.

- 29 Jordan's response about the financial statement impact of Alpha's decision to capitalise the cost of its new computer system is most likely *correct* with respect to:
- A lower net income.
 - B lower total assets.
 - C higher cash flow from operating activities.
- 30 Jordan's response about the ratio impact of Alpha's decision to capitalise interest costs is most likely *correct* with respect to the:
- A interest coverage ratio.
 - B fixed asset turnover ratio.
 - C interest coverage and fixed asset turnover ratios.
- 31 Jordan's response about the impact of Alpha's decision to classify its lease as an operating lease instead of finance lease is most likely *incorrect* with respect to:
- A net income.
 - B solvency and activity ratios.
 - C cash flow from operating activities.
- 32 Jordan's response about the impact of the different depreciation methods on net profit margin is most likely *incorrect* with respect to:
- A accelerated depreciation.
 - B straight-line depreciation.
 - C units-of-production depreciation.
- 33 Jordan's response about his approach to estimating a company's need to reinvest in its productive capacity is most likely *correct* regarding:
- A estimating the average age of the asset base.
 - B estimating the total useful life of the asset base.
 - C estimating the average remaining useful life of the asset base.

- 34 Jordan's response about the effect of Beta's impairment loss is most likely *incorrect* with respect to the impact on its:
- A debt to total assets.
 - B fixed asset turnover.
 - C cash flow from operating activities.
- 35 Jordan's response about the effect of Alpha's revaluation is most likely *correct* with respect to the impact on its:
- A return on equity.
 - B return on assets.
 - C debt to capital ratio.
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SOLUTIONS

- 1 B is correct. Only costs necessary for the machine to be ready to use can be capitalized. Therefore, Total capitalized costs = $12,980 + 1,200 + 700 + 100 = \$14,980$.
- 2 A is correct. Borrowing costs can be capitalized under IFRS until the tangible asset is ready for use. Also, under IFRS, income earned on temporarily investing the borrowed monies decreases the amount of borrowing costs eligible for capitalization. Therefore, Total capitalized interest = $(500 \text{ million} \times 14\% \times 2 \text{ years}) - 10 \text{ million} = 130 \text{ million}$.
- 3 B is correct. A product patent with a defined expiration date is an intangible asset with a finite useful life. A copyright with no expiration date is an intangible asset with an indefinite useful life. Goodwill is no longer considered an intangible asset under IFRS and is considered to have an indefinite useful life.
- 4 C is correct. An intangible asset with a finite useful life is amortized, whereas an intangible asset with an indefinite useful life is not.
- 5 A is correct. If the company uses the straight-line method, the depreciation expense will be one-fifth (20 percent) of the depreciable cost in Year 1. If it uses the units-of-production method, the depreciation expense will be 19 percent ($2,000/10,500$) of the depreciable cost in Year 1. Therefore, if the company uses the straight-line method, its depreciation expense will be higher and its net income will be lower.
- 6 C is correct. If Martinez wants to minimize tax payments in the first year of the machine's life, he should use an accelerated method, such as the double-declining balance method.
- 7 A is correct. Using the straight-line method, depreciation expense amounts to
$$\text{Depreciation expense} = (1,200,000 - 200,000)/8 \text{ years} = 125,000.$$
- 8 B is correct. Using the units-of-production method, depreciation expense amounts to
$$\text{Depreciation expense} = (1,200,000 - 200,000) \times (135,000/800,000) = 168,750.$$
- 9 A is correct. The straight-line method is the method that evenly distributes the cost of an asset over its useful life because amortization is the same amount every year.
- 10 A is correct. A higher residual value results in a lower total depreciable cost and, therefore, a lower amount of amortization in the first year after acquisition (and every year after that).
- 11 B is correct. Using the straight-line method, accumulated amortization amounts to
$$\begin{aligned}\text{Accumulated amortization} &= [(2,300,000 - 500,000)/3 \text{ years}] \times 2 \text{ years} \\ &= 1,200,000\end{aligned}$$
- 12 B is correct. Using the units-of-production method, depreciation expense amounts to
$$\text{Depreciation expense} = 5,800,000 \times (20,000/175,000) = 662,857$$

- 13** B is correct. In this case, the value increase brought about by the revaluation should be recorded directly in equity. The reason is that under IFRS, an increase in value brought about by a revaluation can only be recognized as a profit to the extent that it reverses a revaluation decrease of the same asset previously recognized in the income statement.

- 14** B is correct. The impairment loss equals £3,100,000.

$$\begin{aligned}\text{Impairment} &= \max(\text{Fair value less costs to sell; Value in use}) - \text{Net carrying amount} \\ &= \max(16,800,000 - 800,000; 14,500,000) - 19,100,000 \\ &= -3,100,000.\end{aligned}$$

- 15** B is correct. The result on the sale of the vehicle equals

$$\begin{aligned}\text{Gain or loss on the sale} &= \text{Sale proceeds} - \text{Carrying amount} \\ &= \text{Sale proceeds} - (\text{Acquisition cost} - \text{Accumulated depreciation}) \\ &= 85,000 - \{100,000 - [((100,000 - 10,000)/9 \text{ years}) \\ &\quad \times 3 \text{ years}]\} \\ &= 15,000.\end{aligned}$$

- 16** A is correct. Gain or loss on the sale = Sale proceeds – Carrying amount.

Rearranging this equation, Sale proceeds = Carrying amount + Gain or loss on sale. Thus, Sale price = (12 million – 2 million) + (–3.2 million) = 6.8 million.

- 17** B is correct. IFRS do not require acquisition dates to be disclosed.

- 18** A is correct. IFRS do not require fair value of intangible assets to be disclosed.

- 19** B is correct. Investment property earns rent. Investment property and property, plant, and equipment are tangible and long-lived.

- 20** C is correct. When a company uses the fair value model to value investment property, changes in the fair value of the property are reported in the income statement—not in other comprehensive income.

- 21** A is correct. Investment property earns rent. Inventory is held for resale, and property, plant, and equipment are used in the production of goods and services.

- 22** C is correct. A company will change from the fair value model to either the cost model or revaluation model when the company transfers investment property to property, plant, and equipment.

- 23** C is correct. Expensing rather than capitalising an investment in long-term assets will result in higher expenses and lower net income and net profit margin in the current year. Future years' incomes will not include depreciation expense related to these expenditures. Consequently, year-to-year growth in profitability will be higher. If the expenses had been capitalised, the carrying amount of the assets would have been higher and the 2009 total asset turnover would have been lower.

- 24** C is correct. In 2010, switching to an accelerated depreciation method would increase depreciation expense and decrease income before taxes, taxes payable, and net income. Cash flow from operating activities would increase because of the resulting tax savings.

- 25** B is correct. 2009 net income and net profit margin are lower because of the impairment loss. Consequently, net profit margins in subsequent years are likely to be higher. An impairment loss suggests that insufficient depreciation expense was recognized in prior years, and net income was overstated in prior years. The impairment loss is a non-cash item and will not affect operating cash flows.

- 26** A is correct. The estimated average remaining useful life is 20.75 years.

$$\begin{aligned}\text{Estimate of remaining useful life} &= \text{Net plant and equipment} \div \text{Annual depreciation expense} \\ \text{Net plant and equipment} &= \text{Gross P \& E} - \text{Accumulated depreciation} \\ &= €6000 - €1850 = €4150 \\ \text{Estimate of remaining useful life} &= \text{Net P \& E} \div \text{Depreciation expense} \\ &= €4150 \div €200 = 20.75\end{aligned}$$

- 27** A is correct. When leases are classified as finance leases, the lessee initially reports an asset and liability at a carrying amount equal to the lower of the fair value of the leased asset or the present value of the future lease payments. Under an operating lease, the lessee does not report an asset or liability. Therefore, total asset turnover (total revenue ÷ average total assets) would be lower if the leases were classified as finance leases.
- 28** C is correct. Total liabilities-to-assets would be higher. When leases are classified as finance leases, the lessee initially reports an asset and liability at a carrying amount equal to the lower of the fair value of the leased asset or the present value of the future lease payments. Both the numerator and denominator would increase by an equal amount, but the proportional increase in the numerator is higher and the ratio would be higher. The following exhibit shows what would happen to 2009 total liabilities, assets, and total liabilities-to-assets if €200 million, the fair value of the leased equipment, is added to AMRC's total liabilities and assets. This simple example ignores the impact of accounting for the 2009 lease payment.

	2009 Actual Under Operating Lease	2009 Hypothetical Under Finance Lease
Total liabilities	€2,750	€2,950
Total assets	€5,350	€5,550
Total liabilities-to-assets	51.4%	53.2%

The depreciation and interest expense under a finance lease tends to be higher than the operating lease payment in the early years of the lease. The finance lease would result in lower net income and net profit margin. Long-lived (fixed) assets are higher under a finance lease and fixed asset turnover is lower.

- 29** C is correct. The decision to capitalise the costs of the new computer system results in higher cash flow from operating activities; the expenditure is reported as an outflow of investing activities. The company allocates the capitalised amount over the asset's useful life as depreciation or amortisation expense rather than expensing it in the year of expenditure. Net income and total assets are higher in the current fiscal year.
- 30** B is correct. Alpha's fixed asset turnover will be lower because the capitalised interest will appear on the balance sheet as part of the asset being constructed. Therefore, fixed assets will be higher and the fixed asset turnover ratio (total revenue/average net fixed assets) will be lower than if it had expensed these costs. Capitalised interest appears on the balance sheet as part of the asset being constructed instead of being reported as interest expense in the period incurred. However, the interest coverage ratio should be based on interest payments, not interest expense (earnings before interest and taxes/interest payments), and should be unchanged. To provide a true picture of a company's interest coverage, the entire amount of interest expenditure, both the capitalised portion and the expensed portion, should be used in calculating interest coverage ratios.

- 31** C is correct. The cash flow from operating activities will be lower, not higher, because the full lease payment is treated as an operating cash outflow. With a finance lease, only the portion of the lease payment relating to interest expense potentially reduces operating cash outflows. A company reporting a lease as an operating lease will typically show higher profits in early years, because the lease expense is less than the sum of the interest and depreciation expense. The company reporting the lease as an operating lease will typically report stronger solvency and activity ratios.
- 32** A is correct. Accelerated depreciation will result in an improving, not declining, net profit margin over time, because the amount of depreciation expense declines each year. Under straight-line depreciation, the amount of depreciation expense will remain the same each year. Under the units-of-production method, the amount of depreciation expense reported each year varies with the number of units produced.
- 33** B is correct. The estimated average total useful life of a company's assets is calculated by adding the estimates of the average remaining useful life and the average age of the assets. The average age of the assets is estimated by dividing accumulated depreciation by depreciation expense. The average remaining useful life of the asset base is estimated by dividing net property, plant, and equipment by annual depreciation expense.
- 34** C is correct. The impairment loss is a non-cash charge and will not affect cash flow from operating activities. The debt to total assets and fixed asset turnover ratios will increase, because the impairment loss will reduce the carrying amount of fixed assets and therefore total assets.
- 35** A is correct. In an asset revaluation, the carrying amount of the assets increases. The increase in the asset's carrying amount bypasses the income statement and is reported as other comprehensive income and appears in equity under the heading of revaluation surplus. Therefore, shareholders' equity will increase but net income will not be affected, so return on equity will decline. Return on assets and debt to capital ratios will also decrease.

PRACTICE PROBLEMS

- 1 Using the straight-line method of depreciation for reporting purposes and accelerated depreciation for tax purposes would *most likely* result in a:
 - A valuation allowance.
 - B deferred tax asset.
 - C temporary difference.
- 2 In early 2009 Sanborn Company must pay the tax authority €37,000 on the income it earned in 2008. This amount was recorded on the company's 31 December 2008 financial statements as:
 - A taxes payable.
 - B income tax expense.
 - C a deferred tax liability.
- 3 Income tax expense reported on a company's income statement equals taxes payable, plus the net increase in:
 - A deferred tax assets and deferred tax liabilities.
 - B deferred tax assets, less the net increase in deferred tax liabilities.
 - C deferred tax liabilities, less the net increase in deferred tax assets.
- 4 Analysts should treat deferred tax liabilities that are expected to reverse as:
 - A equity.
 - B liabilities.
 - C neither liabilities nor equity.
- 5 Deferred tax liabilities should be treated as equity when:
 - A they are not expected to reverse.
 - B the timing of tax payments is uncertain.
 - C the amount of tax payments is uncertain.
- 6 When both the timing and amount of tax payments are uncertain, analysts should treat deferred tax liabilities as:
 - A equity.
 - B liabilities.
 - C neither liabilities nor equity.
- 7 When accounting standards require recognition of an expense that is not permitted under tax laws, the result is a:
 - A deferred tax liability.
 - B temporary difference.
 - C permanent difference.
- 8 When certain expenditures result in tax credits that directly reduce taxes, the company will *most likely* record:
 - A a deferred tax asset.
 - B a deferred tax liability.
 - C no deferred tax asset or liability.

- 9** When accounting standards require an asset to be expensed immediately but tax rules require the item to be capitalized and amortized, the company will *most likely* record:
- a deferred tax asset.
 - a deferred tax liability.
 - no deferred tax asset or liability.
- 10** A company incurs a capital expenditure that may be amortized over five years for accounting purposes, but over four years for tax purposes. The company will *most likely* record:
- a deferred tax asset.
 - a deferred tax liability.
 - no deferred tax asset or liability.
- 11** A company receives advance payments from customers that are immediately taxable but will not be recognized for accounting purposes until the company fulfills its obligation. The company will *most likely* record:
- a deferred tax asset.
 - a deferred tax liability.
 - no deferred tax asset or liability.

The following information relates to Questions 12–14

Note I Income Taxes

The components of earnings before income taxes are as follows (\$ thousands):

	2007	2006	2005
Earnings before income taxes:			
United States	\$ 88,157	\$ 75,658	\$ 59,973
Foreign	116,704	113,509	94,760
Total	<u>\$204,861</u>	<u>\$189,167</u>	<u>\$154,733</u>

The components of the provision for income taxes are as follows (\$ thousands):

	2007	2006	2005
Income taxes			
Current:			
Federal			
Federal	\$30,632	\$22,031	\$18,959
Foreign	28,140	27,961	22,263
	<u>\$58,772</u>	<u>\$49,992</u>	<u>\$41,222</u>
Deferred:			
Federal	(\$4,752)	\$5,138	\$2,336
Foreign	124	1,730	621

(continued)

	2007	2006	2005
	(4,628)	6,868	2,957
Total	\$54,144	\$56,860	\$44,179

- 12** In 2007, the company's US GAAP income statement recorded a provision for income taxes *closest* to:
- A** \$30,632.
 - B** \$54,144.
 - C** \$58,772.
- 13** The company's effective tax rate was *highest* in:
- A** 2005.
 - B** 2006.
 - C** 2007.
- 14** Compared to the company's effective tax rate on US income, its effective tax rate on foreign income was:
- A** lower in each year presented.
 - B** higher in each year presented.
 - C** higher in some periods and lower in others.
-
- 15** Zimt AG presents its financial statements in accordance with US GAAP. In 2007, Zimt discloses a valuation allowance of \$1,101 against total deferred tax assets of \$19,201. In 2006, Zimt disclosed a valuation allowance of \$1,325 against total deferred tax assets of \$17,325. The change in the valuation allowance *most likely* indicates that Zimt's:
- A** deferred tax liabilities were reduced in 2007.
 - B** expectations of future earning power has increased.
 - C** expectations of future earning power has decreased.
- 16** Cinnamon, Inc. recorded a total deferred tax asset in 2007 of \$12,301, offset by a \$12,301 valuation allowance. Cinnamon *most likely*:
- A** fully utilized the deferred tax asset in 2007.
 - B** has an equal amount of deferred tax assets and deferred tax liabilities.
 - C** expects not to earn any taxable income before the deferred tax asset expires.

The following information relates to Questions 17–19

The tax effects of temporary differences that give rise to deferred tax assets and liabilities are as follows (\$ thousands):

	2007	2006
Deferred tax assets:		
Accrued expenses	\$8,613	\$7,927
Tax credit and net operating loss carryforwards	2,288	2,554

	2007	2006
LIFO and inventory reserves	5,286	4,327
Other	2,664	2,109
Deferred tax assets	18,851	16,917
Valuation allowance	(1,245)	(1,360)
Net deferred tax assets	<u>\$17,606</u>	<u>\$15,557</u>
Deferred tax liabilities:		
Depreciation and amortization	\$(27,338)	\$(29,313)
Compensation and retirement plans	(3,831)	(8,963)
Other	(1,470)	(764)
Deferred tax liabilities	<u>(32,639)</u>	<u>(39,040)</u>
Net deferred tax liability	<u>(\$15,033)</u>	<u>(\$23,483)</u>

- 17** A reduction in the statutory tax rate would *most likely* benefit the company's:
- A** income statement and balance sheet.
 - B** income statement but not the balance sheet.
 - C** balance sheet but not the income statement.
- 18** If the valuation allowance had been the same in 2007 as it was in 2006, the company would have reported \$115 *higher*:
- A** net income.
 - B** deferred tax assets.
 - C** income tax expense.
- 19** Compared to the provision for income taxes in 2007, the company's cash tax payments were:
- A** lower.
 - B** higher.
 - C** the same.

The following information relates to Questions 20–22

A company's provision for income taxes resulted in effective tax rates attributable to loss from continuing operations before cumulative effect of change in accounting principles that varied from the statutory federal income tax rate of 34 percent, as summarized in the table below.

Year Ended 30 June	2007	2006	2005
Expected federal income tax expense (benefit) from continuing operations at 34 percent	(\$112,000)	\$768,000	\$685,000
Expenses not deductible for income tax purposes	357,000	32,000	51,000
State income taxes, net of federal benefit	132,000	22,000	100,000

(continued)

Year Ended 30 June	2007	2006	2005
Change in valuation allowance for deferred tax assets	(150,000)	(766,000)	(754,000)
Income tax expense	\$227,000	\$56,000	\$82,000

- 20 In 2007, the company's net income (loss) was *closest* to:
- A (\$217,000).
 - B (\$329,000).
 - C (\$556,000).
- 21 The \$357,000 adjustment in 2007 *most likely* resulted in:
- A an increase in deferred tax assets.
 - B an increase in deferred tax liabilities.
 - C no change to deferred tax assets and liabilities.
- 22 Over the three years presented, changes in the valuation allowance for deferred tax assets were *most likely* indicative of:
- A decreased prospect for future profitability.
 - B increased prospects for future profitability.
 - C assets being carried at a higher value than their tax base.
-

SOLUTIONS

- 1 C is correct. Because the differences between tax and financial accounting will correct over time, the resulting deferred tax liability, for which the expense was charged to the income statement but the tax authority has not yet been paid, will be a temporary difference. A valuation allowance would only arise if there was doubt over the company's ability to earn sufficient income in the future to require paying the tax.
- 2 A is correct. The taxes a company must pay in the immediate future are taxes payable.
- 3 C is correct. Higher reported tax expense relative to taxes paid will increase the deferred tax liability, whereas lower reported tax expense relative to taxes paid increases the deferred tax asset.
- 4 B is correct. If the liability is expected to reverse (and thus require a cash tax payment) the deferred tax represents a future liability.
- 5 A is correct. If the liability will not reverse, there will be no required tax payment in the future and the "liability" should be treated as equity.
- 6 C is correct. The deferred tax liability should be excluded from both debt and equity when both the amounts and timing of tax payments resulting from the reversals of temporary differences are uncertain.
- 7 C is correct. Accounting items that are not deductible for tax purposes will not be reversed and thus result in permanent differences.
- 8 C is correct. Tax credits that directly reduce taxes are a permanent difference, and permanent differences do not give rise to deferred tax.
- 9 A is correct. The capitalization will result in an asset with a positive tax base and zero carrying value. The amortization means the difference is temporary. Because there is a temporary difference on an asset resulting in a higher tax base than carrying value, a deferred tax asset is created.
- 10 B is correct. The difference is temporary, and the tax base will be lower (because of more rapid amortization) than the carrying value of the asset. The result will be a deferred tax liability.
- 11 A is correct. The advances represent a liability for the company. The carrying value of the liability exceeds the tax base (which is now zero). A deferred tax asset arises when the carrying value of a liability exceeds its tax base.
- 12 B is correct. The income tax provision in 2007 was \$54,144, consisting of \$58,772 in current income taxes, of which \$4,628 were deferred.
- 13 B is correct. The effective tax rate of 30.1 percent (\$56,860/\$189,167) was higher than the effective rates in 2005 and 2007.
- 14 A is correct. In 2007 the effective tax rate on foreign operations was 24.2 percent $[(\$28,140 + \$124)/\$116,704]$ and the effective US tax rate was $[(\$30,632 - \$4,752)/\$88,157] = 29.4$ percent. In 2006 the effective tax rate on foreign operations was 26.2 percent and the US rate was 35.9 percent. In 2005 the foreign rate was 24.1 percent and the US rate was 35.5 percent.
- 15 B is correct. The valuation allowance is taken against deferred tax assets to represent uncertainty that future taxable income will be sufficient to fully utilize the assets. By decreasing the allowance, Zimt is signaling greater likelihood that future earnings will be offset by the deferred tax asset.

- 16** C is correct. The valuation allowance is taken when the company will “more likely than not” fail to earn sufficient income to offset the deferred tax asset. Because the valuation allowance equals the asset, by extension the company expects *no* taxable income prior to the expiration of the deferred tax assets.
- 17** A is correct. A lower tax rate would increase net income on the income statement, and because the company has a net deferred tax liability, the net liability position on the balance sheet would also improve (be smaller).
- 18** C is correct. The reduction in the valuation allowance resulted in a corresponding reduction in the income tax provision.
- 19** B is correct. The net deferred tax liability was smaller in 2007 than it was in 2006, indicating that in addition to meeting the tax payments provided for in 2007 the company also paid taxes that had been deferred in prior periods.
- 20** C is correct. The income tax provision at the statutory rate of 34 percent is a benefit of \$112,000, suggesting that the pre-tax income was a loss of $\$112,000 / 0.34 = (\$329,412)$. The income tax provision was \$227,000. $(\$329,412) - \$227,000 = (\$556,412)$.
- 21** C is correct. Accounting expenses that are not deductible for tax purposes result in a permanent difference, and thus do not give rise to deferred taxes.
- 22** B is correct. Over the three-year period, changes in the valuation allowance reduced cumulative income taxes by \$1,670,000. The reductions to the valuation allowance were a result of the company being “more likely than not” to earn sufficient taxable income to offset the deferred tax assets.

PRACTICE PROBLEMS

- 1 A company issues €1 million of bonds at face value. When the bonds are issued, the company will record a:
 - A cash inflow from investing activities.
 - B cash inflow from financing activities.
 - C cash inflow from operating activities.
- 2 At the time of issue of 4.50% coupon bonds, the effective interest rate was 5.00%. The bonds were *most likely* issued at:
 - A par.
 - B a discount.
 - C a premium.
- 3 Oil Exploration LLC paid \$45,000 in printing, legal fees, commissions, and other costs associated with its recent bond issue. It is *most likely* to record these costs on its financial statements as:
 - A an asset under US GAAP and reduction of the carrying value of the debt under IFRS.
 - B a liability under US GAAP and reduction of the carrying value of the debt under IFRS.
 - C a cash outflow from investing activities under both US GAAP and IFRS.
- 4 On 1 January 2010, Elegant Fragrances Company issues £1,000,000 face value, five-year bonds with annual interest payments of £55,000 to be paid each 31 December. The market interest rate is 6.0 percent. Using the effective interest rate method of amortisation, Elegant Fragrances is *most likely* to record:
 - A an interest expense of £55,000 on its 2010 income statement.
 - B a liability of £982,674 on the 31 December 2010 balance sheet.
 - C a £58,736 cash outflow from operating activity on the 2010 statement of cash flows.
- 5 Consolidated Enterprises issues €10 million face value, five-year bonds with a coupon rate of 6.5 percent. At the time of issuance, the market interest rate is 6.0 percent. Using the effective interest rate method of amortisation, the carrying value after one year will be *closest* to:
 - A €10.17 million.
 - B €10.21 million.
 - C €10.28 million.
- 6 The management of Bank EZ repurchases its own bonds in the open market. They pay €6.5 million for bonds with a face value of €10.0 million and a carrying value of €9.8 million. The bank will *most likely* report:
 - A other comprehensive income of €3.3 million.
 - B other comprehensive income of €3.5 million.
 - C a gain of €3.3 million on the income statement.
- 7 Innovative Inventions, Inc. needs to raise €10 million. If the company chooses to issue zero-coupon bonds, its debt-to-equity ratio will *most likely*:
 - A rise as the maturity date approaches.

- B decline as the maturity date approaches.
C remain constant throughout the life of the bond.
- 8 Fairmont Golf issued fixed rate debt when interest rates were 6 percent. Rates have since risen to 7 percent. Using only the carrying amount (based on historical cost) reported on the balance sheet to analyze the company's financial position would *most likely* cause an analyst to:
- A overestimate Fairmont's economic liabilities.
B underestimate Fairmont's economic liabilities.
C underestimate Fairmont's interest coverage ratio.
- 9 Debt covenants are *least likely* to place restrictions on the issuer's ability to:
- A pay dividends.
B issue additional debt.
C issue additional equity.
- 10 Compared to using a finance lease, a lessee that makes use of an operating lease will *most likely* report higher:
- A debt.
B rent expense.
C cash flow from operating activity.
- 11 Which of the following is *most likely* a lessee's disclosure about operating leases?
- A Lease liabilities.
B Future obligations by maturity.
C Net carrying amounts of leased assets.
- 12 For a lessor, the leased asset appears on the balance sheet and continues to be depreciated when the lease is classified as:
- A a sales-type lease.
B an operating lease.
C a financing lease.
- 13 Under US GAAP, a lessor's reported revenues at lease inception will be *highest* if the lease is classified as:
- A a sales-type lease.
B an operating lease.
C a direct financing lease.
- 14 A lessor will record interest income if a lease is classified as:
- A a capital lease.
B an operating lease.
C either a capital or an operating lease.
- 15 Cavalier Copper Mines has \$840 million in total liabilities and \$520 million in shareholders' equity. It discloses operating lease commitments over the next five years with a present value of \$100 million. If the lease commitments are treated as debt, the debt-to-total-capital ratio is *closest* to:
- A 0.58.
B 0.62.
C 0.64.

- 16** Penben Corporation has a defined benefit pension plan. At 31 December, its pension obligation is €10 million and pension assets are €9 million. Under either IFRS or US GAAP, the reporting on the balance sheet would be *closest* to which of the following?
- A** €10 million is shown as a liability, and €9 million appears as an asset.
 - B** €1 million is shown as a net pension obligation.
 - C** Pension assets and obligations are not required to be shown on the balance sheet but only disclosed in footnotes.

SOLUTIONS

- 1 B is correct. The company receives €1 million in cash from investors at the time the bonds are issued, which is recorded as a financing activity.
- 2 B is correct. The effective interest rate is greater than the coupon rate and the bonds will be issued at a discount.
- 3 A is correct. Under US GAAP, expenses incurred when issuing bonds are generally recorded as an asset and amortised to the related expense (legal, etc.) over the life of the bonds. Under IFRS, they are included in the measurement of the liability. The related cash flows are financing activities.
- 4 B is correct. The bonds will be issued at a discount because the market interest rate is higher than the stated rate. Discounting the future payments to their present value indicates that at the time of issue, the company will record £978,938 as both a liability and a cash inflow from financing activities. Interest expense in 2010 is £58,736 (£978,938 times 6.0 percent). During the year, the company will pay cash of £55,000 related to the interest payment, but interest expense on the income statement will also reflect £3,736 related to amortisation of the initial discount (£58,736 interest expense less the £55,000 interest payment). Thus, the value of the liability at 31 December 2010 will reflect the initial value (£978,938) plus the amortised discount (£3,736), for a total of £982,674. The cash outflow of £55,000 may be presented as either an operating or financing activity under IFRS.
- 5 A is correct. The coupon rate on the bonds is higher than the market rate, which indicates that the bonds will be issued at a premium. Taking the present value of each payment indicates an issue date value of €10,210,618. The interest expense is determined by multiplying the carrying amount at the beginning of the period (£10,210,618) by the market interest rate at the time of issue (6.0 percent) for an interest expense of €612,637. The value after one year will equal the beginning value less the amount of the premium amortised to date, which is the difference between the amount paid (€650,000) and the expense accrued (£612,637) or €37,363. $\text{€}10,210,618 - \text{€}37,363 = \text{€}10,173,255$ or €10.17 million.
- 6 C is correct. A gain of €3.3 million (carrying amount less amount paid) will be reported on the income statement.
- 7 A is correct. The value of the liability for zero-coupon bonds increases as the discount is amortised over time. Furthermore, the amortised interest will reduce earnings at an increasing rate over time as the value of the liability increases. Higher relative debt and lower relative equity (through retained earnings) will cause the debt-to-equity ratio to increase as the zero-coupon bonds approach maturity.
- 8 A is correct. When interest rates rise, bonds decline in value. Thus, the carrying amount of the bonds being carried on the balance sheet is higher than the market value. The company could repurchase the bonds for less than the carrying amount, so the economic liabilities are overestimated. Because the bonds are issued at a fixed rate, there is no effect on interest coverage.
- 9 C is correct. Covenants protect debtholders from excessive risk taking, typically by limiting the issuer's ability to use cash or by limiting the overall levels of debt relative to income and equity. Issuing additional equity would increase the company's ability to meet its obligations, so debtholders would not restrict that ability.

- 10 B is correct. An operating lease is not recorded on the balance sheet (debt is lower), and lease payments are entirely categorised as rent (interest expense is lower.) Because the rent expense is an operating outflow but principal repayments are financing cash flows, the operating lease will result in lower cash flow from operating activity.
- 11 B is correct. The lessee will disclose the future obligation by maturity of its operating leases. The future obligations by maturity, leased assets, and lease liabilities will all be shown for finance leases.
- 12 B is correct. When a lease is classified as an operating lease, the underlying asset remains on the lessor's balance sheet. The lessor will record a depreciation expense that reduces the asset's value over time.
- 13 A is correct. A sales-type lease treats the lease as a sale of the asset, and revenue is recorded at the time of sale equal to the present value of future lease payments. Under a direct financing lease, only interest income is reported as earned. Under an operating lease, revenue from rent is reported when collected.
- 14 A is correct. A portion of the payments for capital leases, either direct financing or sales-type, is reported as interest income. With an operating lease, all revenue is recorded as rental revenue.
- 15 C is correct. The current debt-to-total-capital ratio is $\$840/(\$840+\$520) = 0.62$. To adjust for the lease commitments, an analyst should add \$100 to both the numerator and denominator: $\$940/(\$940+\$520) = 0.64$.
- 16 B is correct. The company will report a net pension obligation of €1 million equal to the pension obligation (€10 million) less the plan assets (€9 million).

PRACTICE PROBLEMS

- 1 In contrast to earnings quality, financial reporting quality *most likely* pertains to:
 - A sustainable earnings.
 - B relevant information.
 - C adequate return on investment.
- 2 The information provided by a low-quality financial report will *most likely*:
 - A decrease company value.
 - B indicate earnings are not sustainable.
 - C impede the assessment of earnings quality.
- 3 To properly assess a company's past performance, an analyst requires:
 - A high earnings quality.
 - B high financial reporting quality.
 - C both high earnings quality and high financial reporting quality.
- 4 Low quality earnings *most likely* reflect:
 - A low-quality financial reporting.
 - B company activities which are unsustainable.
 - C information that does not faithfully represent company activities.
- 5 Earnings that result from non-recurring activities *most likely* indicate:
 - A lower-quality earnings.
 - B biased accounting choices.
 - C lower-quality financial reporting.
- 6 Which attribute of financial reports would *most likely* be evaluated as optimal in the financial reporting spectrum?
 - A Conservative accounting choices
 - B Sustainable and adequate returns
 - C Emphasized pro forma earnings measures
- 7 Financial reports of the lowest level of quality reflect:
 - A fictitious events.
 - B biased accounting choices.
 - C accounting that is non-compliant with GAAP.
- 8 A high-quality financial report may reflect:
 - A earnings smoothing.
 - B low earnings quality.
 - C understatement of asset impairment.
- 9 If a particular accounting choice is considered aggressive in nature, then the financial performance for the current period would *most likely*:
 - A be neutral.
 - B exhibit an upward bias.
 - C exhibit a downward bias.
- 10 Which of the following is *most likely* to reflect conservative accounting choices?

- A Decreased reported earnings in later periods
 - B Increased reported earnings in the current period
 - C Increased debt reported on the balance sheet at the end of the current period
- 11 Which of the following statements *most likely* describes a situation that would motivate a manager to issue low-quality financial reports?
- A The manager's compensation is tied to stock price performance.
 - B The manager has increased the market share of products significantly.
 - C The manager has brought the company's profitability to a level higher than competitors.
- 12 Which of the following concerns would *most likely* motivate a manager to make conservative accounting choices?
- A Attention to future career opportunities
 - B Expected weakening in the business environment
 - C Debt covenant violation risk in the current period
- 13 Which of the following conditions *best* explains why a company's manager would obtain legal, accounting, and board level approval prior to issuing low-quality financial reports?
- A Motivation
 - B Opportunity
 - C Rationalization
- 14 A company is experiencing a period of strong financial performance. In order to increase the likelihood of exceeding analysts' earnings forecasts in the next reporting period, the company would *most likely* undertake accounting choices that:
- A inflate reported revenue in the current period.
 - B delay expense recognition in the current period.
 - C accelerate expense recognition in the current period.
- 15 Which of the following situations represents a motivation, rather than an opportunity, to issue low-quality financial reports?
- A Poor internal controls
 - B Search for a personal bonus
 - C Inattentive board of directors
- 16 Which of the following situations will *most likely* motivate managers to inflate earnings in the current period?
- A Possibility of bond covenant violation
 - B Earnings in excess of analysts' forecasts
 - C Earnings that are greater than the previous year
- 17 Which of the following *best* describes an opportunity for management to issue low-quality financial reports?
- A Ineffective board of directors
 - B Pressure to achieve some performance level
 - C Corporate concerns about financing in the future
- 18 An audit opinion of a company's financial reports is *most likely* intended to:
- A detect fraud.
 - B reveal misstatements.

- C assure that financial information is presented fairly.
- 19 If a company uses a non-GAAP financial measure in an SEC filing, then the company must:
- A give more prominence to the non-GAAP measure if it is used in earnings releases.
 - B provide a reconciliation of the non-GAAP measure and equivalent GAAP measure.
 - C exclude charges requiring cash settlement from any non-GAAP liquidity measures.
- 20 A company wishing to increase earnings in the current period may choose to:
- A decrease the useful life of depreciable assets.
 - B lower estimates of uncollectible accounts receivables.
 - C classify a purchase as an expense rather than a capital expenditure.
- 21 Bias in revenue recognition would *least likely* be suspected if:
- A the firm engages in barter transactions.
 - B reported revenue is higher than the previous quarter.
 - C revenue is recognized before goods are shipped to customers.
- 22 Which technique *most likely* increases the cash flow provided by operations?
- A Stretching the accounts payable credit period
 - B Applying all non-cash discount amortization against interest capitalized
 - C Shifting classification of interest paid from financing to operating cash flows
- 23 Which of the following is an indication that a company may be recognizing revenue prematurely? Relative to its competitors, the company's:
- A asset turnover is decreasing.
 - B receivables turnover is increasing.
 - C days sales outstanding is increasing.
- 24 Which of the following would *most likely* signal that a company may be using aggressive accrual accounting policies to shift current expenses to later periods? Over the last five-year period, the ratio of cash flow to net income has:
- A increased each year.
 - B decreased each year.
 - C fluctuated from year to year.

SOLUTIONS

- 1 B is correct. Financial reporting quality pertains to the quality of information in financial reports. High-quality financial reporting provides decision-useful information, which is relevant and faithfully represents the economic reality of the company's activities. Earnings of high quality are sustainable and provide an adequate level of return. Highest-quality financial reports reflect both high financial reporting quality and high earnings quality.
- 2 C is correct. Financial reporting quality pertains to the quality of the information contained in financial reports. High-quality financial reports provide decision-useful information that faithfully represents the economic reality of the company. Low-quality financial reports impede assessment of earnings quality. Financial reporting quality is distinguishable from earnings quality, which pertains to the earnings and cash generated by the company's actual economic activities and the resulting financial condition. Low quality earnings are not sustainable and decrease company value.
- 3 B is correct. Financial reporting quality pertains to the quality of the information contained in financial reports. If financial reporting quality is low, the information provided is not useful to assess the company's performance. Financial reporting quality is distinguishable from earnings quality, which pertains to the earnings and cash generated by the company's actual economic activities and the resulting financial condition.
- 4 B is correct. Earnings quality pertains to the earnings and cash generated by the company's actual economic activities and the resulting financial condition. Low-quality earnings are likely not sustainable over time because the company does not expect to generate the same level of earnings in the future or because earnings will not generate sufficient return on investment to sustain the company in the future. Earnings that are not sustainable decrease company value. Earnings quality is distinguishable from financial reporting quality, which pertains to the quality of the information contained in financial reports.
- 5 A is correct. Earnings that result from non-recurring activities are unsustainable. Unsustainable earnings are an example of lower-quality earnings. Recognizing earnings that result from non-recurring activities is neither a biased accounting choice or indicative of lower quality financial reporting because it faithfully represents economic events.
- 6 B is correct. At the top of the quality spectrum of financial reports are reports that conform to GAAP, are decision useful, and have earnings that are sustainable and offer adequate returns. In other words, these reports have both high financial reporting quality and high earnings quality.
- 7 A is correct. Financial reports span a quality continuum from high to low based on decision-usefulness and earnings quality (see Exhibit 2 of the reading). The lowest-quality reports portray fictitious events, which may misrepresent the company's performance and/or obscure fraudulent misappropriation of the company's assets.
- 8 B is correct. High-quality financial reports offer useful information, meaningful information that is relevant and faithfully represents actual performance. Although low earnings quality may not be desirable, if the reported earnings are representative of actual performance, they are consistent with high-quality financial reporting. Highest-quality financial reports reflect both high financial reporting quality and high earnings quality.

- 9** B is correct. Aggressive accounting choices aim to enhance the company's reported performance by inflating the amount of revenues, earnings, and/or operating cash flow reported in the period. Consequently, the financial performance for the current period would most likely exhibit an upward bias.
- 10** C is correct. Accounting choices are considered conservative if they decrease the company's reported performance and financial position in the current period. Conservative choices may increase the amount of debt reported on the balance sheet. Conservative accounting choices may decrease the amount of revenues, earnings, and/or operating cash flow reported in the current period and increase those amounts in later periods.
- 11** A is correct. Managers often have incentives to meet or beat market expectations, particularly if management compensation is linked to increases in stock prices or to reported earnings.
- 12** B is correct. Managers may be motivated to understate earnings in the current period and increase the probability of meeting or exceeding the next period's earnings target.
- 13** C is correct. Typically, conditions of opportunity, motivation, and rationalization exist when individuals issue low-quality financial reports. Rationalization exists when an individual is concerned about a choice and needs to be able to justify it to herself or himself. If the manager is concerned about a choice in a financial reports, she or he may ask for other opinions to convince herself or himself that it is okay.
- 14** C is correct. In a period of strong financial performance, managers may pursue accounting choices that increase the probability of exceeding next period's earnings forecasts. By accelerating expense recognition or delaying revenue recognition, managers may increase earnings in the next period and increase the likelihood of exceeding next period's earnings targets.
- 15** B is correct. Motivation can result from pressure to meet some criteria for personal reasons, such as a bonus, or corporate reasons, such as concern about financing in the future. Poor internal controls and an inattentive board of directors offer opportunities to issue low-quality financial reports.
- 16** A is correct. The possibility of bond covenant violations may motivate managers to inflate earnings in the current period. By inflating earnings in the current period, the company may be able to avoid the consequences associated with violating bond covenants.
- 17** A is correct. Opportunities to issue low quality financial reports include internal conditions such as an ineffective board of directors and external conditions such as accounting standards that provide scope for divergent choices. Pressure to achieve some performance level and corporate concerns about financing in the future are examples of motivations to issue low-quality financial reports. Typically, three conditions exist when low-quality financial reports are issued: opportunity, motivation, and rationalization.
- 18** C is correct. An audit is intended to provide assurance that the company's financial reports are presented fairly, thus providing discipline regarding financial reporting quality. Regulatory agencies usually require that the financial statements of publicly traded companies be audited by an independent auditor to provide assurance that the financial statements conform to accounting standards. Privately held companies may also choose to obtain audit opinions either voluntarily or because an outside party requires it. An audit is not typically intended to detect fraud. An audit is based on sampling and it is possible that the sample might not reveal misstatements.

- 19** B is correct. If a company uses a non-GAAP financial measure in an SEC filing, it is required to provide the most directly comparable GAAP measure with equivalent prominence in the filing. In addition, the company is required to provide a reconciliation between the non-GAAP measure and the equivalent GAAP measure. Similarly, IFRS require that any non-IFRS measures included in financial reports must be defined and their potential relevance explained. The non-IFRS measures must be reconciled with IFRS measures.
- 20** B is correct. If a company wants to increase reported earnings, the company's managers may reduce the allowance for uncollected accounts and uncollected accounts expense reported in the period. Decreasing the useful life of depreciable assets would increase depreciation expense and decrease earnings in the current period. Classifying a purchase as an expense rather than a capital expenditure would decrease earnings in the current period. The use of accrual accounting may result in estimates included in financial reports, because all facts associated with events may not be known at the time of recognition. These estimates can be grounded in reality or can be managed by the company to present a desired financial picture.
- 21** B is correct. Bias in revenue recognition can lead to manipulation of information presented in financial reports. Addressing the question as to whether revenue is higher or lower than the previous period is not sufficient to determine if there is bias in revenue recognition. Additional analytical procedures must be performed to provide warning signals of accounting malfeasance. Barter transactions are difficult to value properly and may result in bias in revenue recognition. Policies that make it easier to prematurely recognize revenue, such as revenue being recognized before goods are shipped to customers, may be a warning sign of accounting malfeasance.
- 22** A is correct. Managers can temporarily show a higher cash flow from operations by stretching the accounts payable credit period. In other words, the managers delay payments until the next accounting period. Applying all non-cash discount amortization against interest capitalized causes reported interest expenses and operating cash outflow to be higher, resulting in a lower cash flow provided by operations. Shifting the classification of interest paid from financing to operating cash flows lowers the cash flow provided by operations.
- 23** C is correct. If a company's days sales outstanding (DSO) is increasing relative to competitors, this may be a signal that revenues are being recorded prematurely or are even fictitious. There are numerous analytical procedures that can be performed to provide evidence of manipulation of information in financial reporting. These warning signs are often linked to bias associated with revenue recognition and expense recognition policies.
- 24** B is correct. If the ratio of cash flow to net income for a company is consistently below 1 or has declined repeatedly over time, this may be a signal of manipulation of information in financial reports through aggressive accrual accounting policies. When net income is consistently higher than cash provided by operations, one possible explanation is that the company may be using aggressive accrual accounting policies to shift current expenses to later periods.

PRACTICE PROBLEMS

- 1 Projecting profit margins into the future on the basis of past results would be *most* reliable when the company:
 - A is in the commodities business.
 - B operates in a single business segment.
 - C is a large, diversified company operating in mature industries.
- 2 Galambos Corporation had an average receivables collection period of 19 days in 2003. Galambos has stated that it wants to decrease its collection period in 2004 to match the industry average of 15 days. Credit sales in 2003 were \$300 million, and analysts expect credit sales to increase to \$400 million in 2004. To achieve the company's goal of decreasing the collection period, the change in the average accounts receivable balance from 2003 to 2004 that must occur is *closest* to:
 - A -\$420,000.
 - B \$420,000.
 - C \$836,000.
- 3 Credit analysts are likely to consider which of the following in making a rating recommendation?
 - A Business risk but not financial risk
 - B Financial risk but not business risk
 - C Both business risk and financial risk
- 4 When screening for potential equity investments based on return on equity, to control risk, an analyst would be *most likely* to include a criterion that requires:
 - A positive net income.
 - B negative net income.
 - C negative shareholders' equity.
- 5 One concern when screening for stocks with low price-to-earnings ratios is that companies with low P/Es may be financially weak. What criterion might an analyst include to avoid inadvertently selecting weak companies?
 - A Net income less than zero
 - B Debt-to-total assets ratio below a certain cutoff point
 - C Current-year sales growth lower than prior-year sales growth
- 6 When a database eliminates companies that cease to exist because of a merger or bankruptcy, this can result in:
 - A look-ahead bias.
 - B back-testing bias.
 - C survivorship bias.
- 7 In a comprehensive financial analysis, financial statements should be:
 - A used as reported without adjustment.
 - B adjusted after completing ratio analysis.
 - C adjusted for differences in accounting standards, such as international financial reporting standards and US generally accepted accounting principles.

- 8** When comparing a US company that uses the last in, first out (LIFO) method of inventory with companies that prepare their financial statements under international financial reporting standards (IFRS), analysts should be aware that according to IFRS, the LIFO method of inventory:
- A** is never acceptable.
 - B** is always acceptable.
 - C** is acceptable when applied to finished goods inventory only.
- 9** An analyst is evaluating the balance sheet of a US company that uses last in, first out (LIFO) accounting for inventory. The analyst collects the following data:

	31 Dec 05	31 Dec 06
Inventory reported on balance sheet	\$500,000	\$600,000
LIFO reserve	\$ 50,000	\$70,000
Average tax rate	30%	30%

After adjusting the amounts to convert to the first in, first out (FIFO) method, inventory at 31 December 2006 would be closest to:

- A** \$600,000.
- B** \$620,000.
- C** \$670,000.

- 10** An analyst gathered the following data for a company (\$ millions):

	31 Dec 2000	31 Dec 2001
Gross investment in fixed assets	\$2.8	\$2.8
Accumulated depreciation	\$1.2	\$1.6

The average age and average depreciable life of the company's fixed assets at the end of 2001 are *closest* to:

	Average Age	Average Depreciable Life
A	1.75 years	7 years
B	1.75 years	14 years
C	4.00 years	7 years

- 11** To compute tangible book value, an analyst would
- A** add goodwill to stockholders' equity.
 - B** add all intangible assets to stockholders' equity.
 - C** subtract all intangible assets from stockholders' equity.
- 12** Which of the following is an off-balance-sheet financing technique? The use of
- A** capital leases.
 - B** operating leases.
 - C** the last in, first out inventory method.
- 13** To better evaluate the solvency of a company, an analyst would most likely add to total liabilities
- A** the present value of future capital lease payments.
 - B** the total amount of future operating lease payments.
 - C** the present value of future operating lease payments.

SOLUTIONS

- 1 C is correct. For a large, diversified company, margin changes in different business segments may offset each other. Furthermore, margins are most likely to be stable in mature industries.
- 2 C is correct. Accounts receivable turnover is equal to 365/19 (collection period in days) = 19.2 for 2003 and needs to equal 365/15 = 24.3 in 2004 for Galambos to meet its goal. Sales/turnover equals the accounts receivable balance. For 2003, $\$300,000,000/19.2 = \$15,625,000$, and for 2004, $\$400,000,000/24.3 = \$16,460,905$. The difference of \$835,905 is the increase in receivables needed for Galambos to achieve its goal.
- 3 C is correct. Credit analysts consider both business risk and financial risk.
- 4 A is correct. Requiring that net income be positive would eliminate companies that report a positive return on equity only because both net income and shareholders' equity are negative.
- 5 B is correct. A lower value of debt/total assets indicates greater financial strength. Requiring that a company's debt/total assets be below a certain cutoff point would allow the analyst to screen out highly leveraged and, therefore, potentially financially weak companies.
- 6 C is correct. Survivorship bias exists when companies that merge or go bankrupt are dropped from the database and only surviving companies remain. Look-ahead bias involves using updated financial information in back-testing that would not have been available at the time the decision was made. Back-testing involves testing models in prior periods and is not, itself, a bias.
- 7 C is correct. Financial statements should be adjusted for differences in accounting standards (as well as accounting and operating choices). These adjustments should be made prior to common-size and ratio analysis.
- 8 A is correct. LIFO is not permitted under IFRS.
- 9 C is correct. To convert LIFO inventory to FIFO inventory, the entire LIFO reserve must be added back: $\$600,000 + \$70,000 = \$670,000$.
- 10 C is correct. The company made no additions to or deletions from the fixed asset account during the year, so depreciation expense is equal to the difference in accumulated depreciation at the beginning of the year and the end of the year, or \$0.4 million. Average age is equal to accumulated depreciation/depreciation expense, or $\$1.6/\$0.4 = 4$ years. Average depreciable life is equal to ending gross investment/depreciation expense = $\$2.8/\$0.4 = 7$ years.
- 11 C is correct. Tangible book value removes all intangible assets, including goodwill, from the balance sheet.
- 12 B is correct. Operating leases can be used as an off-balance-sheet financing technique because neither the asset nor liability appears on the balance sheet. Inventory and capital leases are reported on the balance sheet.
- 13 C is correct. The present value of future operating lease payments would be added to total assets and total liabilities.

PRACTICE PROBLEMS

- 1** Given the following cash flows for a capital project, calculate the NPV and IRR. The required rate of return is 8 percent.

Year	0	1	2	3	4	5
Cash flow	-50,000	15,000	15,000	20,000	10,000	5,000

	NPV	IRR
A	\$1,905	10.9%
B	\$1,905	26.0%
C	\$3,379	10.9%

- 2** Given the following cash flows for a capital project, calculate its payback period and discounted payback period. The required rate of return is 8 percent.

Year	0	1	2	3	4	5
Cash flow	-50,000	15,000	15,000	20,000	10,000	5,000

The discounted payback period is:

- A 0.16 years longer than the payback period.
 - B 0.51 years longer than the payback period.
 - C 1.01 years longer than the payback period.
- 3** An investment of \$100 generates after-tax cash flows of \$40 in Year 1, \$80 in Year 2, and \$120 in Year 3. The required rate of return is 20 percent. The net present value is closest to:
- A \$42.22.
 - B \$58.33.
 - C \$68.52.
- 4** An investment of \$150,000 is expected to generate an after-tax cash flow of \$100,000 in one year and another \$120,000 in two years. The cost of capital is 10 percent. What is the internal rate of return?
- A 28.39 percent.
 - B 28.59 percent.
 - C 28.79 percent.
- 5** Kim Corporation is considering an investment of 750 million won with expected after-tax cash inflows of 175 million won per year for seven years. The required rate of return is 10 percent. What is the project's:

	NPV?	IRR?
A	102 million won	14.0%
B	157 million won	23.3%
C	193 million won	10.0%

- 6 Kim Corporation is considering an investment of 750 million won with expected after-tax cash inflows of 175 million won per year for seven years. The required rate of return is 10 percent. Expressed in years, the project's payback period and discounted payback period, respectively, are *closest* to:
- A 4.3 years and 5.4 years.
B 4.3 years and 5.9 years.
C 4.8 years and 6.3 years.
- 7 An investment of \$20,000 will create a perpetual after-tax cash flow of \$2,000. The required rate of return is 8 percent. What is the investment's profitability index?
- A 1.08.
B 1.16.
C 1.25.
- 8 Hermann Corporation is considering an investment of €375 million with expected after-tax cash inflows of €115 million per year for seven years and an additional after-tax salvage value of €50 million in Year 7. The required rate of return is 10 percent. What is the investment's PI?
- A 1.19.
B 1.33.
C 1.56.
- 9 Erin Chou is reviewing a profitable investment project that has a conventional cash flow pattern. If the cash flows for the project, initial outlay, and future after-tax cash flows all double, Chou would predict that the IRR would:
- A increase and the NPV would increase.
B stay the same and the NPV would increase.
C stay the same and the NPV would stay the same.
- 10 Shirley Shea has evaluated an investment proposal and found that its payback period is one year, it has a negative NPV, and it has a positive IRR. Is this combination of results possible?
- A Yes.
B No, because a project with a positive IRR has a positive NPV.
C No, because a project with such a rapid payback period has a positive NPV.
- 11 An investment has an outlay of 100 and after-tax cash flows of 40 annually for four years. A project enhancement increases the outlay by 15 and the annual after-tax cash flows by 5. As a result, the vertical intercept of the NPV profile of the enhanced project shifts:
- A up and the horizontal intercept shifts left.
B up and the horizontal intercept shifts right.
C down and the horizontal intercept shifts left.
- 12 Projects 1 and 2 have similar outlays, although the patterns of future cash flows are different. The cash flows as well as the NPV and IRR for the two projects are shown below. For both projects, the required rate of return is 10 percent.

Year	Cash Flows					NPV	IRR (%)
	0	1	2	3	4		
Project 1	-50	20	20	20	20	13.40	21.86
Project 2	-50	0	0	0	100	18.30	18.92

The two projects are mutually exclusive. What is the appropriate investment decision?

- A Invest in both projects.
 - B Invest in Project 1 because it has the higher IRR.
 - C Invest in Project 2 because it has the higher NPV.
- 13 Consider the two projects below. The cash flows as well as the NPV and IRR for the two projects are given. For both projects, the required rate of return is 10 percent.

Year	Cash Flows					NPV	IRR (%)
	0	1	2	3	4		
Project 1	-100	36	36	36	36	14.12	16.37
Project 2	-100	0	0	0	175	19.53	15.02

What discount rate would result in the same NPV for both projects?

- A A rate between 0.00 percent and 10.00 percent.
 - B A rate between 10.00 percent and 15.02 percent.
 - C A rate between 15.02 percent and 16.37 percent.
- 14 Wilson Flannery is concerned that this project has multiple IRRs.

Year	0	1	2	3
Cash flows	-50	100	0	-50

How many discount rates produce a zero NPV for this project?

- A One, a discount rate of 0 percent.
 - B Two, discount rates of 0 percent and 32 percent.
 - C Two, discount rates of 0 percent and 62 percent.
- 15 With regard to the net present value (NPV) profiles of two projects, the cross-over rate is *best* described as the discount rate at which:
- A two projects have the same NPV.
 - B two projects have the same internal rate of return.
 - C a project's NPV changes from positive to negative.
- 16 With regard to net present value (NPV) profiles, the point at which a profile crosses the vertical axis is *best* described as:
- A the point at which two projects have the same NPV.
 - B the sum of the undiscounted cash flows from a project.
 - C a project's internal rate of return when the project's NPV is equal to zero.
- 17 With regard to net present value (NPV) profiles, the point at which a profile crosses the horizontal axis is *best* described as:
- A the point at which two projects have the same NPV.
 - B the sum of the undiscounted cash flows from a project.
 - C a project's internal rate of return when the project's NPV is equal to zero.
- 18 With regard to capital budgeting, an appropriate estimate of the incremental cash flows from a project is *least likely* to include:
- A externalities.
 - B interest costs.
 - C opportunity costs.

SOLUTIONS

- 1** C is correct.

$$NPV = -50,000 + \frac{15,000}{1.08} + \frac{15,000}{1.08^2} + \frac{20,000}{1.08^3} + \frac{10,000}{1.08^4} + \frac{5,000}{1.08^5}$$

$$NPV = -50,000 + 13,888.89 + 12,860.08 + 15,876.64 + 7,350.30 \\ + 3,402.92$$

$$NPV = -50,000 + 53,378.83 = 3,378.83$$

The IRR, found with a financial calculator, is 10.88 percent.

- 2** C is correct.

Year	0	1	2	3	4	5
Cash flow	-50,000	15,000	15,000	20,000	10,000	5,000
Cumulative cash flow	-50,000	-35,000	-20,000	0	10,000	15,000
Discounted cash flow	-50,000	13,888.89	12,860.08	15,876.64	7,350.30	3,402.92
Cumulative DCF	-50,000	-36,111.11	-23,251.03	-7,374.38	-24.09	3,378.83

As the table shows, the cumulative cash flow offsets the initial investment in exactly three years. The payback period is 3.00 years. The discounted payback period is between four and five years. The discounted payback period is 4 years plus $24.09/3,402.92 = 0.007$ of the fifth year cash flow, or $4.007 = 4.01$ years. The discounted payback period is $4.01 - 3.00 = 1.01$ years longer than the payback period.

- 3** B is correct.

$$NPV = \sum_{t=0}^3 \frac{CF_t}{(1+r)^t} = -100 + \frac{40}{1.20} + \frac{80}{1.20^2} + \frac{120}{1.20^3} = \$58.33$$

- 4** C is correct. The IRR can be found using a financial calculator or with trial and error. Using trial and error, the total PV is equal to zero if the discount rate is 28.79 percent.

Year	Cash Flow	Present Value			
		28.19%	28.39%	28.59%	28.79%
0	-150,000	-150,000	-150,000	-150,000	-150,000
1	100,000	78,009	77,888	77,767	77,646
2	120,000	73,025	72,798	72,572	72,346
Total		1,034	686	338	-8

A more precise IRR of 28.7854 percent has a total PV closer to zero.

- 5** A is correct.

$$\text{The NPV} = -750 + \sum_{t=1}^7 \frac{175}{1.10^t} = -750 + 851.97 = 101.97 \text{ million won.}$$

The IRR, found with a financial calculator, is 14.02 percent. (The PV is -750, N = 7, and PMT = 175.)

- 6** B is correct.

Year	0	1	2	3	4	5	6	7
Cash flow	-750	175	175	175	175	175	175	175
Cumulative cash flow	-750	-575	-400	-225	-50	125	300	475

The payback period is between four and five years. The payback period is four years plus $50/175 = 0.29$ of the fifth year cash flow, or 4.29 years.

Year	0	1	2	3	4	5	6	7
Cash flow	-750	175	175	175	175	175	175	175
Discounted cash flow	-750	159.09	144.63	131.48	119.53	108.66	98.78	89.80
Cumulative DCF	-750	-590.91	-446.28	-314.80	-195.27	-86.61	12.17	101.97

The discounted payback period is between five and six years. The discounted payback period is five years plus $86.61/98.78 = 0.88$ of the sixth year cash flow, or 5.88 years.

- 7 C is correct.

$$\text{The present value of future cash flows is } PV = \frac{2,000}{0.08} = 25,000$$

$$\text{The profitability index is } PI = \frac{PV}{\text{Investment}} = \frac{25,000}{20,000} = 1.25$$

- 8 C is correct.

$$PV = \sum_{t=1}^7 \frac{115}{1.10^t} + \frac{50}{1.10^7} = 585.53 \text{ million euros}$$

$$PI = \frac{585.53}{375} = 1.56$$

- 9 B is correct. The IRR would stay the same because both the initial outlay and the after-tax cash flows double, so that the return on each dollar invested remains the same. All of the cash flows and their present values double. The difference between total present value of the future cash flows and the initial outlay (the NPV) also doubles.
- 10 A is correct. If the cumulative cash flow in one year equals the outlay and additional cash flows are not very large, this scenario is possible. For example, assume the outlay is 100, the cash flow in Year 1 is 100 and the cash flow in Year 2 is 5. The required return is 10 percent. This project would have a payback of 1.0 years, an NPV of -4.96, and an IRR of 4.77 percent.
- 11 A is correct. The vertical intercept changes from 60 to 65 (NPV when cost of capital is 0%), and the horizontal intercept (IRR, when NPV equals zero) changes from 21.86 percent to 20.68 percent.
- 12 C is correct. When valuing mutually exclusive projects, the decision should be made with the NPV method because this method uses the most realistic discount rate, namely the opportunity cost of funds. In this example, the reinvestment rate for the NPV method (here 10 percent) is more realistic than the reinvestment rate for the IRR method (here 21.86 percent or 18.92 percent).
- 13 B is correct. For these projects, a discount rate of 13.16 percent would yield the same NPV for both (an NPV of 6.73).
- 14 C is correct. Discount rates of 0 percent and approximately 61.8 percent both give a zero NPV.

Rate	0%	20%	40%	60%	61.8%	80%	100%
NPV	0.00	4.40	3.21	0.29	0.00	-3.02	-6.25

- 15** A is correct. The crossover rate is the discount rate at which the NPV profiles for two projects cross; it is the only point where the NPVs of the projects are the same.
- 16** B is correct. The vertical axis represents a discount rate of zero. The point where the profile crosses the vertical axis is simply the sum of the cash flows.
- 17** C is correct. The horizontal axis represents an NPV of zero. By definition, the project's IRR equals an NPV of zero.
- 18** B is correct. Costs to finance the project are taken into account when the cash flows are discounted at the appropriate cost of capital; including interest costs in the cash flows would result in double-counting the cost of debt.

PRACTICE PROBLEMS

- 1 The cost of equity is equal to the:
 - A expected market return.
 - B rate of return required by stockholders.
 - C cost of retained earnings plus dividends.
- 2 Which of the following statements is correct?
 - A The appropriate tax rate to use in the adjustment of the before-tax cost of debt to determine the after-tax cost of debt is the average tax rate because interest is deductible against the company's entire taxable income.
 - B For a given company, the after-tax cost of debt is generally less than both the cost of preferred equity and the cost of common equity.
 - C For a given company, the investment opportunity schedule is upward sloping because as a company invests more in capital projects, the returns from investing increase.
- 3 Using the dividend discount model, what is the cost of equity capital for Zeller Mining if the company will pay a dividend of C\$2.30 next year, has a payout ratio of 30 percent, a return on equity (ROE) of 15 percent, and a stock price of C\$45?
 - A 9.61 percent.
 - B 10.50 percent.
 - C 15.61 percent.
- 4 Dot.Com has determined that it could issue \$1,000 face value bonds with an 8 percent coupon paid semi-annually and a five-year maturity at \$900 per bond. If Dot.Com's marginal tax rate is 38 percent, its after-tax cost of debt is *closest* to:
 - A 6.2 percent.
 - B 6.4 percent.
 - C 6.6 percent.
- 5 The cost of debt can be determined using the yield-to-maturity and the bond rating approaches. If the bond rating approach is used, the:
 - A coupon is the yield.
 - B yield is based on the interest coverage ratio.
 - C company is rated and the rating can be used to assess the credit default spread of the company's debt.
- 6 Morgan Insurance Ltd. issued a fixed-rate perpetual preferred stock three years ago and placed it privately with institutional investors. The stock was issued at \$25 per share with a \$1.75 dividend. If the company were to issue preferred stock today, the yield would be 6.5 percent. The stock's current value is:
 - A \$25.00.
 - B \$26.92.
 - C \$37.31.
- 7 A financial analyst at Buckco Ltd. wants to compute the company's weighted average cost of capital (WACC) using the dividend discount model. The analyst has gathered the following data:

Before-tax cost of new debt	8 percent
Tax rate	40 percent
Target debt-to-equity ratio	0.8033
Stock price	\$30
Next year's dividend	\$1.50
Estimated growth rate	7 percent

Buckco's WACC is *closest* to:

- A 8 percent.
 - B 9 percent.
 - C 12 percent.
- 8 The Gearing Company has an after-tax cost of debt capital of 4 percent, a cost of preferred stock of 8 percent, a cost of equity capital of 10 percent, and a weighted average cost of capital of 7 percent. Gearing intends to maintain its current capital structure as it raises additional capital. In making its capital-budgeting decisions for the average-risk project, the relevant cost of capital is:
- A 4 percent.
 - B 7 percent.
 - C 8 percent.
- 9 Fran McClure of Alba Advisers is estimating the cost of capital of Frontier Corporation as part of her valuation analysis of Frontier. McClure will be using this estimate, along with projected cash flows from Frontier's new projects, to estimate the effect of these new projects on the value of Frontier. McClure has gathered the following information on Frontier Corporation:

	Forecasted for Current Year (\$)	Forecasted for Next Year (\$)
Book value of debt	50	50
Market value of debt	62	63
Book value of shareholders' equity	55	58
Market value of shareholders' equity	210	220

The weights that McClure should apply in estimating Frontier's cost of capital for debt and equity are, respectively:

- A $w_d = 0.200; w_e = 0.800$.
 - B $w_d = 0.185; w_e = 0.815$.
 - C $w_d = 0.223; w_e = 0.777$.
- 10 Wang Securities had a long-term stable debt-to-equity ratio of 0.65. Recent bank borrowing for expansion into South America raised the ratio to 0.75. The increased leverage has what effect on the asset beta and equity beta of the company?
- A The asset beta and the equity beta will both rise.
 - B The asset beta will remain the same and the equity beta will rise.
 - C The asset beta will remain the same and the equity beta will decline.
- 11 Brandon Wiene is a financial analyst covering the beverage industry. He is evaluating the impact of DEF Beverage's new product line of flavored waters. DEF currently has a debt-to-equity ratio of 0.6. The new product line would be financed with \$50 million of debt and \$100 million of equity. In estimating the valuation impact of this new product line on DEF's value, Wiene has estimated

the equity beta and asset beta of comparable companies. In calculating the equity beta for the product line, Wiene is intending to use DEF's existing capital structure when converting the asset beta into a project beta. Which of the following statements is correct?

- A Using DEF's debt-to-equity ratio of 0.6 is appropriate in calculating the new product line's equity beta.
 - B Using DEF's debt-to-equity ratio of 0.6 is not appropriate, but rather the debt-to-equity ratio of the new product, 0.5, is appropriate to use in calculating the new product line's equity beta.
 - C Wiene should use the new debt-to-equity ratio of DEF that would result from the additional \$50 million debt and \$100 million equity in calculating the new product line's equity beta.
- 12 Trumpit Resorts Company currently has 1.2 million common shares of stock outstanding and the stock has a beta of 2.2. It also has \$10 million face value of bonds that have five years remaining to maturity and 8 percent coupon with semi-annual payments, and are priced to yield 13.65 percent. If Trumpit issues up to \$2.5 million of new bonds, the bonds will be priced at par and have a yield of 13.65 percent; if it issues bonds beyond \$2.5 million, the expected yield on the entire issuance will be 16 percent. Trumpit has learned that it can issue new common stock at \$10 a share. The current risk-free rate of interest is 3 percent and the expected market return is 10 percent. Trumpit's marginal tax rate is 30 percent. If Trumpit raises \$7.5 million of new capital while maintaining the same debt-to-equity ratio, its weighted average cost of capital is *closest* to:
- A 14.5 percent.
 - B 15.5 percent.
 - C 16.5 percent.

The following information relates to Questions

13–18¹

Jurgen Knudsen has been hired to provide industry expertise to Henrik Sandell, CFA, an analyst for a pension plan managing a global large-cap fund internally. Sandell is concerned about one of the fund's larger holdings, auto parts manufacturer Kruspa AB. Kruspa currently operates in 80 countries, with the previous year's global revenues at €5.6 billion. Recently, Kruspa's CFO announced plans for expansion into China. Sandell worries that this expansion will change the company's risk profile and wonders if he should recommend a sale of the position.

Sandell provides Knudsen with the basic information. Kruspa's global annual free cash flow to the firm is €500 million and earnings are €400 million. Sandell estimates that cash flow will level off at a 2 percent rate of growth. Sandell also estimates that Kruspa's after-tax free cash flow to the firm on the China project for next three years is, respectively, €48 million, €52 million, and €54.4 million. Kruspa recently announced a dividend of €4.00 per share of stock. For the initial analysis, Sandell requests that Knudsen ignore possible currency fluctuations. He expects the Chinese plant to sell only to customers within China for the first three years. Knudsen is asked to evaluate Kruspa's planned financing of the required €100 million with a €80 public offering of 10-year debt in Sweden and the remainder with an equity offering.

¹ The Level I exam uses only independent questions. This minicase is intended as a learning exercise.

Additional information:

Equity risk premium, Sweden	4.82 percent
Risk-free rate of interest, Sweden	4.25 percent
Industry debt-to-equity ratio	0.3
Market value of Kruspa's debt	€900 million
Market value of Kruspa's equity	€2.4 billion
Kruspa's equity beta	1.3
Kruspa's before-tax cost of debt	9.25 percent
China credit A2 country risk premium	1.88 percent
Corporate tax rate	37.5 percent
Interest payments each year	Level

- 13** Using the capital asset pricing model, Kruspa's cost of equity capital for its typical project is *closest* to:
- A 7.62 percent.
B 10.52 percent.
C 12.40 percent.
- 14** Sandell is interested in the weighted average cost of capital of Kruspa AB prior to its investing in the China project. This weighted average cost of capital (WACC) is *closest* to:
- A 7.65 percent.
B 9.23 percent.
C 10.17 percent.
- 15** In his estimation of the project's cost of capital, Sandell would like to use the asset beta of Kruspa as a base in his calculations. The estimated asset beta of Kruspa prior to the China project is *closest* to:
- A 1.053.
B 1.110.
C 1.327.
- 16** Sandell is performing a sensitivity analysis of the effect of the new project on the company's cost of capital. If the China project has the same asset risk as Kruspa, the estimated project beta for the China project, if it is financed 80 percent with debt, is *closest* to:
- A 1.300.
B 2.635.
C 3.686.
- 17** As part of the sensitivity analysis of the effect of the new project on the company's cost of capital, Sandell is estimating the cost of equity of the China project considering that the China project requires a country equity premium to capture the risk of the project. The cost of equity for the project in this case is *closest* to:
- A 10.52 percent.
B 19.91 percent.
C 28.95 percent.

- 18** In his report, Sandell would like to discuss the sensitivity of the project's net present value to the estimation of the cost of equity. The China project's net present value calculated using the equity beta without and with the country risk premium are, respectively:
- A €26 million and €24 million.
 B €28 million and €25 million.
 C €30 million and €27 million.
-

The following information relates to Questions 19–22²

Boris Duarte, CFA, covers initial public offerings for Zellweger Analytics, an independent research firm specializing in global small-cap equities. He has been asked to evaluate the upcoming new issue of TagOn, a US-based business intelligence software company. The industry has grown at 26 percent per year for the previous three years. Large companies dominate the market, but sizable “pure-play” companies such as Relevant, Ltd., ABJ, Inc., and Opus Software Pvt. Ltd also compete. Each of these competitors is domiciled in a different country, but they all have shares of stock that trade on the US NASDAQ. The debt ratio of the industry has risen slightly in recent years.

Company	Sales in Millions (\$)	Market Value Equity in Millions (\$)	Market Value Debt in Millions (\$)	Equity Beta	Tax Rate	Share Price (\$)
Relevant Ltd.	752	3,800	0.0	1.702	23 percent	42
ABJ, Inc.	843	2,150	6.5	2.800	23 percent	24
Opus Software Pvt. Ltd.	211	972	13.0	3.400	23 percent	13

Duarte uses the information from the preliminary prospectus for TagOn's initial offering. The company intends to issue 1 million new shares. In his conversation with the investment bankers for the deal, he concludes the offering price will be between \$7 and \$12. The current capital structure of TagOn consists of a \$2.4 million five-year non-callable bond issue and 1 million common shares. Other information that Duarte has gathered:

Currently outstanding bonds	\$2.4 million five-year bonds, coupon of 12.5 percent, with a market value of \$2.156 million
Risk-free rate of interest	5.25 percent
Estimated equity risk premium	7 percent
Tax rate	23 percent

- 19** The asset betas for Relevant, ABJ, and Opus, respectively, are:
- A 1.70, 2.52, and 2.73.
 B 1.70, 2.79, and 3.37.
 C 1.70, 2.81, and 3.44.

² The Level I exam uses only independent questions. This minicase is intended as a learning exercise.

- 20 The average asset beta for the pure players in this industry, Relevant, ABJ, and Opus, weighted by market value of equity is *closest* to:
- A 1.67.
 - B 1.97.
 - C 2.27.
- 21 Using the capital asset pricing model, the cost of equity capital for a company in this industry with a debt-to-equity ratio of 0.01, asset beta of 2.27, and a marginal tax rate of 23 percent is *closest* to:
- A 17 percent.
 - B 21 percent.
 - C 24 percent.
- 22 The marginal cost of capital for TagOn, based on an average asset beta of 2.27 for the industry and assuming that new stock can be issued at \$8 per share, is *closest* to:
- A 20.5 percent.
 - B 21.0 percent.
 - C 21.5 percent.

-
- 23 Two years ago, a company issued \$20 million in long-term bonds at par value with a coupon rate of 9 percent. The company has decided to issue an additional \$20 million in bonds and expects the new issue to be priced at par value with a coupon rate of 7 percent. The company has no other debt outstanding and has a tax rate of 40 percent. To compute the company's weighted average cost of capital, the appropriate after-tax cost of debt is *closest* to:
- A 4.2%.
 - B 4.8%.
 - C 5.4%.

- 24 An analyst gathered the following information about a company and the market:
-

Current market price per share of common stock	\$28.00
Most recent dividend per share paid on common stock (D_0)	\$2.00
Expected dividend payout rate	40%
Expected return on equity (ROE)	15%
Beta for the common stock	1.3
Expected rate of return on the market portfolio	13%
Risk-free rate of return	4%

Using the discounted cash flow (DCF) approach, the cost of retained earnings for the company is *closest* to:

- A 15.7%.
 - B 16.1%.
 - C 16.8%.
- 25 An analyst gathered the following information about a company and the market:

Current market price per share of common stock	\$28.00
Most recent dividend per share paid on common stock (D_0)	\$2.00
Expected dividend payout rate	40%
Expected return on equity (ROE)	15%
Beta for the common stock	1.3
Expected rate of return on the market portfolio	13%
Risk-free rate of return	4%

Using the Capital Asset Pricing Model (CAPM) approach, the cost of retained earnings for the company is *closest* to:

- A 13.6%.
- B 15.7%.
- C 16.1%.

- 26 An analyst gathered the following information about a private company and its publicly traded competitor:

Comparable Companies	Tax Rate (%)	Debt/Equity	Equity Beta
Private company	30.0	1.00	N.A.
Public company	35.0	0.90	1.75

Using the pure-play method, the estimated equity beta for the private company is *closest* to:

- A 1.029.
- B 1.104.
- C 1.877.

- 27 An analyst gathered the following information about the capital markets in the United States and in Paragon, a developing country.

Selected Market Information (%)	
Yield on US 10-year Treasury bond	4.5
Yield on Paragon 10-year government bond	10.5
Annualized standard deviation of Paragon stock index	35.0
Annualized standard deviation of Paragon dollar-denominated government bond	25.0

Based on the analyst's data, the estimated country equity premium for Paragon is *closest* to:

- A 4.29%.
- B 6.00%.
- C 8.40%.

SOLUTIONS

- 1 B is correct. The cost of equity is defined as the rate of return required by stockholders.
- 2 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.
- 3 C is correct. First calculate the growth rate using the sustainable growth calculation, and then calculate the cost of equity using the rearranged dividend discount model:

$$g = (1 - \text{Dividend payout ratio})(\text{Return on equity}) = (1 - 0.30)(15\%) = 10.5\%$$

$$r_e = (D_1 / P_0) + g = (\$2.30 / \$45) + 10.50\% = 15.61\%$$

- 4 C is correct. $FV = \$1,000$; $PMT = \$40$; $N = 10$; $PV = \$900$

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

$$\text{YTM} = 5.3149\% \times 2 = 10.62985\%$$

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

- 5 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.
- 6 B is correct. The company can issue preferred stock at 6.5%.

$$P_p = \$1.75 / 0.065 = \$26.92$$

- 7 B is correct.

$$\text{Cost of equity} = D_1 / P_0 + g = \$1.50 / \$30 + 7\% = 5\% + 7\% = 12\%$$

$$D/(D + E) = 0.8033 / 1.8033 = 0.445$$

$$\text{WACC} = [(0.445)(0.08)(1 - 0.4)] + [(0.555)(0.12)] = 8.8\%$$

- 8 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.

- 9 C is correct.

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

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

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

- 11 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.

- 12 B is correct.

Capital structure:

Market value of debt: $FV = \$10,000,000$, $PMT = \$400,000$, $N = 10$,

$I/YR = 13.65\%$. Solving for PV gives the answer \$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 \text{ million} \times 40\% = \3.0 million in bonds, which results in a before-tax rate of 16 percent.

$$r_d(1 - t) = 0.16(1 - 0.3) = 0.112 \text{ or } 11.2\%$$

$$r_e = 0.03 + 2.2 (0.10 - 0.03) = 0.184 \text{ or } 18.4\%$$

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

13 B is correct.

$$r_e = 0.0425 + (1.3)(0.0482) = 0.1052 \text{ or } 10.52\%$$

14 B is correct.

$$\begin{aligned} \text{WACC} &= [(\text{€}900/\text{€}3300) .0925 (1 - 0.375)] + [(\text{€}2400/\text{€}3300)(0.1052)] \\ &= 0.0923 \text{ or } 9.23\% \end{aligned}$$

15 A is correct.

$$\text{Asset beta} = \text{Unlevered beta} = 1.3/(1 + [(1 - 0.375)(\text{€}900/\text{€}2400)]) = 1.053$$

16 C is correct.

$$\text{Project beta} = 1.053 \{1 + [(1 - 0.375)(\text{€}80/\text{€}20)]\} = 1.053 \{3.5\} = 3.686$$

17 C is correct.

$$r_e = 0.0425 + 3.686(0.0482 + 0.0188) = 0.2895 \text{ or } 28.95\%$$

18 C is correct.

Cost of equity without the country risk premium:

$$r_e = 0.0425 + 3.686 (0.0482) = 0.2202 \text{ or } 22.02\%$$

Cost of equity with the country risk premium:

$$r_e = 0.0425 + 3.686 (0.0482 + 0.0188) = 0.2895 \text{ or } 28.95\%$$

Weighted average cost of capital without the country risk premium:

$$\begin{aligned} \text{WACC} &= [0.80 (0.0925) (1 - 0.375)] + [0.20 (0.2202)] = 0.04625 + 0.04404 \\ &= 0.09038 \text{ or } 9.03 \text{ percent} \end{aligned}$$

Weighted average cost of capital with the country risk premium:

$$\begin{aligned} \text{WACC} &= [0.80 (0.0925) (1 - 0.375)] + [0.20 (0.2895)] = 0.04625 + 0.0579 \\ &= 0.1042 \text{ or } 10.42 \text{ percent} \end{aligned}$$

NPV without the country risk premium:

$$\begin{aligned} \text{NPV} &= \frac{\text{€}48 \text{ million}}{(1 + 0.0903)^1} + \frac{\text{€}52 \text{ million}}{(1 + 0.0903)^2} + \frac{\text{€}54.4 \text{ million}}{(1 + 0.0903)^3} - \text{€}100 \text{ million} \\ &= \text{€}44.03 \text{ million} + 43.74 \text{ million} + 41.97 \text{ million} - \text{€}100 \text{ million} \\ &= \text{€}29.74 \text{ million} \end{aligned}$$

NPV with the country risk premium:

$$\begin{aligned} \text{NPV} &= \frac{\text{€48 million}}{(1 + 0.1042)^1} + \frac{\text{€52 million}}{(1 + 0.1042)^2} + \frac{\text{€54.4 million}}{(1 + 0.1042)^3} - \text{€100 million} \\ &= \text{€43.47 million} + 42.65 \text{ million} + 40.41 \text{ million} - \text{€100 million} \\ &= \text{€26.53 million} \end{aligned}$$

19 B is correct.

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

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

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

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

20 C is correct.

Weights are determined based on relative market values:

Pure-Play	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 $(0.5490)(1.702) + (0.3106)(2.7918) + (0.1404)(3.3572)$
 $= 2.27$.

21 B is correct.

Asset beta = 2.27

Levered beta = $2.27 \{1 + [(1 - 0.23)(0.01)]\} = 2.2875$

Cost of equity capital = $0.0525 + (2.2875)(0.07) = 0.2126$ or 21.26%

22 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 = $0.0525 + 2.5055 (0.07) = 0.2279$ or 22.79%

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

Equity weight = $\$16/\$18.156 = 0.8813$

$$\begin{aligned}\text{TagOn's MCC} &= [(0.1187)(0.155)(1 - 0.23)] + [(0.8813)(0.2279)] \\ &= 0.01417 + 0.20083 \\ &= 0.2150 \text{ or } 21.50\%\end{aligned}$$

- 23** 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 on a comparable outstanding. After adjusting for tax, the after-tax cost is $7(1 - 0.4) = 7(0.6) = 4.2\%$.
- 24** C is correct. The expected return is the sum of the expected dividend yield plus expected growth. The expected growth is $(1 - 0.4)15\% = 9\%$. The expected dividend yield is $\$2.18/\$28 = 7.8\%$. The sum is 16.8% .
- 25** B is correct. Using the CAPM approach, $4\% + 1.3(9\%) = 15.7\%$.
- 26** C is correct. Inferring the asset beta for the public company: unlevered beta = $1.75/[1 + (1 - 0.35)(0.90)] = 1.104$. Relevering to reflect the target debt ratio of the private firm: levered beta = $1.104 \times [1 + (1 - 0.30)(1.00)] = 1.877$.
- 27** C is correct. The country equity premium can be estimated as the sovereign yield spread times the volatility of the country's stock market relative to its bond market. Paragon's equity premium is $(10.5\% - 4.5\%) \times (35\%/25\%) = 6\% \times 1.4 = 8.40\%$.

PRACTICE PROBLEMS

- 1 If two companies have identical unit sales volume and operating risk, they are *most likely* to also have identical:
 - A sales risk.
 - B business risk.
 - C sensitivity of operating earnings to changes in the number of units produced and sold.
- 2 Degree of operating leverage is *best* described as a measure of the sensitivity of:
 - A net earnings to changes in sales.
 - B fixed operating costs to changes in variable costs.
 - C operating earnings to changes in the number of units produced and sold.
- 3 The Fulcrum Company produces decorative swivel platforms for home televisions. If Fulcrum produces 40 million units, it estimates that it can sell them for \$100 each. Variable production costs are \$65 per unit and fixed production costs are \$1.05 billion. Which of the following statements is *most accurate*? Holding all else constant, the Fulcrum Company would:
 - A generate positive operating income if unit sales were 25 million.
 - B have less operating leverage if fixed production costs were 10 percent greater than \$1.05 billion.
 - C generate 20 percent more operating income if unit sales were 5 percent greater than 40 million.
- 4 The business risk of a particular company is *most accurately* measured by the company's:
 - A debt-to-equity ratio.
 - B efficiency in using assets to generate sales.
 - C operating leverage and level of uncertainty about demand, output prices, and competition.
- 5 Consider two companies that operate in the same line of business and have the same degree of operating leverage: the Basic Company and the Grundlegend Company. The Basic Company and the Grundlegend Company have, respectively, no debt and 50 percent debt in their capital structure. Which of the following statements is *most accurate*? Compared to the Basic Company, the Grundlegend Company has:
 - A a lower sensitivity of net income to changes in unit sales.
 - B the same sensitivity of operating income to changes in unit sales.
 - C the same sensitivity of net income to changes in operating income.
- 6 Myundai Motors now sells 1 million units at ₩3,529 per unit. Fixed operating costs are ₩1,290 million and variable operating costs are ₩1,500 per unit. If the company pays ₩410 million in interest, the levels of sales at the operating breakeven and breakeven points are, respectively:
 - A ₩1,500,000,000 and ₩2,257,612,900.
 - B ₩2,243,671,760 and ₩2,956,776,737.
 - C ₩2,975,148,800 and ₩3,529,000,000.

- 7 Juan Alavaca is evaluating the risk of two companies in the machinery industry: The Gearing Company and Hebelkraft, Inc. Alavaca used the latest fiscal year's financial statements and interviews with managers of the respective companies to gather the following information:

	The Gearing Company	Hebelkraft, Inc.
Number of units produced and sold	1 million	1.5 million
Sales price per unit	\$200	\$200
Variable cost per unit	\$120	\$100
Fixed operating cost	\$40 million	\$90 million
Fixed financing expense	\$20 million	\$20 million

Based on this information, the break-even points for The Gearing Company and Hebelkraft, Inc. are:

- A 0.75 million and 1.1 million units, respectively.
- B 1 million and 1.5 million units, respectively.
- C 1.5 million and 0.75 million units, respectively.

The following information relates to Questions 8–16

Mary Benn, CFA, is a financial analyst for Twin Fields Investments, located in Storrs, Connecticut, USA. She has been asked by her supervisor, Bill Cho, to examine two small Japanese cell phone component manufacturers: 4G, Inc. and Qphone Corp. Cho indicates that his clients are most interested in the use of leverage by 4G and Qphone. Benn states, "I will have to specifically analyze each company's respective business risk, sales risk, operating risk, and financial risk." "Fine, I'll check back with you shortly," Cho, answers.

Benn begins her analysis by examining the sales prospects of the two firms. The results of her sales analysis appear in Exhibit 1. She also expects very little price variability for these cell phones. She next gathers more data on these two companies to assist her analysis of their operating and financial risk.

When Cho inquires as to her progress Benn responds, "I have calculated Qphone's degree of operating leverage (DOL) and degree of financial leverage (DFL) at Qphone's 2009 level of unit sales. I have also calculated Qphone's break-even level for unit sales. I will have 4G's leverage results shortly."

Cho responds, "Good, I will call a meeting of some potential investors for tomorrow. Please help me explain these concepts to them, and the differences in use of leverage by these two companies. In preparation for the meeting, I have a number of questions":

- "You mentioned business risk; what is included in that?"
- "How would you classify the risk due to the varying mix of variable and fixed costs?"
- "Could you conduct an analysis and tell me how the two companies will fare relative to each other in terms of net income if their unit sales increased by 10 percent above their 2009 unit sales levels?"
- "Finally, what would be an accurate verbal description of the degree of total leverage?"

The relevant data for analysis of 4G is contained in Exhibit 2, and Benn's analysis of the Qphone data appears in Exhibit 3:

Exhibit 1 Benn's Unit Sales Estimates for 4G, Inc. and Qphone Corp.

Company	2009 Unit Sales	Standard Deviation of Unit Sales	2010 Expected Unit Sales Growth Rate (%)
4G, Inc.	1,000,000	25,000	15
Qphone Corp.	1,500,000	10,000	15

Exhibit 2 Sales, Cost, and Expense Data for 4G, Inc. (At Unit Sales of 1,000,000)

Number of units produced and sold	1,000,000
Sales price per unit	¥108
Variable cost per unit	¥72
Fixed operating cost	¥22,500,000
Fixed financing expense	¥9,000,000

Exhibit 3 Benn's Analysis of Qphone (At Unit Sales of 1,500,000)

Degree of operating leverage	1.40
Degree of financial leverage	1.15
Breakeven quantity (units)	571,429

- 8 Based on Benn's analysis, 4G's sales risk relative to Qphone's is *most likely* to be:
 - A lower.
 - B equal.
 - C higher.
- 9 What is the *most appropriate* response to Cho's question regarding the components of business risk?
 - A Sales risk and financial risk.
 - B Operating risk and sales risk.
 - C Financial risk and operating risk.
- 10 The *most appropriate* response to Cho's question regarding the classification of risk arising from the mixture of variable and fixed costs is:
 - A sales risk.
 - B financial risk.
 - C operating risk.

- 11 Based on the information in Exhibit 2, the degree of operating leverage (DOL) of 4G, Inc., at unit sales of 1,000,000, is *closest* to:
- A 1.60.
 - B 2.67.
 - C 3.20.
- 12 Based on the information in Exhibit 2, 4G, Inc.'s degree of financial leverage (DFL), at unit sales of 1,000,000, is *closest* to:
- A 1.33.
 - B 2.67.
 - C 3.00.
- 13 Based on the information in Exhibit 1 and Exhibit 3, Qphone's expected percentage change in operating income for 2010 is *closest* to:
- A 17.25%.
 - B 21.00%.
 - C 24.30%.
- 14 4G's breakeven quantity of unit sales is *closest* to:
- A 437,500 units.
 - B 625,000 units.
 - C 875,000 units.
- 15 In response to Cho's question regarding an increase in unit sales above 2009 unit sales levels, it is *most likely* that 4G's net income will increase at:
- A a slower rate than Qphone's.
 - B the same rate as Qphone's.
 - C a faster rate than Qphone's.
- 16 The *most appropriate* response to Cho's question regarding a description of the degree of total leverage is that degree of total leverage is:
- A the percentage change in net income divided by the percentage change in units sold.
 - B the percentage change in operating income divided by the percentage change in units sold.
 - C the percentage change in net income divided by the percentage change in operating income.
-

SOLUTIONS

- 1 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.
- 2 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.
- 3 C is correct. Because DOL is 4, if unit sales increase by 5 percent, Fulcrum's operating earnings are expected to increase by $4 \times 5\% = 20\%$. The calculation for DOL is:

$$\begin{aligned} \text{DOL} &= \frac{(40 \text{ million})(\$100 - \$65)}{[(40 \text{ million})(\$100 - \$65)] - \$1.05 \text{ billion}} \\ &= \frac{\$1.400 \text{ billion}}{\$1.400 \text{ billion} - \$1.05 \text{ billion}} = \frac{\$1.4}{\$0.35} = 4 \end{aligned}$$

- 4 C is correct. Business risk reflects operating leverage and factors that affect sales (such as those given).
- 5 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.
- 6 B is correct.

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

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

or

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

$$\begin{aligned} \text{Total breakeven} &= \frac{\text{¥1,290 million} + \text{¥410 million}}{(\text{¥3,529} - \text{¥1,500})} = \frac{\text{¥1,700 million}}{\text{¥2,029}} \\ &= 837,851.1582 \text{ units} \end{aligned}$$

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

or

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

- 7 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.,

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

- 8** 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, $10,000/1,500,000 = 0.0067$.
- 9** 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).
- 10** C is correct. Operating risk refers to the risk arising from the mix of fixed and variable costs.

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

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

- 12** C is correct. Degree of financial leverage is

$$\begin{aligned} \text{DFL} &= \frac{[Q(P - V) - F]}{[Q(P - V) - F - C]} \\ &= \frac{1,000,000(\$108 - \$72) - \$22,500,000}{1,000,000(\$108 - \$72) - \$22,500,000 - \$9,000,000} = 3.00 \end{aligned}$$

- 13** 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:

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

- 14** C is correct. The breakeven quantity is computed

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

- 15** 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 $DOL \times DFL = 1.4 \times 1.15 = 1.61$. 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

$$\begin{aligned} \text{DTL} &= \frac{Q(P - V)}{Q(P - V) - F - C} \\ &= \frac{1,000,000(\$108 - \$72)}{1,000,000(\$108 - \$72) - \$22,500,000 - \$9,000,000} = 8.00 \end{aligned}$$

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

PRACTICE PROBLEMS

- 1 The payment of a 10 percent stock dividend by a company will result in an increase in that company's:
 - A current ratio.
 - B financial leverage.
 - C contributed capital.
- 2 If a company's common shares trade at relatively very low prices, that company would be *most likely* to consider the use of a:
 - A stock split.
 - B stock dividend.
 - C reverse stock split.
- 3 In a recent presentation, Doug Pearce made two statements about dividends:

Statement 1 "A stock dividend will increase share price, all other things being equal."

Statement 2 "One practical concern with a stock split is that it will reduce the company's price-to-earnings ratio."

Are Pearce's two statements about the effects of the stock dividend and stock split correct?

 - A No for both statements.
 - B Yes for Statement 1 and no for Statement 2.
 - C No for Statement 1 and yes for Statement 2.
- 4 All other things being equal, the payment of an internally financed cash dividend is *most likely* to result in:
 - A a lower current ratio.
 - B a higher current ratio.
 - C the same current ratio.
- 5 The calendar dates in Column 1 are potentially significant dates in a typical dividend chronology. Column 2 lists descriptions of these potentially significant dates (in random order).

Column 1	Column 2
Friday, 10 June	A. Holder-of-record date
Thursday, 23 June	B. Declaration date
Friday, 24 June	C. Payment date
Tuesday, 28 June	D. Ex-dividend date
Sunday, 10 July	E. Last day shares trade with the right to receive the dividend

Match the significance of these typical dividend chronology dates by placing the correct letter of the description by the appropriate date. Use the template for your answer.

Dividend Chronology	
Friday, 10 June	_____
Thursday, 23 June	_____

Dividend Chronology

Friday, 24 June

Tuesday, 28 June

Sunday, 10 July

- 6 Mary Young intends to take a position in Megasoft Industries once Megasoft begins paying dividends. A dividend of C\$4 is payable by Megasoft on 2 December. The ex-dividend date for the dividend is 10 November, and the holder-of-record date is 12 November. What is the last possible date for Young to purchase her shares if she wants to receive the dividend?
- A 9 November.
B 10 November.
C 12 November.
- 7 Aiken Instruments (AIK) has recently declared a regular quarterly dividend of \$0.50, payable on 12 November, with an ex-dividend date of 28 October. Which date below would be the holder-of-record date assuming all the days listed are business days and that trades settle three business days after the trade date?
- A 27 October.
B 30 October.
C 11 November.
- 8 A company has 1 million shares outstanding and earnings are £2 million. The company decides to use £10 million in idle cash to repurchase shares in the open market. The company's shares are trading at £50 per share. If the company uses the entire £10 million of idle cash to repurchase shares at the market price, the company's earnings per share will be *closest* to:
- A £2.00.
B £2.30.
C £2.50.
- 9 Devon Ltd. common shares sell at \$40 a share and their estimated price-to-earnings ratio (P/E) is 32. If Devon borrows funds to repurchase shares at its after-tax cost of debt of 5 percent, its EPS is *most likely* to:
- A increase.
B decrease.
C remain the same.
- 10 A company can borrow funds at an after-tax cost of 4.5 percent. The company's stock price is \$40 per share, earnings per share is \$2.00, and the company has 15 million shares outstanding. If the company borrows just enough to repurchase 2 million shares of stock at the prevailing market price, that company's earnings per share is *most likely* to:
- A increase.
B decrease.
C remain the same.
- 11 Crozet Corporation plans to borrow just enough money to repurchase 100,000 shares. The following information relates to the share repurchase:

Shares outstanding before buyback	3.1 million
Earnings per share before buyback	\$4.00
Share price at time of buyback	\$50
After-tax cost of borrowing	6%

Crozet's earnings per share after the buyback will be *closest* to:

- A \$4.03.
- B \$4.10.
- C \$4.23.

- 12 A company with 20 million shares outstanding decides to repurchase 2 million shares at the prevailing market price of €30 per share. At the time of the buyback, the company reports total assets of €850 million and total liabilities of €250 million. As a result of the buyback, that company's book value per share will *most likely*:
- A increase.
 - B decrease.
 - C remain the same.
- 13 An analyst gathered the following information about a company:

Number of shares outstanding	10 million
Earnings per share	\$2.00
P/E	20
Book value per share	\$30

If the company repurchases 1 million shares at the prevailing market price, the resulting book value per share will be *closest* to:

- A \$26.
- B \$27.
- C \$29.

- 14 If a company's objective is to support its stock price in the event of a market downturn, it would be advised to authorize:
- A an open market share repurchase plan to be executed over the next five years.
 - B a tender offer share repurchase at a fixed price effective in 30 days.
 - C a Dutch auction tender offer effective in 30 days.
- 15 A company has positive free cash flow and is considering whether to use the entire amount of that free cash flow to pay a special cash dividend or to repurchase shares at the prevailing market price. Shareholders' wealth under the two options will be equivalent unless the:
- A company's book value per share is less than the prevailing market price.
 - B company's book value per share is greater than the prevailing market price.
 - C tax consequences and/or information content for each alternative is different.
- 16 Assume that a company is based in a country that has no taxes on dividends or capital gains. The company is considering either paying a special dividend or repurchasing its own shares. Shareholders of the company would have:
- A greater wealth if the company paid a special cash dividend.

- B** greater wealth if the company repurchased its shares.
- C** the same wealth under either a cash dividend or share repurchase program.

SOLUTIONS

- 1 C is correct. A stock dividend is accounted for as a transfer of retained earnings to contributed capital.
- 2 C is correct. A reverse stock split would increase the price per share of the stock to a higher, more marketable range that could possibly increase the number of investors who would consider buying the stock.
- 3 A is correct. Both statements are incorrect. A stock dividend will decrease the price per share, all other things being equal. A stock split will reduce the price and earnings per share proportionately, leaving the price-to-earnings ratio the same.
- 4 A is correct. By reducing corporate cash, a cash dividend reduces the current ratio, whereas a stock dividend (whatever the size) has no effect on the current ratio.
- 5 The typical dividend chronology is:

Friday, 10 June	B. The declaration date is the day that the corporation issues a statement declaring a dividend.
Thursday, 23 June	E. The last day shares trade with the right to receive the dividend is the day before the ex-dividend date.
Friday, 24 June	D. The ex-dividend date is the first day that the stock trades "ex" (i.e., without) the dividend. If the stock is bought on the ex-dividend date, the seller (not the buyer) will receive the dividend.
Tuesday, 28 June	A. The holder-of-record date is the date that the company uses to document which shareholders will receive the dividend.
Sunday, 10 July	C. The payment date is the date that the company sends out its dividend checks.

- 6 A is correct. To receive the dividend, one must purchase before the ex-dividend date.
- 7 B is correct. The holder-of-record date, 30 October, is two business days after the ex-dividend date, 28 October.
- 8 C is correct. At the current market price, the company can repurchase 200,000 shares ($\$10 \text{ million}/\$50 = 200,000 \text{ shares}$). The company would have 800,000 shares outstanding after the repurchase ($1 \text{ million shares} - 200,000 \text{ shares} = 800,000 \text{ shares}$). EPS before the buyback is $\$2.00$ ($\$2 \text{ million}/1 \text{ million shares} = \2.00). Total earnings after the buyback are the same because the company uses idle (nonearning) cash to purchase the shares, but the number of shares outstanding is reduced to 800,000. EPS increases to $\$2.50$ ($\$2 \text{ million}/800,000 \text{ shares} = \2.50).
- 9 B is correct. If the P/E is 32, the earnings-to-price ratio (earnings yield or E/P) is $1/32 = 3.125$ percent. When the cost of capital is greater than the earnings yield, earnings dilution will result from the buyback.
- 10 A is correct. The company's earnings yield (E/P) is $\$2/\$40 = 0.05$. When the earnings yield is greater than the after-tax cost of borrowed funds, EPS will increase if shares are repurchased using borrowed funds.
- 11 A is correct.

Total earnings before buyback: $\$4.00 \times 3,100,000 \text{ shares} = \$12,400,000$

Total amount of borrowing: $\$50 \times 100,000 \text{ shares} = \$5,000,000$

After-tax cost of borrowing the amount of funds needed: $\$5,000,000 \times 0.06 = \$300,000$

Number of shares outstanding after buyback: $3,100,000 - 100,000 = 3,000,000$

EPS after buyback: $(\$12,400,000 - \$300,000) / 3,000,000 \text{ shares} = \4.03

The P/E before the buyback is $\$50/\$4 = 12.5$; thus, the E/P is 8 percent. The after-tax cost of debt is 6 percent; therefore, EPS will increase.

- 12 C is correct. The company's book value before the buyback is €850 million in assets – €250 million in liabilities = €600 million. Book value per share is €600 million/20 million = €30 per share. The buyback will reduce equity by 2 million shares at the prevailing market price of €30 per share. The book value of equity will be reduced to €600 million – €60 million = €540 million, and the number of shares will be reduced to 18 million; €540 million/18 million = €30 book value per share. If the prevailing market price is equal to the book value per share at the time of the buyback, book value per share is unchanged.
- 13 C is correct. The prevailing market price is $\$2.00(20) = \40.00 per share; thus, the buyback would reduce equity by \$40 million. Book value of equity before the buyback is \$300 million. Book value of equity after the buyback would be \$300 million – \$40 million = \$260 million. The number of shares outstanding after the buyback would be 9 million. Thus, book value per share after the buyback would be $\$260 \text{ million}/9 \text{ million} = \28.89 .
- 14 A is correct. Of the three methods, only an authorized open market share repurchase plan allows the company the flexibility to time share repurchases to coincide with share price declines.
- 15 C is correct. For the two options to be equivalent with respect to shareholders' wealth, the amount of cash distributed, the taxation, and the information content must be the same for both options.
- 16 C is correct. When there are no taxes, there are no tax differences between dividends and capital gains. All other things being equal, the effect on shareholder wealth of a dividend and a share repurchase should be the same.

PRACTICE PROBLEMS

- 1 Suppose a company has a current ratio of 2.5 times and a quick ratio of 1.5 times. If the company's current liabilities are €100 million, the amount of inventory is *closest* to:
 - A €50 million.
 - B €100 million.
 - C €150 million.
- 2 Given the following financial statement data, calculate the operating cycle for this company.

	In Millions (\$)
Credit sales	25,000
Cost of goods sold	20,000
Accounts receivable	2,500
Inventory—Beginning balance	2,000
Inventory—Ending balance	2,300
Accounts payable	1,700

The operating cycle for this company is *closest* to:

- A 42.0 days.
- B 47.9 days.
- C 78.5 days.
- 3 Given the following financial statement data, calculate the net operating cycle for this company.

	In Millions (\$)
Credit sales	40,000
Cost of goods sold	30,000
Accounts receivable	3,000
Inventory—Beginning balance	1,500
Inventory—Ending balance	2,000
Accounts payable	4,000

The net operating cycle of this company is *closest* to:

- A 3.8 days.
- B 24.3 days.
- C 51.7 days.
- 4 The bond equivalent yield for a 182-day US Treasury bill that has a price of \$9,725 per \$10,000 face value is *closest* to:
 - A 5.44%.
 - B 5.53%.
 - C 5.67%.
- 5 A company increasing its credit terms for customers from 1/10, net 30 to 1/10, net 60 will *most likely* experience:

- A an increase in cash on hand.
- B a higher level of uncollectible accounts.
- C an increase in the average collection period.
- 6 Suppose a company uses trade credit with the terms of 2/10, net 50. If the company pays its account on the 50th day, the effective borrowing cost of skipping the discount on day 10 is *closest* to:
- A 14.9%.
- B 15.0%.
- C 20.2%.
- 7 William Jones is evaluating three possible means of borrowing \$1 million for one month:
- Drawing down on a line of credit at 7.2 percent with a 1/2 percent commitment fee on the full amount with no compensating balances.
 - A banker's acceptance at 7.1 percent, an all-inclusive rate.
 - Commercial paper at 6.9 percent with a dealer's commission of 1/4 percent and a backup line cost of 1/3 percent, both of which would be assessed on the \$1 million of commercial paper issued.

Which of these forms of borrowing results in the lowest cost of credit?

- A Line of credit.
- B Banker's acceptance.
- C Commercial paper.

The following information relates to Questions 8–12

Mary Gonzales is evaluating companies in the office supply industry and has compiled the following information:

Company	20X1		20X2	
	Credit Sales (\$)	Average Receivables Balance (\$)	Credit Sales (\$)	Average Receivables Balance (\$)
A	5.0 million	1.0 million	6.0 million	1.2 million
B	3.0 million	1.2 million	4.0 million	1.5 million
C	2.5 million	0.8 million	3.0 million	1.0 million
D	0.5 million	0.1 million	0.6 million	0.2 million
Industry	25.0 million	5.0 million	28.0 million	5.4 million

- 8 Which of the companies had the highest number of days of receivables for the year 20X1?
- A Company A.
- B Company B.
- C Company C.
- 9 Which of the companies has the lowest accounts receivable turnover in the year 20X2?

- A Company A.
 - B Company B.
 - C Company D.
- 10 The industry average receivables collection period:
- A increased from 20X1 to 20X2.
 - B decreased from 20X1 to 20X2.
 - C did not change from 20X1 to 20X2.
- 11 Which of the companies reduced the average time it took to collect on accounts receivable from 20X1 to 20X2?
- A Company B.
 - B Company C.
 - C Company D.
- 12 Mary determined that Company A had an operating cycle of 100 days in 20X2, whereas Company D had an operating cycle of 145 days for the same fiscal year. This means that:
- A Company D's inventory turnover is less than that of Company A.
 - B Company D's inventory turnover is greater than that of Company A.
 - C Company D's cash conversion cycle is shorter than that of Company A.
-

SOLUTIONS

- 1 B is correct.

Current ratio = Current assets/Current Liabilities = Current assets/
€100 million = 2.5

Therefore, current assets = €250 million

Quick ratio = (Current assets – Inventory)/ Current Liabilities = (€250 million – Inventory)/€100 million = 1.5

Therefore, Inventory = **€100 million**

- 2 C is correct.

Number of days of inventory = \$2,300/(\$20,000/365) = 41.975 days

Number of days of receivables = \$2,500/(\$25,000/365) = 36.5 days

Operating cycle = 41.975 + 36.5 days = **78.475 days**

Note: The net operating cycle is 47.9 days.

Purchases = \$20,000 + \$2,300 – \$2,000 = \$20,300

Number of days of payables = \$1,700/(\$20,300/365) = 30.567 days

The net operating cycle is 78.475 – 30.567 = 47.908 days

- 3 A is correct.

Number of days of inventory = \$2,000/(\$30,000/365) = 24.333 days

Number of days of receivables = \$3,000/(\$40,000/365) = 27.375 days

Operating cycle = 24.333 + 27.375 days = 51.708 days

Purchases = \$30,000 + \$2,000 – \$1,500 = \$30,500

Number of days of payables = \$4,000/(\$30,500/365) = 47.869 days

The net operating cycle is 51.708 – 47.869 = **3.839 days**

- 4 C is correct.

Bond equivalent yield = [(\$10,000 – 9,725)/\$9,725] × (365/182) =
5.671 percent

- 5 C is correct. A higher level of uncollectible accounts may occur, but a longer average collection period will certainly occur.

- 6 C is correct.

$$\text{Cost} = \left(1 + \frac{0.02}{0.98}\right)^{365/40} - 1 = 20.24 \text{ percent}$$

7 B is correct.

$$\begin{aligned}\text{Line cost} &= \frac{\text{Interest} + \text{Commitment fee}}{\text{Net Proceed}} \times 12 \\ &= \frac{(0.072 \times \$1,000,000 \times 1/12) + (0.005 \times \$1,000,000 \times 1/12)}{\$1,000,000} \times 12 \\ &= \frac{\$6,000 + 416.67}{\$1,000,000} \times 12 = 0.077 \text{ or } 7.7 \text{ percent}\end{aligned}$$

$$\begin{aligned}\text{Banker's acceptance cost} &= \frac{\text{Interest}}{\text{Net Proceed}} \times 12 \\ &= \frac{(0.071 \times \$1,000,000 \times 1/12)}{\$1,000,000 - (0.071 \times \$1,000,000 \times 1/12)} \times 12 \\ &= \frac{\$5,916.67}{\$994,083.33} \times 12 = 0.0714 \text{ or } 7.14 \text{ percent}\end{aligned}$$

$$\begin{aligned}\text{Commercial paper cost} &= \frac{\text{Interest} + \text{Dealer's commission} + \text{Backup costs}}{\text{Net proceed}} \times 12 \\ &= \frac{(0.069 \times \$1,000,000 \times 1/12) + (0.0025 \times \$1,000,000 \times 1/12) + (0.003333 \times \$1,000,000 \times 1/12)}{\$1,000,000 - (0.069 \times \$1,000,000 \times 1/12)} \times 12 \\ &= \frac{\$5,750 + 208.33 + 277.78}{\$1,000,000 - 5,750} \times 12 = 0.0753 \text{ or } 7.53 \text{ percent}\end{aligned}$$

8 B is correct.

Company A: $\$1.0 \text{ million}/(\$5.0 \text{ million}/365) = 73.0 \text{ days}$

Company B: $\$1.2 \text{ million}/(\$3.0 \text{ million}/365) = 146.0 \text{ days}$

Company C: $\$0.8 \text{ million}/(\$2.5 \text{ million}/365) = 116.8 \text{ days}$

Company D: $\$0.1 \text{ million}/(\$0.5 \text{ million}/365) = 73.0 \text{ days}$

9 B is correct.

Company A: $\$6.0 \text{ million}/\$1.2 \text{ million} = 5.00$

Company B: $\$4.0 \text{ million}/\$1.5 \text{ million} = 2.67$

Company C: $\$3.0 \text{ million}/\$1.0 \text{ million} = 3.00$

Company D: $\$0.6 \text{ million}/\$0.2 \text{ million} = 3.00$

10 B is correct.

20X1: 73 days

20X2: 70.393

Note: If the number of days decreased from 20X1 to 20X2, the receivable turnover increased.

11 A is correct.

Company B increased its accounts receivable (A/R) turnover and reduced its number of days of receivables between 20X1 and 20X2.

Company	20X1		20X2	
	A/R Turnover	Number of Days of Receivables	A/R Turnover	Number of Days of Receivables
A	5.000	73.000	5.000	73.000
B	2.500	146.000	2.667	136.875
C	3.125	116.800	3.000	121.667
D	5.000	73.000	3.000	121.667

12 B is correct.

Company A number of days of inventory = $100 - 73 = 27$ days

Company D number of days of inventory = $145 - 121.67 = 23.33$ days

Company A's turnover = $365/27 = 13.5$ times

Company D's inventory turnover = $365/23.3 = 15.6$ times

PRACTICE PROBLEMS

- 1 Investors should use a portfolio approach to:
 - A reduce risk.
 - B monitor risk.
 - C eliminate risk.
- 2 Which of the following is the *best* reason for an investor to be concerned with the composition of a portfolio?
 - A Risk reduction.
 - B Downside risk protection.
 - C Avoidance of investment disasters.
- 3 With respect to the formation of portfolios, which of the following statements is *most accurate*?
 - A Portfolios affect risk less than returns.
 - B Portfolios affect risk more than returns.
 - C Portfolios affect risk and returns equally.
- 4 Which of the following institutions will *on average* have the greatest need for liquidity?
 - A Banks.
 - B Investment companies.
 - C Non-life insurance companies.
- 5 Which of the following institutional investors will *most likely* have the longest time horizon?
 - A Defined benefit plan.
 - B University endowment.
 - C Life insurance company.
- 6 A defined benefit plan with a large number of retirees is *likely* to have a high need for
 - A income.
 - B liquidity.
 - C insurance.
- 7 Which of the following institutional investors is *most likely* to manage investments in mutual funds?
 - A Insurance companies.
 - B Investment companies.
 - C University endowments.
- 8 With respect to the portfolio management process, the asset allocation is determined in the:
 - A planning step.
 - B feedback step.
 - C execution step.
- 9 The planning step of the portfolio management process is *least likely* to include an assessment of the client's

- A** securities.
B constraints.
C risk tolerance.
- 10** With respect to the portfolio management process, the rebalancing of a portfolio's composition is *most likely* to occur in the:
A planning step.
B feedback step.
C execution step.
- 11** An analyst gathers the following information for the asset allocations of three portfolios:

Portfolio	Fixed Income (%)	Equity (%)	Alternative Assets (%)
1	25	60	15
2	60	25	15
3	15	60	25

Which of the portfolios is *most likely* appropriate for a client who has a high degree of risk tolerance?

- A** Portfolio 1.
B Portfolio 2.
C Portfolio 3.
- 12** Which of the following investment products is *most likely* to trade at their net asset value per share?
A Exchange traded funds.
B Open-end mutual funds.
C Closed-end mutual funds.
- 13** Which of the following financial products is *least likely* to have a capital gain distribution?
A Exchange traded funds.
B Open-end mutual funds.
C Closed-end mutual funds.
- 14** Which of the following forms of pooled investments is subject to the *least* amount of regulation?
A Hedge funds.
B Exchange traded funds.
C Closed-end mutual funds.
- 15** Which of the following pooled investments is *most likely* characterized by a few large investments?
A Hedge funds.
B Buyout funds.
C Venture capital funds.

SOLUTIONS

- 1 A is correct. Combining assets into a portfolio should reduce the portfolio's volatility. Specifically, "individuals and institutions should hold portfolios to reduce risk." As illustrated in the reading, however, risk reduction may not be as great during a period of dramatic economic change.
- 2 A is correct. Combining assets into a portfolio should reduce the portfolio's volatility. The portfolio approach does not necessarily provide downside protection or guarantee that the portfolio always will avoid losses.
- 3 B is correct. As illustrated in the reading, portfolios reduce risk more than they increase returns.
- 4 A is correct. The excess reserves invested by banks need to be relatively liquid. Although investment companies and non-life insurance companies have high liquidity needs, the liquidity need for banks is on average the greatest.
- 5 B is correct. Most foundations and endowments are established with the intent of having perpetual lives. Although defined benefit plans and life insurance companies have portfolios with a long time horizon, they are not perpetual.
- 6 A is correct. Income is necessary to meet the cash flow obligation to retirees. Although defined benefit plans have a need for income, the need for liquidity typically is quite low. A retiree may need life insurance; however, a defined benefit plan does not need insurance.
- 7 B is correct. Investment companies manage investments in mutual funds. Although endowments and insurance companies may own mutual funds, they do not issue or redeem shares of mutual funds.
- 8 C is correct. The client's objectives and constraints are established in the investment policy statement and are used to determine the client's target asset allocation, which occurs in the execution step of the portfolio management process.
- 9 A is correct. Securities are analyzed in the execution step. In the planning step, a client's objectives and constraints are used to develop the investment policy statement.
- 10 B is correct. Portfolio monitoring and rebalancing occurs in the feedback step of the portfolio management process.
- 11 C is correct. Portfolio 3 has the same equity exposure as Portfolio 1 and has a higher exposure to alternative assets, which have greater volatility (as discussed in the section of the reading comparing the endowments from Yale University and the University of Virginia).
- 12 B is correct. Open-end funds trade at their net asset value per share, whereas closed-end funds and exchange traded funds can trade at a premium or a discount.
- 13 A is correct. Exchange traded funds do not have capital gain distributions. If an investor sells shares of an ETF (or open-end mutual fund or closed-end mutual fund), the investor may have a capital gain or loss on the shares sold; however, the gain (or loss) from the sale is not a distribution.
- 14 A is correct. Hedge funds are currently exempt from the reporting requirements of a typical public investment company.
- 15 B is correct. Buyout funds or private equity firms make only a few large investments in private companies with the intent of selling the restructured companies in three to five years. Venture capital funds also have a short time horizon; however, these funds consist of many small investments in companies with the expectation that only a few will have a large payoff (and that most will fail).

PRACTICE PROBLEMS

- 1 Risk management in the case of individuals is *best* described as concerned with:
 - A hedging risk exposures.
 - B maximizing utility while bearing a tolerable level of risk.
 - C maximizing utility while avoiding exposure to undesirable risks.
- 2 Which of the following may be controlled by an investor?
 - A Risk
 - B Raw returns
 - C Risk-adjusted returns
- 3 The process of risk management includes:
 - A minimizing risk.
 - B maximizing returns.
 - C defining and measuring risks being taken.
- 4 Risk governance:
 - A aligns risk management activities with the goals of the overall enterprise.
 - B defines the qualitative assessment and evaluation of potential sources of risk in an organization.
 - C delegates responsibility for risk management to all levels of the organization's hierarchy.
- 5 The factors a risk management framework should address include all of the following *except*:
 - A communications.
 - B policies and processes.
 - C names of responsible individuals.
- 6 Which of the following is the correct sequence of events for risk governance and management that focuses on the entire enterprise? Establishing:
 - A risk tolerance, then risk budgeting, and then risk exposures.
 - B risk exposures, then risk tolerance, and then risk budgeting.
 - C risk budgeting, then risk exposures, and then risk tolerance.
- 7 Which of the following *best* describes activities that are supported by a risk management infrastructure?
 - A Risk tolerance, budgeting, and reporting
 - B Risk tolerance, measurement, and monitoring
 - C Risk identification, measurement, and monitoring
- 8 Effective risk governance in an enterprise provides guidance on all of the following *except*:
 - A unacceptable risks.
 - B worst losses that may be tolerated.
 - C specific methods to mitigate risk for each subsidiary in the enterprise.
- 9 A firm's risk management committee would be expected to do all of the following *except*:
 - A approving the governing body's proposed risk policies.

- B deliberating the governing body's risk policies at the operational level.
- C providing top decision-makers with a forum for considering risk management issues.
- 10 Once an enterprise's risk tolerance is determined, the role of risk management is to:
- A analyze risk drivers.
- B align risk exposures with risk appetite.
- C identify the extent to which the enterprise is willing to fail in meeting its objectives.
- 11 Which factor should *most* affect a company's ability to tolerate risk?
- A A stable market environment
- B The beliefs of the individual board members
- C The ability to dynamically respond to adverse events
- 12 Risk budgeting includes all of the following *except*:
- A determining the target return.
- B quantifying tolerable risk by specific metrics.
- C allocating a portfolio by some risk characteristics of the investments.
- 13 A benefit of risk budgeting is that it:
- A considers risk tradeoffs.
- B establishes a firm's risk tolerance.
- C reduces uncertainty facing the firm.
- 14 Which of the following risks is *best* described as a financial risk?
- A Credit
- B Solvency
- C Operational
- 15 Liquidity risk is *most* associated with:
- A the probability of default.
- B a widening bid–ask spread.
- C a poorly functioning market.
- 16 An example of a non-financial risk is:
- A market risk.
- B liquidity risk.
- C settlement risk.
- 17 If a company has a one-day 5% Value at Risk of \$1 million, this means:
- A 5% of the time the firm is expected to lose at least \$1 million in one day.
- B 95% of the time the firm is expected to lose at least \$1 million in one day.
- C 5% of the time the firm is expected to lose no more than \$1 million in one day.
- 18 An entity choosing to accept a risk exposure may:
- A buy insurance.
- B enter into a derivative contract.
- C establish a reserve fund to cover losses.
- 19 The choice of risk-modification method is based on:
- A minimizing risk at the lowest cost.

- B** maximizing returns at the lowest cost.
- C** weighing costs versus benefits in light of the entity's risk tolerance.

SOLUTIONS

- 1 B is correct. For individuals, risk management concerns maximizing utility while taking risk consistent with individual's level of risk tolerance.
- 2 A is correct. Many decision makers focus on return, which is not something that is easily controlled, as opposed to risk, or exposure to risk, which may actually be managed or controlled
- 3 C is correct. Risks need to be defined and measured so as to be consistent with the entity's chosen level of risk tolerance and target for returns or other outcomes.
- 4 A is correct. Risk governance is the top-down process that defines risk tolerance, provides risk oversight and guidance to align risk with enterprise goals.
- 5 C is correct. While risk infrastructure, which a risk management framework must address, refers to the people and systems required to track risk exposures, there is no requirement to actually name the responsible individuals.
- 6 A is correct. In establishing a risk management system, determining risk tolerance must happen before specific risks can be accepted or reduced. Risk tolerance defines the appetite for risk. Risk budgeting determine how or where the risk is taken and quantifies the tolerable risk by specific metrics. Risk exposures can then be measured and compared against the acceptable risk.
- 7 C is correct. *Risk infrastructure* refers to the people and systems required to track risk exposures and perform most of the quantitative risk analysis to allow an assessment of the organization's risk profile. The risk management infrastructure identifies, measures, and monitors risks (among other things).
- 8 C is correct. Risk governance is not about specifying methods to mitigate risk at the business line level. Rather, it is about establishing an appropriate level of risk for the entire enterprise. Specifics of dealing with risk fall under risk management and the risk infrastructure framework.
- 9 A is correct. The risk management committee is a part of the risk governance structure at the operational level—as such, it does not approve the governing body's policies.
- 10 B is correct. When risk tolerance has been determined, the risk framework should be geared toward measuring, managing, and complying with the risk tolerance, or aligning risk exposure with risk tolerance. The risk tolerance decision begins by looking at what shortfalls within an organization would cause it to fail to achieve some critical goals and what are the organization's risk drivers.
- 11 C is correct. If a company has the ability to adapt quickly to adverse events may allow for a higher risk tolerance. There are other factors, such as beliefs of board members and a stable market environment, which may but should not affect risk tolerance.
- 12 A is correct. Risk budgeting does not include determining the target return. Risk budgeting quantifies and allocates the tolerable risk by specific metrics.
- 13 A is correct. The process of risk budgeting forces the firm to consider risk tradeoffs. As a result, the firm should choose to invest where the return per unit of risk is the highest.

- 14 A is correct. A financial risk originates from the financial markets. Credit risk is one of three financial risks identified in the reading: Credit risk is the chance of loss due to an outside party defaulting on an obligation. Solvency risk depends at least in part on factors internal to the organization and operational risk is an *internal* risk arising from the people and processes within the organization.
- 15 B is correct. Liquidity risk is also called transaction cost risk. When the bid–ask spread widens, purchase and sale transactions become increasingly costly. The risk arises from the uncertainty of the spread.
- 16 C is correct. Settlement risk is related to default risk, but deals with the timing of payments rather than the risk of default.
- 17 A is correct. The VaR measure indicates the probability of a loss of at least a certain level in a time period.
- 18 C is correct. Risk acceptance is similar to self-insurance. An entity choosing to self-insure may set up a reserve fund to cover losses. Buying insurance is a form of risk transfer and using derivatives is a form of risk-shifting, not risk acceptance.
- 19 C is correct. Among the risk-modification methods of risk avoidance, risk acceptance, risk transfer, and risk shifting none has a clear advantage. One must weigh benefits and costs in light of the firm's risk tolerance when choosing the method to use.

PRACTICE PROBLEMS

- 1** An investor purchased 100 shares of a stock for \$34.50 per share at the beginning of the quarter. If the investor sold all of the shares for \$30.50 per share after receiving a \$51.55 dividend payment at the end of the quarter, the holding period return is *closest* to:
 - A** -13.0%.
 - B** -11.6%.
 - C** -10.1%.
- 2** An analyst obtains the following annual rates of return for a mutual fund:

Year	Return (%)
2008	14
2009	-10
2010	-2

The fund's holding period return over the three-year period is *closest* to:

- A** 0.18%.
- B** 0.55%.
- C** 0.67%.
- 3** An analyst observes the following annual rates of return for a hedge fund:

Year	Return (%)
2008	22
2009	-25
2010	11

The hedge fund's annual geometric mean return is *closest* to:

- A** 0.52%.
- B** 1.02%.
- C** 2.67%.
- 4** Which of the following return calculating methods is *best* for evaluating the annualized returns of a buy-and-hold strategy of an investor who has made annual deposits to an account for each of the last five years?
 - A** Geometric mean return.
 - B** Arithmetic mean return.
 - C** Money-weighted return.
- 5** An investor evaluating the returns of three recently formed exchange-traded funds gathers the following information:

ETF	Time Since Inception	Return Since Inception (%)
1	146 days	4.61
2	5 weeks	1.10
3	15 months	14.35

The ETF with the highest annualized rate of return is:

- A ETF 1.
 B ETF 2.
 C ETF 3.
- 6 With respect to capital market theory, which of the following asset characteristics is *least likely* to impact the variance of an investor's equally weighted portfolio?
 A Return on the asset.
 B Standard deviation of the asset.
 C Covariances of the asset with the other assets in the portfolio.
- 7 A portfolio manager creates the following portfolio:

Security	Security Weight (%)	Expected Standard Deviation (%)
1	30	20
2	70	12

If the correlation of returns between the two securities is 0.40, the expected standard deviation of the portfolio is *closest to*:

- A 10.7%.
 B 11.3%.
 C 12.1%.
- 8 A portfolio manager creates the following portfolio:

Security	Security Weight (%)	Expected Standard Deviation (%)
1	30	20
2	70	12

If the covariance of returns between the two securities is -0.0240 , the expected standard deviation of the portfolio is *closest to*:

- A 2.4%.
 B 7.5%.
 C 9.2%.

The following information relates to Questions 9–10

A portfolio manager creates the following portfolio:

Security	Security Weight (%)	Expected Standard Deviation (%)
1	30	20
2	70	12

- 9 If the standard deviation of the portfolio is 14.40%, the correlation between the two securities is equal to:
 A -1.0 .

- B 0.0.
C 1.0.
- 10 If the standard deviation of the portfolio is 14.40%, the covariance between the two securities is equal to:
A 0.0006.
B 0.0240.
C 1.0000.
-

The following information relates to Questions 11–14

An analyst observes the following historic geometric returns:

Asset Class	Geometric Return (%)
Equities	8.0
Corporate Bonds	6.5
Treasury bills	2.5
Inflation	2.1

- 11 The real rate of return for equities is *closest* to:
A 5.4%.
B 5.8%.
C 5.9%.
- 12 The real rate of return for corporate bonds is *closest* to:
A 4.3%.
B 4.4%.
C 4.5%.
- 13 The risk premium for equities is *closest* to:
A 5.4%.
B 5.5%.
C 5.6%.
- 14 The risk premium for corporate bonds is *closest* to:
A 3.5%.
B 3.9%.
C 4.0%.
-
- 15 With respect to trading costs, liquidity is *least likely* to impact the:
A stock price.
B bid–ask spreads.
C brokerage commissions.
- 16 Evidence of risk aversion is *best* illustrated by a risk–return relationship that is:
A negative.

- B neutral.
C positive.
- 17 With respect to risk-averse investors, a risk-free asset will generate a numerical utility that is:
A the same for all individuals.
B positive for risk-averse investors.
C equal to zero for risk seeking investors.
- 18 With respect to utility theory, the most risk-averse investor will have an indifference curve with the:
A most convexity.
B smallest intercept value.
C greatest slope coefficient.
- 19 With respect to an investor's utility function expressed as: $U = E(r) - \frac{1}{2}A\sigma^2$, which of the following values for the measure for risk aversion has the *least* amount of risk aversion?
A -4.
B 0.
C 4.

The following information relates to Questions 20–23

A financial planner has created the following data to illustrate the application of utility theory to portfolio selection:

Investment	Expected Return (%)	Expected Standard Deviation (%)
1	18	2
2	19	8
3	20	15
4	18	30

- 20 A risk-neutral investor is *most likely* to choose:
A Investment 1.
B Investment 2.
C Investment 3.
- 21 If an investor's utility function is expressed as $U = E(r) - \frac{1}{2}A\sigma^2$ and the measure for risk aversion has a value of -2, the risk-seeking investor is *most likely* to choose:
A Investment 2.
B Investment 3.
C Investment 4.

- 22** If an investor's utility function is expressed as $U = E(r) - \frac{1}{2}A\sigma^2$ and the measure for risk aversion has a value of 2, the risk-averse investor is *most likely* to choose:
- A** Investment 1.
 - B** Investment 2.
 - C** Investment 3.
- 23** If an investor's utility function is expressed as $U = E(r) - \frac{1}{2}A\sigma^2$ and the measure for risk aversion has a value of 4, the risk-averse investor is *most likely* to choose:
- A** Investment 1.
 - B** Investment 2.
 - C** Investment 3.
-
- 24** With respect to the mean–variance portfolio theory, the capital allocation line, CAL, is the combination of the risk-free asset and a portfolio of all:
- A** risky assets.
 - B** equity securities.
 - C** feasible investments.
- 25** Two individual investors with different levels of risk aversion will have optimal portfolios that are:
- A** below the capital allocation line.
 - B** on the capital allocation line.
 - C** above the capital allocation line.

The following information relates to Questions 26–28

A portfolio manager creates the following portfolio:

Security	Expected Annual Return (%)	Expected Standard Deviation (%)
1	16	20
2	12	20

- 26** If the portfolio of the two securities has an expected return of 15%, the proportion invested in Security 1 is:
- A** 25%.
 - B** 50%.
 - C** 75%.
- 27** If the correlation of returns between the two securities is -0.15 , the expected standard deviation of an equal-weighted portfolio is *closest* to:
- A** 13.04%.
 - B** 13.60%.

- C 13.87%.
- 28 If the two securities are uncorrelated, the expected standard deviation of an equal-weighted portfolio is *closest* to:
- A 14.00%.
- B 14.14%.
- C 20.00%.
-
- 29 As the number of assets in an equally-weighted portfolio increases, the contribution of each individual asset's variance to the volatility of the portfolio:
- A increases.
- B decreases.
- C remains the same.
- 30 With respect to an equally-weighted portfolio made up of a large number of assets, which of the following contributes the *most* to the volatility of the portfolio?
- A Average variance of the individual assets.
- B Standard deviation of the individual assets.
- C Average covariance between all pairs of assets.
- 31 The correlation between assets in a two-asset portfolio increases during a market decline. If there is no change in the proportion of each asset held in the portfolio or the expected standard deviation of the individual assets, the volatility of the portfolio is *most likely* to:
- A increase.
- B decrease.
- C remain the same.

The following information relates to Questions 32–34

An analyst has made the following return projections for each of three possible outcomes with an equal likelihood of occurrence:

Asset	Outcome 1 (%)	Outcome 2 (%)	Outcome 3 (%)	Expected Return (%)
1	12	0	6	6
2	12	6	0	6
3	0	6	12	6

- 32 Which pair of assets is perfectly negatively correlated?
- A Asset 1 and Asset 2.
- B Asset 1 and Asset 3.
- C Asset 2 and Asset 3.
- 33 If the analyst constructs two-asset portfolios that are equally-weighted, which pair of assets has the *lowest* expected standard deviation?
- A Asset 1 and Asset 2.

- B Asset 1 and Asset 3.
C Asset 2 and Asset 3.
- 34 If the analyst constructs two-asset portfolios that are equally weighted, which pair of assets provides the *least* amount of risk reduction?
A Asset 1 and Asset 2.
B Asset 1 and Asset 3.
C Asset 2 and Asset 3.
-
- 35 Which of the following statements is *least* accurate? The efficient frontier is the set of all attainable risky assets with the:
A highest expected return for a given level of risk.
B lowest amount of risk for a given level of return.
C highest expected return relative to the risk-free rate.
- 36 The portfolio on the minimum-variance frontier with the lowest standard deviation is:
A unattainable.
B the optimal risky portfolio.
C the global minimum-variance portfolio.
- 37 The set of portfolios on the minimum-variance frontier that dominates all sets of portfolios below the global minimum-variance portfolio is the:
A capital allocation line.
B Markowitz efficient frontier.
C set of optimal risky portfolios.
- 38 The dominant capital allocation line is the combination of the risk-free asset and the:
A optimal risky portfolio.
B levered portfolio of risky assets.
C global minimum-variance portfolio.
- 39 Compared to the efficient frontier of risky assets, the dominant capital allocation line has higher rates of return for levels of risk greater than the optimal risky portfolio because of the investor's ability to:
A lend at the risk-free rate.
B borrow at the risk-free rate.
C purchase the risk-free asset.
- 40 With respect to the mean–variance theory, the optimal portfolio is determined by each individual investor's:
A risk-free rate.
B borrowing rate.
C risk preference.

SOLUTIONS

- 1 C is correct. -10.1% is the holding period return, which is calculated as: $(3,050 - 3,450 + 51.55)/3,450$, which is comprised of a dividend yield of $1.49\% = 51.55/(3,450)$ and a capital loss yield of $-11.59\% = -400/(3,450)$.
- 2 B is correct. $[(1 + 0.14)(1 - 0.10)(1 - 0.02)] - 1 = 0.0055 = 0.55\%$.
- 3 A is correct. $[(1 + 0.22)(1 - 0.25)(1 + 0.11)]^{(1/3)} - 1 = 1.0157^{(1/3)} - 1 = 0.0052 = 0.52\%$
- 4 A is correct. The geometric mean return compounds the returns instead of the amount invested.
- 5 B is correct. The annualized rate of return for ETF 2 is $12.05\% = (1.0110^{52/5}) - 1$, which is greater than the annualized rate of ETF 1, $11.93\% = (1.0461^{365/146}) - 1$, and ETF 3, $11.32\% = (1.1435^{12/15}) - 1$. Despite having the lowest value for the periodic rate, ETF 2 has the highest annualized rate of return because of the reinvestment rate assumption and the compounding of the periodic rate.
- 6 A is correct. The asset's returns are not used to calculate the portfolio's variance [only the assets' weights, standard deviations (or variances), and covariances (or correlations) are used].
- 7 C is correct.

$$\begin{aligned}\sigma_{port} &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2} \\ &= \sqrt{(0.3)^2 (20\%)^2 + (0.7)^2 (12\%)^2 + 2(0.3)(0.7)(0.40)(20\%)(12\%)} \\ &= (0.3600\% + 0.7056\% + 0.4032\%)^{0.5} = (1.4688\%)^{0.5} = 2.11\%\end{aligned}$$

- 8 A is correct.

$$\begin{aligned}\sigma_{port} &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \text{Cov}(R_1 R_2)} \\ &= \sqrt{(0.3)^2 (20\%)^2 + (0.7)^2 (12\%)^2 + 2(0.3)(0.7)(-0.0240)} \\ &= (0.3600\% + 0.7056\% - 1.008\%)^{0.5} = (0.0576\%)^{0.5} = 2.40\%\end{aligned}$$

- 9 C is correct. A portfolio standard deviation of 14.40% is the weighted average, which is possible only if the correlation between the securities is equal to 1.0.
- 10 B is correct. A portfolio standard deviation of 14.40% is the weighted average, which is possible only if the correlation between the securities is equal to 1.0. If the correlation coefficient is equal to 1.0, then the covariance must equal 0.0240, calculated as: $\text{Cov}(R_1, R_2) = \rho_{12} \sigma_1 \sigma_2 = (1.0)(20\%)(12\%) = 2.40\% = 0.0240$.
- 11 B is correct. $(1 + 0.080)/(1 + 0.0210) = 5.8\%$
- 12 A is correct. $(1 + 0.065)/(1 + 0.0210) = 4.3\%$
- 13 A is correct. $(1 + 0.080)/(1 + 0.0250) = 5.4\%$
- 14 B is correct. $(1 + 0.0650)/(1 + 0.0250) = 3.9\%$
- 15 C is correct. Brokerage commissions are negotiated with the brokerage firm. A security's liquidity impacts the operational efficiency of trading costs. Specifically, liquidity impacts the bid–ask spread and can impact the stock price (if the ability to sell the stock is impaired by the uncertainty associated with being able to sell the stock).

- 16** C is correct. Historical data over long periods of time indicate that there exists a positive risk–return relationship, which is a reflection of an investor's risk aversion.
- 17** A is correct. A risk-free asset has a variance of zero and is not dependent on whether the investor is risk neutral, risk seeking or risk averse. That is, given that the utility function of an investment is expressed as $U = E(r) - \frac{1}{2}A\sigma^2$, where A is the measure of risk aversion, then the sign of A is irrelevant if the variance is zero (like that of a risk-free asset).
- 18** C is correct. The most risk-averse investor has the indifference curve with the greatest slope.
- 19** A is correct. A negative value in the given utility function indicates that the investor is a risk seeker.
- 20** C is correct. Investment 3 has the highest rate of return. Risk is irrelevant to a risk-neutral investor, who would have a measure of risk aversion equal to 0. Given the utility function, the risk-neutral investor would obtain the greatest amount of utility from Investment 3.

Investment	Expected Return (%)	Expected Standard Deviation (%)	Utility $A = 0$
1	18	2	0.1800
2	19	8	0.1900
3	20	15	0.2000
4	18	30	0.1800

- 21** C is correct. Investment 4 provides the highest utility value (0.2700) for a risk-seeking investor, who has a measure of risk aversion equal to -2.

Investment	Expected Return (%)	Expected Standard Deviation (%)	Utility $A = -2$
1	18	2	0.1804
2	19	8	0.1964
3	20	15	0.2225
4	18	30	0.2700

- 22** B is correct. Investment 2 provides the highest utility value (0.1836) for a risk-averse investor who has a measure of risk aversion equal to 2.

Investment	Expected Return (%)	Expected Standard Deviation (%)	Utility $A = 2$
1	18	2	0.1796
2	19	8	0.1836
3	20	15	0.1775
4	18	30	0.0900

- 23** A is correct. Investment 1 provides the highest utility value (0.1792) for a risk-averse investor who has a measure of risk aversion equal to 4.

Investment	Expected Return (%)	Expected Standard Deviation (%)	Utility $A = 4$
1	18	2	0.1792
2	19	8	0.1772
3	20	15	0.1550
4	18	30	0.0000

24 A is correct. The CAL is the combination of the risk-free asset with zero risk and the portfolio of all risky assets that provides for the set of feasible investments. Allowing for borrowing at the risk-free rate and investing in the portfolio of all risky assets provides for attainable portfolios that dominate risky assets below the CAL.

25 B is correct. The CAL represents the set of all feasible investments. Each investor's indifference curve determines the optimal combination of the risk-free asset and the portfolio of all risky assets, which must lie on the CAL.

26 C is correct.

$$R_p = w_1 \times R_1 + (1 - w_1) \times R_2$$

$$R_p = w_1 \times 16\% + (1 - w_1) \times 12\%$$

$$15\% = 0.75(16\%) + 0.25(12\%)$$

27 A is correct.

$$\begin{aligned}\sigma_{port} &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2} \\ &= \sqrt{(0.5)^2 (20\%)^2 + (0.5)^2 (20\%)^2 + 2(0.5)(0.5)(-0.15)(20\%)(20\%)} \\ &= (1.0000\% + 1.0000\% - 0.3000\%)^{0.5} = (1.7000\%)^{0.5} = 13.04\%\end{aligned}$$

28 B is correct.

$$\begin{aligned}\sigma_{port} &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2} \\ &= \sqrt{(0.5)^2 (20\%)^2 + (0.5)^2 (20\%)^2 + 2(0.5)(0.5)(0.00)(20\%)(20\%)} \\ &= (1.0000\% + 1.0000\% + 0.0000\%)^{0.5} = (2.0000\%)^{0.5} = 14.14\%\end{aligned}$$

29 B is correct. The contribution of each individual asset's variance (or standard deviation) to the portfolio's volatility decreases as the number of assets in the equally weighted portfolio increases. The contribution of the co-movement measures between the assets increases (i.e., covariance and correlation) as the number of assets in the equally weighted portfolio increases. The following equation for the variance of an equally weighted portfolio illustrates these

$$\text{points: } \sigma_p^2 = \frac{\bar{\sigma}^2}{N} + \frac{N-1}{N} \overline{COV} = \frac{\bar{\sigma}^2}{N} + \frac{N-1}{N} \bar{\rho} \bar{\sigma}^2.$$

30 C is correct. The co-movement measures between the assets increases (i.e., covariance and correlation) as the number of assets in the equally weighted portfolio increases. The contribution of each individual asset's variance (or

standard deviation) to the portfolio's volatility decreases as the number of assets in the equally weighted portfolio increases. The following equation for the variance of an equally weighted portfolio illustrates these points:

$$\sigma_p^2 = \frac{\bar{\sigma}^2}{N} + \frac{N-1}{N} \overline{COV} = \frac{\bar{\sigma}^2}{N} + \frac{N-1}{N} \bar{\rho} \bar{\sigma}^2$$

- 31 A is correct. Higher correlations will produce less diversification benefits provided that the other components of the portfolio standard deviation do not change (i.e., the weights and standard deviations of the individual assets).
- 32 C is correct. Asset 2 and Asset 3 have returns that are the same for Outcome 2, but the exact opposite returns for Outcome 1 and Outcome 3; therefore, because they move in opposite directions at the same magnitude, they are perfectly negatively correlated.
- 33 C is correct. An equally weighted portfolio of Asset 2 and Asset 3 will have the lowest portfolio standard deviation, because for each outcome, the portfolio has the same expected return (they are perfectly negatively correlated).
- 34 A is correct. An equally weighted portfolio of Asset 1 and Asset 2 has the highest level of volatility of the three pairs. All three pairs have the same expected return; however, the portfolio of Asset 1 and Asset 2 provides the least amount of risk reduction.
- 35 C is correct. The efficient frontier does not account for the risk-free rate. The efficient frontier is the set of all attainable risky assets with the highest expected return for a given level of risk or the lowest amount of risk for a given level of return.
- 36 C is correct. The global minimum-variance portfolio is the portfolio on the minimum-variance frontier with the lowest standard deviation. Although the portfolio is attainable, when the risk-free asset is considered, the global minimum-variance portfolio is not the optimal risky portfolio.
- 37 B is correct. The Markowitz efficient frontier has higher rates of return for a given level of risk. With respect to the minimum-variance portfolio, the Markowitz efficient frontier is the set of portfolios above the global minimum-variance portfolio that dominates the portfolios below the global minimum-variance portfolio.
- 38 A is correct. The use of leverage and the combination of a risk-free asset and the optimal risky asset will dominate the efficient frontier of risky assets (the Markowitz efficient frontier).
- 39 B is correct. The CAL dominates the efficient frontier at all points except for the optimal risky portfolio. The ability of the investor to purchase additional amounts of the optimal risky portfolio by borrowing (i.e., buying on margin) at the risk-free rate makes higher rates of return for levels of risk greater than the optimal risky asset possible.
- 40 C is correct. Each individual investor's optimal mix of the risk-free asset and the optimal risky asset is determined by the investor's risk preference.

PRACTICE PROBLEMS

- 1 The line depicting the total risk and expected return of portfolio combinations of a risk-free asset and any risky asset is the:
 - A security market line.
 - B capital allocation line.
 - C security characteristic line.
- 2 The portfolio of a risk-free asset and a risky asset has a better risk-return tradeoff than investing in only one asset type because the correlation between the risk-free asset and the risky asset is equal to:
 - A -1.0.
 - B 0.0.
 - C 1.0.
- 3 With respect to capital market theory, an investor's optimal portfolio is the combination of a risk-free asset and a risky asset with the highest:
 - A expected return.
 - B indifference curve.
 - C capital allocation line slope.
- 4 Highly risk-averse investors will *most likely* invest the majority of their wealth in:
 - A risky assets.
 - B risk-free assets.
 - C the optimal risky portfolio.
- 5 The capital market line (CML) is the graph of the risk and return of portfolio combinations consisting of the risk-free asset and:
 - A any risky portfolio.
 - B the market portfolio.
 - C the leveraged portfolio.
- 6 Which of the following statements *most accurately* defines the market portfolio in capital market theory? The market portfolio consists of all:
 - A risky assets.
 - B tradable assets.
 - C investable assets.
- 7 With respect to capital market theory, the optimal risky portfolio:
 - A is the market portfolio.
 - B has the highest expected return.
 - C has the lowest expected variance.
- 8 Relative to portfolios on the CML, any portfolio that plots above the CML is considered:
 - A inferior.
 - B inefficient.
 - C unachievable.

- 9 A portfolio on the capital market line with returns greater than the returns on the market portfolio represents a(n):
A lending portfolio.
B borrowing portfolio.
C unachievable portfolio.
- 10 With respect to the capital market line, a portfolio on the CML with returns less than the returns on the market portfolio represents a(n):
A lending portfolio.
B borrowing portfolio.
C unachievable portfolio.
- 11 Which of the following types of risk is *most likely* avoided by forming a diversified portfolio?
A Total risk.
B Systematic risk.
C Nonsystematic risk.
- 12 Which of the following events is *most likely* an example of nonsystematic risk?
A A decline in interest rates.
B The resignation of chief executive officer.
C An increase in the value of the US dollar.
- 13 With respect to the pricing of risk in capital market theory, which of the following statements is *most accurate*?
A All risk is priced.
B Systematic risk is priced.
C Nonsystematic risk is priced.
- 14 The sum of an asset's systematic variance and its nonsystematic variance of returns is equal to the asset's:
A beta.
B total risk.
C total variance.
- 15 With respect to return-generating models, the intercept term of the market model is the asset's estimated:
A beta.
B alpha.
C variance.
- 16 With respect to return-generating models, the slope term of the market model is an estimate of the asset's:
A total risk.
B systematic risk.
C nonsystematic risk.
- 17 With respect to return-generating models, which of the following statements is *most accurate*? Return-generating models are used to directly estimate the:
A expected return of a security.
B weights of securities in a portfolio.
C parameters of the capital market line.

The following information relates to Questions 18–20

An analyst gathers the following information:

Security	Expected Annual Return (%)	Expected Standard Deviation (%)	Correlation between Security and the Market
Security 1	11	25	0.6
Security 2	11	20	0.7
Security 3	14	20	0.8
Market	10	15	1.0

- 18 Which security has the *highest* total risk?
- A Security 1.
 - B Security 2.
 - C Security 3.
- 19 Which security has the *highest* beta measure?
- A Security 1.
 - B Security 2.
 - C Security 3.
- 20 Which security has the *least* amount of market risk?
- A Security 1.
 - B Security 2.
 - C Security 3.
-
- 21 With respect to capital market theory, the average beta of all assets in the market is:
- A less than 1.0.
 - B equal to 1.0.
 - C greater than 1.0.
- 22 The slope of the security characteristic line is an asset's:
- A beta.
 - B excess return.
 - C risk premium.
- 23 The graph of the capital asset pricing model is the:
- A capital market line.
 - B security market line.
 - C security characteristic line.
- 24 With respect to capital market theory, correctly priced individual assets can be plotted on the:
- A capital market line.
 - B security market line.
 - C capital allocation line.

- 25 With respect to the capital asset pricing model, the primary determinant of expected return of an individual asset is the:
- A asset's beta.
 - B market risk premium.
 - C asset's standard deviation.
- 26 With respect to the capital asset pricing model, which of the following values of beta for an asset is *most likely* to have an expected return for the asset that is less than the risk-free rate?
- A -0.5
 - B 0.0
 - C 0.5
- 27 With respect to the capital asset pricing model, the market risk premium is:
- A less than the excess market return.
 - B equal to the excess market return.
 - C greater than the excess market return.

The following information relates to Questions

28–31

An analyst gathers the following information:

Security	Expected Standard Deviation (%)	Beta
Security 1	25	1.50
Security 2	15	1.40
Security 3	20	1.60

- 28 With respect to the capital asset pricing model, if the expected market risk premium is 6% and the risk-free rate is 3%, the expected return for Security 1 is *closest* to:
- A 9.0%.
 - B 12.0%.
 - C 13.5%.
- 29 With respect to the capital asset pricing model, if expected return for Security 2 is equal to 11.4% and the risk-free rate is 3%, the expected return for the market is *closest* to:
- A 8.4%.
 - B 9.0%.
 - C 10.3%.
- 30 With respect to the capital asset pricing model, if the expected market risk premium is 6% the security with the *highest* expected return is:
- A Security 1.
 - B Security 2.
 - C Security 3.
- 31 With respect to the capital asset pricing model, a decline in the expected market return will have the *greatest* impact on the expected return of:

- A Security 1.
 - B Security 2.
 - C Security 3.
-

- 32 Which of the following performance measures is consistent with the CAPM?
- A M^2 .
 - B Sharpe ratio.
 - C Jensen's alpha.
- 33 Which of the following performance measures does *not* require the measure to be compared to another value?
- A Sharpe ratio.
 - B Treynor ratio.
 - C Jensen's alpha.
- 34 Which of the following performance measures is *most* appropriate for an investor who is *not* fully diversified?
- A M^2 .
 - B Treynor ratio.
 - C Jensen's alpha.
- 35 Analysts who have estimated returns of an asset to be greater than the expected returns generated by the capital asset pricing model should consider the asset to be:
- A overvalued.
 - B undervalued.
 - C properly valued.
- 36 With respect to capital market theory, which of the following statements *best* describes the effect of the homogeneity assumption? Because all investors have the same economic expectations of future cash flows for all assets, investors will invest in:
- A the same optimal risky portfolio.
 - B the Standard and Poor's 500 Index.
 - C assets with the same amount of risk.
- 37 With respect to capital market theory, which of the following assumptions allows for the existence of the market portfolio? All investors:
- A are price takers.
 - B have homogeneous expectations.
 - C plan for the same, single holding period.
- 38 The intercept of the best fit line formed by plotting the excess returns of a manager's portfolio on the excess returns of the market is *best* described as Jensen's:
- A beta.
 - B ratio.
 - C alpha.
- 39 Portfolio managers who are maximizing risk-adjusted returns will seek to invest *more* in securities with:
- A lower values of Jensen's alpha.
 - B values of Jensen's alpha equal to 0.

- C higher values of Jensen's alpha.
- 40 Portfolio managers, who are maximizing risk-adjusted returns, will seek to invest *less* in securities with:
- A lower values for nonsystematic variance.
 - B values of nonsystematic variance equal to 0.
 - C higher values for nonsystematic variance.

SOLUTIONS

- 1 B is correct. A capital allocation line (CAL) plots the expected return and total risk of combinations of the risk-free asset and a risky asset (or a portfolio of risky assets).
- 2 B is correct. A portfolio of the risk-free asset and a risky asset or a portfolio of risky assets can result in a better risk-return tradeoff than an investment in only one type of an asset, because the risk-free asset has zero correlation with the risky asset.
- 3 B is correct. Investors will have different optimal portfolios depending on their indifference curves. The optimal portfolio for each investor is the one with highest utility; that is, where the CAL is tangent to the individual investor's highest possible indifference curve.
- 4 B is correct. Although the optimal risky portfolio is the market portfolio, highly risk-averse investors choose to invest most of their wealth in the risk-free asset.
- 5 B is correct. Although the capital allocation line includes all possible combinations of the risk-free asset and any risky portfolio, the capital market line is a special case of the capital allocation line, which uses the market portfolio as the optimal risky portfolio.
- 6 A is correct. The market includes all risky assets, or anything that has value; however, not all assets are tradable, and not all tradable assets are investable.
- 7 A is correct. The optimal risky portfolio is the market portfolio. Capital market theory assumes that investors have homogeneous expectations, which means that all investors analyze securities in the same way and are rational. That is, investors use the same probability distributions, use the same inputs for future cash flows, and arrive at the same valuations. Because their valuations of all assets are identical, all investors will invest in the same optimal risky portfolio (i.e., the market portfolio).
- 8 C is correct. Theoretically, any point above the CML is not achievable and any point below the CML is dominated by and inferior to any point on the CML.
- 9 B is correct. As one moves further to the right of point M on the capital market line, an increasing amount of borrowed money is being invested in the market portfolio. This means that there is negative investment in the risk-free asset, which is referred to as a leveraged position in the risky portfolio.
- 10 A is correct. The combinations of the risk-free asset and the market portfolio on the CML where returns are less than the returns on the market portfolio are termed 'lending' portfolios.
- 11 C is correct. Investors are capable of avoiding nonsystematic risk by forming a portfolio of assets that are not highly correlated with one another, thereby reducing total risk and being exposed only to systematic risk.
- 12 B is correct. Nonsystematic risk is specific to a firm, whereas systematic risk affects the entire economy.
- 13 B is correct. Only systematic risk is priced. Investors do not receive any return for accepting nonsystematic or diversifiable risk.
- 14 C is correct. The sum of systematic variance and nonsystematic variance equals the total variance of the asset. References to total risk as the sum of systematic risk and nonsystematic risk refer to variance, not to risk.
- 15 B is correct. In the market model, $R_i = \alpha_i + \beta_i R_m + e_i$, the intercept, α_i , and slope coefficient, β_i , are estimated using historical security and market returns.

- 16** B is correct. In the market model, $R_i = \alpha_i + \beta_i R_m + e_i$, the slope coefficient, β_i , is an estimate of the asset's systematic or market risk.
- 17** A is correct. In the market model, $R_i = \alpha_i + \beta_i R_m + e_i$, the intercept, α_i and slope coefficient, β_i , are estimated using historical security and market returns. These parameter estimates then are used to predict firm-specific returns that a security may earn in a future period.
- 18** A is correct. Security 1 has the highest total variance; $0.0625 = 0.25^2$ compared to Security 2 and Security 3 with a total variance of 0.0400.
- 19** C is correct. Security 3 has the highest beta value; $1.07 = \frac{\rho_{3,m}\sigma_3}{\sigma_m} = \frac{(0.80)(20\%)}{15\%}$ compared to Security 1 and Security 2 with beta values of 1.00 and 0.93, respectively.
- 20** B is correct. Security 2 has the lowest beta value; $0.93 = \frac{\rho_{2,m}\sigma_2}{\sigma_m} = \frac{(0.70)(20\%)}{15\%}$ compared to Security 1 and 3 with beta values of 1.00 and 1.07, respectively.
- 21** B is correct. The average beta of all assets in the market, by definition, is equal to 1.0.
- 22** A is correct. The security characteristic line is a plot of the excess return of the security on the excess return of the market. In such a graph, Jensen's alpha is the intercept and the beta is the slope.
- 23** B is correct. The security market line (SML) is a graphical representation of the capital asset pricing model, with beta risk on the x-axis and expected return on the y-axis.
- 24** B is correct. The security market line applies to any security, efficient or not. The CAL and the CML use the total risk of the asset (or portfolio of assets) rather than its systematic risk, which is the only risk that is priced.
- 25** A is correct. The CAPM shows that the primary determinant of expected return for an individual asset is its beta, or how well the asset correlates with the market.
- 26** A is correct. If an asset's beta is negative, the required return will be less than the risk-free rate in the CAPM. When combined with a positive market return, the asset reduces the risk of the overall portfolio, which makes the asset very valuable. Insurance is an example of a negative beta asset.
- 27** B is correct. In the CAPM, the market risk premium is the difference between the return on the market and the risk-free rate, which is the same as the return in excess of the market return.
- 28** B is correct. The expected return of Security 1, using the CAPM, is $12.0\% = 3\% + 1.5(6\%)$; $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$.
- 29** B is correct. The expected risk premium for Security 2 is 8.4%, $(11.4\% - 3\%)$, indicates that the expected market risk premium is 6%; therefore, since the risk-free rate is 3% the expected rate of return for the market is 9%. That is, using the CAPM, $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$, $11.4\% = 3\% + 1.4(X\%)$, where $X\% = (11.4\% - 3\%)/1.4 = 6.0\% = \text{market risk premium}$.
- 30** C is correct. Security 3 has the highest beta; thus, regardless of the value for the risk-free rate, Security 3 will have the highest expected return:
- $$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$
- 31** C is correct. Security 3 has the highest beta; thus, regardless of the risk-free rate the expected return of Security 3 will be most sensitive to a change in the expected market return.

- 32 C is correct. Jensen's alpha adjusts for systematic risk, and M -squared and the Sharpe Ratio adjust for total risk.
- 33 C is correct. The sign of Jensen's alpha indicates whether or not the portfolio has outperformed the market. If alpha is positive, the portfolio has outperformed the market; if alpha is negative, the portfolio has underperformed the market.
- 34 A is the correct. M -squared adjusts for risk using standard deviation (i.e., total risk).
- 35 B is correct. If the estimated return of an asset is above the SML (the expected return), the asset has a lower level of risk relative to the amount of expected return and would be a good choice for investment (i.e., undervalued).
- 36 A is correct. The homogeneity assumption refers to all investors having the same economic expectation of future cash flows. If all investors have the same expectations, then all investors should invest in the same optimal risky portfolio, therefore implying the existence of only one optimal portfolio (i.e., the market portfolio).
- 37 B is correct. The homogeneous expectations assumption means that all investors analyze securities in the same way and are rational. That is, they use the same probability distributions, use the same inputs for future cash flows, and arrive at the same valuations. Because their valuation of all assets is identical, they will generate the same optimal risky portfolio, which is the market portfolio.
- 38 C is correct. This is because of the plot of the excess return of the security on the excess return of the market. In such a graph, Jensen's alpha is the intercept and the beta is the slope.
- 39 C is correct. Since managers are concerned with maximizing risk-adjusted returns, securities with a higher value of Jensen's alpha, α_p , should have a higher weight.
- 40 C is correct. Since managers are concerned with maximizing risk-adjusted returns, securities with greater nonsystematic risk should be given less weight in the portfolio.

PRACTICE PROBLEMS

- 1 Which of the following is *least* important as a reason for a written investment policy statement (IPS)?
 - A The IPS may be required by regulation.
 - B Having a written IPS is part of best practice for a portfolio manager.
 - C Having a written IPS ensures the client's risk and return objectives can be achieved.
- 2 Which of the following *best* describes the underlying rationale for a written investment policy statement (IPS)?
 - A A written IPS communicates a plan for trying to achieve investment success.
 - B A written IPS provides investment managers with a ready defense against client lawsuits.
 - C A written IPS allows investment managers to instruct clients about the proper use and purpose of investments.
- 3 A written investment policy statement (IPS) is *most* likely to succeed if:
 - A it is created by a software program to assure consistent quality.
 - B it is a collaborative effort of the client and the portfolio manager.
 - C it reflects the investment philosophy of the portfolio manager.
- 4 The section of the investment policy statement (IPS) that provides information about how policy may be executed, including investment constraints, is *best* described as the:
 - A *Investment Objectives*.
 - B *Investment Guidelines*.
 - C *Statement of Duties and Responsibilities*.
- 5 Which of the following is *least* likely to be placed in the appendices to an investment policy statement (IPS)?
 - A *Rebalancing Policy*.
 - B *Strategic Asset Allocation*.
 - C *Statement of Duties and Responsibilities*.
- 6 Which of the following typical topics in an investment policy statement (IPS) is *most* closely linked to the client's "distinctive needs"?
 - A *Procedures*.
 - B *Investment Guidelines*.
 - C *Statement of Duties and Responsibilities*.
- 7 An investment policy statement that includes a return objective of outperforming the FTSE 100 by 120 basis points is *best* characterized as having a(n):
 - A relative return objective.
 - B absolute return objective.
 - C arbitrage-based return objective.
- 8 Risk assessment questionnaires for investment management clients are *most* useful in measuring:
 - A value at risk.

- B ability to take risk.
C willingness to take risk.
- 9 Which of the following is *best* characterized as a relative risk objective?
A Value at risk for the fund will not exceed US\$3 million.
B The fund will not underperform the DAX by more than 250 basis points.
C The fund will not lose more than €2.5 million in the coming 12-month period.
- 10 In preparing an investment policy statement, which of the following is *most* difficult to quantify?
A Time horizon.
B Ability to accept risk.
C Willingness to accept risk.
- 11 After interviewing a client in order to prepare a written investment policy statement (IPS), you have established the following:
 - The client has earnings that vary dramatically between £30,000 and £70,000 (pre-tax) depending on weather patterns in Britain.
 - In three of the previous five years, the after-tax income of the client has been less than £20,000.
 - The client's mother is dependent on her son (the client) for approximately £9,000 per year support.
 - The client's own subsistence needs are approximately £12,000 per year.
 - The client has more than 10 years' experience trading investments including commodity futures, stock options, and selling stock short.
 - The client's responses to a standard risk assessment questionnaire suggest he has above average risk tolerance.The client is *best* described as having a:
A low ability to take risk, but a high willingness to take risk.
B high ability to take risk, but a low willingness to take risk.
C high ability to take risk and a high willingness to take risk.
- 12 After interviewing a client in order to prepare a written investment policy statement (IPS), you have established the following:
 - The client has earnings that have exceeded €120,000 (pre-tax) each year for the past five years.
 - She has no dependents.
 - The client's subsistence needs are approximately €45,000 per year.
 - The client states that she feels uncomfortable with her lack of understanding of securities markets.
 - All of the client's current savings are invested in short-term securities guaranteed by an agency of her national government.
 - The client's responses to a standard risk assessment questionnaire suggest she has low risk tolerance.The client is *best* described as having a:
A low ability to take risk, but a high willingness to take risk.
B high ability to take risk, but a low willingness to take risk.
C high ability to take risk and a high willingness to take risk.

- 13** A client who is a 34-year old widow with two healthy young children (aged 5 and 7) has asked you to help her form an investment policy statement. She has been employed as an administrative assistant in a bureau of her national government for the previous 12 years. She has two primary financial goals—her retirement and providing for the college education of her children. This client's time horizon is *best* described as being:
- long term.
 - short term.
 - medium term.
- 14** The timing of payouts for property and casualty insurers is unpredictable ("lumpy") in comparison with the timing of payouts for life insurance companies. Therefore, in general, property and casualty insurers have:
- lower liquidity needs than life insurance companies.
 - greater liquidity needs than life insurance companies.
 - a higher return objective than life insurance companies.
- 15** A client who is a director of a publicly listed corporation is required by law to refrain from trading that company's stock at certain points of the year when disclosure of financial results are pending. In preparing a written investment policy statement (IPS) for this client, this restriction on trading:
- is irrelevant to the IPS.
 - should be included in the IPS.
 - makes it illegal for the portfolio manager to work with this client.
- 16** Consider the pairwise correlations of monthly returns of the following asset classes:

	Brazilian Equities	East Asian Equities	European Equities	US Equities
Brazilian equities	1.00	0.70	0.85	0.76
East Asian equities	0.70	1.00	0.91	0.88
European equities	0.85	0.91	1.00	0.90
US equities	0.76	0.88	0.90	1.00

Based solely on the information in the above table, which equity asset class is *most* sharply distinguished from US equities?

- Brazilian equities.
 - European equities.
 - East Asian equities.
- 17** Returns on asset classes are *best* described as being a function of:
- the failure of arbitrage.
 - exposure to the idiosyncratic risks of those asset classes.
 - exposure to sets of systematic factors relevant to those asset classes.
- 18** In defining asset classes as part of the strategic asset allocation decision, pairwise correlations within asset classes should generally be:
- equal to correlations among asset classes.
 - lower than correlations among asset classes.
 - higher than correlations among asset classes.
- 19** Tactical asset allocation is *best* described as:
- attempts to exploit arbitrage possibilities among asset classes.

- B the decision to deliberately deviate from the policy portfolio.
 - C selecting asset classes with the desired exposures to sources of systematic risk in an investment portfolio.
- 20 Investing the majority of the portfolio on a passive or low active risk basis while a minority of the assets is managed aggressively in smaller portfolios is *best* described as:
- A the core–satellite approach.
 - B a top-down investment policy.
 - C a delta-neutral hedge approach.

SOLUTIONS

- 1 C is correct. Depending on circumstances, a written IPS or its equivalent may be required by law or regulation and a written IPS is certainly consistent with best practices. The mere fact that a written IPS is prepared for a client, however, does not *ensure* that risk and return objectives will in fact be achieved.
- 2 A is correct. A written IPS is best seen as a communication instrument allowing clients and portfolio managers to mutually establish investment objectives and constraints.
- 3 B is correct. A written IPS, to be successful, must incorporate a full understanding of the client's situation and requirements. As stated in the reading, "The IPS will be developed following a fact finding discussion with the client."
- 4 B is correct. The major components of an IPS are listed in Section 2.2 of the reading. *Investment Guidelines* are described as the section that provides information about how policy may be executed, including investment constraints. *Statement of Duties and Responsibilities* "detail[s] the duties and responsibilities of the client, the custodian of the client's assets, the investment managers, and so forth." *Investment Objectives* is "a section explaining the client's objectives in investing."
- 5 C is correct. The major components of an IPS are listed in Section 2.2 of the reading. Strategic Asset Allocation (also known as the policy portfolio) and Rebalancing Policy are often included as appendices to the IPS. The *Statement of Duties and Responsibilities*, however, is an integral part of the IPS and is unlikely to be placed in an appendix.
- 6 B is correct. According to the reading, "The sections of an IPS that are most closely linked to the client's distinctive needs are those dealing with investment objectives and constraints." *Investment Guidelines* "[provide] information about how policy may be executed, including investment constraints." *Procedures* "[detail] the steps to be taken to keep the IPS current and the procedures to follow to respond to various contingencies." *Statement of Duties and Responsibilities* "detail[s] the duties and responsibilities of the client, the custodian of the client's assets, the investment managers, and so forth."
- 7 A is correct. Because the return objective specifies a target return *relative to* the FTSE 100 Index, the objective is best described as a relative return objective.
- 8 C is correct. Risk attitude is a subjective factor and measuring risk attitude is difficult. Oftentimes, investment managers use psychometric questionnaires, such as those developed by Grable and Joo (2004), to assess a client's willingness to take risk.
- 9 B is correct. The reference to the DAX marks this response as a relative risk objective. Value at risk establishes a minimum value of loss expected during a specified time period at a given level of probability. A statement of maximum allowed absolute loss (€2.5 million) is an absolute risk objective.
- 10 C is correct. Measuring willingness to take risk (risk tolerance, risk aversion) is an exercise in applied psychology. Instruments attempting to measure risk attitudes exist, but they are clearly less objective than measurements of ability to take risk. Ability to take risk is based on relatively objective traits such as expected income, time horizon, and existing wealth relative to liabilities.

- 11** A is correct. The volatility of the client's income and the significant support needs for his mother and himself suggest that the client has a low ability to take risk. The client's trading experience and his responses to the risk assessment questionnaire indicate that the client has an above average willingness to take risk.
- 12** B is correct. On the one hand, the client has a stable, high income and no dependents. On the other hand, she exhibits above average risk aversion. Her ability to take risk is high, but her willingness to take risk is low.
- 13** A is correct. The client's financial objectives are long term. Her stable employment indicates that her immediate liquidity needs are modest. The children will not go to college until 10 or more years later. Her time horizon is best described as being long term.
- 14** B is correct. The unpredictable nature of property and casualty (P&C) claims forces P&C insurers to allocate a substantial proportion of their investments into liquid, short maturity assets. This need for liquidity also forces P&C companies to accept investments with relatively low expected returns. Liquidity is of less concern to life insurance companies given the greater predictability of life insurance payouts.
- 15** B is correct. When a client has a restriction in trading, such as this obligation to refrain from trading, the IPS "should note this constraint so that the portfolio manager does not inadvertently trade the stock on the client's behalf."
- 16** A is correct. The correlation between US equities and Brazilian equities is 0.76. The correlations between US equities and East Asian equities and the correlation between US equities and European equities both exceed 0.76. Lower correlations indicate a greater degree of separation between asset classes. Therefore, using solely the data given in the table, returns on Brazilian equities are most sharply distinguished from returns on US equities.
- 17** C is correct. Strategic asset allocation depends on several principles. As stated in the reading, "One principle is that a portfolio's systematic risk accounts for most of its change in value over the long run." A second principle is that, "the returns to groups of like assets... predictably reflect exposures to certain sets of systematic factors." This latter principle establishes that returns on asset classes primarily reflect the systematic risks of the classes.
- 18** C is correct. As the reading states, "an asset class should contain homogeneous assets... paired correlations of securities would be high within an asset class, but should be lower versus securities in other asset classes."
- 19** B is correct. Tactical asset allocation allows actual asset allocation to deviate from that of the strategic asset allocation (policy portfolio) of the IPS. Tactical asset allocation attempts to take advantage of temporary dislocations from the market conditions and assumptions that drove the policy portfolio decision.
- 20** A is correct. The core–satellite approach to constructing portfolios is defined as "investing the majority of the portfolio on a passive or low active risk basis while a minority of the assets is managed aggressively in smaller portfolios."

PRACTICE PROBLEMS

- 1 Akihiko Takabe has designed a sophisticated forecasting model, which predicts the movements in the overall stock market, in the hope of earning a return in excess of a fair return for the risk involved. He uses the predictions of the model to decide whether to buy, hold, or sell the shares of an index fund that aims to replicate the movements of the stock market. Takabe would *best* be characterized as a(n):
 - A hedger.
 - B investor.
 - C information-motivated trader.
- 2 James Beach is young and has substantial wealth. A significant proportion of his stock portfolio consists of emerging market stocks that offer relatively high expected returns at the cost of relatively high risk. Beach believes that investment in emerging market stocks is appropriate for him given his ability and willingness to take risk. Which of the following labels *most appropriately* describes Beach?
 - A Hedger.
 - B Investor.
 - C Information-motivated trader.
- 3 Lisa Smith owns a manufacturing company in the United States. Her company has sold goods to a customer in Brazil and will be paid in Brazilian real (BRL) in three months. Smith is concerned about the possibility of the BRL depreciating more than expected against the US dollar (USD). Therefore, she is planning to sell three-month futures contracts on the BRL. The seller of such contracts generally gains when the BRL depreciates against the USD. If Smith were to sell these future contracts, she would *most appropriately* be described as a(n):
 - A hedger.
 - B investor.
 - C information-motivated trader.
- 4 Which of the following is *not* a function of the financial system?
 - A To regulate arbitrageurs' profits (excess returns).
 - B To help the economy achieve allocational efficiency.
 - C To facilitate borrowing by businesses to fund current operations.
- 5 An investor primarily invests in stocks of publicly traded companies. The investor wants to increase the diversification of his portfolio. A friend has recommended investing in real estate properties. The purchase of real estate would *best* be characterized as a transaction in the:
 - A derivative investment market.
 - B traditional investment market.
 - C alternative investment market.
- 6 A hedge fund holds its excess cash in 90-day commercial paper and negotiable certificates of deposit. The cash management policy of the hedge fund is *best described* as using:
 - A capital market instruments.

- B money market instruments.
C intermediate-term debt instruments.
- 7 An oil and gas exploration and production company announces that it is offering 30 million shares to the public at \$45.50 each. This transaction is *most likely* a sale in the:
A futures market.
B primary market.
C secondary market.
- 8 Consider a mutual fund that invests primarily in fixed-income securities that have been determined to be appropriate given the fund's investment goal. Which of the following is *least likely* to be a part of this fund?
A Warrants.
B Commercial paper.
C Repurchase agreements.
- 9 A friend has asked you to explain the differences between open-end and closed-end funds. Which of the following will you *most likely* include in your explanation?
A Closed-end funds are unavailable to new investors.
B When investors sell the shares of an open-end fund, they can receive a discount or a premium to the fund's net asset value.
C When selling shares, investors in an open-end fund sell the shares back to the fund whereas investors in a closed-end fund sell the shares to others in the secondary market.
- 10 The usefulness of a forward contract is limited by some problems. Which of the following is *most likely* one of those problems?
A Once you have entered into a forward contract, it is difficult to exit from the contract.
B Entering into a forward contract requires the long party to deposit an initial amount with the short party.
C If the price of the underlying asset moves adversely from the perspective of the long party, periodic payments must be made to the short party.
- 11 Tony Harris is planning to start trading in commodities. He has heard about the use of futures contracts on commodities and is learning more about them. Which of the following is Harris *least likely* to find associated with a futures contract?
A Existence of counterparty risk.
B Standardized contractual terms.
C Payment of an initial margin to enter into a contract.
- 12 A German company that exports machinery is expecting to receive \$10 million in three months. The firm converts all its foreign currency receipts into euros. The chief financial officer of the company wishes to lock in a minimum fixed rate for converting the \$10 million to euro but also wants to keep the flexibility to use the future spot rate if it is favorable. What hedging transaction is *most likely* to achieve this objective?
A Selling dollars forward.
B Buying put options on the dollar.
C Selling futures contracts on dollars.

- 13 A book publisher requires substantial quantities of paper. The publisher and a paper producer have entered into an agreement for the publisher to buy and the producer to supply a given quantity of paper four months later at a price agreed upon today. This agreement is a:
- A futures contract.
 - B forward contract.
 - C commodity swap.
- 14 The Standard & Poor's Depository Receipts (SPDRs) is an investment that tracks the S&P 500 stock market index. Purchases and sales of SPDRs during an average trading day are *best* described as:
- A primary market transactions in a pooled investment.
 - B secondary market transactions in a pooled investment.
 - C secondary market transactions in an actively managed investment.
- 15 The Standard & Poor's Depository Receipts (SPDRs) is an exchange-traded fund in the United States that is designed to track the S&P 500 stock market index. The current price of a share of SPDRs is \$113. A trader has just bought call options on shares of SPDRs for a premium of \$3 per share. The call options expire in five months and have an exercise price of \$120 per share. On the expiration date, the trader will exercise the call options (ignore any transaction costs) if and only if the shares of SPDRs are trading:
- A below \$120 per share.
 - B above \$120 per share.
 - C above \$123 per share.
- 16 Which of the following statements about exchange-traded funds is *most correct*?
- A Exchange-traded funds are not backed by any assets.
 - B The investment companies that create exchange-traded funds are financial intermediaries.
 - C The transaction costs of trading shares of exchange-traded funds are substantially greater than the combined costs of trading the underlying assets of the fund.
- 17 Jason Schmidt works for a hedge fund and he specializes in finding profit opportunities that are the result of inefficiencies in the market for convertible bonds—bonds that can be converted into a predetermined amount of a company's common stock. Schmidt tries to find convertibles that are priced inefficiently relative to the underlying stock. The trading strategy involves the simultaneous purchase of the convertible bond and the short sale of the underlying common stock. The above process could best be described as:
- A hedging.
 - B arbitrage.
 - C securitization.
- 18 Pierre-Louis Robert just purchased a call option on shares of the Michelin Group. A few days ago he wrote a put option on Michelin shares. The call and put options have the same exercise price, expiration date, and number of shares underlying. Considering both positions, Robert's exposure to the risk of the stock of the Michelin Group is:
- A long.
 - B short.
 - C neutral.

- 19** An online brokerage firm has set the minimum margin requirement at 55 percent. What is the maximum leverage ratio associated with a position financed by this minimum margin requirement?
- A 1.55.
B 1.82.
C 2.22.
- 20** A trader has purchased 200 shares of a non-dividend-paying firm on margin at a price of \$50 per share. The leverage ratio is 2.5. Six months later, the trader sells these shares at \$60 per share. Ignoring the interest paid on the borrowed amount and the transaction costs, what was the return to the trader during the six-month period?
- A 20 percent.
B 33.33 percent.
C 50 percent.
- 21** Jason Williams purchased 500 shares of a company at \$32 per share. The stock was bought on 75 percent margin. One month later, Williams had to pay interest on the amount borrowed at a rate of 2 percent per month. At that time, Williams received a dividend of \$0.50 per share. Immediately after that he sold the shares at \$28 per share. He paid commissions of \$10 on the purchase and \$10 on the sale of the stock. What was the rate of return on this investment for the one-month period?
- A -12.5 percent.
B -15.4 percent.
C -50.1 percent.
- 22** Caroline Rogers believes the price of Gamma Corp. stock will go down in the near future. She has decided to sell short 200 shares of Gamma Corp. at the current market price of €47. The initial margin requirement is 40 percent. Which of the following is an appropriate statement regarding the margin requirement that Rogers is subject to on this short sale?
- A She will need to contribute €3,760 as margin.
B She will need to contribute €5,640 as margin.
C She will only need to leave the proceeds from the short sale as deposit and does not need to contribute any additional funds.
- 23** The current price of a stock is \$25 per share. You have \$10,000 to invest. You borrow an additional \$10,000 from your broker and invest \$20,000 in the stock. If the maintenance margin is 30 percent, at what price will a margin call first occur?
- A \$9.62.
B \$17.86.
C \$19.71.
- 24** You have placed a sell market-on-open order—a market order that would automatically be submitted at the market's open tomorrow and would fill at the market price. Your instruction, to sell the shares at the market open, is a(n):
- A execution instruction.
B validity instruction.
C clearing instruction.
- 25** A market has the following limit orders standing on its book for a particular stock. The bid and ask sizes are number of shares in hundreds.

Bid Size	Limit Price (€)	Offer Size
5	9.73	
12	9.81	
4	9.84	
6	9.95	
	10.02	5
	10.10	12
	10.14	8

What is the market?

- A 9.73 bid, offered at 10.14.
 - B 9.81 bid, offered at 10.10.
 - C 9.95 bid, offered at 10.02.
- 26 Consider the following limit order book for a stock. The bid and ask sizes are number of shares in hundreds.

Bid Size	Limit Price (¥)	Offer Size
3	122.80	
8	123.00	
4	123.35	
	123.80	7
	124.10	6
	124.50	7

A new buy limit order is placed for 300 shares at ¥123.40. This limit order is said to:

- A take the market.
 - B make the market.
 - C make a new market.
- 27 Currently, the market in a stock is “\$54.62 bid, offered at \$54.71.” A new sell limit order is placed at \$54.62. This limit order is said to:
- A take the market.
 - B make the market.
 - C make a new market.
- 28 Jim White has sold short 100 shares of Super Stores at a price of \$42 per share. He has also simultaneously placed a “good-till-cancelled, stop 50, limit 55 buy” order. Assume that if the stop condition specified by White is satisfied and the order becomes valid, it will get executed. Excluding transaction costs, what is the maximum possible loss that White can have?
- A \$800.
 - B \$1,300.
 - C Unlimited.
- 29 You own shares of a company that are currently trading at \$30 a share. Your technical analysis of the shares indicates a support level of \$27.50. That is, if the price of the shares is going down, it is more likely to stay above this level rather than fall below it. If the price does fall below this level, however, you believe that the price may continue to decline. You have no immediate intent to sell the

shares but are concerned about the possibility of a huge loss if the share price declines below the support level. Which of the following types of orders could you place to most appropriately address your concern?

- A Short sell order.
 - B Good-till-cancelled stop sell order.
 - C Good-till-cancelled stop buy order.
- 30 In an underwritten offering, the risk that the entire issue may not be sold to the public at the stipulated offering price is borne by the:
- A issuer.
 - B investment bank.
 - C buyers of the part of the issue that is sold.
- 31 A British company listed on the Alternative Investment Market of the London Stock Exchange, announced the sale of 6,686,665 shares to a small group of qualified investors at £0.025 per share. Which of the following *best describes* this sale?
- A Shelf registration.
 - B Private placement.
 - C Initial public offering.
- 32 A German publicly traded company, to raise new capital, gave its existing shareholders the opportunity to subscribe for new shares. The existing shareholders could purchase two new shares at a subscription price of €4.58 per share for every 15 shares held. This is an example of a(n):
- A rights offering.
 - B private placement.
 - C initial public offering.
- 33 Consider an order-driven system that allows hidden orders. The following four sell orders on a particular stock are currently in the system's limit order book. Based on the commonly used order precedence hierarchy, which of these orders will have precedence over others?

Order	Time of Arrival (HH:MM:SS)	Limit Price (€)	Special Instruction (If any)
I	9:52:01	20.33	
II	9:52:08	20.29	Hidden order
III	9:53:04	20.29	
IV	9:53:49	20.29	

- A Order I (time of arrival of 9:52:01).
 - B Order II (time of arrival of 9:52:08).
 - C Order III (time of arrival of 9:53:04).
- 34 Zhenhu Li has submitted an immediate-or-cancel buy order for 500 shares of a company at a limit price of CNY 74.25. There are two sell limit orders standing in that stock's order book at that time. One is for 300 shares at a limit price of CNY 74.30 and the other is for 400 shares at a limit price of CNY 74.35. How many shares in Li's order would get cancelled?
- A None (the order would remain open but unfilled).
 - B 200 (300 shares would get filled).
 - C 500 (there would be no fill).

- 35** A market has the following limit orders standing on its book for a particular stock:

Buyer	Bid Size (Number of Shares)		Offer Size (Number of Shares)		Seller
		Limit Price (£)			
Keith	1,000	19.70			
Paul	200	19.84			
Ann	400	19.89			
Mary	300	20.02			
		20.03	800	Jack	
		20.11	1,100	Margaret	
		20.16	400	Jeff	

Ian submits a day order to sell 1,000 shares, limit £19.83. Assuming that no more buy orders are submitted on that day after Ian submits his order, what would be Ian's average trade price?

- A** £19.70.
 - B** £19.92.
 - C** £20.05.
- 36** A financial analyst is examining whether a country's financial market is well functioning. She finds that the transaction costs in this market are low and trading volumes are high. She concludes that the market is quite liquid. In such a market:
- A** traders will find it hard to make use of their information.
 - B** traders will find it easy to trade and their trading will make the market less informationally efficient.
 - C** traders will find it easy to trade and their trading will make the market more informationally efficient.
- 37** The government of a country whose financial markets are in an early stage of development has hired you as a consultant on financial market regulation. Your first task is to prepare a list of the objectives of market regulation. Which of the following is *least likely* to be included in this list of objectives?
- A** Minimize agency problems in the financial markets.
 - B** Ensure that financial markets are fair and orderly.
 - C** Ensure that investors in the stock market achieve a rate of return that is at least equal to the risk-free rate of return.

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 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.
- 11 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.
- 12 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.

- 13 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.
- 14 B is correct. SPDRs trade in the secondary market and are a pooled investment vehicle.
- 15 B is correct. The holder of the call option will exercise the call options if the price is above the exercise price of \$120 per share. Note that if the stock price is above \$120 but less than \$123, 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 \$122, the option buyer would exercise the option to make $\$2 = \$122 - \$120$ 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.
- 16 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.
- 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 $1.82 = 100\% \text{ position} \div 55\% \text{ equity}$. 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 $50\% = 2.5 \times 20\%$.
- Another way to look at this problem is that the equity contributed by the trader (the minimum margin requirement) is $40\% = 100\% \div 2.5$. The trader contributed $\$20 = 40\% \text{ 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 \times \32

Equity invested = $\$12,000 = 0.75 \times \$16,000$

Amount borrowed = $\$4,000 = 16,000 - 12,000$

Interest paid at month end = $\$80 = 0.02 \times \$4,000$

Dividend received at month end = $\$250 = 500 \times \0.50

Proceeds on stock sale = $\$14,000 = 500 \times \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 $\text{€}3,760 = 40\% \text{ of } \text{€}9,400$ as the initial margin. Rogers will need to leave the proceeds from the short sale ($\text{€}9,400 = 200 \times \text{€}47$) 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 \times \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.

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

The solution is $P = \$17.86$.

- 24 B is correct. An instruction regarding when to fill an order is considered a validity instruction.
- 25 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.
- 26 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.
- 27 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.
- 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:

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

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.

PRACTICE PROBLEMS

- 1 A security market index represents the:
 - A risk of a security market.
 - B security market as a whole.
 - C security market, market segment, or asset class.
- 2 Security market indices are:
 - A constructed and managed like a portfolio of securities.
 - B simple interchangeable tools for measuring the returns of different asset classes.
 - C valued on a regular basis using the actual market prices of the constituent securities.
- 3 When creating a security market index, an index provider must first determine the:
 - A target market.
 - B appropriate weighting method.
 - C number of constituent securities.
- 4 One month after inception, the price return version and total return version of a single index (consisting of identical securities and weights) will be equal if:
 - A market prices have not changed.
 - B capital gains are offset by capital losses.
 - C the securities do not pay dividends or interest.
- 5 The values of a price return index and a total return index consisting of identical equal-weighted dividend-paying equities will be equal:
 - A only at inception.
 - B at inception and on rebalancing dates.
 - C at inception and on reconstitution dates.
- 6 An analyst gathers the following information for an equal-weighted index comprised of assets Able, Baker, and Charlie:

Security	Beginning of Period Price (€)	End of Period Price (€)	Total Dividends (€)
Able	10.00	12.00	0.75
Baker	20.00	19.00	1.00
Charlie	30.00	30.00	2.00

The price return of the index is:

- A 1.7%.
- B 5.0%.
- C 11.4%.
- 7 An analyst gathers the following information for an equal-weighted index comprised of assets Able, Baker, and Charlie:

Security	Beginning of Period Price (€)	End of Period Price (€)	Total Dividends (€)
Able	10.00	12.00	0.75
Baker	20.00	19.00	1.00
Charlie	30.00	30.00	2.00

The total return of the index is:

- A** 5.0%.
- B** 7.9%.
- C** 11.4%.

- 8 An analyst gathers the following information for a price-weighted index comprised of securities ABC, DEF, and GHI:

Security	Beginning of Period Price (£)	End of Period Price (£)	Total Dividends (£)
ABC	25.00	27.00	1.00
DEF	35.00	25.00	1.50
GHI	15.00	16.00	1.00

The price return of the index is:

- A** -4.6%.
- B** -9.3%.
- C** -13.9%.

- 9 An analyst gathers the following information for a market-capitalization-weighted index comprised of securities MNO, QRS, and XYZ:

Security	Beginning of Period Price (¥)	End of Period Price (¥)	Dividends per Share (¥)	Shares Outstanding
MNO	2,500	2,700	100	5,000
QRS	3,500	2,500	150	7,500
XYZ	1,500	1,600	100	10,000

The price return of the index is:

- A** -9.33%.
- B** -10.23%.
- C** -13.90%.

- 10 An analyst gathers the following information for a market-capitalization-weighted index comprised of securities MNO, QRS, and XYZ:

Security	Beginning of Period Price (¥)	End of Period Price (¥)	Dividends Per Share (¥)	Shares Outstanding
MNO	2,500	2,700	100	5,000
QRS	3,500	2,500	150	7,500
XYZ	1,500	1,600	100	10,000

The total return of the index is:

- A** 1.04%.
- B** -5.35%.
- C** -10.23%.

- 11** When creating a security market index, the target market:
- determines the investment universe.
 - is usually a broadly defined asset class.
 - determines the number of securities to be included in the index.
- 12** An analyst gathers the following data for a price-weighted index:

Security	Beginning of Period		End of Period	
	Price (€)	Shares	Price (€)	Shares
A	20.00	300	22.00	300
B	50.00	300	48.00	300
C	26.00	2,000	30.00	2,000

The price return of the index over the period is:

- 4.2%.
- 7.1%.
- 21.4%.

- 13** An analyst gathers the following data for a value-weighted index:

Security	Beginning of Period		End of Period	
	Price (£)	Shares	Price (£)	Shares
A	20.00	300	22.00	300
B	50.00	300	48.00	300
C	26.00	2,000	30.00	2,000

The return on the value-weighted index over the period is:

- 7.1%.
- 11.0%.
- 21.4%.

- 14** An analyst gathers the following data for an equally-weighted index:

Security	Beginning of Period		End of Period	
	Price (¥)	Shares	Price (¥)	Shares
A	20.00	300	22.00	300
B	50.00	300	48.00	300
C	26.00	2,000	30.00	2,000

The return on the index over the period is:

- 4.2%.
- 6.8%.
- 7.1%.

- 15** Which of the following index weighting methods requires an adjustment to the divisor after a stock split?

- Price weighting.
- Fundamental weighting.
- Market-capitalization weighting.

- 16** If the price return of an equal-weighted index exceeds that of a market-capitalization-weighted index comprised of the same securities, the *most likely* explanation is:

- A stock splits.
 - B dividend distributions.
 - C outperformance of small-market-capitalization stocks.
- 17 A float-adjusted market-capitalization-weighted index weights each of its constituent securities by its price and:
- A its trading volume.
 - B the number of its shares outstanding.
 - C the number of its shares available to the investing public.
- 18 Which of the following index weighting methods is most likely subject to a value tilt?
- A Equal weighting.
 - B Fundamental weighting.
 - C Market-capitalization weighting.
- 19 Rebalancing an index is the process of periodically adjusting the constituent:
- A securities' weights to optimize investment performance.
 - B securities to maintain consistency with the target market.
 - C securities' weights to maintain consistency with the index's weighting method.
- 20 Which of the following index weighting methods requires the most frequent rebalancing?
- A Price weighting.
 - B Equal weighting.
 - C Market-capitalization weighting.
- 21 Reconstitution of a security market index reduces:
- A portfolio turnover.
 - B the need for rebalancing.
 - C the likelihood that the index includes securities that are not representative of the target market.
- 22 Security market indices are used as:
- A measures of investment returns.
 - B proxies to measure unsystematic risk.
 - C proxies for specific asset classes in asset allocation models.
- 23 Uses of market indices do not include serving as a:
- A measure of systematic risk.
 - B basis for new investment products.
 - C benchmark for evaluating portfolio performance.
- 24 Which of the following statements regarding sector indices is *most* accurate?
Sector indices:
- A track different economic sectors and cannot be aggregated to represent the equivalent of a broad market index.
 - B provide a means to determine whether an active investment manager is more successful at stock selection or sector allocation.
 - C apply a universally agreed upon sector classification system to identify the constituent securities of specific economic sectors, such as consumer goods, energy, finance, health care.
- 25 Which of the following is an example of a style index? An index based on:

- A geography.
 - B economic sector.
 - C market capitalization.
- 26 Which of the following statements regarding fixed-income indices is *most* accurate?
- A Liquidity issues make it difficult for investors to easily replicate fixed-income indices.
 - B Rebalancing and reconstitution are the only sources of turnover in fixed-income indices.
 - C Fixed-income indices representing the same target market hold similar numbers of bonds.
- 27 An aggregate fixed-income index:
- A comprises corporate and asset-backed securities.
 - B represents the market of government-issued securities.
 - C can be subdivided by market or economic sector to create more narrowly defined indices.
- 28 Fixed-income indices are *least likely* constructed on the basis of:
- A maturity.
 - B type of issuer.
 - C coupon frequency.
- 29 Commodity index values are based on:
- A futures contract prices.
 - B the market price of the specific commodity.
 - C the average market price of a basket of similar commodities.
- 30 Which of the following statements is *most* accurate?
- A Commodity indices all share similar weighting methods.
 - B Commodity indices containing the same underlying commodities offer similar returns.
 - C The performance of commodity indices can be quite different from that of the underlying commodities.
- 31 Which of the following is *not* a real estate index category?
- A Appraisal index.
 - B Initial sales index.
 - C Repeat sales index.
- 32 A unique feature of hedge fund indices is that they:
- A are frequently equal weighted.
 - B are determined by the constituents of the index.
 - C reflect the value of private rather than public investments.
- 33 The returns of hedge fund indices are *most likely*:
- A biased upward.
 - B biased downward.
 - C similar across different index providers.
- 34 In comparison to equity indices, the constituent securities of fixed-income indices are:
- A more liquid.

- B** easier to price.
- C** drawn from a larger investment universe.

SOLUTIONS

- 1 C is correct. A security market index represents the value of a given security market, market segment, or asset class.
- 2 A is correct. Security market indices are constructed and managed like a portfolio of securities.
- 3 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.
- 4 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 indices will be identical in value.
- 5 A is correct. At inception, the values of the price return and total return versions of an index are equal.
- 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 $1/3 \times [20\% + (-5\%) + 0\%] = 5\%$.
- 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 = $1/3 \times (27.5\% + 0\% + 6.7\%) = 11.4\%$.
- 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		End of Period	
	Price (£)		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

Security	Beginning of Period Price (¥)	Shares Outstanding	Beginning of Period Value (¥)	End of Period Price (¥)	End of Period Value (¥)
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 indices 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 indices play a critical role as proxies for asset classes in asset allocation models.
- 23** A is correct. Security market indices are used as proxies for measuring market or systematic risk, not as measures of systematic risk.
- 24** B is correct. Sector indices provide a means to determine whether a portfolio manager is more successful at stock selection or sector allocation.
- 25** C is correct. Style indices 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 indices.
- 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 indices.
- 28** C is correct. Coupon frequency is not a dimension on which fixed-income indices are based.
- 29** A is correct. Commodity indices consist of futures contracts on one or more commodities.
- 30** C is correct. The performance of commodity indices can be quite different from that of the underlying commodities because the indices consist of futures contracts on the commodities rather than the actual commodities.
- 31** B is correct. It is not a real estate index category.
- 32** 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.
- 33** A is correct. Voluntary performance reporting may lead to survivorship bias, and poorer performing hedge funds will be less likely to report their performance.
- 34** C is correct. The fixed-income market has more issuers and securities than the equity market.

READING

47

Market Efficiency

by W. Sean Cleary, PhD, CFA, Howard J. Atkinson, CIMA, ICD.D, CFA, and
Pamela Peterson Drake, PhD, CFA

Sean Cleary, PhD, CFA, is at Queen's University (Canada). Howard J. Atkinson, CIMA, ICD.D, CFA, is at Horizons ETF Management (Canada) Inc. (Canada). Pamela Peterson Drake, PhD, CFA, is at James Madison University (USA).

LEARNING OUTCOMES

Mastery	<i>The candidate should be able to:</i>
<input type="checkbox"/>	a. describe market efficiency and related concepts, including their importance to investment practitioners;
<input type="checkbox"/>	b. distinguish between market value and intrinsic value;
<input type="checkbox"/>	c. explain factors that affect a market's efficiency;
<input type="checkbox"/>	d. contrast weak-form, semi-strong-form, and strong-form market efficiency;
<input type="checkbox"/>	e. explain the implications of each form of market efficiency for fundamental analysis, technical analysis, and the choice between active and passive portfolio management;
<input type="checkbox"/>	f. describe market anomalies;
<input type="checkbox"/>	g. describe behavioral finance and its potential relevance to understanding market anomalies.

INTRODUCTION

1

Market efficiency concerns the extent to which market prices incorporate available information. If market prices do not fully incorporate information, then opportunities may exist to make a profit from the gathering and processing of information. The subject of market efficiency is, therefore, of great interest to investment managers, as illustrated in Example 1.

PRACTICE PROBLEMS

- 1 In an efficient market, the change in a company's share price is *most likely* the result of:
 - A insiders' private information.
 - B the previous day's change in stock price.
 - C new information coming into the market.
- 2 Regulation that restricts some investors from participating in a market will *most likely*:
 - A impede market efficiency.
 - B not affect market efficiency.
 - C contribute to market efficiency.
- 3 With respect to efficient market theory, when a market allows short selling, the efficiency of the market is *most likely* to:
 - A increase.
 - B decrease.
 - C remain the same.
- 4 Which of the following regulations will *most likely* contribute to market efficiency? Regulatory restrictions on:
 - A short selling.
 - B foreign traders.
 - C insiders trading with nonpublic information.
- 5 Which of the following market regulations will *most likely* impede market efficiency?
 - A Restricting traders' ability to short sell.
 - B Allowing unrestricted foreign investor trading.
 - C Penalizing investors who trade with nonpublic information.
- 6 If markets are efficient, the difference between the intrinsic value and market value of a company's security is:
 - A negative.
 - B zero.
 - C positive.
- 7 The intrinsic value of an undervalued asset is:
 - A less than the asset's market value.
 - B greater than the asset's market value.
 - C the value at which the asset can currently be bought or sold.
- 8 The market value of an undervalued asset is:
 - A greater than the asset's intrinsic value.
 - B the value at which the asset can currently be bought or sold.
 - C equal to the present value of all the asset's expected cash flows.
- 9 With respect to the efficient market hypothesis, if security prices reflect *only* past prices and trading volume information, then the market is:
 - A weak-form efficient.

- B strong-form efficient.
C semi-strong-form efficient.
- 10 Which one of the following statements *best* describes the semi-strong form of market efficiency?
A Empirical tests examine the historical patterns in security prices.
B Security prices reflect all publicly known and available information.
C Semi-strong-form efficient markets are not necessarily weak-form efficient.
- 11 If markets are semi-strong efficient, standard fundamental analysis will yield abnormal trading profits that are:
A negative.
B equal to zero.
C positive.
- 12 If prices reflect all public and private information, the market is *best* described as:
A weak-form efficient.
B strong-form efficient.
C semi-strong-form efficient.
- 13 If markets are semi-strong-form efficient, then passive portfolio management strategies are *most likely* to:
A earn abnormal returns.
B outperform active trading strategies.
C underperform active trading strategies.
- 14 If a market is semi-strong-form efficient, the risk-adjusted returns of a passively managed portfolio relative to an actively managed portfolio are *most likely*:
A lower.
B higher.
C the same.
- 15 Technical analysts assume that markets are:
A weak-form efficient.
B weak-form inefficient.
C semi-strong-form efficient.
- 16 Fundamental analysts assume that markets are:
A weak-form inefficient.
B semi-strong-form efficient.
C semi-strong-form inefficient.
- 17 If a market is weak-form efficient but semi-strong-form inefficient, then which of the following types of portfolio management is *most likely* to produce abnormal returns?
A Passive portfolio management.
B Active portfolio management based on technical analysis.
C Active portfolio management based on fundamental analysis.
- 18 An increase in the time between when an order to trade a security is placed and when the order is executed *most likely* indicates that market efficiency has:
A decreased.
B remained the same.

- C increased.
- 19 With respect to efficient markets, a company whose share price reacts gradually to the public release of its annual report *most likely* indicates that the market where the company trades is:
- A semi-strong-form efficient.
 - B subject to behavioral biases.
 - C receiving additional information about the company.
- 20 Which of the following is *least likely* to explain the January effect anomaly?
- A Tax-loss selling.
 - B Release of new information in January.
 - C Window dressing of portfolio holdings.
- 21 If a researcher conducting empirical tests of a trading strategy using time series of returns finds statistically significant abnormal returns, then the researcher has *most likely* found:
- A a market anomaly.
 - B evidence of market inefficiency.
 - C a strategy to produce future abnormal returns.
- 22 Which of the following market anomalies is inconsistent with weak-form market efficiency?
- A Earnings surprise.
 - B Momentum pattern.
 - C Closed-end fund discount.
- 23 Researchers have found that value stocks have consistently outperformed growth stocks. An investor wishing to exploit the value effect should purchase the stock of companies with above-average:
- A dividend yields.
 - B market-to-book ratios.
 - C price-to-earnings ratios.
- 24 With respect to rational and irrational investment decisions, the efficient market hypothesis requires:
- A only that the market is rational.
 - B that all investors make rational decisions.
 - C that some investors make irrational decisions.
- 25 Observed overreactions in markets can be explained by an investor's degree of:
- A risk aversion.
 - B loss aversion.
 - C confidence in the market.
- 26 Like traditional finance models, the behavioral theory of loss aversion assumes that investors dislike risk; however, the dislike of risk in behavioral theory is assumed to be:
- A leptokurtic.
 - B symmetrical.
 - C asymmetrical.

SOLUTIONS

- 1 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.
- 2 A is correct. Reducing the number of market participants can accentuate market imperfections and impede market efficiency (e.g., restrictions on foreign investor trading).
- 3 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.
- 4 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.
- 5 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.
- 6 B is correct. A security's intrinsic value and market value should be equal when markets are efficient.
- 7 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.
- 8 B is correct. The market value is the transaction price at which an asset can be currently bought or sold.
- 9 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.
- 10 B is correct. In semi-strong-form efficient markets, security prices reflect all publicly available information.
- 11 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.
- 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. 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.
- 14 B is correct. In a semi-strong-form efficient market, passive portfolio strategies should outperform active portfolio strategies on a risk-adjusted basis.
- 15 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.

- 16** 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.
- 17** 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.
- 18** A is correct. Operating inefficiencies reduce market efficiency.
- 19** 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.
- 20** 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.
- 21** 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.
- 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** 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.
- 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.

PRACTICE PROBLEMS

- 1 Which of the following is *not* a characteristic of common equity?
 - A It represents an ownership interest in the company.
 - B Shareholders participate in the decision-making process.
 - C The company is obligated to make periodic dividend payments.
- 2 The type of equity voting right that grants one vote for each share of equity owned is referred to as:
 - A proxy voting.
 - B statutory voting.
 - C cumulative voting.
- 3 All of the following are characteristics of preference shares *except*:
 - A They are either callable or putable.
 - B They generally do not have voting rights.
 - C They do not share in the operating performance of the company.
- 4 Participating preference shares entitle shareholders to:
 - A participate in the decision-making process of the company.
 - B convert their shares into a specified number of common shares.
 - C receive an additional dividend if the company's profits exceed a pre-determined level.
- 5 Which of the following statements about private equity securities is *incorrect*?
 - A They cannot be sold on secondary markets.
 - B They have market-determined quoted prices.
 - C They are primarily issued to institutional investors.
- 6 Venture capital investments:
 - A can be publicly traded.
 - B do not require a long-term commitment of funds.
 - C provide mezzanine financing to early-stage companies.
- 7 Which of the following statements *most accurately* describes one difference between private and public equity firms?
 - A Private equity firms are focused more on short-term results than public firms.
 - B Private equity firms' regulatory and investor relations operations are less costly than those of public firms.
 - C Private equity firms are incentivized to be more open with investors about governance and compensation than public firms.
- 8 Emerging markets have benefited from recent trends in international markets. Which of the following has *not* been a benefit of these trends?
 - A Emerging market companies do not have to worry about a lack of liquidity in their home equity markets.
 - B Emerging market companies have found it easier to raise capital in the markets of developed countries.

- C Emerging market companies have benefited from the stability of foreign exchange markets.
- 9 When investing in unsponsored depository receipts, the voting rights to the shares in the trust belong to:
- A the depository bank.
 - B the investors in the depository receipts.
 - C the issuer of the shares held in the trust.
- 10 With respect to Level III sponsored ADRs, which of the following is *least likely* to be accurate? They:
- A have low listing fees.
 - B are traded on the NYSE, NASDAQ, and AMEX.
 - C are used to raise equity capital in US markets.
- 11 A basket of listed depository receipts, or an exchange-traded fund, would *most likely* be used for:
- A gaining exposure to a single equity.
 - B hedging exposure to a single equity.
 - C gaining exposure to multiple equities.
- 12 Calculate the total return on a share of equity using the following data:
- Purchase price: \$50
- Sale price: \$42
- Dividend paid during holding period: \$2
- A -12.0%
 - B -14.3%
 - C -16.0%
- 13 If a US-based investor purchases a euro-denominated ETF and the euro subsequently depreciates in value relative to the dollar, the investor will have a total return that is:
- A lower than the ETF's total return.
 - B higher than the ETF's total return.
 - C the same as the ETF's total return.
- 14 Which of the following is *incorrect* about the risk of an equity security? The risk of an equity security is:
- A based on the uncertainty of its cash flows.
 - B based on the uncertainty of its future price.
 - C measured using the standard deviation of its dividends.
- 15 From an investor's point of view, which of the following equity securities is the *least* risky?
- A Putable preference shares.
 - B Callable preference shares.
 - C Non-callable preference shares.
- 16 Which of the following is *least likely* to be a reason for a company to issue equity securities on the primary market?
- A To raise capital.
 - B To increase liquidity.
 - C To increase return on equity.

- 17** Which of the following is *not* a primary goal of raising equity capital?
- To finance the purchase of long-lived assets.
 - To finance the company's revenue-generating activities.
 - To ensure that the company continues as a going concern.
- 18** Which of the following statements is *most accurate* in describing a company's book value?
- Book value increases when a company retains its net income.
 - Book value is usually equal to the company's market value.
 - The ultimate goal of management is to maximize book value.
- 19** Calculate the book value of a company using the following information:

Number of shares outstanding	100,000
Price per share	€52
Total assets	€12,000,000
Total liabilities	€7,500,000
Net Income	€2,000,000

- €4,500,000.
 - €5,200,000.
 - €6,500,000.
- 20** Which of the following statements is *least accurate* in describing a company's market value?
- Management's decisions do not influence the company's market value.
 - Increases in book value may not be reflected in the company's market value.
 - Market value reflects the collective and differing expectations of investors.
- 21** Calculate the 2009 return on equity (ROE) of a stable company using the following data:

Total sales	£2,500,000
Net income	£2,000,000
Beginning of year total assets	£50,000,000
Beginning of year total liabilities	£35,000,000
Number of shares outstanding at the end of 2009	1,000,000
Price per share at the end of 2009	£20

- 10.0%.
 - 13.3%.
 - 16.7%.
- 22** Holding all other factors constant, which of the following situations will *most likely* lead to an increase in a company's return on equity?
- The market price of the company's shares increases.
 - Net income increases at a slower rate than shareholders' equity.
 - The company issues debt to repurchase outstanding shares of equity.
- 23** Which of the following measures is the *most difficult* to estimate?
- The cost of debt.
 - The cost of equity.
 - Investors' required rate of return on debt.

24 A company's cost of equity is often used as a proxy for investors':

- A** average required rate of return.
- B** minimum required rate of return.
- C** maximum required rate of return.

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 $\text{€}12,000,000 - \text{€}7,500,000 = \text{€}4,500,000$.

- 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}) . For 2009, the BVE_{t-1} is equal to the beginning total assets minus the beginning total liabilities, which equals $\text{£}50,000,000 - \text{£}35,000,000 = \text{£}15,000,000$. Therefore, $ROE_{2009} = \text{£}2,000,000/\text{£}15,000,000 = 13.3\%$.
- 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.

PRACTICE PROBLEMS

- 1 Which of the following is *least likely* to involve industry analysis?
 - A Sector rotation strategy.
 - B Top-down fundamental investing.
 - C Tactical asset allocation strategy.
- 2 A sector rotation strategy involves investing in a sector by:
 - A making regular investments in it.
 - B investing in a pre-selected group of sectors on a rotating basis.
 - C timing investment to take advantage of business-cycle conditions.
- 3 Which of the following information about a company would *most likely* depend on an industry analysis? The company's:
 - A dividend policy.
 - B competitive environment.
 - C trends in corporate expenses.
- 4 Which industry classification system uses a three-tier classification system?
 - A Russell Global Sectors.
 - B Industry Classification Benchmark.
 - C Global Industry Classification Standard.
- 5 In which sector would a manufacturer of personal care products be classified?
 - A Health care.
 - B Consumer staples.
 - C Consumer discretionary.
- 6 Which of the following statements about commercial and government industry classification systems is *most accurate*?
 - A Many commercial classification systems include private for-profit companies.
 - B Both commercial and government classification systems exclude not-for-profit companies.
 - C Commercial classification systems are generally updated more frequently than government classification systems.
- 7 Which of the following is *not* a limitation of the cyclical/non-cyclical descriptive approach to classifying companies?
 - A A cyclical company may have a growth component in it.
 - B Business-cycle sensitivity is a discrete phenomenon rather than a continuous spectrum.
 - C A global company can experience economic expansion in one part of the world while experiencing recession in another part.
- 8 A company that is sensitive to the business cycle would *most likely*:
 - A not have growth opportunities.
 - B experience below-average fluctuation in demand.
 - C sell products that the customer can purchase at a later date if necessary.

- 9 Which of the following factors would *most likely* be a limitation of applying business-cycle analysis to global industry analysis?
- A Some industries are relatively insensitive to the business cycle.
 - B Correlations of security returns between different world markets are relatively low.
 - C One region or country of the world may experience recession while another region experiences expansion.
- 10 Which of the following statements about peer groups is *most* accurate?
- A Constructing a peer group for a company follows a standardized process.
 - B Commercial industry classification systems often provide a starting point for constructing a peer group.
 - C A peer group is generally composed of all the companies in the most narrowly defined category used by the commercial industry classification system.
- 11 With regard to forming a company's peer group, which of the following statements is *not* correct?
- A Comments from the management of the company about competitors are generally not used when selecting the peer group.
 - B The higher the proportion of revenue and operating profit of the peer company derived from business activities similar to the subject company, the more meaningful the comparison.
 - C Comparing the company's performance measures with those for a potential peer-group company is of limited value when the companies are exposed to different stages of the business cycle.
- 12 When selecting companies for inclusion in a peer group, a company operating in three different business segments would:
- A be in only one peer group.
 - B possibly be in more than one peer group.
 - C not be included in any peer group.
- 13 An industry that *most likely* has both high barriers to entry and high barriers to exit is the:
- A restaurant industry.
 - B advertising industry.
 - C automobile industry.
- 14 Which factor is *most likely* associated with stable market share?
- A Low switching costs.
 - B Low barriers to entry.
 - C Slow pace of product innovation.
- 15 Which of the following companies *most likely* has the greatest ability to quickly increase its capacity?
- A Restaurant.
 - B Steel producer.
 - C Legal services provider.
- 16 A population that is rapidly aging would *most likely* cause the growth rate of the industry producing eye glasses and contact lenses to:
- A decrease.
 - B increase.

- C not change.
- 17 If over a long period of time a country's average level of educational accomplishment increases, this development would *most likely* lead to the country's amount of income spent on consumer discretionary goods to:
- A decrease.
 - B increase.
 - C not change.
- 18 If the technology for an industry involves high fixed capital investment, then one way to seek higher profit growth is by pursuing:
- A economies of scale.
 - B diseconomies of scale.
 - C removal of features that differentiate the product or service provided.
- 19 Which of the following life-cycle phases is typically characterized by high prices?
- A Mature.
 - B Growth.
 - C Embryonic.
- 20 In which of the following life-cycle phases are price wars *most likely* to be absent?
- A Mature.
 - B Decline.
 - C Growth.
- 21 When graphically depicting the life-cycle model for an industry as a curve, the variables on the axes are:
- A price and time.
 - B demand and time.
 - C demand and stage of the life cycle.
- 22 Which of the following is *most likely* a characteristic of a concentrated industry?
- A Infrequent, tacit coordination.
 - B Difficulty in monitoring other industry members.
 - C Industry members attempting to avoid competition on price.
- 23 Which of the following industry characteristics is generally *least likely* to produce high returns on capital?
- A High barriers to entry
 - B High degree of concentration
 - C Short lead time to build new plants
- 24 An industry with high barriers to entry and weak pricing power *most likely* has:
- A high barriers to exit.
 - B stable market shares.
 - C significant numbers of issued patents.
- 25 Economic value is created for an industry's shareholders when the industry earns a return:
- A below the cost of capital.
 - B equal to the cost of capital.
 - C above the cost of capital.

- 26 Which of the following industries is *most likely* to be characterized as concentrated with strong pricing power?
- A Asset management.
 - B Alcoholic beverages.
 - C Household and personal products.
- 27 With respect to competitive strategy, a company with a successful cost leadership strategy is *most likely* characterized by:
- A a low cost of capital.
 - B reduced market share.
 - C the ability to offer products at higher prices than competitors.
- 28 When conducting a company analysis, the analysis of demand for a company's product is *least likely* to consider the:
- A company's cost structure.
 - B motivations of the customer base.
 - C product's differentiating characteristics.
- 29 Which of the following statements about company analysis is *most* accurate?
- A The complexity of spreadsheet modeling ensures precise forecasts of financial statements.
 - B The interpretation of financial ratios should focus on comparing the company's results over time but not with competitors.
 - C The corporate profile would include a description of the company's business, investment activities, governance, and strengths and weaknesses.

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 A is correct. The Russell system uses three tiers, whereas the other two systems are based on four tiers or levels.
- 5 B is correct. Personal care products are classified as consumer staples in the "Description of Representative Sectors."
- 6 C is correct. Commercial systems are generally updated more frequently than government systems, and include only publicly traded for-profit companies.
- 7 B is correct. Business-cycle sensitivity falls on a continuum and is not a discrete "either-or" phenomenon.
- 8 C is correct. Customers' flexibility as to when they purchase the product makes the product more sensitive to the business cycle.
- 9 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.
- 10 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.
- 11 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.
- 12 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.
- 13 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.
- 14 C is correct. A slow pace of product innovation often means that customers prefer to stay with suppliers they know, implying stable market shares.
- 15 C is correct. Capacity increases in providing legal 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.
- 16 B is correct. Vision typically deteriorates at advanced ages. An increased number of older adults implies more eyewear products will be purchased.
- 17 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.

- 18 A is correct. Seeking economies of scale would tend to reduce per-unit costs and increase profit.
- 19 C is correct. The embryonic stage is characterized by slow growth and high prices.
- 20 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, e.g., by engaging in price competition.
- 21 B is correct. The industry life-cycle model shows how demand evolves through time as an industry passes from the embryonic stage through the stage of decline.
- 22 C is correct. The relatively few members of the industry generally try to avoid price competition.
- 23 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.
- 24 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.
- 25 C is correct. Economic profit is earned and value created for shareholders when the company earns returns above the company's cost of capital.
- 26 B is correct. As displayed in Exhibit 4, the alcoholic beverage industry is concentrated and possesses strong pricing power.
- 27 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.
- 28 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.
- 29 C is correct. The corporate profile would provide an understanding of these elements.

PRACTICE PROBLEMS

- 1 An analyst estimates the intrinsic value of a stock to be in the range of €17.85 to €21.45. The current market price of the stock is €24.35. This stock is *most likely*:
 - A overvalued.
 - B undervalued.
 - C fairly valued.
- 2 An analyst determines the intrinsic value of an equity security to be equal to \$55. If the current price is \$47, the equity is *most likely*:
 - A undervalued.
 - B fairly valued.
 - C overvalued.
- 3 In asset-based valuation models, the intrinsic value of a common share of stock is based on the:
 - A estimated market value of the company's assets.
 - B estimated market value of the company's assets plus liabilities.
 - C estimated market value of the company's assets minus liabilities.
- 4 Which of the following is *most likely* used in a present value model?
 - A Enterprise value.
 - B Price to free cash flow.
 - C Free cash flow to equity.
- 5 Book value is *least likely* to be considered when using:
 - A a multiplier model.
 - B an asset-based valuation model.
 - C a present value model.
- 6 An analyst is attempting to calculate the intrinsic value of a company and has gathered the following company data: EBITDA, total market value, and market value of cash and short-term investments, liabilities, and preferred shares. The analyst is *least likely* to use:
 - A a multiplier model.
 - B a discounted cash flow model.
 - C an asset-based valuation model.
- 7 An analyst who bases the calculation of intrinsic value on dividend-paying capacity rather than expected dividends will *most likely* use the:
 - A dividend discount model.
 - B free cash flow to equity model.
 - C cash flow from operations model.
- 8 An investor expects to purchase shares of common stock today and sell them after two years. The investor has estimated dividends for the next two years, D_1 and D_2 , and the selling price of the stock two years from now, P_2 . According to the dividend discount model, the intrinsic value of the stock today is the present value of:
 - A next year's dividend, D_1 .

- B future expected dividends, D_1 and D_2 .
C future expected dividends and price— D_1 , D_2 and P_2 .
- 9 In the free cash flow to equity (FCFE) model, the intrinsic value of a share of stock is calculated as:
A the present value of future expected FCFE.
B the present value of future expected FCFE plus net borrowing.
C the present value of future expected FCFE minus fixed capital investment.
- 10 With respect to present value models, which of the following statements is *most accurate*?
A Present value models can be used only if a stock pays a dividend.
B Present value models can be used only if a stock pays a dividend or is expected to pay a dividend.
C Present value models can be used for stocks that currently pay a dividend, are expected to pay a dividend, or are not expected to pay a dividend.
- 11 A Canadian life insurance company has an issue of 4.80 percent, \$25 par value, perpetual, non-convertible, non-callable preferred shares outstanding. The required rate of return on similar issues is 4.49 percent. The intrinsic value of a preferred share is *closest to*:
A \$25.00.
B \$26.75.
C \$28.50.
- 12 Two analysts estimating the value of a non-convertible, non-callable, perpetual preferred stock with a constant dividend arrive at different estimated values. The *most likely* reason for the difference is that the analysts used different:
A time horizons.
B required rates of return.
C estimated dividend growth rates.
- 13 The Beasley Corporation has just paid a dividend of \$1.75 per share. If the required rate of return is 12.3 percent per year and dividends are expected to grow indefinitely at a constant rate of 9.2 percent per year, the intrinsic value of Beasley Corporation stock is *closest to*:
A \$15.54.
B \$56.45.
C \$61.65.
- 14 An investor is considering the purchase of a common stock with a \$2.00 annual dividend. The dividend is expected to grow at a rate of 4 percent annually. If the investor's required rate of return is 7 percent, the intrinsic value of the stock is *closest to*:
A \$50.00.
B \$66.67.
C \$69.33.
- 15 An analyst gathers or estimates the following information about a stock:

Current price per share	€22.56
Current annual dividend per share	€1.60
Annual dividend growth rate for Years 1–4	9.00%
Annual dividend growth rate for Years 5+	4.00%
Required rate of return	12%

Based on a dividend discount model, the stock is *most likely*:

- A undervalued.
- B fairly valued.
- C overvalued.

- 16 An analyst is attempting to value shares of the Dominion Company. The company has just paid a dividend of \$0.58 per share. Dividends are expected to grow by 20 percent next year and 15 percent the year after that. From the third year onward, dividends are expected to grow at 5.6 percent per year indefinitely. If the required rate of return is 8.3 percent, the intrinsic value of the stock is *closest* to:
- A \$26.00.
 - B \$27.00.
 - C \$28.00.
- 17 Hideki Corporation has just paid a dividend of ¥450 per share. Annual dividends are expected to grow at the rate of 4 percent per year over the next four years. At the end of four years, shares of Hideki Corporation are expected to sell for ¥9000. If the required rate of return is 12 percent, the intrinsic value of a share of Hideki Corporation is *closest* to:
- A ¥5,850.
 - B ¥7,220.
 - C ¥7,670.
- 18 The Gordon growth model can be used to value dividend-paying companies that are:
- A expected to grow very fast.
 - B in a mature phase of growth.
 - C very sensitive to the business cycle.
- 19 The best model to use when valuing a young dividend-paying company that is just entering the growth phase is *most likely* the:
- A Gordon growth model.
 - B two-stage dividend discount model.
 - C three-stage dividend discount model.
- 20 An equity analyst has been asked to estimate the intrinsic value of the common stock of Omega Corporation, a leading manufacturer of automobile seats. Omega is in a mature industry, and both its earnings and dividends are expected to grow at a rate of 3 percent annually. Which of the following is *most likely* to be the best model for determining the intrinsic value of an Omega share?
- A Gordon growth model.
 - B Free cash flow to equity model.
 - C Multistage dividend discount model.

- 21** A price earnings ratio that is derived from the Gordon growth model is inversely related to the:
- growth rate.
 - dividend payout ratio.
 - required rate of return.
- 22** The primary difference between P/E multiples based on comparables and P/E multiples based on fundamentals is that fundamentals-based P/Es take into account:
- future expectations.
 - the law of one price.
 - historical information.
- 23** An analyst makes the following statement: "Use of P/E and other multiples for analysis is not effective because the multiples are based on historical data and because not all companies have positive accounting earnings." The analyst's statement is *most likely*:
- inaccurate with respect to both historical data and earnings.
 - accurate with respect to historical data and inaccurate with respect to earnings.
 - inaccurate with respect to historical data and accurate with respect to earnings.
- 24** An analyst has prepared a table of the average trailing twelve-month price-to-earning (P/E), price-to-cash flow (P/CF), and price-to-sales (P/S) for the Tanaka Corporation for the years 2005 to 2008.

Year	P/E	P/CF	P/S
2005	4.9	5.4	1.2
2006	6.1	8.6	1.5
2007	8.3	7.3	1.9
2008	9.2	7.9	2.3

As of the date of the valuation in 2009, the trailing twelve-month P/E, P/CF, and P/S are, respectively, 9.2, 8.0, and 2.5. Based on the information provided, the analyst may reasonably conclude that Tanaka shares are *most likely*:

- overvalued.
 - undervalued.
 - fairly valued.
- 25** An analyst has gathered the following information for the Oudin Corporation:
- Expected earnings per share = €5.70
 Expected dividends per share = €2.70
 Dividends are expected to grow at 2.75 percent per year indefinitely
 The required rate of return is 8.35 percent
- Based on the information provided, the price/earnings multiple for Oudin is *closest* to:
- 5.7.
 - 8.5.
 - 9.4.
- 26** An analyst gathers the following information about two companies:

	Alpha Corp.	Delta Co.
Current price per share	\$57.32	\$18.93
Last year's EPS	\$3.82	\$1.35
Current year's estimated EPS	\$4.75	\$1.40

Which of the following statements is *most accurate*?

- A Delta has the higher trailing P/E multiple and lower current estimated P/E multiple.
 - B Alpha has the higher trailing P/E multiple and lower current estimated P/E multiple.
 - C Alpha has the higher trailing P/E multiple and higher current estimated P/E multiple.
- 27 An analyst gathers the following information about similar companies in the banking sector:

	First Bank	Prime Bank	Pioneer Trust
P/B	1.10	0.60	0.60
P/E	8.40	11.10	8.30

Which of the companies is *most likely* to be undervalued?

- A First Bank.
 - B Prime Bank.
 - C Pioneer Trust.
- 28 The market value of equity for a company can be calculated as enterprise value:
- A minus market value of debt, preferred stock, and short-term investments.
 - B plus market value of debt and preferred stock minus short-term investments.
 - C minus market value of debt and preferred stock plus short-term investments.
- 29 Which of the following statements regarding the calculation of the enterprise value multiple is *most likely* correct?
- A Operating income may be used instead of EBITDA.
 - B EBITDA may not be used if company earnings are negative.
 - C Book value of debt may be used instead of market value of debt.
- 30 An analyst has determined that the appropriate EV/EBITDA for Rainbow Company is 10.2. The analyst has also collected the following forecasted information for Rainbow Company:
- EBITDA = \$22,000,000
 Market value of debt = \$56,000,000
 Cash = \$1,500,000
- The value of equity for Rainbow Company is *closest* to:
- A \$169 million.
 - B \$224 million.
 - C \$281 million.
- 31 Enterprise value is most often determined as market capitalization of common equity and preferred stock minus the value of cash equivalents plus the:

- A book value of debt.
 - B market value of debt.
 - C market value of long-term debt.
- 32 Asset-based valuation models are best suited to companies where the capital structure does not have a high proportion of:
- A debt.
 - B intangible assets.
 - C current assets and liabilities.
- 33 Which of the following is *most likely* a reason for using asset-based valuation?
- A The analyst is valuing a privately held company.
 - B The company has a relatively high level of intangible assets.
 - C The market values of assets and liabilities are different from the balance sheet values.
- 34 A disadvantage of the EV method for valuing equity is that the following information may be difficult to obtain:
- A Operating income.
 - B Market value of debt.
 - C Market value of equity.
- 35 Which type of equity valuation model is *most likely* to be preferable when one is comparing similar companies?
- A A multiplier model.
 - B A present value model.
 - C An asset-based valuation model.
- 36 Which of the following is *most likely* considered a weakness of present value models?
- A Present value models cannot be used for companies that do not pay dividends.
 - B Small changes in model assumptions and inputs can result in large changes in the computed intrinsic value of the security.
 - C The value of the security depends on the investor's holding period; thus, comparing valuations of different companies for different investors is difficult.

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\% \times \$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 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:

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

$$\begin{aligned} D_{n+1} &= D_0(1 + g_S)^n(1 + g_L) \\ D_1 &= €1.60 \times 1.09 = €1.744 \end{aligned}$$

$$\begin{aligned}
 D_2 &= €1.60 \times (1.09)^2 = €1.901 \\
 D_3 &= €1.60 \times (1.09)^3 = €2.072 \\
 D_4 &= €1.60 \times (1.09)^4 = €2.259 \\
 D_5 &= [€1.60 \times (1.09)^4](1.04) = €2.349 \\
 V_4 &= €2.349 / (0.12 - 0.04) = €29.363 \\
 V_0 &= \frac{1.744}{(1.12)^1} + \frac{1.901}{(1.12)^2} + \frac{2.072}{(1.12)^3} + \frac{2.259}{(1.12)^4} + \frac{29.363}{(1.12)^4} \\
 &= 1.557 + 1.515 + 1.475 + 1.436 + 18.661 \\
 &= €24.64 \text{ (which is greater than the current price of €22.56)}
 \end{aligned}$$

16 C is correct.

$$\begin{aligned}
 V_0 &= \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{P_2}{(1+r)^2} \\
 &= \frac{0.70}{(1.083)} + \frac{0.80}{(1.083)^2} + \frac{31.29}{(1.083)^2} \\
 &= \$28.01
 \end{aligned}$$

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

17 B is correct.

$$\begin{aligned}
 V_0 &= \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{D_4}{(1+r)^4} + \frac{P_4}{(1+r)^4} \\
 &= \frac{468}{(1.12)} + \frac{486.72}{(1.12)^2} + \frac{506.19}{(1.12)^3} + \frac{526.44}{(1.12)^4} + \frac{9000}{(1.12)^4} \\
 &= ¥7,220
 \end{aligned}$$

18 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.

19 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.

20 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.

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

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

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 .

- 22** 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.
- 23** 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.
- 24** A is correct. Tanaka shares are most likely overvalued. As the table below shows, all the 2009 multiples are currently above their 2005–2008 averages.

Year	P/E	P/CF	P/R
2005	4.9	5.4	1.2
2006	6.1	8.6	1.5
2007	8.3	7.3	1.9
2008	9.2	7.9	2.3
Average	7.1	7.3	1.7

- 25** B is correct.

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

- 26** B is correct. P/E = Current price/EPS, and Estimated P/E = Current price/Estimated EPS.

$$\text{Alpha P/E} = \$57.32/\$3.82 = 15.01$$

$$\text{Alpha estimated P/E} = \$57.32/4.75 = 12.07$$

$$\text{Delta P/E} = \$18.93/\$1.35 = 14.02$$

$$\text{Delta estimated P/E} = \$18.93/\$1.40 = 13.52$$

- 27** 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.
- 28** 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.
- 29** 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.
- 30** A is correct.

$$\text{EV} = 10.2 \times 22,000,000 = \$224,400,000$$

$$\begin{aligned}\text{Equity value} &= \text{EV} - \text{Debt} + \text{Cash} \\ &= \$224,400,000 - \$56,000,000 + \$1,500,000 \\ &= \$169,900,000\end{aligned}$$

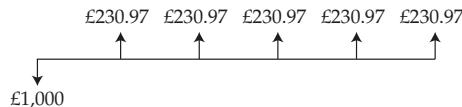
- 31** B is correct. The market value of debt must be calculated and taken out of the enterprise value. Enterprise value, sometimes known as the cost of a takeover, is the cost of the purchase of the company, which would include the assumption of the company's debts at market value.
- 32** B is correct. 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.
- 33** 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.
- 34** B is correct. According to the reading, analysts may have not have access to market quotations for company debt.
- 35** 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.
- 36** 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.

PRACTICE PROBLEMS

- 1 A 10-year bond was issued four years ago. The bond is denominated in US dollars, offers a coupon rate of 10% with interest paid semi-annually, and is currently priced at 102% of par. The bond's:
 - A tenor is six years.
 - B nominal rate is 5%.
 - C redemption value is 102% of the par value.
- 2 A sovereign bond has a maturity of 15 years. The bond is *best* described as a:
 - A perpetual bond.
 - B pure discount bond.
 - C capital market security.
- 3 A company has issued a floating-rate note with a coupon rate equal to the three-month Libor + 65 basis points. Interest payments are made quarterly on 31 March, 30 June, 30 September, and 31 December. On 31 March and 30 June, the three-month Libor is 1.55% and 1.35%, respectively. The coupon rate for the interest payment made on 30 June is:
 - A 2.00%.
 - B 2.10%.
 - C 2.20%.
- 4 The legal contract that describes the form of the bond, the obligations of the issuer, and the rights of the bondholders can be *best* described as a bond's:
 - A covenant.
 - B indenture.
 - C debenture.
- 5 Which of the following is a type of external credit enhancement?
 - A Covenants
 - B A surety bond
 - C Overcollateralization
- 6 An affirmative covenant is *most likely* to stipulate:
 - A limits on the issuer's leverage ratio.
 - B how the proceeds of the bond issue will be used.
 - C the maximum percentage of the issuer's gross assets that can be sold.
- 7 Which of the following *best* describes a negative bond covenant? The issuer is:
 - A required to pay taxes as they come due.
 - B prohibited from investing in risky projects.
 - C required to maintain its current lines of business.
- 8 A South African company issues bonds denominated in pound sterling that are sold to investors in the United Kingdom. These bonds can be *best* described as:
 - A Eurobonds.
 - B global bonds.
 - C foreign bonds.
- 9 Relative to domestic and foreign bonds, Eurobonds are *most likely* to be:

- A bearer bonds.
 - B registered bonds.
 - C subject to greater regulation.
- 10 An investor in a country with an original issue discount tax provision purchases a 20-year zero-coupon bond at a deep discount to par value. The investor plans to hold the bond until the maturity date. The investor will *most likely* report:
- A a capital gain at maturity.
 - B a tax deduction in the year the bond is purchased.
 - C taxable income from the bond every year until maturity.
- 11 A bond that is characterized by a fixed periodic payment schedule that reduces the bond's outstanding principal amount to zero by the maturity date is *best* described as a:
- A bullet bond.
 - B plain vanilla bond.
 - C fully amortized bond.
- 12 If interest rates are expected to increase, the coupon payment structure *most likely* to benefit the issuer is a:
- A step-up coupon.
 - B inflation-linked coupon.
 - C cap in a floating-rate note.
- 13 Investors who believe that interest rates will rise *most likely* prefer to invest in:
- A inverse floaters.
 - B fixed-rate bonds.
 - C floating-rate notes.
- 14 A 10-year, capital-indexed bond linked to the Consumer Price Index (CPI) is issued with a coupon rate of 6% and a par value of 1,000. The bond pays interest semi-annually. During the first six months after the bond's issuance, the CPI increases by 2%. On the first coupon payment date, the bond's:
- A coupon rate increases to 8%.
 - B coupon payment is equal to 40.
 - C principal amount increases to 1,020.
- 15 The provision that provides bondholders the right to sell the bond back to the issuer at a predetermined price prior to the bond's maturity date is referred to as:
- A a put provision.
 - B a make-whole call provision.
 - C an original issue discount provision.
- 16 Which of the following provisions is a benefit to the issuer?
- A Put provision
 - B Call provision
 - C Conversion provision
- 17 Relative to an otherwise similar option-free bond, a:
- A putable bond will trade at a higher price.
 - B callable bond will trade at a higher price.
 - C convertible bond will trade at a lower price.
- 18 Which type of bond *most likely* earns interest on an implied basis?

- A Floater
 - B Conventional bond
 - C Pure discount bond
- 19** Clauses that specify the rights of the bondholders and any actions that the issuer is obligated to perform or is prohibited from performing are:
- A covenants.
 - B collaterals.
 - C credit enhancements.
- 20** Which of the following type of debt obligation *most likely* protects bondholders when the assets serving as collateral are non-performing?
- A Covered bonds
 - B Collateral trust bonds
 - C Mortgage-backed securities
- 21** Which of the following *best* describes a negative bond covenant? The requirement to:
- A insure and maintain assets.
 - B comply with all laws and regulations.
 - C maintain a minimum interest coverage ratio.
- 22** Relative to negative bond covenants, positive covenants are *most likely*:
- A legally enforceable.
 - B cheaper for the issuers.
 - C enacted at the time of the bond issue.
- 23** A five-year bond has the following cash flows:



- The bond can *best* be described as a:
- A bullet bond.
 - B fully amortized bond.
 - C partially amortized bond.
- 24** Investors seeking some general protection against a poor economy are *most likely* to select a:
- A deferred coupon bond.
 - B credit-linked coupon bond.
 - C payment-in-kind coupon bond.
- 25** The benefit to the issuer of a deferred coupon bond is *most likely* related to:
- A tax management.
 - B cash flow management.
 - C original issue discount price.
- 26** Which of the following bond types provides the *most* benefit to a bondholder when bond prices are declining?
- A Callable
 - B Plain vanilla

- C Multiple put
- 27 Which type of call bond option offers the *greatest* flexibility as to when the issuer can exercise the option?
- A A Bermuda call
 - B A European call
 - C An American call
- 28 Which of the following *best* describes a convertible bond's conversion premium?
- A Bond price minus conversion value
 - B Par value divided by conversion price
 - C Current share price multiplied by conversion ratio

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 10 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 Libor 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. In many jurisdictions, debentures are unsecured bonds.
- 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 overcollateralization 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 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.
- 9 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.
- 10 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.
- 11 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.
- 12 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.
- 13 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.

- 14 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 $(0.06 \times 1,020) \div 2 = 30.60$.
- 15 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.
- 16 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.
- 17 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.
- 18 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.

- 19 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.
- 20 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.
- 21 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.
- 22 B is correct. Positive (or affirmative) covenants are typically administrative in nature and do not impose additional costs on the issuer, whereas negative covenants are frequently costly.
- 23 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.
- 24 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.
- 25 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.
- 26 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.
- 27 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.
- 28 A is correct. The conversion premium is the difference between the convertible bond's price and its conversion value.

PRACTICE PROBLEMS

- 1 In most countries, the bond market sector with the smallest amount of bonds outstanding is *most likely* the:
 - A government sector.
 - B financial corporate sector.
 - C non-financial corporate sector.
- 2 The distinction between investment grade debt and non-investment grade debt is *best* described by differences in:
 - A tax status.
 - B credit quality.
 - C maturity dates.
- 3 A bond issued internationally, outside the jurisdiction of the country in whose currency the bond is denominated, is *best* described as a:
 - A Eurobond.
 - B foreign bond.
 - C municipal bond.
- 4 Compared with developed markets bonds, emerging markets bonds *most likely*:
 - A offer lower yields.
 - B exhibit higher risk.
 - C benefit from lower growth prospects.
- 5 With respect to floating-rate bonds, a reference rate such as the London interbank offered rate (Libor) is *most likely* used to determine the bond's:
 - A spread.
 - B coupon rate.
 - C frequency of coupon payments.
- 6 Which of the following statements is *most accurate*? An interbank offered rate:
 - A is a single reference rate.
 - B applies to borrowing periods of up to 10 years.
 - C is used as a reference rate for interest rate swaps.
- 7 An investment bank that underwrites a bond issue *most likely*:
 - A buys and resells the newly issued bonds to investors or dealers.
 - B acts as a broker and receives a commission for selling the bonds to investors.
 - C incurs less risk associated with selling the bonds than in a best efforts offering.
- 8 In major developed bond markets, newly issued sovereign bonds are *most often* sold to the public via a(n):
 - A auction.
 - B private placement.
 - C best efforts offering.
- 9 A mechanism by which an issuer may be able to offer additional bonds to the general public without preparing a new and separate offering circular *best* describes:

- A the grey market.
 - B a shelf registration.
 - C a private placement.
- 10 Which of the following statements related to secondary bond markets is *most accurate*?
- A Newly issued corporate bonds are issued in secondary bond markets.
 - B Secondary bond markets are where bonds are traded between investors.
 - C The major participants in secondary bond markets globally are retail investors.
- 11 A bond market in which a communications network matches buy and sell orders initiated from various locations is *best* described as an:
- A organized exchange.
 - B open market operation.
 - C over-the-counter market.
- 12 A liquid secondary bond market allows an investor to sell a bond at:
- A the desired price.
 - B a price at least equal to the purchase price.
 - C a price close to the bond's fair market value.
- 13 Sovereign bonds are *best* described as:
- A bonds issued by local governments.
 - B secured obligations of a national government.
 - C bonds backed by the taxing authority of a national government.
- 14 Agency bonds are issued by:
- A local governments.
 - B national governments.
 - C quasi-government entities.
- 15 The type of bond issued by a multilateral agency such as the International Monetary Fund (IMF) is *best* described as a:
- A sovereign bond.
 - B supranational bond.
 - C quasi-government bond.
- 16 Which of the following statements relating to commercial paper is *most accurate*?
- A There is no secondary market for trading commercial paper.
 - B Only the strongest, highly rated companies issue commercial paper.
 - C Commercial paper is a source of interim financing for long-term projects.
- 17 Eurocommercial paper is *most likely*:
- A negotiable.
 - B denominated in euro.
 - C issued on a discount basis.
- 18 When issuing debt, a company may use a sinking fund arrangement as a means of reducing:
- A credit risk.
 - B inflation risk.
 - C interest rate risk.

- 19** Which of the following is a source of wholesale funds for banks?
- A** Demand deposits
 - B** Money market accounts
 - C** Negotiable certificates of deposit
- 20** A characteristic of negotiable certificates of deposit is:
- A** they are mostly available in small denominations.
 - B** they can be sold in the open market prior to maturity.
 - C** a penalty is imposed if the depositor withdraws funds prior to maturity.
- 21** A repurchase agreement is *most comparable* to a(n):
- A** interbank deposit.
 - B** collateralized loan.
 - C** negotiable certificate of deposit.
- 22** The repo margin on a repurchase agreement is *most likely* to be lower when:
- A** the underlying collateral is in short supply.
 - B** the maturity of the repurchase agreement is long.
 - C** the credit risk associated with the underlying collateral is high.

SOLUTIONS

- 1 C is correct. In most countries, the largest issuers of bonds are the national and local governments as well as financial institutions. Thus, the bond market sector with the smallest amount of bonds outstanding is the non-financial corporate sector.
- 2 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).
- 3 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.
- 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 markets bonds. A is incorrect because emerging markets bonds typically offer higher (not lower) yields than developed markets bonds to compensate investors for the higher risk. C is incorrect because emerging markets bonds usually benefit from higher (not lower) growth prospects than developed markets 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 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).
- 7 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 who then sell them to investors. B and C are incorrect because the bond issuing mechanism where 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).
- 8 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 effort offerings.

- 9** 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.
- 10** B is correct. Secondary bond markets are where 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).
- 11** 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.
- 12** 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.
- 13** C is correct. Sovereign bonds are usually unsecured obligations of the national government issuing the bonds; they are not backed 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.
- 14** 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.
- 15** 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.
- 16** 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.
- 17** 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.

- 18 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.
- 19 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).
- 20 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.
- 21 B is correct. A repurchase agreement (repo) can be viewed as a collateralized loan where 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.
- 22 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.

PRACTICE PROBLEMS

- 1 A portfolio manager is considering the purchase of a bond with a 5.5% coupon rate that pays interest annually and matures in three years. If the required rate of return on the bond is 5%, the price of the bond per 100 of par value is *closest* to:
 - A 98.65.
 - B 101.36.
 - C 106.43.
- 2 A bond with two years remaining until maturity offers a 3% coupon rate with interest paid annually. At a market discount rate of 4%, the price of this bond per 100 of par value is *closest* to:
 - A 95.34.
 - B 98.00.
 - C 98.11.
- 3 An investor who owns a bond with a 9% coupon rate that pays interest semiannually and matures in three years is considering its sale. If the required rate of return on the bond is 11%, the price of the bond per 100 of par value is *closest* to:
 - A 95.00.
 - B 95.11.
 - C 105.15.
- 4 A bond offers an annual coupon rate of 4%, with interest paid semiannually. The bond matures in two years. At a market discount rate of 6%, the price of this bond per 100 of par value is *closest* to:
 - A 93.07.
 - B 96.28.
 - C 96.33.
- 5 A bond offers an annual coupon rate of 5%, with interest paid semiannually. The bond matures in seven years. At a market discount rate of 3%, the price of this bond per 100 of par value is *closest* to:
 - A 106.60.
 - B 112.54.
 - C 143.90.
- 6 A zero-coupon bond matures in 15 years. At a market discount rate of 4.5% per year and assuming annual compounding, the price of the bond per 100 of par value is *closest* to:
 - A 51.30.
 - B 51.67.
 - C 71.62.
- 7 Consider the following two bonds that pay interest annually:

Bond	Coupon Rate	Time-to-Maturity
A	5%	2 years
B	3%	2 years

At a market discount rate of 4%, the price difference between Bond A and Bond B per 100 of par value is *closest* to:

- A 3.70.
- B 3.77.
- C 4.00.

The following information relates to Questions 8 and 9

Bond	Price	Coupon Rate	Time-to-Maturity
A	101.886	5%	2 years
B	100.000	6%	2 years
C	97.327	5%	3 years

- 8 Which bond offers the lowest yield-to-maturity?
- A Bond A
 - B Bond B
 - C Bond C
- 9 Which bond will *most likely* experience the smallest percent change in price if the market discount rates for all three bonds increase by 100 basis points?
- A Bond A
 - B Bond B
 - C Bond C
-
- 10 Suppose a bond's price is expected to increase by 5% if its market discount rate decreases by 100 basis points. If the bond's market discount rate increases by 100 basis points, the bond price is *most likely* to change by:
- A 5%.
 - B less than 5%.
 - C more than 5%.

The following information relates to Questions 11 and 12

Bond	Coupon Rate	Maturity (years)
A	6%	10
B	6%	5
C	8%	5

All three bonds are currently trading at par value.

- 11** Relative to Bond C, for a 200 basis point decrease in the required rate of return, Bond B will *most likely* exhibit a(n):
A equal percentage price change.
B greater percentage price change.
C smaller percentage price change.
- 12** Which bond will *most likely* experience the greatest percentage change in price if the market discount rates for all three bonds increase by 100 basis points?
A Bond A
B Bond B
C Bond C

- 13** An investor considers the purchase of a 2-year bond with a 5% coupon rate, with interest paid annually. Assuming the sequence of spot rates shown below, the price of the bond is *closest* to:

Time-to-Maturity	Spot Rates
1 year	3%
2 years	4%

- A** 101.93.
B 102.85.
C 105.81.
- 14** A 3-year bond offers a 10% coupon rate with interest paid annually. Assuming the following sequence of spot rates, the price of the bond is *closest* to:

Time-to-Maturity	Spot Rates
1 year	8.0%
2 years	9.0%
3 years	9.5%

- A** 96.98.
B 101.46.
C 102.95.

**The following information relates to Questions
15–17**

Bond	Coupon Rate	Time-to-Maturity	Time-to-Maturity	Spot Rates
X	8%	3 years	1 year	8%
Y	7%	3 years	2 years	9%
Z	6%	3 years	3 years	10%

All three bonds pay interest annually.

- 15 Based upon the given sequence of spot rates, the price of Bond X is *closest* to:
- A 95.02.
 - B 95.28.
 - C 97.63.
- 16 Based upon the given sequence of spot rates, the price of Bond Y is *closest* to:
- A 87.50.
 - B 92.54.
 - C 92.76.
- 17 Based upon the given sequence of spot rates, the yield-to-maturity of Bond Z is *closest* to:
- A 9.00%.
 - B 9.92%.
 - C 11.93%
-
- 18 Bond dealers *most* often quote the:
- A flat price.
 - B full price.
 - C full price plus accrued interest.

**The following information relates to Questions
19–21**

Bond G, described in the exhibit below, is sold for settlement on 16 June 2014.

Annual Coupon	5%
Coupon Payment Frequency	Semiannual
Interest Payment Dates	10 April and 10 October
Maturity Date	10 October 2016
Day Count Convention	30/360
Annual Yield-to-Maturity	4%

- 19 The full price that Bond G will settle at on 16 June 2014 is *closest* to:
- A 102.36.
 - B 103.10.

- C 103.65.
- 20 The accrued interest per 100 of par value for Bond G on the settlement date of 16 June 2014 is *closest* to:
- A 0.46.
 - B 0.73.
 - C 0.92.
- 21 The flat price for Bond G on the settlement date of 16 June 2014 is *closest* to:
- A 102.18.
 - B 103.10.
 - C 104.02.
-
- 22 Matrix pricing allows investors to estimate market discount rates and prices for bonds:
- A with different coupon rates.
 - B that are not actively traded.
 - C with different credit quality.
- 23 When underwriting new corporate bonds, matrix pricing is used to get an estimate of the:
- A required yield spread over the benchmark rate.
 - B market discount rate of other comparable corporate bonds.
 - C yield-to-maturity on a government bond having a similar time-to-maturity.
- 24 A bond with 20 years remaining until maturity is currently trading for 111 per 100 of par value. The bond offers a 5% coupon rate with interest paid semiannually. The bond's annual yield-to-maturity is *closest* to:
- A 2.09%.
 - B 4.18%.
 - C 4.50%.
- 25 The annual yield-to-maturity, stated for with a periodicity of 12, for a 4-year, zero-coupon bond priced at 75 per 100 of par value is *closest* to:
- A 6.25%.
 - B 7.21%.
 - C 7.46%.
- 26 A 5-year, 5% semiannual coupon payment corporate bond is priced at 104.967 per 100 of par value. The bond's yield-to-maturity, quoted on a semiannual bond basis, is 3.897%. An analyst has been asked to convert to a monthly periodicity. Under this conversion, the yield-to-maturity is *closest* to:
- A 3.87%.
 - B 4.95%.
 - C 7.67%.

The following information relates to Questions 27–30

A bond with 5 years remaining until maturity is currently trading for 101 per 100 of par value. The bond offers a 6% coupon rate with interest paid semiannually. The bond is first callable in 3 years, and is callable after that date on coupon dates according to the following schedule:

End of Year	Call Price
3	102
4	101
5	100

- 27 The bond's annual yield-to-maturity is *closest* to:
- A 2.88%.
 - B 5.77%.
 - C 5.94%.
- 28 The bond's annual yield-to-first-call is *closest* to:
- A 3.12%.
 - B 6.11%.
 - C 6.25%.
- 29 The bond's annual yield-to-second-call is *closest* to:
- A 2.97%.
 - B 5.72%.
 - C 5.94%.
- 30 The bond's yield-to-worst is *closest* to:
- A 2.88%.
 - B 5.77%.
 - C 6.25%.
-
- 31 A two-year floating-rate note pays 6-month Libor plus 80 basis points. The floater is priced at 97 per 100 of par value. Current 6-month Libor is 1.00%. Assume a 30/360 day-count convention and evenly spaced periods. The discount margin for the floater in basis points (bps) is *closest* to:
- A 180 bps.
 - B 236 bps.
 - C 420 bps.
- 32 An analyst evaluates the following information relating to floating rate notes (FRNs) issued at par value that have 3-month Libor as a reference rate:

Floating Rate Note	Quoted Margin	Discount Margin
X	0.40%	0.32%
Y	0.45%	0.45%
Z	0.55%	0.72%

Based only on the information provided, the FRN that will be priced at a premium on the next reset date is:

- A FRN X.
 - B FRN Y.
 - C FRN Z.
- 33 A 365-day year bank certificate of deposit has an initial principal amount of USD 96.5 million and a redemption amount due at maturity of USD 100 million. The number of days between settlement and maturity is 350. The bond equivalent yield is *closest* to:
- A 3.48%.
 - B 3.65%.
 - C 3.78%.
- 34 The bond equivalent yield of a 180-day banker's acceptance quoted at a discount rate of 4.25% for a 360-day year is *closest* to:
- A 4.31%.
 - B 4.34%.
 - C 4.40%.
- 35 Which of the following statements describing a par curve is *incorrect*?
- A A par curve is obtained from a spot curve.
 - B All bonds on a par curve are assumed to have different credit risk.
 - C A par curve is a sequence of yields-to-maturity such that each bond is priced at par value.
- 36 A yield curve constructed from a sequence of yields-to-maturity on zero-coupon bonds is the:
- A par curve.
 - B spot curve.
 - C forward curve.
- 37 The rate, interpreted to be the incremental return for extending the time-to-maturity of an investment for an additional time period, is the:
- A add-on rate.
 - B forward rate.
 - C yield-to-maturity.

The following information relates to Questions 38 and 39

Time Period	Forward Rate
"0y1"	0.80%
"1y1"	1.12%
"2y1"	3.94%
"3y1"	3.28%
"4y1"	3.14%

All rates are annual rates stated for a periodicity of one (effective annual rates).

- 38** The 3-year implied spot rate is *closest* to:
- A 1.18%.
 - B 1.94%.
 - C 2.28%.
- 39** The value per 100 of par value of a two-year, 3.5% coupon bond, with interest payments paid annually, is *closest* to:
- A 101.58.
 - B 105.01.
 - C 105.82.
-
- 40** The spread component of a specific bond's yield-to-maturity is *least likely* impacted by changes in:
- A its tax status.
 - B its quality rating.
 - C inflation in its currency of denomination.
- 41** The yield spread of a specific bond over the standard swap rate in that currency of the same tenor is *best* described as the:
- A I-spread.
 - B Z-spread.
 - C G-spread.

The following information relates to Question 42

Bond	Coupon Rate	Time-to-Maturity	Price
UK Government Benchmark Bond	2%	3 years	100.25
UK Corporate Bond	5%	3 years	100.65

Both bonds pay interest annually. The current three-year EUR interest rate swap benchmark is 2.12%.

- 42** The G-spread in basis points (bps) on the UK corporate bond is *closest* to:
- A 264 bps.
 - B 285 bps.
 - C 300 bps.
-
- 43** A corporate bond offers a 5% coupon rate and has exactly 3 years remaining to maturity. Interest is paid annually. The following rates are from the benchmark spot curve:

Time-to-Maturity	Spot Rate
1 year	4.86%
2 years	4.95%
3 years	5.65%

The bond is currently trading at a Z-spread of 234 basis points. The value of the bond is *closest to*:

- A 92.38.
 - B 98.35.
 - C 106.56.
- 44 An option-adjusted spread (OAS) on a callable bond is the Z-spread:
- A over the benchmark spot curve.
 - B minus the standard swap rate in that currency of the same tenor.
 - C minus the value of the embedded call option expressed in basis points per year.

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

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

$$PV = 2.46 + 2.43 + 2.39 + \dots + 2.06 + 83.21 = 112.54$$

- 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 an identical term 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 percent change in price if market discount rates increase by 100 basis points. 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 percent change in price than Bond A because of the coupon effect. Bond B will also experience a smaller percent 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 basis point decrease in the market discount rate will cause the price of the bond to increase by 5%, then a 100 basis point 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 (5 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 percent 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 both offer the same 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 basis points.
- 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. Then 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 not added to 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 2014, there are 2.5 years (5 semiannual periods) to maturity. These five semiannual periods occur on 10 October 2014, 10 April 2015, 10 October 2015, 10 April 2016 and 10 October 2016.

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

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 2014 and 16 June 2014 is 66 days based on the 30/360 day count convention. (This is 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 2014 and 16 June 2014 is 66 days based on the 30/360 day count convention. (This is 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.

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

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

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

- 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).

$$PV^{Flat} = PV^{Full} - \text{Accrued Interest}$$

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

- 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 used to estimate the required yield spread of a new bond.

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

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

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

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

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

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

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

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

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

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

$$r = 0.02883$$

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 $2.883\% \times 2 = 5.77\%$ (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:

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

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

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

$$r = 0.03123$$

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 $3.123\% \times 2 = 6.25\%$ (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:

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

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

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

$$r = 0.0297$$

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 $2.97\% \times 2 = 5.94\%$.

- 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 above, 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 basis points. Given the floater has a maturity of two years and is linked to 6-month Libor, the formula for calculating discount margin is:

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

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 given values in:

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

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

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 basis points.

- 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).

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

$$AOR = 1.04286 \times 0.03627$$

$$AOR = 0.03783 \text{ or approximately } 3.78\%$$

- 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 the PV is calculated using an assumed 360-day year and the 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-maturities 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 timeframe.
- 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 indices such as 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 3 year implied spot rate is closest to 1.94%. It is calculated as the geometric average of the one-year forward rates:

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

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

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

$$1.01944 = 1 + z_3$$

$$1.01944 - 1 = z_3$$

$$0.01944 = z_3, z_3 = 1.944\% \text{ or approximately } 1.94\%$$

- 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 of 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 such 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:

$$\begin{aligned} PV &= \frac{PMT}{(1+z_1+Z)^1} + \frac{PMT}{(1+z_2+Z)^2} + \frac{PMT+FV}{(1+z_3+Z)^3} \\ &= \frac{5}{(1+0.0486+0.0234)^1} + \frac{5}{(1+0.0495+0.0234)^2} + \frac{105}{(1+0.0565+0.0234)^3} \\ &= \frac{5}{1.0720} + \frac{5}{1.15111} + \frac{105}{1.25936} = 4.66 + 4.34 + 83.38 = 92.38 \end{aligned}$$

- 44** C is correct. The option value in basis points per year is subtracted from the Z-spread to calculate the option-adjusted spread (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.

PRACTICE PROBLEMS

- 1 Securitization is beneficial for banks because it:
 - A repackages bank loans into simpler structures.
 - B increases the funds available for banks to lend.
 - C allows banks to maintain ownership of their securitized assets.
- 2 Securitization benefits financial markets by:
 - A increasing the role of intermediaries.
 - B establishing a barrier between investors and originating borrowers.
 - C allowing investors to tailor credit risk and interest rate risk exposures to meet their individual needs.
- 3 A benefit of securitization is the:
 - A reduction in disintermediation.
 - B simplification of debt obligations.
 - C creation of tradable securities with greater liquidity than the original loans.
- 4 In a securitization, the special purpose entity (SPE) is responsible for the:
 - A issuance of the asset-backed securities.
 - B collection of payments from the borrowers.
 - C recovery of underlying assets from delinquent borrowers.
- 5 A special purpose entity issues asset-backed securities in the following structure.

Bond Class	Par Value (€ millions)
A (senior)	200
B (subordinated)	20
C (subordinated)	5

At which of the following amounts of default in par value would Bond Class A experience a loss?

- A €20 million
- B €25 million
- C €26 million
- 6 In a securitization, time tranching provides investors with the ability to choose between:
 - A extension and contraction risks.
 - B senior and subordinated bond classes.
 - C fully amortizing and partially amortizing loans.
- 7 The last payment in a partially amortizing residential mortgage loan is *best* referred to as a:
 - A waterfall.
 - B principal repayment.
 - C balloon payment.
- 8 If a mortgage borrower makes prepayments without penalty to take advantage of falling interest rates, the lender will *most likely* experience:

- A extension risk.
 - B contraction risk.
 - C yield maintenance.
- 9 Which of the following characteristics of a residential mortgage loan would *best* protect the lender from a strategic default by the borrower?
- A Recourse
 - B A prepayment option
 - C Interest-only payments
- 10 William Marolf obtains a 5 million EUR mortgage loan from Bank Nederlandse. A year later the principal on the loan is 4 million EUR and Marolf defaults on the loan. Bank Nederlandse forecloses, sells the property for 2.5 million EUR, and is entitled to collect the 1.5 million EUR shortfall, from Marolf. Marolf *most likely* had a:
- A bullet loan.
 - B recourse loan.
 - C non-recourse loan.
- 11 Fran Martin obtains a non-recourse mortgage loan for \$500,000. One year later, when the outstanding balance of the mortgage is \$490,000, Martin cannot make his mortgage payments and defaults on the loan. The lender forecloses on the loan and sells the house for \$315,000. What amount is the lender entitled to claim from Martin?
- A \$0.
 - B \$175,000.
 - C \$185,000.
- 12 Which of the following describes a typical feature of a non-agency residential mortgage-backed security (RMBS)?
- A Senior/subordinated structure
 - B A pool of conforming mortgages as collateral
 - C A guarantee by a government-sponsored enterprise
- 13 If interest rates increase, an investor who owns a mortgage pass-through security is *most likely* affected by:
- A credit risk.
 - B extension risk.
 - C contraction risk.
- 14 Which of the following is *most likely* an advantage of collateralized mortgage obligations (CMOs)? CMOs can
- A eliminate prepayment risk.
 - B be created directly from a pool of mortgage loans.
 - C meet the asset/liability requirements of institutional investors.
- 15 The longest-term tranche of a sequential-pay CMO is *most likely* to have the lowest:
- A average life.
 - B extension risk.
 - C contraction risk.
- 16 The tranches in a collateralized mortgage obligation (CMO) that are *most likely* to provide protection against both extension and contraction risk are:

- A planned amortization class (PAC) tranches.
B support tranches.
C sequential-pay tranches.
- 17 Support tranches are *most* appropriate for investors who are:
A concerned about their exposure to extension risk.
B concerned about their exposure to concentration risk.
C willing to accept prepayment risk in exchange for higher returns.
- 18 In the context of mortgage-backed securities, a conditional prepayment rate (CPR) of 8% means that approximately 8% of the outstanding mortgage pool balance at the beginning of the year is expected to be prepaid:
A in the current month.
B by the end of the year.
C over the life of the mortgages.
- 19 For a mortgage pass-through security, which of the following risks *most likely* increases as interest rates decline?
A Balloon
B Extension
C Contraction
- 20 Credit risk is an important consideration for commercial mortgage-backed securities (CMBS) if the CMBS are backed by mortgage loans that:
A are non-recourse.
B have call protection.
C have prepayment penalty points.
- 21 Which commercial mortgage-backed security (CMBS) characteristic causes a CMBS to trade more like a corporate bond than a residential mortgage-backed security (RMBS)?
A Call protection
B Internal credit enhancement
C Debt-service coverage ratio level
- 22 A commercial mortgage-backed security (CMBS) does not meet the debt-to-service coverage at the loan level necessary to achieve a desired credit rating. Which of the following features would *most likely* improve the credit rating of the CMBS?
A Subordination
B Call protection
C Balloon payments
- 23 If a default occurs in a non-recourse commercial mortgage-backed security (CMBS), the lender will *most likely*:
A recover prepayment penalty points paid by the borrower to offset losses.
B use only the proceeds received from the sale of the property to recover losses.
C initiate a claim against the borrower for any shortfall resulting from the sale of the property.
- 24 Which of the following investments is least subject to prepayment risk?
A Auto loan receivable-backed securities
B Commercial mortgage-backed securities (CMBSs)

- C Non-agency residential mortgage-backed securities (RMBSs)
- 25 An excess spread account incorporated into a securitization is designed to limit:
- A credit risk.
 - B extension risk.
 - C contraction risk.
- 26 Which of the following *best* describes the cash flow that owners of credit card receivable asset-backed securities receive during the lockout period?
- A No cash flow
 - B Only principal payments collected
 - C Only finance charges collected and fees
- 27 Collateralized mortgage obligations (CMOs) are designed to:
- A eliminate contraction risk in support tranches.
 - B distribute prepayment risk to various tranches.
 - C eliminate extension risk in planned amortization tranches.

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. In a securitization, the special purpose entity (SPE) 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.
- 5 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 only experience a loss when defaults exceed €25 million.
- 6 A is correct. Time tranching is the process in which a set of bond classes or tranches are 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.
- 7 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.”
- 8 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.
- 9 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.
- 10 B is correct. Bank Nederlandse has a claim against Marolf for 1.5 million EUR, 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 only been entitled to the proceeds from the sale of the underlying property, or 2.5 million EUR. 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.

- 11 A is correct. Because the loan has a non-recourse feature, the lender can only look to 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.
- 12 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 enhancements 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.
- 13 B is correct. Extension risk is the risk that when interest rates 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.
- 14 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 are mortgage-related products, not the mortgages themselves.
- 15 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.
- 16 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 the longer-term tranches.
- 17 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.
- 18 B is correct. CPR is an annualized rate, which 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.
- 19 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.

- 20 A is correct. If commercial mortgage loans are non-recourse loans, the lender can only look to 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.
- 21 A is correct. With CMBS, investors have considerable call protection. An investor in a 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 a RMBS. Both internal credit enhancement and the debt-service-coverage (DSC) ratio address credit risk, not prepayment risk.
- 22 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.
- 23 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.
- 24 B is correct. A critical feature that differentiates CMBSs from RMBSs is the call protection provided to investors. An investor in a RMBS is exposed to considerable prepayment risk because the borrower has the right to prepay the loan before maturity. CMBSs provide investors with considerable call protection that comes either at the structure level or at the loan level.
- 25 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, extension, or contraction.
- 26 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.
- 27 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.

PRACTICE PROBLEMS

- 1 A “buy-and-hold” investor purchases a fixed-rate bond at a discount and holds the security until it matures. Which of the following sources of return is *least likely* to contribute to the investor’s total return over the investment horizon, assuming all payments are made as scheduled?
 - A Capital gain
 - B Principal payment
 - C Reinvestment of coupon payments
- 2 Which of the following sources of return is *most likely* exposed to interest rate risk for an investor of a fixed-rate bond who holds the bond until maturity?
 - A Capital gain or loss
 - B Redemption of principal
 - C Reinvestment of coupon payments
- 3 An investor purchases a bond at a price above par value. Two years later, the investor sells the bond. The resulting capital gain or loss is measured by comparing the price at which the bond is sold to the:
 - A carrying value.
 - B original purchase price.
 - C original purchase price value plus the amortized amount of the premium.

The following information relates to Problems

4–6

An investor purchases a nine-year, 7% annual coupon payment bond at a price equal to par value. After the bond is purchased and before the first coupon is received, interest rates increase to 8%. The investor sells the bond after five years. Assume that interest rates remain unchanged at 8% over the five-year holding period.

- 4 Per 100 of par value, the future value of the reinvested coupon payments at the end of the holding period is *closest* to:
 - A 35.00.
 - B 40.26.
 - C 41.07.
- 5 The capital gain/loss per 100 of par value resulting from the sale of the bond at the end of the five-year holding period is *closest* to a:
 - A loss of 8.45.
 - B loss of 3.31.
 - C gain of 2.75.
- 6 Assuming that all coupons are reinvested over the holding period, the investor’s five-year horizon yield is *closest* to:
 - A 5.66%.

- B 6.62%.
C 7.12%.
-

- 7 An investor buys a three-year bond with a 5% coupon rate paid annually. The bond, with a yield-to-maturity of 3%, is purchased at a price of 105.657223 per 100 of par value. Assuming a 5-basis point change in yield-to-maturity, the bond's approximate modified duration is *closest* to:
- A 2.78.
B 2.86.
C 5.56.
- 8 Which of the following statements about duration is correct? A bond's:
- A effective duration is a measure of yield duration.
B modified duration is a measure of curve duration.
C modified duration cannot be larger than its Macaulay duration.
- 9 An investor buys a 6% annual payment bond with three years to maturity. The bond has a yield-to-maturity of 8% and is currently priced at 94.845806 per 100 of par. The bond's Macaulay duration is *closest* to:
- A 2.62.
B 2.78.
C 2.83.
- 10 The interest rate risk of a fixed-rate bond with an embedded call option is *best* measured by:
- A effective duration.
B modified duration.
C Macaulay duration.
- 11 Which of the following is *most* appropriate for measuring a bond's sensitivity to shaping risk?
- A key rate duration
B effective duration
C modified duration
- 12 A Canadian pension fund manager seeks to measure the sensitivity of her pension liabilities to market interest rate changes. The manager determines the present value of the liabilities under three interest rate scenarios: a base rate of 7%, a 100 basis point increase in rates up to 8%, and a 100 basis point drop in rates down to 6%. The results of the manager's analysis are presented below:

Interest Rate Assumption	Present Value of Liabilities
6%	CAD 510.1 million
7%	CAD 455.4 million
8%	CAD 373.6 million

The effective duration of the pension fund's liabilities is *closest* to:

- A 1.49.
B 14.99.
C 29.97.

- 13 Which of the following statements about Macaulay duration is correct?

- A A bond's coupon rate and Macaulay duration are positively related.
- B A bond's Macaulay duration is inversely related to its yield-to-maturity.
- C The Macaulay duration of a zero-coupon bond is less than its time-to-maturity.
- 14** Assuming no change in the credit risk of a bond, the presence of an embedded put option:
- A reduces the effective duration of the bond.
- B increases the effective duration of the bond.
- C does not change the effective duration of the bond.
- 15** A bond portfolio consists of the following three fixed-rate bonds. Assume annual coupon payments and no accrued interest on the bonds. Prices are per 100 of par value.

Bond	Maturity	Market Value	Price	Coupon	Yield-to-Maturity	Modified Duration
A	6 years	170,000	85.0000	2.00%	4.95%	5.42
B	10 years	120,000	80.0000	2.40%	4.99%	8.44
C	15 years	100,000	100.0000	5.00%	5.00%	10.38

The bond portfolio's modified duration is *closest* to:

- A 7.62.
- B 8.08.
- C 8.20.
- 16** A limitation of calculating a bond portfolio's duration as the weighted average of the yield durations of the individual bonds that compose the portfolio is that it:
- A assumes a parallel shift to the yield curve.
- B is less accurate when the yield curve is less steeply sloped.
- C is not applicable to portfolios that have bonds with embedded options.
- 17** Using the information below, which bond has the *greatest* money duration per 100 of par value assuming annual coupon payments and no accrued interest?

Bond	Time-to-Maturity	Price Per 100 of Par Value	Coupon Rate	Yield-to-Maturity	Modified Duration
A	6 years	85.00	2.00%	4.95%	5.42
B	10 years	80.00	2.40%	4.99%	8.44
C	9 years	85.78	3.00%	5.00%	7.54

- A Bond A
- B Bond B
- C Bond C
- 18** A bond with exactly nine years remaining until maturity offers a 3% coupon rate with annual coupons. The bond, with a yield-to-maturity of 5%, is priced at 85.784357 per 100 of par value. The estimated price value of a basis point for the bond is *closest* to:
- A 0.0086.
- B 0.0648.
- C 0.1295.

- 19 The “second-order” effect on a bond’s percentage price change given a change in yield-to-maturity can be *best* described as:
- A duration.
 - B convexity.
 - C yield volatility.
- 20 A bond is currently trading for 98.722 per 100 of par value. If the bond’s yield-to-maturity (YTM) rises by 10 basis points, the bond’s full price is expected to fall to 98.669. If the bond’s YTM decreases by 10 basis points, the bond’s full price is expected to increase to 98.782. The bond’s approximate convexity is *closest* to:
- A 0.071.
 - B 70.906.
 - C 1,144.628.
- 21 A bond has an annual modified duration of 7.020 and annual convexity of 65.180. If the bond’s yield-to-maturity decreases by 25 basis points, the expected percentage price change is *closest* to:
- A 1.73%.
 - B 1.76%.
 - C 1.78%.
- 22 A bond has an annual modified duration of 7.140 and annual convexity of 66.200. The bond’s yield-to-maturity is expected to increase by 50 basis points. The expected percentage price change is *closest* to:
- A -3.40%.
 - B -3.49%.
 - C -3.57%.
- 23 Which of the following statements relating to yield volatility is *most* accurate? If the term structure of yield volatility is downward sloping, then:
- A short-term rates are higher than long-term rates.
 - B long-term yields are more stable than short-term yields.
 - C short-term bonds will always experience greater price fluctuation than long-term bonds.
- 24 The holding period for a bond at which the coupon reinvestment risk offsets the market price risk is *best* approximated by:
- A duration gap.
 - B modified duration.
 - C Macaulay duration.
- 25 When the investor’s investment horizon is less than the Macaulay duration of the bond she owns:
- A the investor is hedged against interest rate risk.
 - B reinvestment risk dominates, and the investor is at risk of lower rates.
 - C market price risk dominates, and the investor is at risk of higher rates.
- 26 An investor purchases an annual coupon bond with a 6% coupon rate and exactly 20 years remaining until maturity at a price equal to par value. The investor’s investment horizon is eight years. The approximate modified duration of the bond is 11.470 years. The duration gap at the time of purchase is *closest* to:
- A -7.842.

- B 3.470.
C 4.158.
- 27 A manufacturing company receives a ratings upgrade and the price increases on its fixed-rate bond. The price increase was *most likely* caused by a(n):
A decrease in the bond's credit spread.
B increase in the bond's liquidity spread.
C increase of the bond's underlying benchmark rate.

SOLUTIONS

- 1 A is correct. A capital gain is least likely to contribute to the investor's total return. There is no capital gain (or loss) because the bond is held to maturity. The carrying value of the bond at maturity is par value, the same as the redemption amount. When a fixed-rate bond is held to its maturity, the investor receives the principal payment at maturity. This principal payment is a source of return for the investor. A fixed-rate bond pays periodic coupon payments, and the reinvestment of these coupon payments is a source of return for the investor. The investor's total return is the redemption of principal at maturity and the sum of the reinvested coupons.
- 2 C is correct. Because the fixed-rate bond is held to maturity (a "buy-and-hold" investor), interest rate risk arises entirely from changes in coupon reinvestment rates. Higher interest rates increase income from reinvestment of coupon payments, and lower rates decrease income from coupon reinvestment. There will not be a capital gain or loss because the bond is held until maturity. The carrying value at the maturity date is par value, the same as the redemption amount. The redemption of principal does not expose the investor to interest rate risk. The risk to a bond's principal is credit risk.
- 3 A is correct. Capital gains (losses) arise if a bond is sold at a price above (below) its constant-yield price trajectory. A point on the trajectory represents the carrying value of the bond at that time. That is, the capital gain/loss is measured from the bond's carrying value, the point on the constant-yield price trajectory, and not from the original purchase price. The carrying value is the original purchase price plus the amortized amount of the discount if the bond is purchased at a price below par value. If the bond is purchased at a price above par value, the carrying value is the original purchase price minus (not plus) the amortized amount of the premium. The amortized amount for each year is the change in the price between two points on the trajectory.
- 4 C is correct. The future value of reinvested cash flows at 8% after five years is closest to 41.07 per 100 of par value.

$$\left[7 \times (1.08)^4\right] + \left[7 \times (1.08)^3\right] + \left[7 \times (1.08)^2\right] + \left[7 \times (1.08)^1\right] + 7 = 41.0662$$

The 0.07 difference between the sum of the coupon payments over the five-year holding period (35) and the future value of the reinvested coupons (41.07) represents the "interest-on-interest" gain from compounding.

- 5 B is correct. The capital loss is closest to 3.31 per 100 of par value. After five years, the bond has four years remaining until maturity and the sale price of the bond is 96.69, calculated as:

$$\frac{7}{(1.08)^1} + \frac{7}{(1.08)^2} + \frac{7}{(1.08)^3} + \frac{107}{(1.08)^4} = 96.69$$

The investor purchased the bond at a price equal to par value (100). Because the bond was purchased at a price equal to its par value, the carrying value is par value. Therefore, the investor experienced a capital loss of $96.69 - 100 = -3.31$.

- 6** B is correct. The investor's five-year horizon yield is closest to 6.62%. After five years, the sale price of the bond is 96.69 (from problem 5) and the future value of reinvested cash flows at 8% is 41.0662 (from problem 4) per 100 of par value. The total return is 137.76 (= 41.07 + 96.69), resulting in a realized five-year horizon yield of 6.62%:

$$100.00 = \frac{137.76}{(1+r)^5}, \quad r = 0.0662$$

- 7** A is correct. The bond's approximate modified duration is closest to 2.78.

Approximate modified duration is calculated as:

$$\text{ApproxModDur} = \frac{(PV_-) - (PV_+)}{2 \times (\Delta \text{Yield}) \times (PV_0)}$$

Lower yield-to-maturity by 5 bps to 2.95%:

$$PV_- = \frac{5}{(1 + 0.0295)^1} + \frac{5}{(1 + 0.0295)^2} + \frac{5 + 100}{(1 + 0.0295)^3} = 105.804232$$

Increase yield-to-maturity by 5 bps to 3.05%:

$$PV_+ = \frac{5}{(1 + 0.0305)^1} + \frac{5}{(1 + 0.0305)^2} + \frac{5 + 100}{(1 + 0.0305)^3} = 105.510494$$

$$PV_0 = 105.657223, \Delta \text{Yield} = 0.0005$$

$$\text{ApproxModDur} = \frac{105.804232 - 105.510494}{2 \times 0.0005 \times 105.657223} = 2.78$$

- 8** C is correct. A bond's modified duration cannot be larger than its Macaulay duration. The formula for modified duration is:

$$\text{ModDur} = \frac{\text{MacDur}}{1 + r}$$

where r is the bond's yield-to-maturity per period. A bond's yield-to-maturity has an effective lower bound of 0, and thus the denominator $1 + r$ term has a lower bound of 1. Therefore, ModDur will typically be less than MacDur.

Effective duration is a measure of curve duration. Modified duration is a measure of yield duration.

- 9** C is correct. The bond's Macaulay duration is closest to 2.83. Macaulay duration (MacDur) is a weighted average of the times to the receipt of cash flow. The weights are the shares of the full price corresponding to each coupon and principal payment.

Period	Cash Flow	Present Value	Weight	Period × Weight
1	6	5.555556	0.058575	0.058575
2	6	5.144033	0.054236	0.108472
3	106	84.146218	0.887190	2.661570
		94.845806	1.000000	2.828617

Thus, the bond's Macaulay duration (MacDur) is 2.83.

Alternatively, Macaulay duration can be calculated using the following closed-form formula:

$$\text{MacDur} = \left\{ \frac{1+r}{r} - \frac{1+r + [N \times (c-r)]}{c \times [(1+r)^N - 1] + r} \right\} - (t/T)$$

$$\text{MacDur} = \left\{ \frac{1.08}{0.08} - \frac{1.08 + [3 \times (0.06 - 0.08)]}{0.06 \times [(1.08)^3 - 1] + 0.08} \right\} - 0$$

$$\text{MacDur} = 13.50 - 10.67 = 2.83$$

- 10 A is correct. The interest rate risk of a fixed-rate bond with an embedded call option is best measured by effective duration. A callable bond's future cash flows are uncertain because they are contingent on future interest rates. The issuer's decision to call the bond depends on future interest rates. Therefore, the yield-to-maturity on a callable bond is not well defined. Only effective duration, which takes into consideration the value of the call option, is the appropriate interest rate risk measure. Yield durations like Macaulay and modified durations are not relevant for a callable bond because they assume no changes in cash flows when interest rates change.
- 11 A is correct. Key rate duration is used to measure a bond's sensitivity to a shift at one or more maturity segments of the yield curve which result in a change to yield curve shape. Modified and effective duration measure a bond's sensitivity to parallel shifts in the entire curve.
- 12 B is correct. The effective duration of the pension fund's liabilities is closest to 14.99. The effective duration is calculated as follows:

$$\text{EffDur} = \frac{(PV_-) - (PV_+)}{2 \times (\Delta\text{Curve}) \times (PV_0)}$$

$$PV_0 = 455.4, PV_+ = 373.6, PV_- = 510.1, \text{ and } \Delta\text{Curve} = 0.0100.$$

$$\text{EffDur} = \frac{510.1 - 373.6}{2 \times 0.0100 \times 455.4} = 14.99$$

- 13 B is correct. A bond's yield-to-maturity is inversely related to its Macaulay duration: The higher the yield-to-maturity, the lower its Macaulay duration and the lower the interest rate risk. A higher yield-to-maturity decreases the weighted average of the times to the receipt of cash flow, and thus decreases the Macaulay duration.
- A bond's coupon rate is inversely related to its Macaulay duration: The lower the coupon, the greater the weight of the payment of principal at maturity. This results in a higher Macaulay duration. Zero-coupon bonds do not pay periodic coupon payments; therefore, the Macaulay duration of a zero-coupon bond is its time-to-maturity.
- 14 A is correct. The presence of an embedded put option reduces the effective duration of the bond, especially when rates are rising. If interest rates are low compared with the coupon rate, the value of the put option is low and the impact of the change in the benchmark yield on the bond's price is very similar to the impact on the price of a non-putable bond. But when benchmark interest rates rise, the put option becomes more valuable to the investor. The ability to

sell the bond at par value limits the price depreciation as rates rise. The presence of an embedded put option reduces the sensitivity of the bond price to changes in the benchmark yield, assuming no change in credit risk.

- 15** A is correct. The portfolio's modified duration is closest to 7.62. Portfolio duration is commonly estimated as the market-value-weighted average of the yield durations of the individual bonds that compose the portfolio.

The total market value of the bond portfolio is $170,000 + 120,000 + 100,000 = 390,000$.

The portfolio duration is $5.42 \times (170,000/390,000) + 8.44 \times (120,000/390,000) + 10.38 \times (100,000/390,000) = 7.62$.

- 16** A is correct. A limitation of calculating a bond portfolio's duration as the weighted average of the yield durations of the individual bonds is that this measure implicitly assumes a parallel shift to the yield curve (all rates change by the same amount in the same direction). In reality, interest rate changes frequently result in a steeper or flatter yield curve. This approximation of the "theoretically correct" portfolio duration is *more* accurate when the yield curve is flatter (less steeply sloped). An advantage of this approach is that it can be used with portfolios that include bonds with embedded options. Bonds with embedded options can be included in the weighted average using the effective durations for these securities.

- 17** B is correct. Bond B has the greatest money duration per 100 of par value. Money duration (MoneyDur) is calculated as the annual modified duration (AnnModDur) times the full price (PV^{Full}) of the bond including accrued interest. Bond B has the highest money duration per 100 of par value.

$$\text{MoneyDur} = \text{AnnModDur} \times PV^{Full}$$

$$\text{MoneyDur of Bond A} = 5.42 \times 85.00 = 460.70$$

$$\text{MoneyDur of Bond B} = 8.44 \times 80.00 = 675.20$$

$$\text{MoneyDur of Bond C} = 7.54 \times 85.78 = 646.78$$

- 18** B is correct. The PVBP is closest to 0.0648. The formula for the price value of a basis point is:

$$\text{PVBP} = \frac{(PV_-) - (PV_+)}{2}$$

where:

$PVBP$ = price value of a basis point

PV_- = full price calculated by lowering the yield-to-maturity by one basis point

PV_+ = full price calculated by raising the yield-to-maturity by one basis point

Lowering the yield-to-maturity by one basis point to 4.99% results in a bond price of 85.849134:

$$PV_- = \frac{3}{(1 + 0.0499)^1} + \dots + \frac{3 + 100}{(1 + 0.0499)^9} = 85.849134$$

Increasing the yield-to-maturity by one basis point to 5.01% results in a bond price of 85.719638:

$$PV_+ = \frac{3}{(1 + 0.0501)^1} + \cdots + \frac{3 + 100}{(1 + 0.0501)^9} = 85.719638$$

$$PVBP = \frac{85.849134 - 85.719638}{2} = 0.06475$$

Alternatively, the PVBP can be derived using modified duration:

$$\text{ApproxModDur} = \frac{(PV_-) - (PV_+)}{2 \times (\Delta\text{Yield}) \times (PV_0)}$$

$$\text{ApproxModDur} = \frac{85.849134 - 85.719638}{2 \times 0.0001 \times 85.784357} = 7.548$$

$$PVBP = 7.548 \times 85.784357 \times 0.0001 = 0.06475$$

- 19** B is correct. Convexity measures the “second order” effect on a bond’s percentage price change given a change in yield-to-maturity. Convexity adjusts the percentage price change estimate provided by modified duration to better approximate the true relationship between a bond’s price and its yield-to-maturity which is a curved line (convex).

Duration estimates the change in the bond’s price along the straight line that is tangent to this curved line (“first order” effect). Yield volatility measures the magnitude of changes in the yields along the yield curve.

- 20** B is correct. The bond’s approximate convexity is closest to 70.906. Approximate convexity (ApproxCon) is calculated using the following formula:

$$\text{ApproxCon} = [PV_- + PV_+ - (2 \times PV_0)] / (\Delta\text{Yield}^2 \times PV_0)$$

where:

PV_- = new price when the yield-to-maturity is decreased

PV_+ = new price when the yield-to-maturity is increased

PV_0 = original price

ΔYield = change in yield-to-maturity

$$\text{ApproxCon} = [98.782 + 98.669 - (2 \times 98.722)] / (0.001^2 \times 98.722) = 70.906$$

- 21** C is correct. The expected percentage price change is closest to 1.78%. The convexity-adjusted percentage price change for a bond given a change in the yield-to-maturity is estimated by:

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

$$\% \Delta PV^{Full} \approx [-7.020 \times (-0.0025)] + [0.5 \times 65.180 \times (-0.0025)^2] = 0.017754, \text{ or } 1.78\%$$

- 22** B is correct. The expected percentage price change is closest to -3.49%. The convexity-adjusted percentage price change for a bond given a change in the yield-to-maturity is estimated by:

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

$$\% \Delta PV^{Full} \approx [-7.140 \times 0.005] + [0.5 \times 66.200 \times (0.005)^2] = -0.034873, \text{ or } -3.49\%$$

- 23** B is correct. If the term structure of yield volatility is downward-sloping, then short-term bond yields-to-maturity have greater volatility than for long-term bonds. Therefore, long-term yields are more stable than short-term yields. Higher volatility in short-term rates does not necessarily mean that the level of short-term rates is higher than long-term rates. With a downward-sloping term structure of yield volatility, short-term bonds will not always experience greater price fluctuation than long-term bonds. The estimated percentage change in a bond price depends on the modified duration and convexity as well as on the yield-to-maturity change.
- 24** C is correct. When the holder of a bond experiences a one-time parallel shift in the yield curve, the Macaulay duration statistic identifies the number of years necessary to hold the bond so that the losses (or gains) from coupon reinvestment offset the gains (or losses) from market price changes. The duration gap is the difference between the Macaulay duration and the investment horizon. Modified duration approximates the percentage price change of a bond given a change in its yield-to-maturity.
- 25** C is correct. The duration gap is equal to the bond's Macaulay duration minus the investment horizon. In this case, the duration gap is positive, and price risk dominates coupon reinvestment risk. The investor risk is to higher rates. The investor is hedged against interest rate risk if the duration gap is zero; that is, the investor's investment horizon is equal to the bond's Macaulay duration. The investor is at risk of lower rates only if the duration gap is negative; that is, the investor's investment horizon is greater than the bond's Macaulay duration. In this case, coupon reinvestment risk dominates market price risk.
- 26** C is correct. The duration gap is closest to 4.158. The duration gap is a bond's Macaulay duration minus the investment horizon. The approximate Macaulay duration is the approximate modified duration times one plus the yield-to-maturity. It is 12.158 ($= 11.470 \times 1.06$). Given an investment horizon of eight years, the duration gap for this bond at purchase is positive: $12.158 - 8 = 4.158$. When the investment horizon is less than the Macaulay duration of the bond, the duration gap is positive, and price risk dominates coupon reinvestment risk.
- 27** A is correct. The price increase was most likely caused by a decrease in the bond's credit spread. The ratings upgrade most likely reflects a lower expected probability of default and/or a greater level of recovery of assets if default occurs. The decrease in credit risk results in a smaller credit spread. The increase in the bond price reflects a decrease in the yield-to-maturity due to a smaller credit spread. The change in the bond price was not due to a change in liquidity risk or an increase in the benchmark rate.

PRACTICE PROBLEMS

- 1 The risk that a bond's creditworthiness declines is *best* described by:
 - A credit migration risk.
 - B market liquidity risk.
 - C spread widening risk.
- 2 Stedsmart Ltd and Fignermo Ltd are alike with respect to financial and operating characteristics, except that Stedsmart Ltd has less publicly traded debt outstanding than Fignermo Ltd. Stedsmart Ltd is *most likely* to have:
 - A no market liquidity risk.
 - B lower market liquidity risk.
 - C higher market liquidity risk.
- 3 In the event of default, debentures' claims will *most likely* rank:
 - A above that of secured debt holders.
 - B below that of secured debt holders.
 - C the same as that of secured debt holders.
- 4 In the event of default, the recovery rate of which of the following bonds would *most likely* be the highest?
 - A First mortgage debt
 - B Senior unsecured debt
 - C Junior subordinate debt
- 5 During bankruptcy proceedings of a firm, the priority of claims was not strictly adhered to. Which of the following is the *least likely* explanation for this outcome?
 - A Senior creditors compromised.
 - B The value of secured assets was less than the amount of the claims.
 - C A judge's order resulted in actual claims not adhering to strict priority of claims.
- 6 A fixed income analyst is *least likely* to conduct an independent analysis of credit risk because credit rating agencies:
 - A may at times mis-rate issues.
 - B often lag the market in pricing credit risk.
 - C cannot foresee future debt-financed acquisitions.
- 7 If goodwill makes up a large percentage of a company's total assets, this *most likely* indicates that:
 - A the company has low free cash flow before dividends.
 - B there is a low likelihood that the market price of the company's common stock is below book value.
 - C a large percentage of the company's assets are not of high quality.
- 8 In order to analyze the **collateral** of a company a credit analyst should assess the:
 - A cash flows of the company.
 - B soundness of management's strategy.

- C value of the company's assets in relation to the level of debt.
- 9 In order to determine the **capacity** of a company, it would be *most* appropriate to analyze the:
- company's strategy.
 - growth prospects of the industry.
 - aggressiveness of the company's accounting policies.
- 10 A credit analyst is evaluating the credit worthiness of three companies: a construction company, a travel and tourism company, and a beverage company. Both the construction and travel and tourism companies are cyclical, whereas the beverage company is non-cyclical. The construction company has the highest debt level of the three companies. The highest credit risk is *most likely* exhibited by the:
- construction company.
 - beverage company.
 - travel and tourism company.
- 11 Based on the information provided in Exhibit 1, the EBITDA interest coverage ratio of Adidas AG is *closest* to:
- 7.91x.
 - 10.12x.
 - 12.99x.

Exhibit 1 Adidas AG Excerpt from Consolidated Income Statement Year Ending 31 December 2010 (€ in millions)

Gross profit	5,730
Royalty and commission income	100
Other operating income	110
Other operating expenses	5,046
Operating profit	894
Interest income	25
Interest expense	113
Income before taxes	806
Income taxes	238
Net income	568
Additional information:	
Depreciation and amortization: €249 million	

Source: Adidas AG Annual Financial Statements, December 2010

- 12 The following information is from the annual report of Adidas AG for December 2010:
- Depreciation and amortization: €249 million
 - Total assets: €10,618 million
 - Total debt: €1,613 million
 - Shareholders' equity: €4,616 million
- The debt/capital ratio of Adidas AG is *closest* to:
- 15.19%.

- B 25.90%.
- C 34.94%.
- 13 Funds from operations (FFO) of Pay Handle Ltd increased in 2011. In 2011 the total debt of the company remained unchanged, while additional common shares were issued. Pay Handle Ltd's ability to service its debt in 2011, as compared to 2010, *most likely*:
- A improved.
- B worsened.
- C remained the same.
- 14 Based on the information in Exhibit 2, Grupa Zywiec SA's credit risk is *most likely*:
- A lower than the industry.
- B higher than the industry.
- C the same as the industry.

Exhibit 2 European Food, Beverage, and Tobacco Industry and Grupa Zywiec SA Selected Financial Ratios for 2010

	Total debt/Total capital (%)	FFO/Total debt (%)	Return on capital (%)	Total debt/ EBITDA (x)	EBITDA interest coverage (x)
Grupa Zywiec SA	47.1	77.5	19.6	1.2	17.7
Industry Median	42.4	23.6	6.55	2.85	6.45

- 15 Based on the information in Exhibit 3, the credit rating of Davide Campari-Milano S.p.A. is *most likely*:
- A lower than Associated British Foods plc.
- B higher than Associated British Foods plc.
- C the same as Associated British Foods plc.

Exhibit 3 European Food, Beverage, and Tobacco Industry; Associated British Foods plc; and Davide Campari-Milano S.p.A Selected Financial Ratios, 2010

Company	Total debt/total capital (%)	FFO/total debt (%)	Return on capital (%)	Total debt/EBITDA (x)	EBITDA interest coverage (x)
Associated British Foods plc	0.2	84.3	0.1	1.0	13.9
Davide Campari- Milano S.p.A.	42.9	22.9	8.2	3.2	3.2

Exhibit 3 (Continued)

Company	Total debt/ total capital (%)	FFO/ total debt (%)	Return on capital (%)	Total debt/ EBITDA (x)	EBITDA interest coverage (x)
European Food, Beverage, and Tobacco Median	42.4	23.6	6.55	2.85	6.45

- 16** Holding all other factors constant, the *most likely* effect of low demand and heavy new issue supply on bond yield spreads is that yield spreads will:
- A widen.
 - B tighten.
 - C not be affected.
- 17** Credit risk of a corporate bond is *best* described as the:
- A risk that an issuer's creditworthiness deteriorates.
 - B probability that the issuer fails to make full and timely payments.
 - C risk of loss resulting from the issuer failing to make full and timely payments.
- 18** Loss severity is *best* described as the:
- A default probability multiplied by the loss given default.
 - B portion of a bond's value recovered by bondholders in the event of default.
 - C portion of a bond's value, including unpaid interest, an investor loses in the event of default.
- 19** The two components of credit risk are default probability and:
- A spread risk.
 - B loss severity.
 - C market liquidity risk.
- 20** For a high-quality debt issuer with a large amount of publicly traded debt, bond investors tend to devote *most* effort to assessing the issuer's:
- A default risk.
 - B loss severity.
 - C market liquidity risk.
- 21** The priority of claims for senior subordinated debt is:
- A lower than for senior unsecured debt.
 - B the same as for senior unsecured debt.
 - C higher than for senior unsecured debt.
- 22** A senior unsecured credit instrument holds a higher priority of claims than one ranked as:
- A mortgage debt.
 - B second lien loan.
 - C senior subordinated.
- 23** In a bankruptcy proceeding, when the absolute priority of claims is enforced:
- A senior subordinated creditors rank above second lien holders.

- B preferred equity shareholders rank above unsecured creditors.
- C creditors with a secured claim have the first right to the value of that specific property.
- 24 In the event of default, which of the following is *most likely* to have the highest recovery rate?
- A Second lien
- B Senior unsecured
- C Senior subordinated
- 25 The process of moving credit ratings of different issues up or down from the issuer rating in response to different payment priorities is *best* described as:
- A notching.
- B structural subordination.
- C cross-default provisions.
- 26 The factor considered by rating agencies when a corporation has debt at both its parent holding company and operating subsidiaries is *best* referred to as:
- A credit migration risk.
- B corporate family rating.
- C structural subordination.
- 27 Which type of security is *most likely* to have the same rating as the issuer?
- A Preferred stock
- B Senior secured bond
- C Senior unsecured bond
- 28 The rating agency process whereby the credit ratings on issues are moved up or down from the issuer rating *best* describes:
- A notching.
- B pari passu ranking.
- C cross-default provisions.
- 29 Which industry characteristic *most likely* has a positive effect on a company's ability to service debt?
- A Low barriers to entry in the industry
- B High number of suppliers to the industry
- C Broadly dispersed market share among large number of companies in the industry
- 30 When determining the capacity of a borrower to service debt, a credit analyst should begin with an examination of:
- A industry structure.
- B industry fundamentals.
- C company fundamentals.
- 31 Which of the following accounting issues should *mostly likely* be considered a character warning flag in credit analysis?
- A Expensing items immediately
- B Changing auditors infrequently
- C Significant off-balance-sheet financing

Use the following Exhibit for Questions 32 and 33**Exhibit 4 Industrial Comparative Ratio Analysis, Year 20XX**

	EBITDA Margin (%)	Return on Capital (%)	EBIT/Interest Expense (x)	EBITDA/Interest Expense (x)	Debt/EBITDA (x)	Debt/Capital (%)
Company A	25.1	25.0	15.9	19.6	1.6	35.2
Company B	29.6	36.3	58.2	62.4	0.5	15.9
Company C	21.8	16.6	8.9	12.4	2.5	46.3

32 Based on only the leverage ratios in Exhibit 4, the company with the *highest* credit risk is:

- A Company A.
- B Company B.
- C Company C.

33 Based on only the coverage ratios in Exhibit 4, the company with the *highest* credit quality is:

- A Company A.
- B Company B.
- C Company C.

34 Credit yield spreads *most likely* widen in response to:

- A high demand for bonds.
- B weak performance of equities.
- C strengthening economic conditions.

35 The factor that *most likely* results in corporate credit spreads widening is:

- A an improving credit cycle.
- B weakening economic conditions.
- C a period of high demand for bonds.

36 Which of the following factors in credit analysis is more important for general obligation non-sovereign government debt than for sovereign debt?

- A Per capita income
- B Power to levy and collect taxes
- C Requirement to balance an operating budget

SOLUTIONS

- 1 A is correct. Credit migration risk or downgrade risk refers to the risk that a bond issuer's creditworthiness may deteriorate or migrate lower. The result is that investors view the risk of default to be higher, causing the spread on the issuer's bonds to widen.
- 2 C is correct. Market liquidity risk refers to the risk that the price at which investors transact may be different from the price indicated in the market. Market liquidity risk is increased by (1) less debt outstanding and/or (2) a lower issue credit rating. Because Stedsmart Ltd is comparable to Fignermo Ltd except for less publicly traded debt outstanding, it should have higher market liquidity risk.
- 3 B is correct. Unsecured bonds are often referred to as debentures. Unsecured debt holders only have a general claim on the issuer's assets and cash flow and have a lower priority claim than secured debt holders. Secured debt holders have a direct claim on certain assets and their associated cash flows.
- 4 A is correct. First mortgage debt is senior secured debt and has the highest priority of claims. First mortgage debt also has the highest expected recovery rate. First mortgage debt refers to the pledge of specific property. Neither senior unsecured nor junior subordinate debt has any claims on specific assets.
- 5 B is correct. Whether or not secured assets are sufficient for the claims against them does not influence priority of claims. Any deficiency between pledged assets and the claims against them becomes senior unsecured debt and still adheres to the guidelines of priority of claims.
- 6 C is correct. Both analysts and ratings agencies have difficulty foreseeing future debt-financed acquisitions.
- 7 C is correct. Goodwill is viewed as a lower quality asset compared with tangible assets that can be sold and more easily converted into cash.
- 8 C is correct. The value of assets in relation to the level of debt is important to assess the collateral of the company; that is, the quality and value of the assets that support the debt levels of the company.
- 9 B is correct. The growth prospects of the industry provide the analyst insight regarding the capacity of the company.
- 10 A is correct. The construction company is both highly leveraged, which increases credit risk, and in a highly cyclical industry, which results in more volatile earnings.
- 11 B is correct. The interest expense is €113 million and $\text{EBITDA} = \text{Operating profit} + \text{Depreciation and amortization} = €894 + 249 \text{ million} = €1,143 \text{ million}$. $\text{EBITDA interest coverage} = \text{EBITDA}/\text{Interest expense} = 1,143/113 = 10.12 \text{ times}$.
- 12 B is correct. Total debt is €1,613 million with $\text{Total capital} = \text{Total debt} + \text{Shareholders' equity} = €1,613 + 4,616 = €6,229 \text{ million}$. The $\text{Debt/Capital ratio} = 1,613/6,229 = 25.90\%$.
- 13 A is correct. If the debt of the company remained unchanged but FFO increased, more cash is available to service debt compared to the previous year. Additionally, the debt/capital ratio has improved. It would imply that the ability of Pay Handle Ltd to service their debt has improved.
- 14 A is correct. Based on four of the five credit ratios, Grupa Zywiec SA's credit quality is superior to that of the industry.

- 15** A is correct. Davide Campari-Milano S.p.A. has more financial leverage and less interest coverage than Associated British Foods plc, which implies greater credit risk.
- 16** A is correct. Low demand implies wider yield spreads, while heavy supply will widen spreads even further.
- 17** C is correct. Credit risk is the risk of loss resulting from the borrower failing to make full and timely payments of interest and/or principal.
- 18** C is correct. Loss severity is the portion of a bond's value (including unpaid interest) an investor loses in the event of default.
- 19** B is correct. The two components of credit risk are default probability and loss severity. In the event of default, loss severity is the portion of a bond's value (including unpaid interest) an investor loses. A and C are incorrect because spread and market liquidity risk are credit-related risks, not components of credit risk.
- 20** A is correct. Credit risk has two components: default risk and loss severity. Because default risk is quite low for most high-quality debt issuers, bond investors tend to focus more on this likelihood and less on the potential loss severity.
- 21** A is correct. Senior subordinated debt is ranked lower than senior unsecured debt and thus has a lower priority of payment.
- 22** C is correct. The highest-ranked unsecured debt is senior unsecured debt. Lower-ranked debt includes senior subordinated debt. A and B are incorrect because mortgage debt and second lien loans are secured and higher ranked.
- 23** C is correct. According to the absolute priority of claims, in the event of bankruptcy, creditors with a secured claim have the right to the value of that specific property before any other claim.
- 24** A is correct. A second lien has a secured interest in the pledged assets. Second lien debt ranks higher in priority of payment than senior unsecured and senior subordinated debt and thus would most likely have a higher recovery rate.
- 25** A is correct. Notching is the process for moving ratings up or down relative to the issuer rating when rating agencies consider secondary factors, such as priority of claims in the event of a default and the potential loss severity.
- 26** C is correct. Structural subordination can arise when a corporation with a holding company structure has debt at both its parent holding company and operating subsidiaries. Debt at the operating subsidiaries is serviced by the cash flow and assets of the subsidiaries before funds are passed to the parent holding company.
- 27** C is correct. The issuer credit rating usually applies to its senior unsecured debt.
- 28** A is correct. Recognizing different payment priorities, and thus the potential for higher (or lower) loss severity in the event of default, the rating agencies have adopted a notching process whereby their credit ratings on issues can be moved up or down from the issuer rating (senior unsecured).
- 29** B is correct. An industry with a high number of suppliers reduces the suppliers' negotiating power, thus helping companies control expenses and aiding in the servicing of debt.
- 30** A is correct. Credit analysis starts with industry structure—for example, by looking at the major forces of competition, followed by an analysis of industry fundamentals—and then turns to examination of the specific issuer.

- 31** C is correct. Credit analysts can make judgments about management's character by evaluating the use of aggressive accounting policies, such as timing revenue recognition. This activity is a potential warning flag for other behaviors or actions that may adversely affect an issuer's creditworthiness.
- 32** C is correct. The debt/capital and debt/EBITDA ratios are used to assess a company's leverage. Higher leverage ratios indicate more leverage and thus higher credit risk. Company C's debt/capital (46.3%) and debt/EBITDA (2.5 \times) leverage ratios are higher than those for Companies A and B.
- 33** B is correct. The EBITDA/interest expense and EBIT/interest expense ratios are coverage ratios. Coverage ratios measure an issuer's ability to meet its interest payments. A higher ratio indicates better credit quality. Company B's EBITDA/interest expense (62.4 \times) and EBIT/interest expense (58.2 \times) coverage ratios are higher than those for Companies A and C.
- 34** B is correct. In weak financial markets, including weak markets for equities, credit spreads will widen.
- 35** B is correct. Weakening economic conditions will push investors to desire a greater risk premium and drive overall credit spreads wider.
- 36** C is correct. Non-sovereign governments typically must balance their operating budgets and lack the discretion to use monetary policy as many sovereigns can.

PRACTICE PROBLEMS

- 1 A derivative is *best* described as a financial instrument that derives its performance by:
 - A passing through the returns of the underlying.
 - B replicating the performance of the underlying.
 - C transforming the performance of the underlying.
- 2 Compared with exchange-traded derivatives, over-the-counter derivatives would *most likely* be described as:
 - A standardized.
 - B less transparent.
 - C more transparent.
- 3 Exchange-traded derivatives are:
 - A largely unregulated.
 - B traded through an informal network.
 - C guaranteed by a clearinghouse against default.
- 4 Which of the following derivatives is classified as a contingent claim?
 - A Futures contracts
 - B Interest rate swaps
 - C Credit default swaps
- 5 In contrast to contingent claims, forward commitments provide the:
 - A right to buy or sell the underlying asset in the future.
 - B obligation to buy or sell the underlying asset in the future.
 - C promise to provide credit protection in the event of default.
- 6 Which of the following derivatives provide payoffs that are non-linearly related to the payoffs of the underlying?
 - A Options
 - B Forwards
 - C Interest-rate swaps
- 7 An interest rate swap is a derivative contract in which:
 - A two parties agree to exchange a series of cash flows.
 - B the credit seller provides protection to the credit buyer.
 - C the buyer has the right to purchase the underlying from the seller.
- 8 Forward commitments subject to default are:
 - A forwards and futures.
 - B futures and interest rate swaps.
 - C interest rate swaps and forwards.
- 9 Which of the following derivatives is *least likely* to have a value of zero at initiation of the contract?
 - A Futures
 - B Options
 - C Forwards

- 10 A credit derivative is a derivative contract in which the:
- A clearinghouse provides a credit guarantee to both the buyer and the seller.
 - B seller provides protection to the buyer against the credit risk of a third party.
 - C the buyer and seller provide a performance bond at initiation of the contract.
- 11 Compared with the underlying spot market, derivative markets are *more likely* to have:
- A greater liquidity.
 - B higher transaction costs.
 - C higher capital requirements.
- 12 Which of the following characteristics is *least likely* to be a benefit associated with using derivatives?
- A More effective management of risk
 - B Payoffs similar to those associated with the underlying
 - C Greater opportunities to go short compared with the spot market
- 13 Which of the following is *most likely* to be a destabilizing consequence of speculation using derivatives?
- A Increased defaults by speculators and creditors
 - B Market price swings resulting from arbitrage activities
 - C The creation of trading strategies that result in asymmetric performance
- 14 The law of one price is *best* described as:
- A the true fundamental value of an asset.
 - B earning a risk-free profit without committing any capital.
 - C two assets that will produce the same cash flows in the future must sell for equivalent prices.
- 15 Arbitrage opportunities exist when:
- A two identical assets or derivatives sell for different prices.
 - B combinations of the underlying asset and a derivative earn the risk-free rate.
 - C arbitrageurs simultaneously buy takeover targets and sell takeover acquirers.

SOLUTIONS

- 1 C is correct. A derivative is a financial instrument that transforms the performance of the underlying. The transformation of performance function of derivatives is what distinguishes it from mutual funds and exchange traded funds that pass through the returns of the underlying.
A is incorrect because derivatives, in contrast to mutual funds and exchange traded funds, do not simply pass through the returns of the underlying at payout. B is incorrect because a derivative transforms rather than replicates the performance of the underlying.
- 2 B is correct. Over-the-counter-derivatives markets are customized and mostly unregulated. As a result, over-the-counter markets are less transparent in comparison with the high degree of transparency and standardization associated with exchange-traded derivative markets.
A is incorrect because exchange-traded derivatives are standardized, whereas over-the counter derivatives are customized. C is incorrect because exchange-traded derivatives are characterized by a high degree of transparency because all transactions are disclosed to exchanges and regulatory agencies, whereas over-the-counter derivatives are relatively opaque.
- 3 C is correct. Exchanged-traded derivatives are guaranteed by a clearinghouse against default.
A is incorrect because traded derivatives are characterized by a relatively high degree of regulation. B is incorrect because the terms of exchange-traded derivatives terms are specified by the exchange.
- 4 C is correct. A credit default swap (CDS) is a derivative in which the credit protection seller provides protection to the credit protection buyer against the credit risk of a separate party. CDS are classified as a contingent claim.
A is incorrect because futures contracts are classified as forward commitments. B is incorrect because interest rate swaps are classified as forward commitments.
- 5 B is correct. Forward commitments represent an obligation to buy or sell the underlying asset at an agreed upon price at a future date.
A is incorrect because the right to buy or sell the underlying asset is a characteristic of contingent claims, not forward commitments. C is incorrect because a credit default swap provides a promise to provide credit protection to the credit protection buyer in the event of a credit event such as a default or credit downgrade and is classified as a contingent claim.
- 6 A is correct. Options are classified as a contingent claim which provides payoffs that are non-linearly related to the performance of the underlying.
B is incorrect because forwards are classified as a forward commitment, which provides payoffs that are linearly related to the performance of the underlying. C is incorrect because interest-rate swaps are classified as a forward commitment, which provides payoffs that are linearly related to the performance of the underlying.
- 7 A is correct. An interest rate swap is defined as a derivative in which two parties agree to exchange a series of cash flows: One set of cash flows is variable, and the other set can be variable or fixed.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PRACTICE PROBLEMS

- 1 An arbitrage opportunity is *least likely* to be exploited when:
 - A one position is illiquid.
 - B the price differential between assets is large.
 - C the investor can execute a transaction in large volumes.
- 2 An arbitrageur will *most likely* execute a trade when:
 - A transaction costs are low.
 - B costs of short-selling are high.
 - C prices are consistent with the law of one price.
- 3 An arbitrage transaction generates a net inflow of funds:
 - A throughout the holding period.
 - B at the end of the holding period.
 - C at the start of the holding period.
- 4 The price of a forward contract:
 - A is the amount paid at initiation.
 - B is the amount paid at expiration.
 - C fluctuates over the term of the contract.
- 5 Assume an asset pays no dividends or interest, and also assume that the asset does not yield any non-financial benefits or incur any carrying cost. At initiation, the price of a forward contract on that asset is:
 - A lower than the value of the contract.
 - B equal to the value of the contract.
 - C greater than the value of the contract.
- 6 With respect to a forward contract, as market conditions change:
 - A only the price fluctuates.
 - B only the value fluctuates.
 - C both the price and the value fluctuate.
- 7 The value of a forward contract at expiration is:
 - A positive to the long party if the spot price is higher than the forward price.
 - B negative to the short party if the forward price is higher than the spot price.
 - C positive to the short party if the spot price is higher than the forward price.
- 8 At the initiation of a forward contract on an asset that neither receives benefits nor incurs carrying costs during the term of the contract, the forward price is equal to the:
 - A spot price.
 - B future value of the spot price.
 - C present value of the spot price.
- 9 Stocks BWQ and ZER are each currently priced at \$100 per share. Over the next year, stock BWQ is expected to generate significant benefits whereas stock ZER is not expected to generate any benefits. There are no carrying costs associated with holding either stock over the next year. Compared with ZER, the one-year forward price of BWQ is *most likely*:

- A lower.
B the same.
C higher.
- 10 If the net cost of carry of an asset is positive, then the price of a forward contract on that asset is *most likely*:
A lower than if the net cost of carry was zero.
B the same as if the net cost of carry was zero.
C higher than if the net cost of carry was zero.
- 11 If the present value of storage costs exceeds the present value of its convenience yield, then the commodity's forward price is *most likely*:
A less than the spot price compounded at the risk-free rate.
B the same as the spot price compounded at the risk-free rate.
C higher than the spot price compounded at the risk-free rate.
- 12 Which of the following factors *most likely* explains why the spot price of a commodity in short supply can be greater than its forward price?
A Opportunity cost
B Lack of dividends
C Convenience yield
- 13 When interest rates are constant, futures prices are *most likely*:
A less than forward prices.
B equal to forward prices.
C greater than forward prices.
- 14 In contrast to a forward contract, a futures contract:
A trades over-the-counter.
B is initiated at a zero value.
C is marked-to-market daily.
- 15 To the holder of a long position, it is more desirable to own a forward contract than a futures contract when interest rates and futures prices are:
A negatively correlated.
B uncorrelated.
C positively correlated.
- 16 The value of a swap typically:
A is non-zero at initiation.
B is obtained through replication.
C does not fluctuate over the life of the contract.
- 17 The price of a swap typically:
A is zero at initiation.
B fluctuates over the life of the contract.
C is obtained through a process of replication.
- 18 The value of a swap is equal to the present value of the:
A fixed payments from the swap.
B net cash flow payments from the swap.
C underlying at the end of the contract.

- 19 A European call option and a European put option are written on the same underlying, and both options have the same expiration date and exercise price. At expiration, it is possible that both options will have:
- A negative values.
 - B the same value.
 - C positive values.
- 20 At expiration, a European put option will be valuable if the exercise price is:
- A less than the underlying price.
 - B equal to the underlying price.
 - C greater than the underlying price.
- 21 The value of a European call option at expiration is the greater of zero or the:
- A value of the underlying.
 - B value of the underlying minus the exercise price.
 - C exercise price minus the value of the underlying.
- 22 For a European call option with two months until expiration, if the spot price is below the exercise price, the call option will *most likely* have:
- A zero time value.
 - B positive time value.
 - C positive exercise value.
- 23 When the price of the underlying is below the exercise price, a put option is:
- A in-the-money.
 - B at-the-money.
 - C out-of-the-money.
- 24 If the risk-free rate increases, the value of an in-the-money European put option will *most likely*:
- A decrease.
 - B remain the same.
 - C increase.
- 25 The value of a European call option is inversely related to the:
- A exercise price.
 - B time to expiration.
 - C volatility of the underlying.
- 26 The table below shows three European call options on the same underlying:

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

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

- A Option 1.
 - B Option 2.
 - C Option 3.
- 27 The value of a European put option can be either directly or inversely related to the:
- A exercise price.

- B time to expiration.
C volatility of the underlying.
- 28 Prior to expiration, the lowest value of a European put option is the greater of zero or the:
A exercise price minus the value of the underlying.
B present value of the exercise price minus the value of the underlying.
C value of the underlying minus the present value of the exercise price.
- 29 A European put option on a dividend-paying stock is *most likely* to increase if there is an increase in:
A carrying costs.
B the risk-free rate.
C dividend payments.
- 30 Based on put-call parity, a trader who combines a long asset, a long put, and a short call will create a synthetic:
A long bond.
B fiduciary call.
C protective put.
- 31 Which of the following transactions is the equivalent of a synthetic long call position?
A Long asset, long put, short call
B Long asset, long put, short bond
C Short asset, long call, long bond
- 32 Which of the following is *least likely* to be required by the binomial option pricing model?
A Spot price
B Two possible prices one period later
C Actual probabilities of the up and down moves
- 33 An at-the-money American call option on a stock that pays no dividends has three months remaining until expiration. The market value of the option will *most likely* be:
A less than its exercise value.
B equal to its exercise value.
C greater than its exercise value.
- 34 At expiration, American call options are worth:
A less than European call options.
B the same as European call options.
C more than European call options.
- 35 Which of the following circumstances will *most likely* affect the value of an American call option relative to a European call option?
A Dividends are declared
B Expiration date occurs
C The risk-free rate changes
- 36 Combining a protective put with a forward contract generates equivalent outcomes at expiration to those of a:
A fiduciary call.

- B** long call combined with a short asset.
- C** forward contract combined with a risk-free bond.

SOLUTIONS

- 1 A is correct. An illiquid position is a limit to arbitrage because it may be difficult to realize gains of an illiquid offsetting position. A significant opportunity arises from a sufficiently large price differential or a small price differential that can be employed on a very large scale.
- 2 A is correct. Some arbitrage opportunities represent such small price discrepancies that they are only worth exploiting if the transaction costs are low. An arbitrage opportunity may require short-selling assets at costs that eliminate any profit potential. If the law of one price holds, there is no arbitrage opportunity.
- 3 C is correct. Arbitrage is a type of transaction undertaken when two assets or portfolios produce identical results but sell for different prices. A trader buys the asset or portfolio with the lower price and sells the asset or portfolio with the higher price, generating a net inflow of funds at the start of the holding period. Because the two assets or portfolios produce identical results, a long position in one and short position in the other means that at the end of the holding period, the payoffs offset. Therefore, there is no money gained or lost at the end of the holding period, so there is no risk.
- 4 B is correct. The forward price is agreed upon at the start of the contract and is the fixed price at which the underlying will be purchased (or sold) at expiration. Payment is made at expiration. The value of the forward contract may change over time, but the forward price does not change.
- 5 C is correct. The price of a forward contract is a contractually fixed price, established at initiation, at which the underlying will be purchased (or sold) at expiration. The value of a forward contract at initiation is zero; therefore, the forward price is greater than the value of the forward contract at initiation.
- 6 B is correct. The value of the forward contract, unlike its price, will adjust as market conditions change. The forward price is fixed at initiation.
- 7 A is correct. When a forward contract expires, if the spot price is higher than the forward price, the long party profits from paying the lower forward price for the underlying. Therefore, the forward contract has a positive value to the long party and a negative value to the short party. However, if the forward price is higher than the spot price, the short party profits from receiving the higher forward price (the contract value is positive to the short party and negative to the long party).
- 8 B is correct. At initiation, the forward price is the future value of the spot price (spot price compounded at the risk-free rate over the life of the contract). If the forward price were set to the spot price or the present value of the spot price, it would be possible for one side to earn an arbitrage profit by selling the asset and investing the proceeds until contract expiration.
- 9 A is correct. The forward price of each stock is found by compounding the spot price by the risk-free rate for the period and then subtracting the future value of any benefits and adding the future value of any costs. In the absence of any benefits or costs, the one-year forward prices of BWQ and ZER should be equal. After subtracting the benefits related to BWQ, the one-year forward price of BWQ is lower than the one-year forward price of ZER.
- 10 A is correct. An asset's forward price is increased by the future value of any costs and decreased by the future value of any benefits: $F_0(T) = S_0(1 + r)^T - (\gamma - \theta)(1 + r)^T$. If the net cost of carry (benefits less costs) is positive, the forward price is lower than if the net cost of carry was zero.

- 11** C is correct. When a commodity's storage costs exceed its convenience yield benefits, the net cost of carry (benefits less costs) is negative. Subtracting this negative amount from the spot price compounded at the risk-free rate results in an addition to the compounded spot price. The result is a commodity forward price which is higher than the spot price compounded. The commodity's forward price is less than the spot price compounded when the convenience yield benefits exceed the storage costs and the commodity's forward price is the same as the spot price compounded when the costs equal the benefits.
- 12** C is correct. The convenience yield is a benefit of holding the asset and generally exists when a commodity is in short supply. The future value of the convenience yield is subtracted from the compounded spot price and reduces the commodity's forward price relative to its spot price. The opportunity cost is the risk-free rate. In the absence of carry costs, the forward price is the spot price compounded at the risk-free rate and will exceed the spot price. Dividends are benefits that reduce the forward price but the lack of dividends has no effect on the spot price relative to the forward price of a commodity in short supply.
- 13** B is correct. When interest rates are constant, forwards and futures will likely have the same prices. The price differential will vary with the volatility of interest rates. In addition, if futures prices and interest rates are uncorrelated, forward and futures prices will be the same. If futures prices are positively correlated with interest rates, futures contracts are more desirable to holders of long positions than are forwards. This is because rising prices lead to future profits that are reinvested in periods of rising interest rates, and falling prices lead to losses that occur in periods of falling interest rates. If futures prices are negatively correlated with interest rates, futures contracts are less desirable to holders of long positions than are forwards. The more desirable contract will tend to have the higher price.
- 14** C is correct. Futures contracts are marked-to-market on a daily basis. The accumulated gains and losses from the previous day's trading session are deducted from the accounts of those holding losing positions and transferred to the accounts of those holding winning positions. Futures contracts trade on an exchange, forward contracts are over-the-counter transactions. Typically both forward and futures contracts are initiated at a zero value.
- 15** A is correct. If futures prices and interest rates are negatively correlated, forwards are more desirable to holders of long positions than are futures. This is because rising prices lead to futures profits that are reinvested in periods of falling interest rates. It is better to receive all of the cash at expiration under such conditions. If futures prices and interest rates are uncorrelated, forward and futures prices will be the same. If futures prices are positively correlated with interest rates, futures contracts are more desirable to holders of long positions than are forwards.
- 16** B is correct. Valuation of the swap during its life appeals to replication and the principle of arbitrage. Valuation consists of reproducing the remaining payments on the swap with other transactions. The value of that replication strategy is the value of the swap. The swap price is typically set such that the swap contract has a value of zero at initiation. The value of a swap contract will change during the life of the contract as the value of the underlying changes in value.
- 17** C is correct. Replication is the key to pricing a swap. The swap price is determined at initiation by replication. The value (not the price) of the swap is typically zero at initiation and the fixed swap price is typically determined such that the value of the swap will be zero at initiation.

- 18 B is correct. The principal of replication articulates that the valuation of a swap is the present value of all the net cash flow payments from the swap, not simply the present value of the fixed payments of the swap or the present value of the underlying at the end of the contract.
- 19 B is correct. If the underlying has a value equal to the exercise price at expiration, both options will have zero value since they both have the same exercise price. For example, if the exercise price is \$25 and at expiration the underlying price is \$25, both the call option and the put option will have a value of zero. The value of an option cannot fall below zero. The holder of an option is not obligated to exercise the option; therefore, the options each have a minimum value of zero. If the call has a positive value, the put, by definition, must have a zero value and vice versa. Both cannot have a positive value.
- 20 C is correct. A European put option will be valuable at expiration if the exercise price is greater than the underlying price. The holder can put (deliver) the underlying and receive the exercise price which is higher than the spot price. A European put option would be worthless if the exercise price was equal to or less than the underlying price.
- 21 B is correct. The value of a European call option at expiration is the greater of zero or the value of the underlying minus the exercise price.
- 22 B is correct. A European call option with two months until expiration will typically have positive time value, where time value reflects the value of the uncertainty that arises from the volatility in the underlying. The call option has a zero exercise value if the spot price is below the exercise price. The exercise value of a European call option is $\text{Max}(0, S_t - X)$, where S_t is the current spot price at time t and X is the exercise price.
- 23 A is correct. When the price of the underlying is below the exercise price for a put, the option is said to be in-the-money. If the price of the underlying is the same as the exercise price, the put is at-the-money and if it is above the exercise price, the put is out-of-the-money.
- 24 A is correct. An in-the-money European put option decreases in value with an increase in the risk-free rate. A higher risk-free rate reduces the present value of any proceeds received on exercise.
- 25 A is correct. The value of a European call option is inversely related to the exercise price. A lower exercise price means there are more potential outcomes at which the call expires in-the-money. The option value will be greater the lower the exercise price. For a higher exercise price, the opposite is true. Both the time to expiration and the volatility of the underlying are directly (positively) related to the value of a European call option.
- 26 B is correct. The value of a European call option is inversely related to the exercise price and directly related to the time to expiration. Option 1 and Option 2 have the same exercise price; however, Option 2 has a longer time to expiration. Consequently, Option 2 would likely have a higher value than Option 1. Option 2 and Option 3 have the same time to expiration; however, Option 2 has a lower exercise price. Thus, Option 2 would likely have a higher value than Option 3.
- 27 B is correct. The value of a European put option can be either directly or indirectly related to time to expiration. The direct effect is more common, but the inverse effect can prevail the longer the time to expiration, the higher the risk-free rate, and the deeper in-the-money is the put. The value of a European put option is directly related to the exercise price and the volatility of the underlying.

- 28** B is correct. Prior to expiration, the lowest value of a European put is the greater of zero or the present value of the exercise price minus the value of the underlying.
- 29** C is correct. Payments, such as dividends, reduce the value of the underlying which increases the value of a European put option. Carrying costs reduce the value of a European put option. An increase in the risk-free interest rate may decrease the value of a European put option.
- 30** A is correct. A long bond can be synthetically created by combining a long asset, a long put, and a short call. A fiduciary call is created by combining a long call with a risk free bond. A protective put is created by combining a long asset with a long put.
- 31** B is correct. According to put-call parity, a synthetic call can be constructed by combining a long asset, long put, and short bond positions.
- 32** C is correct. The actual probabilities of the up and down moves in the underlying do not appear in the binomial option pricing model, only the pseudo or "risk-neutral" probabilities. Both the spot price of the underlying and two possible prices one period later are required by the binomial option pricing model.
- 33** C is correct. Prior to expiration, an American call option will typically have a value in the market that is greater than its exercise value. Although the American option is at-the-money and therefore has an exercise value of zero, the time value of the call option would likely lead to the option having a positive market value.
- 34** B is correct. At expiration, the values of American and European call options are effectively the same; both are worth the greater of zero and the exercise value.
- 35** A is correct. When a dividend is declared, an American call option will have a higher value than a European call option because an American call option holder can exercise early to capture the value of the dividend. At expiration, both types of call options are worth the greater of zero and the exercise value. A change in the risk-free rate does not affect the relative values of American and European call options.
- 36** A is correct. Put-call forward parity demonstrates that the outcome of a protective put with a forward contract (long put, long risk-free bond, long forward contract) equals the outcome of a fiduciary call (long call, long risk-free bond). The outcome of a protective put with a forward contract is also equal to the outcome of a protective put with asset (long put, long asset).

PRACTICE PROBLEMS

- 1 Consider a call option selling for \$4 in which the exercise price is \$50.
 - A Determine the value at expiration and the profit for a buyer under the following outcomes:
 - i. The price of the underlying at expiration is \$55.
 - ii. The price of the underlying at expiration is \$51.
 - iii. The price of the underlying at expiration is \$48.
 - B Determine the value at expiration and the profit for a seller under the following outcomes:
 - i. The price of the underlying at expiration is \$49.
 - ii. The price of the underlying at expiration is \$52.
 - iii. The price of the underlying at expiration is \$55.
 - C Determine the following:
 - i. The maximum profit to the buyer (maximum loss to the seller).
 - ii. The maximum loss to the buyer (maximum profit to the seller).
 - D Determine the breakeven price of the underlying at expiration.
- 2 Suppose you believe that the price of a particular underlying, currently selling at \$99, is going to increase substantially in the next six months. You decide to purchase a call option expiring in six months on this underlying. The call option has an exercise price of \$105 and sells for \$7.
 - A Determine the profit under the following outcomes for the price of the underlying six months from now:
 - i. \$99.
 - ii. \$104.
 - iii. \$105.
 - iv. \$109.
 - v. \$112.
 - vi. \$115.
 - B Determine the breakeven price of the underlying at expiration. Check that your answer is consistent with the solution to Part A of this problem.
- 3 Consider a put option on the NASDAQ 100 selling for \$106.25 in which the exercise price is 2100.
 - A Determine the value at expiration and the profit for a buyer under the following outcomes:
 - i. The price of the underlying at expiration is 2125.
 - ii. The price of the underlying at expiration is 2050.
 - iii. The price of the underlying at expiration is 1950.
 - B Determine the value at expiration and the profit for a seller under the following outcomes:
 - i. The price of the underlying at expiration is 1975.
 - ii. The price of the underlying at expiration is 2150.

- C** Determine the following:
- The maximum profit to the buyer (maximum loss to the seller).
 - The maximum loss to the buyer (maximum profit to the seller).
- D** Determine the breakeven price of the underlying at expiration.
- 4** Suppose you believe that the price of a particular underlying, currently selling at \$99, will decrease considerably in the next six months. You decide to purchase a put option expiring in six months on this underlying. The put option has an exercise price of \$95 and sells for \$5.
- A** Determine the profit for you under the following outcomes for the price of the underlying six months from now:
- \$100.
 - \$95.
 - \$93.
 - \$90.
 - \$85.
- B** Determine the breakeven price of the underlying at expiration. Check that your answer is consistent with the solution to Part A of this problem.
- C**
- What is the maximum profit that you can have?
 - At what expiration price of the underlying would this profit be realized?
- 5** You simultaneously purchase an underlying priced at \$77 and write a call option on it with an exercise price of \$80 and selling at \$6.
- A** What is the term commonly used for the position that you have taken?
- B** Determine the value at expiration and the profit for your strategy under the following outcomes:
- The price of the underlying at expiration is \$70.
 - The price of the underlying at expiration is \$75.
 - The price of the underlying at expiration is \$80.
 - The price of the underlying at expiration is \$85.
- C** Determine the following:
- The maximum profit.
 - The maximum loss.
 - The expiration price of the underlying at which you would realize the maximum profit.
 - The expiration price of the underlying at which you would incur the maximum loss.
- D** Determine the breakeven price at expiration.
- 6** Suppose you simultaneously purchase an underlying priced at \$77 and a put option on it, with an exercise price of \$75 and selling at \$3.
- A** What is the term commonly used for the position that you have taken?
- B** Determine the value at expiration and the profit for your strategy under the following outcomes:
- The price of the underlying at expiration is \$70.
 - The price of the underlying at expiration is \$75.
 - The price of the underlying at expiration is \$80.
 - The price of the underlying at expiration is \$85.
 - The price of the underlying at expiration is \$90.

- C** Determine the following:
- The maximum profit.
 - The maximum loss.
 - The expiration price of the underlying at which you would incur the maximum loss.
- D** Determine the breakeven price at expiration.
- 7 The recent price per share of Dragon Vacations, Inc. is \$50 per share. Calls with exactly six months left to expiration are available on Dragon with strikes of \$45, \$50, and \$55. The prices of the calls are \$8.75, \$6.00, and \$4.00, respectively. Assume that each call contract is for 100 shares of stock and that at initiation of the strategy the investor purchases 100 shares of Dragon at the current market price. Further assume that the investor will close out the strategy in six months when the options expire, including the sale of any stock not delivered against exercise of a call, whether the stock price goes up or goes down. If the closing price of Dragon stock in six months is exactly \$60, the profit to a covered call using the \$50 strike call is *closest* to:
- A \$400.
B \$600.
C \$1,600.
- 8 The recent price per share of Win Big, Inc. is €50 per share. Verna Hillsborough buys 100 shares at €50. To protect against a fall in price, Hillsborough buys one put, covering 100 shares of Win Big, with a strike price of €40. The put premium is €1 per share. If Win Big closes at €45 per share at the expiration of the put and Hillsborough sells her shares at €45, Hillsborough's profit from the stay/put is *closest* to:
- A -€1,100.
B -€600.
C €900.

SOLUTIONS

1 A Call buyer

$$\text{i. } c_T = \max(0, S_T - X) = \max(0, 55 - 50) = 5$$

$$\Pi = c_T - c_0 = 5 - 4 = 1$$

$$\text{ii. } c_T = \max(0, S_T - X) = \max(0, 51 - 50) = 1$$

$$\Pi = c_T - c_0 = 1 - 4 = -3$$

$$\text{iii. } c_T = \max(0, S_T - X) = \max(0, 48 - 50) = 0$$

$$\Pi = c_T - c_0 = 0 - 4 = -4$$

B Call seller

$$\text{i. Value} = -c_T = -\max(0, S_T - X) = -\max(0, 49 - 50) = 0$$

$$\Pi = -c_T + c_0 = -0 + 4 = 4$$

$$\text{ii. Value} = -c_T = -\max(0, S_T - X) = -\max(0, 52 - 50) = -2$$

$$\Pi = -c_T + c_0 = -2 + 4 = 2$$

$$\text{iii. Value} = -c_T = -\max(0, S_T - X) = -\max(0, 55 - 50) = -5$$

$$\Pi = -c_T + c_0 = -5 + 4 = -1$$

C Maximum and minimum

$$\text{i. Maximum profit to buyer (loss to seller)} = \infty$$

$$\text{ii. Maximum loss to buyer (profit to seller)} = c_0 = 4$$

$$\text{D } S_T^* = X + c_0 = 50 + 4 = 54$$

2 A *i.* $c_T = \max(0, S_T - X) = \max(0, 99 - 105) = 0$

$$\Pi = c_T - c_0 = 0 - 7 = -7$$

$$\text{ii. } c_T = \max(0, S_T - X) = \max(0, 104 - 105) = 0$$

$$\Pi = c_T - c_0 = 0 - 7 = -7$$

$$\text{iii. } c_T = \max(0, S_T - X) = \max(0, 105 - 105) = 0$$

$$\Pi = c_T - c_0 = 0 - 7 = -7$$

$$\text{iv. } c_T = \max(0, S_T - X) = \max(0, 109 - 105) = 4$$

$$\Pi = c_T - c_0 = 4 - 7 = -3$$

$$\text{v. } c_T = \max(0, S_T - X) = \max(0, 112 - 105) = 7$$

$$\Pi = c_T - c_0 = 7 - 7 = 0$$

$$\text{vi. } c_T = \max(0, S_T - X) = \max(0, 115 - 105) = 10$$

$$\Pi = c_T - c_0 = 10 - 7 = 3$$

$$\text{B } S_T^* = X + c_0 = 105 + 7 = 112$$

Clearly, this result is consistent with our solution above, where the profit is exactly zero in Part A(v), in which the price at expiration is 112.

3 A Put buyer

$$\text{i. } p_T = \max(0, X - S_T) = \max(0, 2100 - 2125) = 0$$

$$\Pi = p_T - p_0 = 0 - 106.25 = -106.25$$

$$\text{ii. } p_T = \max(0, X - S_T) = \max(0, 2100 - 2050) = 50$$

$$\Pi = p_T - p_0 = 50 - 106.25 = -56.25$$

$$\text{iii. } p_T = \max(0, X - S_T) = \max(0, 2100 - 1950) = 150$$

$$\Pi = p_T - p_0 = 150 - 106.25 = 43.75$$

B Put seller

i. Value = $-p_T = -\max(0, X - S_T) = -\max(0, 2100 - 1975) = -125$

$$\Pi = -p_T + p_0 = -125 + 106.25 = -18.75$$

ii. Value = $-p_T = -\max(0, X - S_T) = -\max(0, 2100 - 2150) = 0$

$$\Pi = -p_T + p_0 = -0 + 106.25 = 106.25$$

C Maximum and minimum

i. Maximum profit to buyer(loss to seller) = $X - p_0 = 2100 - 106.25 = 1993.75$

ii. Maximum loss to buyer(profit to seller) = $p_0 = 106.25$

D $S_T^* = X - p_0 = 2100 - 106.25 = 1993.75$

4 A i. $p_T = \max(0, X - S_T) = \max(0, 95 - 100) = 0$

$$\Pi = p_T - p_0 = 0 - 5 = -5$$

ii. $p_T = \max(0, X - S_T) = \max(0, 95 - 95) = 0$

$$\Pi = p_T - p_0 = 0 - 5 = -5$$

iii. $p_T = \max(0, X - S_T) = \max(0, 95 - 93) = 2$

$$\Pi = p_T - p_0 = 2 - 5 = -3$$

iv. $p_T = \max(0, X - S_T) = \max(0, 95 - 90) = 5$

$$\Pi = p_T - p_0 = 5 - 5 = 0$$

v. $p_T = \max(0, X - S_T) = \max(0, 95 - 85) = 10$

$$\Pi = p_T - p_0 = 10 - 5 = 5$$

B $S_T^* = X - p_0 = 95 - 5 = 90$

Clearly, this result is consistent with our solution above, where the profit is exactly zero in Part A(iv), in which the price at expiration is 90.

C i. Maximum profit (to put buyer) = $X - p_0 = 95 - 5 = 90$.

ii. This profit would be realized in the unlikely scenario of the price of the underlying falling all the way down to zero.

5 A This position is commonly called a covered call.

B i. $V_T = S_T - \max(0, S_T - X) = 70 - \max(0, 70 - 80) = 70 - 0 = 70$

$$\Pi = V_T - V_0 = 70 - (S_0 - c_0) = 70 - (77 - 6) = 70 - 71 = -1$$

ii. $V_T = S_T - \max(0, S_T - X) = 75 - \max(0, 75 - 80) = 75 - 0 = 75$

$$\Pi = V_T - V_0 = 75 - (S_0 - c_0) = 75 - (77 - 6) = 4$$

iii. $V_T = S_T - \max(0, S_T - X) = 80 - \max(0, 80 - 80) = 80 - 0 = 80$

$$\Pi = V_T - V_0 = 80 - (S_0 - c_0) = 80 - (77 - 6) = 9$$

iv. $V_T = S_T - \max(0, S_T - X) = 85 - \max(0, 85 - 80) = 85 - 5 = 80$

$$\Pi = V_T - V_0 = 80 - (S_0 - c_0) = 80 - (77 - 6) = 9$$

C i. Maximum profit = $X - S_0 + c_0 = 80 - 77 + 6 = 9$

ii. Maximum loss = $S_0 - c_0 = 77 - 6 = 71$

iii. The maximum profit would be realized if the expiration price of the underlying is at or above the exercise price of \$80.

iv. The maximum loss would be incurred if the underlying price drops to zero.

D $S_T^* = S_0 - c_0 = 77 - 6 = 71$

6 A This position is commonly called a protective put.

B i. $V_T = S_T + \max(0, X - S_T) = 70 + \max(0, 75 - 70) = 70 + 5 = 75$

$$\Pi = V_T - V_0 = 75 - (S_0 + p_0) = 75 - (77 + 3) = 75 - 80 = -5$$

- ii. $V_T = S_T + \max(0, X - S_T) = 75 + \max(0, 75 - 75) = 75 + 0 = 75$
 $\Pi = V_T - V_0 = 75 - (S_0 + p_0) = 75 - (77 + 3) = 75 - 80 = -5$
- iii. $V_T = S_T + \max(0, X - S_T) = 80 + \max(0, 75 - 80) = 80 + 0 = 80$
 $\Pi = V_T - V_0 = 80 - (S_0 + p_0) = 80 - (77 + 3) = 80 - 80 = 0$
- iv. $V_T = S_T + \max(0, X - S_T) = 85 + \max(0, 75 - 85) = 85 + 0 = 85$
 $\Pi = V_T - V_0 = 85 - (S_0 + p_0) = 85 - (77 + 3) = 85 - 80 = 5$
- v. $V_T = S_T + \max(0, X - S_T) = 90 + \max(0, 75 - 90) = 90 + 0 = 90$
 $\Pi = V_T - V_0 = 90 - (S_0 + p_0) = 90 - (77 + 3) = 90 - 80 = 10$
- C i. Maximum profit = ∞
ii. Maximum loss = $-(X - S_0 - p_0) = -(75 - 77 - 3) = 5$
iii. The maximum loss would be incurred if the expiration price of the underlying were at or below the exercise price of \$75.
- D $S_T^* = S_0 + p_0 = 77 + 3 = 80$
- 7 B is correct. Buying the stock at \$50 and delivering it against the \$50 strike call generates a payoff of zero. The premium is retained by the writer. The net profit is \$6.00 per share \times 100 shares or \$600.
- 8 B is correct. The loss on her stock is $(€45 - €50) \times 100 = -€500$. She also paid €100 for the put. The put expires worthless, making her total loss €600.

PRACTICE PROBLEMS

- 1 Which of the following is *least likely* to be considered an alternative investment?
 - A Real estate
 - B Commodities
 - C Long-only equity funds
- 2 An investor is seeking an investment that can take long and short positions, may use multi-strategies, and historically exhibits low correlation with a traditional investment portfolio. The investor's goals will be *best* satisfied with an investment in:
 - A real estate.
 - B a hedge fund.
 - C a private equity fund.
- 3 Relative to traditional investments, alternative investments are *least likely* to be characterized by:
 - A high levels of transparency.
 - B limited historical return data.
 - C significant restrictions on redemptions.
- 4 Alternative investment funds are typically managed:
 - A actively.
 - B to generate positive beta return.
 - C assuming that markets are efficient.
- 5 An investor is most likely to consider adding alternative investments to a traditional investment portfolio because:
 - A of their historically higher returns.
 - B of their historically lower standard deviation of returns.
 - C their inclusion is expected to reduce the portfolio's Sharpe ratio.
- 6 An investor may prefer a single hedge fund to a fund of funds if he seeks:
 - A due diligence expertise.
 - B better redemption terms.
 - C a less complex fee structure.
- 7 Hedge funds are similar to private equity funds in that both:
 - A are typically structured as partnerships.
 - B assess management fees based on assets under management.
 - C do not earn an incentive fee until the initial investment is repaid.
- 8 An investor seeks a current income stream as a component of total return, and desires an investment that historically has low correlation with other asset classes. The investment *most likely* to achieve the investor's goals is:
 - A timberland.
 - B collectibles.
 - C commodities.

- 9 A hedge fund invests primarily in distressed debt. Quoted market prices are available for the underlying holdings but they trade infrequently. Which of the following will the hedge fund *most likely* use in calculating net asset value for trading purposes?
- A Average quotes
 - B Average quotes adjusted for liquidity
 - C Bid prices for short positions and ask prices for long positions
- 10 Angel investing capital is typically provided in which stage of financing?
- A Later-stage.
 - B Formative-stage.
 - C Mezzanine-stage.
- 11 If a commodity's forward curve is in contango, the component of a commodities futures return *most likely* to reflect this is:
- A spot prices.
 - B the roll yield.
 - C the collateral yield.
- 12 United Capital is a hedge fund with \$250 million of initial capital. United charges a 2% management fee based on assets under management at year end, and a 20% incentive fee based on returns in excess of an 8% hurdle rate. In its first year, United appreciates 16%. Assume management fees are calculated using end-of-period valuation. The investor's net return assuming the performance fee is calculated net of the management fee is *closest* to:
- A 11.58%.
 - B 12.54%.
 - C 12.80%.
- 13 Capricorn Fund of Funds invests GBP 100 million in each of Alpha Hedge Fund and ABC Hedge Fund. Capricorn FOF has a "1 and 10" fee structure. Management fees and incentive fees are calculated independently at the end of each year. After one year, net of their respective management and incentive fees, the investment in Alpha is valued at GBP80 million and the investment in ABC is valued at GBP140 million. The annual return to an investor in Capricorn, net of fees assessed at the fund of funds level, is *closest* to:
- A 7.9%.
 - B 8.0%.
 - C 8.1%.
- 14 An analyst wanting to assess the downside risk of an alternative investment is *least likely* to use the investment's:
- A Sortino ratio.
 - B value at risk (VaR).
 - C standard deviation of returns.

SOLUTIONS

- 1 C is correct. Long-only equity funds are typically considered traditional investments and real estate and commodities are typically classified as alternative investments.
- 2 B is correct. Hedge funds may use a variety of strategies (event-driven, relative value, macro and equity hedge), generally have a low correlation with traditional investments, and may take long and short positions.
- 3 A is correct. Alternative investments are characterized as typically having low levels of transparency.
- 4 A is correct. There are many approaches to managing alternative investment funds but typically these funds are actively managed.
- 5 A is correct. The historically higher returns to most categories of alternative investments compared with traditional investments result in potentially higher returns to a portfolio containing alternative investments. The less than perfect correlation with traditional investments results in portfolio risk (standard deviation) being less than the weighted average of the standard deviations of the investments. This has potential to increase the Sharpe ratio in spite of the historically higher standard deviation of returns of most categories of alternative investments.
- 6 C is correct. Hedge funds of funds have multi-layered fee structures, while the fee structure for a single hedge fund is less complex. Funds of funds presumably have some expertise in conducting due diligence on hedge funds and may be able to negotiate more favorable redemption terms than could an individual investor in a single hedge fund.
- 7 A is correct. Private equity funds and hedge funds are typically structured as partnerships where investors are limited partners (LP) and the fund is the general partner (GP). The management fee for private equity funds is based on committed capital whereas for hedge funds the management fees are based on assets under management. For most private equity funds, the general partner does not earn an incentive fee until the limited partners have received their initial investment back.
- 8 A is correct. Timberland offers an income stream based on the sale of timber products as a component of total return and has historically generated returns not highly correlated with other asset classes.
- 9 B is correct. Many practitioners believe that liquidity discounts are necessary to reflect fair value. This has resulted in some funds having two NAVs - for trading and reporting. The fund may use average quotes for reporting purposes but apply liquidity discounts for trading purposes.
- 10 B is correct. Formative-stage financing occurs when the company is still in the process of being formed and encompasses several financing steps. Angel investing capital is typically raised in this early stage of financing.
- 11 B is correct. Roll yield refers to the difference between the spot price of a commodity and the price specified by its futures contract (or the difference between two futures contracts with different expiration dates). When futures prices are higher than the spot price, the commodity forward curve is upward sloping, and the prices are referred to as being in contango. Contango occurs when there is little or no convenience yield.

- 12** B is correct. The net investor return is 12.54%, calculated as:

End of year capital = \$250 million \times 1.16 = \$290 million

Management fee = \$290 million \times 2% = \$5.8 million

Hurdle amount = 8% of \$250 million = \$20 million;

Incentive fee = (\$290 – \$250 – \$20 – \$5.8) million \times 20% = \$2.84 million

Total fees to United Capital = (\$5.8 + \$2.84) million = \$8.64 million

Investor net return: $(\$290 - \$250 - \$8.64) / \$250 = 12.54\%$

- 13** A is correct because the net investor return is 7.9%, calculated as:

First, note that “1 and 10” refers to a 1% management fee, and a 10% incentive fee.

End of year capital = GBP140 million + GBP80 million = GBP220 million

Management fee = GBP220 million \times 1% = GBP2.2 million

Incentive fee = (GBP220 – GBP200) million \times 10% = GBP2 million

Total fees to Capricorn = (GBP2.2 + GBP2) million = GBP4.2 million

Investor net return: $(\text{GBP}220 - \text{GBP}200 - \text{GBP}4.2) / \text{GBP}200 = 7.9\%$

- 14** C is correct. Downside risk measures focus on the left side of the return distribution curve where losses occur. The standard deviation of returns assumes that returns are normally distributed. Many alternative investments do not exhibit close-to-normal distribution of returns, which is a crucial assumption for the validity of a standard deviation as a comprehensive risk measure. Assuming normal probability distributions when calculating these measures will lead to an underestimation of downside risk for a negatively skewed distribution. Both the Sortino ratio and the value-at-risk measure are both measures of downside risk.