

学习最新网课加微信 ABE547 朋友圈更新两年

PRACTICE PROBLEMS

- 1 Critique the statement: “No equity investor needs to understand valuation models because real-time market prices for equities are easy to obtain online.”
- 2 The reading defined intrinsic value as “the value of an asset given a hypothetically complete understanding of the asset’s investment characteristics.” Discuss why “hypothetically” is included in the definition and the practical implication(s).
- 3
 - A Explain why liquidation value is generally not relevant to estimating intrinsic value for profitable companies.
 - B Explain whether making a going-concern assumption would affect the value placed on a company’s inventory.
- 4 Explain how the procedure for using a valuation model to infer market expectations about a company’s future growth differs from using the same model to obtain an independent estimate of value.
- 5 Example 1, based on a study of Intel Corporation that used a present value model (Cornell 2001), examined what future revenue growth rates were consistent with Intel’s stock price of \$61.50 just prior to its earnings announcement, and \$43.31 only five days later. The example states, “Using a conservatively low discount rate, Cornell estimated that Intel’s price before the announcement, \$61.50, was consistent with a forecasted growth rate of 20 percent a year for the subsequent 10 years and then 6 percent per year thereafter.” Discuss the implications of using a higher discount rate than Cornell did.
- 6 Discuss how understanding a company’s business (the first step in equity valuation) might be useful in performing a sensitivity analysis related to a valuation of the company.
- 7 In a research note on the ordinary shares of the Milan Fashion Group (MFG) dated early July 2007 when a recent price was €7.73 and projected annual dividends were €0.05, an analyst stated a target price of €9.20. The research note did not discuss how the target price was obtained or how it should be interpreted. Assume the target price represents the expected price of MFG. What further specific pieces of information would you need to form an opinion on whether MFG was fairly valued, overvalued, or undervalued?
- 8 You are researching XMI Corporation (XMI). XMI has shown steady earnings per share growth (18 percent a year during the last seven years) and trades at a very high multiple to earnings (its P/E is currently 40 percent above the average P/E for a group of the most comparable stocks). XMI has generally grown through acquisition, by using XMI stock to purchase other companies whose stock traded at lower P/Es. In investigating the financial disclosures of these acquired companies and talking to industry contacts, you conclude that XMI has been forcing the companies it acquires to accelerate the payment of expenses before the acquisition deals are closed. As one example, XMI asks acquired companies to immediately pay all pending accounts payable, whether or not they are due. Subsequent to the acquisition, XMI reinstitutes normal expense payment patterns.

- A What are the effects of XMI's pre-acquisition expensing policies?
- B The statement is made that XMI's "P/E is currently 40 percent above the average P/E for a group of the most comparable stocks." What type of valuation model is implicit in that statement?

The following information relates to Questions 9–16

Guardian Capital is a rapidly growing US investment firm. The Guardian Capital research team is responsible for identifying undervalued and overvalued publicly traded equities that have a market capitalization greater than \$500 million.

Due to the rapid growth of assets under management, Guardian Capital recently hired a new analyst, Jack Richardson, to support the research process. At the new analyst orientation meeting, the director of research made the following statements about equity valuation at Guardian:

- Statement 1 "Analysts at Guardian Capital seek to identify mispricing, relying on price eventually converging to intrinsic value. However, convergence of the market price to an analyst's estimate of intrinsic value may not happen within the portfolio manager's investment time horizon. So, besides evidence of mispricing, analysts should look for the presence of a particular market or corporate event—that is, a catalyst—that will cause the marketplace to re-evaluate the subject firm's prospects."
- Statement 2 "An active investment manager attempts to capture positive alpha. But mispricing of assets is not directly observable. It is therefore important that you understand the possible sources of perceived mispricing."
- Statement 3 "For its distressed securities fund, Guardian Capital screens its investable universe of securities for companies in financial distress."
- Statement 4 "For its core equity fund, Guardian Capital selects financially sound companies that are expected to generate significant positive free cash flow from core business operations within a multiyear forecast horizon."
- Statement 5 "Guardian Capital's research process requires analysts to evaluate the reasonableness of the expectations implied by the market price by comparing the market's implied expectations to his or her own expectations."

After the orientation meeting, the director of research asks Richardson to evaluate three companies that are retailers of men's clothing: Diamond Co., Renaissance Clothing, and Deluxe Men's Wear.

Richardson starts his analysis by evaluating the characteristics of the men's retail clothing industry. He finds few barriers to new retail entrants, high intra-industry rivalry among retailers, low product substitution costs for customers and a large number of wholesale clothing suppliers.

While conducting his analysis, Richardson discovers that Renaissance Clothing included three non-recurring items in their most recent earnings release: a positive litigation settlement, a one-time tax credit, and the gain on the sale of a non-operating asset.

To estimate each firm's intrinsic value, Richardson applies appropriate discount rates to each firm's estimated free cash flows over a ten-year time horizon and to the estimated value of the firm at the end of the ten-year horizon.

Michelle Lee, a junior technology analyst at Guardian, asks the director of research for advice as to which valuation model to use for VEGA, a fast growing semiconductor company that is rapidly gaining market share.

The director of research states that "the valuation model selected must be consistent with the characteristics of the company being valued."

Lee tells the director of research that VEGA is not expected to be profitable for several more years. According to management guidance, when the company turns profitable, it will invest in new product development; as a result, it does not expect to initiate a dividend for an extended period of time. Lee also notes that she expects that certain larger competitors will become interested in acquiring VEGA because of its excellent growth prospects. The director of research advises Lee to consider that in her valuation.

- 9 Based on Statement 2, which of the following sources of perceived mispricing do active investment managers attempt to identify? The difference between:
- A intrinsic value and market price.
 - B estimated intrinsic value and market price.
 - C intrinsic value and estimated intrinsic value.
- 10 With respect to Statements 3 and 4, which of the following measures of value would the distressed securities fund's analyst consider that a core equity fund analyst might ignore?
- A Fair value
 - B Liquidation value
 - C Fair market value
- 11 With respect to Statement 4, which measure of value is *most* relevant for the analyst of the fund described?
- A Liquidation value
 - B Investment value
 - C Going-concern value
- 12 According to Statement 5, analysts are expected to use valuation concepts and models to:
- A value private businesses.
 - B render fairness opinions.
 - C extract market expectations.
- 13 Based on Richardson's industry analysis, which of the following characteristics of men's retail clothing retailing would *positively* affect its profitability? That industry's:
- A entry costs.
 - B substitution costs.
 - C number of suppliers.
- 14 Which of the following statements about the reported earnings of Renaissance Clothing is *most accurate*? Relative to sustainable earnings, reported earnings are likely:
- A unbiased.
 - B upward biased.
 - C downward biased.

- 15 Which valuation model is Richardson applying in his analysis of the retailers?
- A Relative value
 - B Absolute value
 - C Sum-of-the-parts
- 16 Which valuation model would the director of research *most likely* recommend Lee use to estimate the value of VEGA?
- A Free cash flow
 - B Dividend discount
 - C P/E relative valuation

The following information relates to Questions 17–20

Bruno Santos is an equity analyst with a regional investment bank. Santos reviews the growth prospects and quality of earnings for Phoenix Enterprises, one of the companies he follows. He has developed a stock valuation model for this firm based on its forecasted fundamentals. His revenue growth rate estimate is less than that implied by the market price.

Phoenix's financial statements over the past five years show strong performance, with above average growth. Santos has decided to use a lower forecasted growth rate in his models, reflecting the effect of "regression to the mean" over time. He notes two reasons for his lower growth rate forecast:

- Reason 1 Successful companies tend to draw more competition, putting their high profits under pressure.
- Reason 2 Phoenix's intellectual property and franchise agreements will be weakening over time.

Santos meets with Walter Hartmann, a newly hired associate in his department. In their conversation, Hartmann states, "Security analysts forecast company performance using both top-down and bottom-up analysis. I can think of three examples:

- 1 A restaurant chain forecasts its sales to be its market share times forecast industry sales.
- 2 An electric utility company forecasts that its sales will grow proportional to increases in GDP.
- 3 A retail furniture company forecasts next year's sales by assuming that the sales in its newly built stores will have similar sales per square meter to that of its existing stores."

Hartmann is reviewing some possible trades for three stocks in the health care industry based on a pairs-trading strategy. Hartmann's evaluations are as follows:

- HG Health is 15% overvalued.
- Corgent Cell Sciences is 10% overvalued.
- Johnson Labs is 15% undervalued.

- 17 Based on Santos's revenue growth rate estimate, the shares of Phoenix are *most likely*:

- A undervalued.
 - B fairly valued.
 - C overvalued.
- 18 Which of the reasons given by Santos *most likely* justifies a reduction in Phoenix's forecasted growth rate?
- A Reason 1 only
 - B Reason 2 only
 - C Both Reason 1 and Reason 2
- 19 Which of Hartmann's examples of company performance forecasting *best* describes an example of bottom-up forecasting?
- A Restaurant chain
 - B Electric utility company
 - C Retail furniture company
- 20 Based on his trading strategy, which of the following should Hartmann recommend?
- A Short HG Health and Corgent Cell Sciences
 - B Buy Johnson Labs and Corgent Cell Sciences
 - C Buy Johnson Labs and short Corgent Cell Sciences
-

The following information relates to questions 21–24

Abby Dormier is a sell-side analyst for a small Wall Street brokerage firm covering publicly and actively traded companies with listed equity shares. Dormier is responsible for issuing either a buy, hold, or sell rating for the shares of Company A and Company B. The appropriate valuation model for each company was chosen based on the following characteristics of each company:

Company A is an employment services firm with no debt and has fixed assets consisting primarily of computers, servers, and commercially available software. Many of the assets are intangible, including human capital. The company has a history of occasionally paying a special cash dividend.

Company B operates in three unrelated industries with differing rates of growth: tobacco (60% of earnings), shipbuilding (30% of earnings), and aerospace consulting (10% of earnings). The company pays a regular dividend that is solely derived from the earnings produced by the tobacco division.

Dormier considers the following development in making any necessary adjustments to the models before assigning ratings:

Company B has finalized the terms to acquire 70% of the outstanding shares of Company X, an actively traded tobacco company, in an all-stock deal.

Dormier assigns ratings to each of the companies and provides a rationale for each rating. The director of research asks Dormier: "How did you arrive at these recommendations? Describe how you used a top-down approach, which is the policy at our company."

Dormier replies, “I arrived at my recommendations through my due diligence process. I have studied all of the public disclosure documents; I have participated in the company conference calls, being careful with my questions in such a public forum; and I have studied the dynamics of the underlying industries. The valuation models are robust and use an extensive set of company-specific quantitative and qualitative inputs.”

- 21 Based on Company A's characteristics, which of the following absolute valuation models is *most* appropriate for valuing that company?
- A Asset based
 - B Dividend discount
 - C Free cash flow to the firm
- 22 Based on Company B's characteristics, which of the following valuation models is *most* appropriate for valuing that company?
- A Asset based
 - B Sum of the parts
 - C Dividend discount
- 23 Which of the following is *most likely* to be appropriate to consider in Company B's valuation of Company X?
- A Blockage factor
 - B Control premium
 - C Lack of marketability discount
- 24 Based on Dormier's response to the director of research, Dormier's process could have been more consistent with the firm's policy by:
- A incorporating additional micro-level inputs into her valuation models.
 - B evaluating the impact of general economic conditions on each company.
 - C asking more probing questions during publicly available company conference calls.

SOLUTIONS

- 1 The statement is flawed in at least two ways. First, active investors believe that stock prices do not always accurately reflect all relevant information on the security; for such investors, knowledge of equity valuation models is important for identifying investment opportunities because they represent a way to translate the investor's forecasts into value estimates for comparison with market prices. Thus, the "all" in "all investors" is misleading. Second, not all equities are publicly traded and have market prices, and the most recent market price can be stale for the many public equities that trade only infrequently.
- 2 No matter how diligent the analyst, some uncertainty always exists concerning 1) the accuracy of the analyst's forecasts and 2) whether an intrinsic value estimate accounts for all sources of risk reflected in market price. Thus, knowledge of a stock's investment characteristics is always incomplete. The practical consequences are that an investor can only estimate intrinsic value and active security selection carries the risk of making mistakes in estimating value.
- 3 **A** Liquidation value is typically not relevant to estimating intrinsic value for profitable companies because, in general, value would be destroyed by selling such a company's assets individually. Stated another way, the value added by being a going concern is a relevant investment characteristic that an intrinsic value estimate would recognize.
B A going-concern assumption generally increases the value placed on a company's inventory relative to not making that assumption. Usually, inventory that can be sold in the company's regular distribution channels would realize higher amounts than inventory that must be sold immediately because a company is being liquidated.
- 4 The key difference is that for inferring investor expectations the market price is used as the model input for value whereas for obtaining an independent estimate of value, value is left as the unknown in the model. In the latter case, value is estimated based on the analyst's estimates for the variables that determine value.
- 5 Consider the present value of a single cash flow. If one increased the discount rate, one would also need to increase the cash flow if a constant present value were to be maintained. By a similar argument, if Cornell had used a higher discount rate, he would have needed to project a higher level of assumed future cash flows than he did for their present value to have been consistent with the given pre-announcement price of \$61.50. Thus, the implied growth rate consistent with a price of \$61.50 would have been higher than the 20 percent growth rate estimated by Cornell.
- 6 An understanding of the company's business facilitates a focus on the key business aspects that affect value, and from a practical perspective, highlights the critical inputs to a forecast that should be tested using sensitivity analysis.
- 7 You need to know 1) the time horizon for the price target and 2) the required rate of return on MFG. The price target of €9.20 represents a potential 20 percent return from investing in the stock if the time horizon is one year, calculated as $(€9.20 + €0.05)/€7.73 - 1.0 = 0.197$; without a time frame, however, you cannot evaluate the attractiveness of that return. Given that the time frame for the return is established, you need to have an estimate of the required rate of return over the same time horizon.

If the expected return of 19.7 percent exceeds the security's required return for the same horizon—in other words, if the share's expected alpha is positive—then MFG would appear to be undervalued.

- 8 **A** Accelerating the payment of expenses reduces the acquired companies' last reported pre-acquisition cash flow. Accelerating expense recognition reduces the acquired companies' last reported pre-acquisition earnings. XMI's cash flow and earnings growth rates following the acquisitions would be expected to be biased upwards because of the depressed levels for the acquirees.
- B** That is an example of a relative valuation model (or the method of comparables), which compares a company's market multiple to the multiples of similar companies.
- 9 **A** is correct. The difference between the true (real) but unobservable intrinsic value and the observed market price contributes to the abnormal return or alpha which is the concern of active investment managers.
- 10 **B** is correct. The measure of value the distressed securities fund's analyst would consider that the core equity fund analyst might ignore is liquidation value. The liquidation value of a company is its value if it were dissolved and its assets sold individually.
- 11 **C** is correct. For its core equity fund, Guardian Capital screens its investable universe of securities for well-capitalized companies that are expected to generate significant future free cash flow from core business operations. The concern with future free cash flows implies that going-concern value is relevant.
- 12 **C** is correct. Market prices reflect the expectations of investors about the future performance of companies. The analyst can evaluate the reasonableness of the expectations implied by the market price by comparing the market's implied expectations to his own expectations. This process assumes a valuation model, as discussed in the text.
- 13 **C** is correct. The men's retail clothing industry is characterized by a large number of wholesale clothing suppliers. When many suppliers of the products needed by industry participants exist, competition among suppliers should limit their ability to raise input prices. Thus the large number of suppliers is a factor that should positively affect industry profitability.
- 14 **B** is correct. The effects of favorable nonrecurring events in reported earnings would tend to bias reported earnings upward relative to sustainable earnings because non-recurring items are by definition not expected to repeat. Renaissance Clothing included three non-recurring items in their most recent earnings release that all led to higher earnings for the current period: a positive litigation settlement, a one-time tax credit, and the gain on the sale of a non-operating asset.
- 15 **B** is correct. An absolute valuation model is a model that specifies an asset's intrinsic value. The most important type of absolute equity valuation models are present value models (also referred to as discounted cash flow models) and the model described by Richardson is of that type.
- 16 **A** is correct. The broad criteria for model selection are that a valuation model be consistent with the characteristics of the company being valued, appropriate given the availability and quality of the data and consistent with the purpose of the valuation. VEGA currently has negative earnings, making the use of P/E relative valuation difficult if not impossible. As VEGA does not pay a dividend and is not expected to for the foreseeable future; this would make the application of a dividend discount model problematic. However, the lack of a dividend would not be an obstacle to free cash flow valuation. Furthermore, the director

of research has advised that the possibility that competitors may seek to acquire VEGA be taken in to account in valuing VEGA. The reading states that free cash flow valuation can be appropriate in such circumstances. Thus, the director of research would be most likely to recommend free cash flow valuation.

- 17 C is correct. If the revenue growth rate inferred by the market price exceeds the growth rate that the firm could reasonably expect, Santos should conclude that the market price is too high and thus that the firm is overvalued.
- 18 C is correct. Increased competition for successful firms can cause a regression to the mean of a company's growth rate. Expiring and weakening intellectual property and franchise agreements can also reduce potential growth.
- 19 C is correct. The retail furniture company forecasting sales based on sales per square meter is an example of bottom-up forecasting because it aggregates forecasts at a micro level to larger-scale forecasts.
- 20 C is correct. Pairs trading involves buying an undervalued stock and shorting an overvalued stock in the same industry. Hartmann should buy Johnson Labs (15% undervalued) and short Corgent Cell Sciences (10% overvalued).
- 21 C is correct. The free cash flow to the firm model is the most appropriate of the choices because it can be used whether the company has significant marketable assets or consistently pays a cash dividend. Much of Company A's assets are intangible and although the company has a history of paying a dividend, it has been only occasionally and in the form of a special dividend (i.e., not a consistent cash dividend).
- 22 B is correct. This valuation model would be consistent with the characteristics of the company. Company B is a conglomerate operating in three unrelated industries with significantly different expected revenue growth rates. The sum-of-the-parts valuation model sums the estimated values of each of the company's businesses as if each business were an independent going concern. Sum-of-the-parts analysis is most useful when valuing a company with segments in different industries that have different valuation characteristics.
- 23 B is correct. A control premium may be reflected in the value of a stock investment that would give an investor a controlling position. Company B acquired 70% of the outstanding stock of Company X; more than 50% is considered a controlling ownership position.
- 24 B is correct. A top-down forecasting approach moves from macroeconomic forecasts to industry forecasts and then to individual company and asset forecasts. Analysts are expected to understand the general economic conditions before finalizing a research report and making a recommendation. According to Dormier's response, she did not comment on the general economic conditions and such considerations would be consistent with the firm's policy of using a top-down approach.

PRACTICE PROBLEMS

- 1 A Canada-based investor buys shares of Toronto-Dominion Bank (TD.TO) for C\$72.08 on 15 October 2007 with the intent of holding them for a year. The dividend rate was C\$2.11 per year. The investor actually sells the shares on 5 November 2007 for C\$69.52. The investor notes the following additional facts:
 - No dividends were paid between 15 October and 5 November.
 - The required return on TD.TO equity was 8.7 percent on an annual basis and 0.161 percent on a weekly basis.
 - A State the lengths of the expected and actual holding-periods.
 - B Given that TD.TO was fairly priced, calculate the price appreciation return (capital gains yield) anticipated by the investor given his initial expectations and initial expected holding period.
 - C Calculate the investor's realized return.
 - D Calculate the realized alpha.
- 2 The estimated betas for AOL Time Warner, J.P. Morgan Chase & Company, and The Boeing Company are 2.50, 1.50, and 0.80, respectively. The risk-free rate of return is 4.35 percent and the equity risk premium is 8.04 percent. Calculate the required rates of return for these three stocks using the CAPM.
- 3 The estimated factor sensitivities of TerraNova Energy to Fama–French factors and the risk premia associated with those factors are given in the table below:

	Factor Sensitivity	Risk Premium (%)
Market factor	1.20	4.5
Size factor	−0.50	2.7
Value factor	−0.15	4.3

- A Based on the Fama–French model, calculate the required return for TerraNova Energy using these estimates. Assume that the Treasury bill rate is 4.7 percent.
 - B Describe the expected style characteristics of TerraNova based on its factor sensitivities.
- 4 Newmont Mining (NEM) has an estimated beta of −0.2. The risk-free rate of return is 4.5 percent, and the equity risk premium is estimated to be 7.5 percent. Using the CAPM, calculate the required rate of return for investors in NEM.
- 5 An analyst wants to account for financial distress and market-capitalization as well as market risk in his cost of equity estimate for a particular traded company. Which of the following models is *most appropriate* for achieving that objective?
 - A The capital asset pricing model (CAPM).
 - B The Fama–French model.
 - C A macroeconomic factor model.
- 6 The following facts describe Larsen & Toubro Ltd's component costs of capital and capital structure. Based on the information given, calculate Larsen & Toubro's WACC.

Component Costs of Capital	(%)
Cost of equity based on the CAPM:	15.6
Pretax cost of debt:	8.28
Tax rate:	30
Target weight in capital structure:	Equity 80, Debt 20

The following information relates to Questions 7–12

An equity index is established in 2001 for a country that has relatively recently established a market economy. The index vendor constructed returns for the five years prior to 2001 based on the initial group of companies constituting the index in 2001. Over 2004 to 2006 a series of military confrontations concerning a disputed border disrupted the economy and financial markets. The dispute is conclusively arbitrated at the end of 2006. In total, ten years of equity market return history is available as of the beginning of 2007. The geometric mean return relative to 10-year government bond returns over 10 years is 2 percent per year. The forward dividend yield on the index is 1 percent. Stock returns over 2004 to 2006 reflect the setbacks but economists predict the country will be on a path of a 4 percent real GDP growth rate by 2009. Earnings in the public corporate sector are expected to grow at a 5 percent per year real growth rate. Consistent with that, the market P/E ratio is expected to grow at 1 percent per year. Although inflation is currently high at 6 percent per year, the long-term forecast is for an inflation rate of 4 percent per year. Although the yield curve has usually been upward sloping, currently the government yield curve is inverted; at the short-end, yields are 9 percent and at 10-year maturities, yields are 7 percent.

- 7 The inclusion of index returns prior to 2001 would be expected to:
- A bias the historical equity risk premium estimate upwards.
 - B bias the historical equity risk premium estimate downwards.
 - C have no effect on the historical equity risk premium estimate.
- 8 The events of 2004 to 2006 would be expected to:
- A bias the historical equity risk premium estimate upwards.
 - B bias the historical equity risk premium estimate downwards.
 - C have no effect on the historical equity risk premium estimate.
- 9 In the current interest rate environment, using a required return estimate based on the short-term government bond rate and a historical equity risk premium defined in terms of a short-term government bond rate would be expected to:
- A bias long-term required return on equity estimates upwards.
 - B bias long-term required return on equity estimates downwards.
 - C have no effect on long-term required return on equity estimates.
- 10 A supply side estimate of the equity risk premium as presented by The Ibbotson–Chen earnings model is *closest* to:
- A 3.2 percent.
 - B 4.0 percent.
 - C 4.3 percent.

- 11 Common stock issues in the above market with average systematic risk are *most likely* to have required rates of return:
- A between 2 percent and 7 percent.
 - B between 7 and 9 percent.
 - C 9 percent or greater.
- 12 Which of the following statements is *most accurate*? If two equity issues have the same market risk but the first issue has higher leverage, greater liquidity, and a higher required return, the higher required return is *most likely* the result of the first issue's:
- A greater liquidity.
 - B higher leverage.
 - C higher leverage and greater liquidity.

Questions 13 through 19 relate to Horizon Asset Management

Judy Chen is the primary portfolio manager of the global equities portfolio at Horizon Asset Management. Lars Johansson, a recently hired equity analyst, has been assigned to Chen to assist her with the portfolio.

Chen recently sold shares of Novo-Gemini, Inc. from the portfolio. Chen tasks Johansson with assessing the return performance of Novo-Gemini, with specific trade information provided in Exhibit 1.

Exhibit 1 Novo-Gemini, Inc. Trade Details

- 1 Novo-Gemini shares were purchased for \$20.75 per share.
- 2 At the time of purchase, research by Chen suggested that Novo-Gemini shares were expected to sell for \$29.00 per share at the end of a 3-year holding period.
- 3 At the time of purchase, the required return for Novo-Gemini based upon the capital asset pricing model (CAPM) was estimated to be 12.6% on an annual basis.
- 4 Exactly 3 years after the purchase date, the shares were sold for \$30.05 per share.
- 5 No dividends were paid by Novo-Gemini over the 3-year holding period.

Chen explains to Johansson that, at the time of purchase, the CAPM used to estimate a required return for Novo-Gemini incorporated an unadjusted historical equity risk premium estimate for the US equity market. Chen notes that the US equities market has experienced a meaningful string of favorable inflation and productivity surprises in the past. She asks Johansson whether the historical equity risk premium should have been adjusted before estimating the required return for Novo-Gemini.

For another perspective on the reward to bearing risk, Chen asks Johansson to calculate a forward looking equity risk premium for the US equity market using data on the S&P 500 index in Exhibit 2.

Exhibit 2 S&P 500 Index Data

Dividend yield, based on year-ahead aggregate forecasted dividends	1.2%
Consensus long-term earnings growth rate	4%
20-year US government bond yield	3%

Chen is now considering adding shares of Bezak, Inc. to the portfolio. Chen asks Johansson to calculate Bezak's weighted average cost of capital using the CAPM with the information provided in Exhibit 3.

Exhibit 3 Bezak, Inc.

Pretax cost of debt	4.9%
Long-term debt as a percent of total capital, at market value	25%
Marginal tax rate	30%
Bezak, Inc. beta	2.00
Estimated equity risk premium	5.5%
Risk-free rate	3.0%

Lastly, Chen asks Johansson to evaluate Twin Industries, a privately owned US company that may initiate a public stock offering. Johansson decides to adapt CAPM to estimate the required return on equity for Twin Industries. Using the MSCI/Standard & Poor's Global Industry Classification Standard (GICS), Johansson identifies a publicly traded peer company with an estimated beta of 1.09 that is much larger but otherwise similar to Twin Industries. Twin Industries is funded 49% by debt while the publicly traded peer company is funded 60% by debt.

- 13 Based upon Exhibit 1, the expected three-year holding period return for Novo-Gemini Inc. at the time of purchase was *closest* to:
- A 39.76%.
 - B 42.76%.
 - C 44.82%.
- 14 Based upon Exhibit 1, the realized three-year holding period return for Novo-Gemini Inc. was *closest* to:
- A 39.76%.
 - B 42.76%.
 - C 44.82%.
- 15 Based on the historical record of surprises in inflation and productivity, the historical equity risk premium for the US equity market, if it is used as an estimate of the forward-looking equity risk premium, should *most likely* be:
- A left unchanged.
 - B adjusted upward.
 - C adjusted downward.
- 16 Based on Exhibit 2, the forward-looking estimate for the US equity risk premium is *closest* to:
- A 2.2%.
 - B 5.8%.

- C** 8.2%.
- 17** Based on Exhibit 3, and assuming interest on debt is tax-deductible, the weighted average cost of capital (WACC) for Bezak, Inc. is *closest* to:
 - A** 10.87%.
 - B** 11.36%.
 - C** 13.61%.
- 18** The estimate of beta for Twin Industries is *closest* to:
 - A** 0.44.
 - B** 0.85.
 - C** 0.89.
- 19** A potential weakness of Johansson's approach to estimating the required return on equity for Twin Industries is that the return estimate:
 - A** does not include a size premium.
 - B** may overstate potential returns over the long-term.
 - C** does not consider systematic risk arising from the economics of the industry.

SOLUTIONS

- 1 **A** The expected holding was one year. The actual holding period was from 15 October 2007 to 5 November 2007, which is three weeks.
- B** Given fair pricing, the expected return equals the required return, 8.7 percent. The expected price appreciation return over the initial anticipated one-year holding period must be equal to the required return minus the dividend yield, $2.11/72.08 = 0.0293$ or 2.93 percent. Thus expected price appreciation return was $8.7\% - 2.93\% = 5.77$ percent.
- C** The realized return was $(\$69.52 - \$72.08)/\$72.08 = -0.03552$ or negative 3.55 percent over three weeks. There was no dividend yield return over the actual holding period.
- D** The required return over a three-week holding period was $(1.00161)^3 - 1 = 0.484$ percent. Using the answer to C, the realized alpha was $-3.552 - 0.484 = -4.036$ percent or -4.04 percent.

- 2 For AOL Time Warner, the required return is

$$r = R_F + \beta[E(R_M) - R_F] = 4.35\% + 2.50(8.04\%) = 4.35\% + 20.10\% = 24.45\%$$

For J.P. Morgan Chase, the required return is

$$r = R_F + \beta[E(R_M) - R_F] = 4.35\% + 1.50(8.04\%) = 4.35\% + 12.06\% = 16.41\%$$

For Boeing, the required return is

$$r = R_F + \beta[E(R_M) - R_F] = 4.35\% + 0.80(8.04\%) = 4.35\% + 6.43\% = 10.78\%$$

- 3 **A** The Fama–French model gives the required return as

$$\begin{aligned} r = & \text{T-bill rate} \\ & + (\text{Sensitivity to equity market factor} \times \text{Equity risk premium}) \\ & + (\text{Sensitivity to size factor} \times \text{Size risk premium}) \\ & + (\text{Sensitivity to value factor} \times \text{Value risk premium}) \end{aligned}$$

For TerraNova Energy, the required return is

$$\begin{aligned} r = & 4.7\% + (1.20 \times 4.5\%) + (-0.50 \times 2.7\%) + (-0.15 \times 4.3\%) \\ = & 4.7\% + 5.4\% - 1.35\% - 0.645\% \\ = & 8.1\% \end{aligned}$$

- B** TerraNova Energy appears to be a large-cap, growth-oriented, high market risk stock as indicated by its negative size beta, negative value beta, and market beta above 1.0.
- 4 The required return is given by

$$r = 0.045 + (-0.2)(0.075) = 4.5\% - 1.5\% = 3.0\%$$

This example indicates that Newmont Mining has a required return of 3 percent. When beta is negative, an asset has a CAPM required rate of return that is below the risk-free rate. Cases of equities with negative betas are relatively rare.

- 5 B is correct. The Fama–French model incorporates market, size, and value risk factors. One possible interpretation of the value risk factor is that it relates to financial distress.
- 6 Larsen & Toubro Ltd's WACC is 13.64 percent calculated as follows:

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

- 7 A is correct. The backfilling of index returns using companies that have survived to the index construction date is expected to introduce a positive survivorship bias into returns.
- 8 B is correct. The events of 2004 to 2006 depressed share returns but 1) are not a persistent feature of the stock market environment, 2) were not offset by other positive events within the historical record, and 3) have led to relatively low valuation levels, which are expected to rebound.
- 9 A is correct. The required return reflects the magnitude of the historical equity risk premium, which is generally higher when based on a short-term interest rate (as a result of the normal upward sloping yield curve), and the current value of the rate being used to represent the risk-free rate. The short-term rate is currently higher than the long-term rate, which will also increase the required return estimate. The short-term interest rate, however, overstates the long-term expected inflation rate. Using the short-term interest rate, estimates of the long-term required return on equity will be biased upwards.
- 10 C is correct. According to this model, the equity risk premium is

$$\text{Equity risk premium} = \left\{ \left[(1 + \text{EINFL})(1 + \text{EGREPS})(1 + \text{EGPE}) - 1.0 \right] + \text{EINC} \right\} - \text{Expected risk-free return}$$

Here:

EINFL = 4 percent per year (long-term forecast of inflation)

EGREPS = 5 percent per year (growth in real earnings)

EGPE = 1 percent per year (growth in market P/E ratio)

EINC = 1 percent per year (dividend yield or the income portion)

Risk-free return = 7 percent per year (for 10-year maturities)

By substitution, we get:

$$\begin{aligned} \left\{ \left[(1.04)(1.05)(1.01) - 1.0 \right] + 0.01 \right\} - 0.07 &= 0.113 - 0.07 \\ &= 0.043 \text{ or } 4.3 \text{ percent.} \end{aligned}$$

- 11 C is correct. Based on a long-term government bond yield of 7 percent, a beta of 1, and any of the risk premium estimates that can be calculated from the givens (e.g., a 2 percent historical risk premium estimate or 4.3 percent supply side equity risk premium estimate), the required rate of return would be at least 9 percent. Based on using a short-term rate of 9 percent, C is the correct choice.

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

- 13 A is correct. This is the expected 3-year holding period return, calculated as:

$$\begin{aligned}\text{3-year expected return} &= (V_0 - P_0)/P_0 = (\$29.00 - \$20.75)/\$20.75 \\ &= 39.76\%.\end{aligned}$$

- 14 C is correct. The realized holding period return (note that no dividends were paid during the 3-year holding period) is 44.82%. Specifically, the realized 3-year holding period is calculated as calculated as:

$$\begin{aligned}\text{3-year realized return} &= (P_H - P_0)/(P_0) = (30.05 - 20.75)/20.75 \\ &= 44.82\%.\end{aligned}$$

- 15 C is correct. A string of favorable inflation and productivity surprises may result in a series of high returns that increase the historical mean estimate of the equity risk premium. To mitigate that concern, the analyst may adjust the historical estimate downward based on an independent forward-looking estimate.

- 16 A is correct. Given the data presented, the equity risk premium can be estimated as:

Equity risk premium = dividend yield on the index based on year-ahead aggregate forecasted dividends and aggregate market value + consensus long-term earnings growth rate – current long-term government bond yield. The equity risk premium = 1.2% + 4.0% – 3.0% = 2.2%.

- 17 B is correct. The weighted average cost of capital is taking the sum product of each component of capital multiplied by the component's after-tax cost.

First, estimate the cost of equity using the CAPM:

$$\text{Cost of equity} = \text{Risk-free rate} + [\text{Equity Risk Premium} \times \text{Beta}]$$

$$\text{Cost of equity} = 3.0\% + [5.5\% \times 2.00] = 14\%$$

Now, calculate Bezak's WACC:

	Equity	Debt	WACC
Weight	0.75	0.25	
After Tax Cost	14%	$(1 - 0.30) \times 4.9\%$	
Weight × After Tax Cost	10.5%	+ 0.8575%	= 11.36%

- 18 B is correct. The steps to estimating a beta for a non-traded company are:

Step 1 Select the comparable benchmark

Step 2 Estimate benchmark's beta

Step 3 Un-lever the benchmark's beta

Step 4 Lever the beta to reflect the subject company's financial leverage

The beta of the benchmark peer company data is given as 1.09. Next, this beta needs to be unlevered, calculated as:

$$\beta_u = \left[\frac{1}{1 + \left(\frac{D}{E} \right)} \right] \beta_l$$

$$\beta_u = \left[\frac{1}{1 + \left(\frac{0.60}{0.40} \right)} \right] (1.09)$$

$$\beta_u = 0.436, \text{ or } 0.44$$

Then, the unlevered beta needs to be levered up to reflect the financial leverage of Twin Industries, calculated as:

$$\beta'_E \approx \left[1 + \left(\frac{D'}{E'} \right) \right] \beta_u$$

$$\beta'_E \approx \left[1 + \left(\frac{0.49}{0.51} \right) \right] (0.436)$$

$$\beta_u = 0.8549, \text{ or } 0.85$$

- 19** A is correct. Johansson intends to estimate a required return on equity using a modified CAPM approach. Twin Industries is stated to be smaller than the chosen proxy benchmark being used and there is no size premium adjustment in the CAPM framework; the framework adjusts the beta for leverage differences but this does not adjust for firm size differences. The build-up method may be more appropriate as it includes the equity risk premium and one or more additional premia, often based on factors such as size and perceived company-specific risk.

PRACTICE PROBLEMS

The following information relates to Questions 1–6

Angela Green, an investment manager at Horizon Investments, intends to hire a new investment analyst. After conducting initial interviews, Green has narrowed the pool to three candidates. She plans to conduct second interviews to further assess the candidates' knowledge of industry and company analysis.

Prior to the second interviews, Green asks the candidates to analyze Chrome Network Systems, a company that manufactures internet networking products. Each candidate is provided Chrome's financial information presented in Exhibit 1.

Exhibit 1 Chrome Network Systems Selected Financial Information (in millions of \$)

	Year Ended:		
	2010	2011	2012
Net sales	46.8	50.5	53.9
Cost of sales	18.2	18.4	18.8
Gross profit	28.6	32.1	35.1
Selling, general, and administrative (SG&A) expenses	19.3	22.5	25.1
Operating income	9.3	9.6	10.0
Interest expense	0.5	0.7	0.6
Income before provision for income tax	8.8	8.9	9.4
Provision for income taxes	2.8	2.8	3.1
Net income	6.0	6.1	6.3

Green asks each candidate to forecast the 2013 income statement for Chrome and to outline the key assumptions used in their analysis. The job candidates are told to include Horizon's economic outlook for 2013 in their analysis, which assumes nominal GDP growth of 3.6%, based on expectations of real GDP growth of 1.6% and inflation of 2.0%.

Green receives the models from each of the candidates and schedules second interviews. To prepare for the interviews, Green compiles a summary of the candidates' key assumptions in Exhibit 2.

Exhibit 2 Summary of Key Assumptions Used in Candidates' Models

Metric	Candidate A	Candidate B	Candidate C
Net sales	Net sales will grow at the average annual growth rate in net sales over the 2010–2012 time period.	Industry sales will grow at the same rate as nominal GDP, but Chrome will have a 2 percentage points decline in market share.	Net sales will grow 50 basis points slower than nominal GDP.
Cost of sales	2013 gross margin will be same as the average annual gross margin over the 2010–2012 time period.	2013 gross margin will decline as costs increase by expected inflation.	2013 gross margin will increase by 20 basis points from 2012.
Selling, general, and administrative (SG&A) expenses	2013 SG&A/net sales ratio will be the same as the average ratio over the 2010–2012 time period.	2013 SG&A will grow at the rate of inflation.	2013 SG&A/net sales ratio will be the same as the 2012 ratio.
Interest expense	2013 interest expense assumes the effective interest rate will be the same as the 2012 rate.	2013 interest expense will be the same as the 2012 interest expense.	2013 interest expense will be the same as the average expense over the 2010–2012 time period.
Income taxes	2013 effective tax rate will be the same as the 2012 rate.	2013 effective tax rate will equal the blended statutory rate of 30%.	2013 effective tax rate will be the same as the average effective tax rate over the 2010–2012 time period.

- Based on Exhibit 1, which of the following provides the strongest evidence that Chrome displays economies of scale?
 - Increasing net sales
 - Profit margins that are increasing with net sales
 - Gross profit margins that are increasing with net sales
- Based on Exhibit 2, the job candidate *most likely* using a bottom-up approach to model net sales is:
 - Candidate A.
 - Candidate B.
 - Candidate C.
- Based on Exhibit 2, the modeling approach used by Candidate B to project future net sales is *most accurately* classified as a:
 - hybrid approach.
 - top-down approach.
 - bottom-up approach.

- 4 Based on Exhibits 1 and 2, Candidate C's forecast for cost of sales in 2013 is *closest* to:
- A \$18.3 million.
 - B \$18.9 million.
 - C \$19.3 million.
- 5 Based on Exhibits 1 and 2, Candidate A's forecast for selling, general, and administrative expenses in 2013 is *closest* to:
- A \$23.8 million.
 - B \$25.5 million.
 - C \$27.4 million.
- 6 Based on Exhibit 2, forecasted interest expense will reflect changes in Chrome's debt level under the forecast assumptions used by:
- A Candidate A.
 - B Candidate B.
 - C Candidate C.
-

The following information relates to Questions 7–12

Nigel French, an analyst at Taurus Investment Management, is analyzing Archway Technologies, a manufacturer of luxury electronic auto equipment, at the request of his supervisor, Lukas Wright. French is asked to evaluate Archway's profitability over the past five years relative to its two main competitors, which are located in different countries with significantly different tax structures.

French begins by assessing Archway's competitive position within the luxury electronic auto equipment industry using Porter's five forces framework. A summary of French's industry analysis is presented in Exhibit 3.

Exhibit 3 Analysis of Luxury Electronic Auto Equipment Industry Using Porter's Five Forces Framework

Force	Factors to Consider
Threat of substitutes	Customer switching costs are high
Rivalry	Archway holds 60% of world market share; each of its two main competitors holds 15%
Bargaining power of suppliers	Primary inputs are considered basic commodities, and there are a large number of suppliers
Bargaining power of buyers	Luxury electronic auto equipment is very specialized (non-standardized)
Threat of new entrants	High fixed costs to enter industry

French notes that for the year just ended (2014), Archway's cost of goods sold was 30% of sales. To forecast Archway's income statement for 2015, French assumes that all companies in the industry will experience an inflation rate of 8% on the cost of goods sold. Exhibit 4 shows French's forecasts relating to Archway's price and volume changes.

Exhibit 4 Archway's 2015 Forecasted Price and Volume Changes

Average price increase per unit	5.00%
Volume growth	–3.00%

After putting together income statement projections for Archway, French forecasts Archway's balance sheet items; he uses Archway's historical efficiency ratios to forecast the company's working capital accounts.

Based on his financial forecast for Archway, French estimates a terminal value using a valuation multiple based on the company's average price-to-earnings multiple (P/E) over the past five years. Wright discusses with French how the terminal value estimate is sensitive to key assumptions about the company's future prospects. Wright asks French:

“What change in the calculation of the terminal value would you make if a technological development that would adversely affect Archway was forecast to occur sometime beyond your financial forecast horizon?”

- 7 Which return metric should French use to assess Archway's five-year historic performance relative to its competitors?
 - A Return on equity
 - B Return on invested capital
 - C Return on capital employed
- 8 Based on the current competitive landscape presented in Exhibit 3, French should conclude that Archway's ability to:
 - A pass along price increases is high.
 - B demand lower input prices from suppliers is low.
 - C generate above-average returns on invested capital is low.
- 9 Based on the current competitive landscape presented in Exhibit 3, Archway's operating profit margins over the forecast horizon are *least likely* to:
 - A decrease.
 - B remain constant.
 - C increase.
- 10 Based on Exhibit 4, Archway's forecasted gross profit margin for 2015 is *closest* to:
 - A 62.7%.
 - B 67.0%.
 - C 69.1%.
- 11 French's approach to forecasting Archway's working capital accounts would be *most likely* classified as a:
 - A hybrid approach.
 - B top-down approach.

- C bottom-up approach.
- 12 The *most appropriate* response to Wright's question about the technological development is to:
- A increase the required return.
 - B decrease the price-to-earnings multiple.
 - C decrease the perpetual growth rate.
-

The following information relates to Questions 13–18

Gertrude Fromm is a transportation sector analyst at Tucana Investments. She is conducting an analysis of Omikroon, N.V., a publicly traded European transportation company that manufactures and sells scooters and commercial trucks.

Omikroon's petrol scooter division is the market leader in its sector and has two competitors. Omikroon's petrol scooters have a strong brand-name and a well-established distribution network. Given the strong branding established by the market leaders, the cost of entering the industry is high. But Fromm anticipates that inexpensive imported small petrol-fueled motorcycles may become substitutes for Omikroon's petrol scooters.

Fromm uses return on invested capital as the metric to assess Omikroon's performance.

Omikroon has just introduced the first electric scooter to the market at year-end 2014. The company's expectations are as follows:

- Competing electric scooters will reach the market in 2016.
- Electric scooters will not be a substitute for petrol scooters.
- The important research costs in 2015 and 2016 will lead to more efficient electric scooters.

Fromm decides to use a five-year forecast horizon for Omikroon after considering the following factors:

- Factor 1 The annual portfolio turnover at Tucana investments is 30%.
- Factor 2 The electronic scooter industry is expected to grow rapidly over the next 10 years.
- Factor 3 Omikroon has announced it would acquire a light truck manufacturer that will be fully integrated to its truck division by 2016 and will add 2% to its total revenues.

Fromm uses the base case forecast for 2015 shown in Exhibit 5 to perform the following sensitivity analysis:

- The price of an imported specialty metal used for engine parts increases by 20%.
- This metal constitutes 4% of Omikroon's cost of sales.
- Omikroon will not be able to pass on the higher metal expense to its customers.

Exhibit 5 Omikroon's Selected Financial Forecasts for 2015 Base Case (€ millions)

	Petrol Scooter Division	Commercial Truck Division	Electric Scooter Division	Total
Sales	99.05	45.71	7.62	152.38
Cost of sales				105.38
Gross profit				47.00
Operating profit				9.20

Omikroon will initially outsource its electric scooter parts. But manufacturing these parts in-house beginning in 2016 will imply changes to an existing factory. This factory cost €7 million three years ago and had an estimated useful life of 10 years. Fromm is evaluating two scenarios:

- Scenario 1 Sell the existing factory for €5 million. Build a new factory costing €30 million with a useful life of 10 years.
- Scenario 2 Refit the existing factory for €27 million.

- 13 Using Porter's five forces analysis, which of the following competitive factors is likely to have the *greatest* impact on Omikroon's petrol scooter pricing power?
 - A Rivalry
 - B Threat of substitutes
 - C Threat of new entrants
- 14 The metric used by Fromm to assess Omikroon's performance takes into account:
 - A degree of financial leverage.
 - B operating liabilities relative to operating assets.
 - C competitiveness relative to companies in other tax regimes.
- 15 Based on Omikroon's expectations, the gross profit margin of Omikroon's electric scooter division in 2016 is *most likely* to be affected by:
 - A competition.
 - B research costs.
 - C cannibalization by petrol scooters.
- 16 Which factor *best* justifies the five-year forecast horizon for Omikroon selected by Fromm?
 - A Factor 1
 - B Factor 2
 - C Factor 3
- 17 Fromm's sensitivity analysis will result in a decrease in the 2015 base case gross profit margin *closest to*:
 - A 0.55 percentage points.
 - B 0.80 percentage points.
 - C 3.32 percentage points.
- 18 Fromm's estimate of growth capital expenditure included in Omikroon's property, plant, and equipment under Scenario 2 should be:

- A lower than under Scenario 1.
- B the same as under Scenario 1.
- C higher than under Scenario 1.

SOLUTIONS

- 1 C is correct. Economies of scale are a situation in which average costs decrease with increasing sales volume. Chrome's gross margins have been increasing with net sales. Gross margins that increase with sales levels provide evidence of economies of scale, assuming that higher levels of sales reflect increased unit sales. Gross margin more directly reflects the cost of sales than does profit margin.

Metric	2010	2011	2012
Net sales	\$46.8	\$50.5	\$53.9
Gross profit	28.6	32.1	35.1
Gross margin (gross profit/net sales)	61.11%	63.56%	65.12%

- 2 A is correct. A bottom-up approach for developing inputs to equity valuation models begins at the level of the individual company or a unit within the company. By modeling net sales using the average annual growth rate, Candidate A is using a bottom-up approach. Both Candidate B and Candidate C are using a top-down approach, which begins at the level of the overall economy.
- 3 B is correct. A top-down approach usually begins at the level of the overall economy. Candidate B assumes industry sales will grow at the same rate as nominal GDP but that Chrome will have a 2 percentage points decline in market share. Candidate B is not using any elements of a bottom-up approach; therefore, a hybrid approach is not being employed.
- 4 C is correct. Candidate C assumes that the 2013 gross margin will increase by 20 bps from 2012 and that net sales will grow at 50 bps slower than nominal GDP (nominal GDP = Real GDP + Inflation = 1.6% + 2.0% = 3.6%). Accordingly, the 2013 forecasted costs of sales are \$19.27 million, rounded to \$19.3 million.

Metric	Calculation	Result
2013 gross margin = 2012 gm + 20 bps	$\$35.1/\$53.9 = 65.12\% + 0.20\% =$	65.32%
2013 CoS/net sales = 100% – gross margin	$100\% - 65.32\% =$	34.68%
2013 net sales = 2012 net sales \times (1 + Nominal GDP – 0.50%)	$\$53.9 \text{ million} \times (1 + 0.036 - 0.005) = \$53.9 \text{ million} \times 1.031 =$	\$55.57 million
2013 cost of sales = 2013 net sales \times CoS/net sales	$\$55.57 \times 34.68\% =$	\$19.27 million

- 5 B is correct. Candidate A assumes that the 2013 SG&A/net sales ratio will be the same as the average SG&A/net sales ratio over the 2010–2012 time period, and that net sales will grow at the annual average growth rate in net sales over the 2010–2012 time period. Accordingly, the 2013 forecasted selling, general, and administrative expenses are \$25.5 million.

Metric	Calculation	Result
Average SG&A/net sales, 2010–2012*	$(41.24\% + 44.55\% + 46.57\%)/3 =$	44.12%
Average annual growth sales in net sales, 2010–2012**	$(7.91\% + 6.73\%)/2 =$	7.32%

Metric	Calculation	Result
2013 net sales = 2012 net sales × (1 + Average annual growth rate in net sales)	\$53.9 million × 1.0732 =	\$57.85 million
2013 SG&A = 2013 net sales × Average SG&A/net sales	\$57.85 million × 44.12% =	\$25.52 million

* SG&A/net sales ratios are calculated as follows:

Metric	2010	2011	2012
Net Sales	\$46.8	\$50.5	\$53.9
SG&A expenses	19.3	22.5	25.1
SG&A-to-sales ratio	41.24%	44.55%	46.57%

** Growth rate in net sales is calculated as follows:

Year	Calculation
2011	$(\$50.5/\$46.8) - 1 = 7.91\%$
2012	$(\$53.9/\$50.5) - 1 = 6.73\%$

- 6 A is correct. In forecasting financing costs such as interest expense, the debt/equity structure of a company is a key determinant. Accordingly, a method that recognizes the relationship between the income statement account (interest expense) and the balance sheet account (debt) would be a preferable method for forecasting interest expense when compared with methods that forecast based solely on the income statement account. By using the effective interest rate (interest expense divided by average gross debt), Candidate A is taking the debt/equity structure into account whereas Candidate B (who forecasts 2013 interest expense to be the same as 2012 interest expense) and Candidate C (who forecasts 2013 interest expense to be the same as the 2010–2012 average interest expense) are not taking the balance sheet into consideration.
- 7 C is correct. The return on capital employed (ROCE) is a pre-tax return measure that can be useful in the peer comparison of companies in countries with different tax structures. Archway's two main competitors are located in different countries with significantly different tax structures, and therefore, a pre-tax measure of return on capital is better than an after-tax measure.
- 8 A is correct. Porter's five forces framework in Exhibit 3 describes an industry with high barriers to entry, high customer switching costs (suggesting a low threat of substitutes), and a specialized product (suggesting low bargaining power of buyers). Furthermore, the primary production inputs from the large group of suppliers are considered basic commodities (suggesting low bargaining power of suppliers). These favorable industry characteristics will likely enable Archway to pass along price increases and generate above-average returns on invested capital.
- 9 A is correct. The current favorable characteristics of the industry (high barriers to entry, low bargaining power of suppliers and buyers, low threat of substitutes), coupled with Archway's dominant market share position, is likely to lead to Archway's profit margins being at least equal to or greater than current levels over the forecast horizon.
- 10 C is correct. The calculation of Archway's gross profit margin for 2015, which reflects the industry-wide 8% inflation on cost of goods sold (COGS), is calculated as follows:

Revenue growth	1.85%
Cost of goods sold increase	4.76%
Forecasted revenue (Base revenue = 100)	101.85
Forecasted COGS (Base COGS = 30)	31.43
Forecasted gross profit	70.42
Forecasted gross profit margin	69.14%

$$\text{Revenue growth} = (1 + \text{Price increase for revenue}) \times (1 + \text{Volume growth}) - 1$$

$$\text{Revenue growth} = (1.05) \times (0.97) - 1 = 1.85\%$$

$$\text{COGS increase} = (1 + \text{Price increase for COGS}) \times (1 + \text{Volume growth}) - 1$$

$$\text{COGS increase} = (1.08) \times (0.97) - 1 = 4.76\%$$

$$\text{Forecasted revenue} = \text{Base revenue} \times \text{Revenue growth increase}$$

$$\text{Forecasted revenue} = 100 \times 1.0185 = 101.85$$

$$\text{Forecasted COGS} = \text{Base COGS} \times \text{COGS increase}$$

$$\text{Forecasted COGS} = 30 \times 1.0476 = 31.43$$

$$\text{Forecasted gross profit} = \text{Forecasted revenue} - \text{Forecasted COGS}$$

$$\text{Forecasted gross profit} = 101.85 - 31.43 = 70.42$$

$$\text{Forecasted gross profit margin} = \frac{\text{Forecasted gross profit}}{\text{Forecasted revenue}}$$

$$\text{Forecasted gross profit margin} = 70.42/101.85 = 69.14\%$$

- 11 C is correct. French is using a bottom-up approach to forecast Archway's working capital accounts by using the company's historical efficiency ratios to project future performance.
- 12 B is correct. If the future growth or profitability of a company is likely to be lower than the historical average (in this case, because of a potential technological development), then the target multiple should reflect a discount to the historical multiple to reflect this difference in growth and/or profitability. If a multiple is used to derive the terminal value of a company, the choice of the multiple should be consistent with the long-run expectations for growth and required return. French tells Wright he believes that such a technological development may have an adverse impact on Archway beyond the forecast horizon.
- 13 B is correct. Inexpensive, small imported motorcycles are substitutes for petrol scooters and may increasingly have an impact on Omikroon's petrol scooter pricing power.
- 14 B is correct. Return on invested capital is net operating profit minus adjusted taxes divided by invested capital, where invested capital is defined as operating assets minus operating liabilities.
- 15 A is correct. Competition from other electric scooter manufacturers is expected to begin in one year. After this time, competing electric scooters could lead to lower demand for Omikroon's electric scooters and affect Omikroon's gross profit margin.
- 16 B is correct. The electric scooter industry is new and growing and the contribution of Omikroon's electric scooter division is forecast to expand over 10 years.

- 17 A is correct. The sensitivity analysis consists of an increase of 20% in the price of an input that constitutes 4% of cost of sales. Change in gross profit margin because of that increase is calculated as the change in cost of sales because of price increase divided by sales:

$$\begin{aligned} &= (\text{Cost of sales} \times 0.04 \times 0.2) / \text{Sales} \\ &= (105.38 \times 0.04 \times 0.2) / 152.38 \\ &= 0.0055 \end{aligned}$$

- 18 C is correct. In Scenario 2, growth capital expenditure of €27 million for the refit of the existing idle factory is higher than the growth capital expenditure in Scenario 1 of €25 million. The €25 million is the cost of building a new factory for €30 million less the proceeds from the sale of the existing idle factory of €5 million.

PRACTICE PROBLEMS

- 1 Amy Tanner is an analyst for a US pension fund. Her supervisor has asked her to value the stocks of General Electric (GE) and General Motors (GM). Tanner wants to evaluate the appropriateness of the dividend discount model (DDM) for valuing GE and GM and has compiled the following data for the two companies for 2000 through 2007.

Year	GE			GM		
	EPS (\$)	DPS (\$)	Payout Ratio	EPS (\$)	DPS (\$)	Payout Ratio
2007	2.17	1.15	0.53	-68.45	1.00	-0.01
2006	1.99	1.03	0.52	-3.50	1.00	-0.29
2005	1.76	0.91	0.52	-18.50	2.00	-0.11
2004	1.61	0.82	0.51	4.94	2.00	0.40
2003	1.55	0.77	0.50	5.03	2.00	0.40
2002	1.51	0.73	0.48	3.35	2.00	0.60
2001	1.41	0.66	0.47	1.77	2.00	1.13
2000	1.27	0.57	0.45	6.68	2.00	0.30

Source: Compustat.

- For each of the stocks, explain whether the DDM is appropriate for valuing the stock.
- 2 Vincent Nguyen, an analyst, is examining the stock of British Airways (BAY) as of the beginning of 2008. He notices that the consensus forecast by analysts is that the stock will pay a £4 dividend per share in 2009 (based on 21 analysts) and a £5 dividend in 2010 (based on 10 analysts). Nguyen expects the price of the stock at the end of 2010 to be £250. He has estimated that the required rate of return on the stock is 11 percent. Assume all dividends are paid at the end of the year.
- A Using the DDM, estimate the value of BAY stock at the end of 2009.
- B Using the DDM, estimate the value of BAY stock at the end of 2008.
- 3 Justin Owens is an analyst for an equity mutual fund that invests in British stocks. At the beginning of 2008, Owens is examining domestic stocks for possible inclusion in the fund. One of the stocks that he is analyzing is British Sky Broadcasting Group (BSY). The stock has paid dividends per share of £9, £12.20, and £15.50 at the end of 2005, 2006, and 2007, respectively. The consensus forecast by analysts is that the stock will pay a dividend per share of £18.66 at the end of 2008 (based on 19 analysts) and £20.20 at the end of 2009 (based on 17 analysts). Owens has estimated that the required rate of return on the stock is 11 percent.
- A Compare the compound annual growth rate in dividends from 2005 to 2007 inclusive (i.e., from a beginning level of £9 to an ending level of £15.50) with the consensus predicted compound annual growth rate in dividends from 2007 to 2009, inclusive.

- B** Owens believes that BSY has matured such that the dividend growth rate will be constant going forward at half the consensus compound annual growth rate from 2007 to 2009, inclusive, computed in Part A. Using the growth rate forecast of Owens as the constant growth rate from 2007 onwards, estimate the value of the stock as of the end of 2007 given an 11 percent required rate of return on equity.
- C** State the relationship between estimated value and r and estimated value and g .
- 4** During the period 1960–2007, earnings of the S&P 500 Index companies have increased at an average rate of 8.18 percent per year and the dividends paid have increased at an average rate of 5.9 percent per year. Assume that:
- Dividends will continue to grow at the 1960–2007 rate.
 - The required return on the index is 8 percent.
 - Companies in the S&P 500 Index collectively paid \$246.6 billion in dividends in 2007.

Estimate the aggregate value of the S&P 500 Index component companies at the beginning of 2008 using the Gordon growth model.

- 5** Great Plains Energy is a public utility holding company that listed its 4.5 percent cumulative perpetual preferred stock series E on the NYSE Euronext in March 1952. The par value of the preferred stock is \$100. If the required rate of return on this stock is 5.6 percent, estimate the value of the stock.
- 6** German Resources is involved in coal mining. The company is currently profitable and is expected to pay a dividend of €4 per share next year. The company has suspended exploration, however, and because its current mature operations exhaust the existing mines, you expect that the dividends paid by the company will decline forever at an 8 percent rate. The required return on German Resource's stock is 11 percent. Using the DDM, estimate the value of the stock.
- 7** Maspeth Robotics shares are currently selling for €24 and have paid a dividend of €1 per share for the most recent year. The following additional information is given:
- The risk-free rate is 4 percent;
 - The shares have an estimated beta of 1.2; and
 - The equity risk premium is estimated at 5 percent.

Based on the above information, determine the constant dividend growth rate that would be required to justify the market price of €24.

- 8** You believe the Gordon (constant) growth model is appropriate to value the stock of Reliable Electric Corp. The company had an EPS of \$2 in 2008. The earnings in the next year without the additional planned investments are expected to remain at \$2. The retention ratio is 0.60. The company is expected to earn an ROE of 14 percent on its investments and the required rate of return is 11 percent. Assume that all dividends are paid at the end of the year.
- A** Calculate the company's sustainable growth rate.
- B** Estimate the value of the company's stock at the beginning of 2009.
- C** Calculate the present value of growth opportunities.
- D** Determine the fraction of the company's value which comes from its growth opportunities.
- 9** Stellar Baking Company in Australia has a trailing P/E of 14. Analysts predict that Stellar's dividends will continue to grow at its recent rate of 4.5 percent per year into the indefinite future. Given a current dividend and EPS of A\$0.7 per

share and A\$2.00 per share, respectively, and a required rate of return on equity of 8 percent, determine whether Stellar Baking Company is undervalued, fairly valued, or overvalued. Justify your answer.

- 10** Mohan Gupta is the portfolio manager of an India-based equity fund. He is analyzing the value of Tata Chemicals Ltd. Tata Chemicals is India's leading manufacturer of inorganic chemicals, and also manufactures fertilizers and food additives. Gupta has concluded that the DDM is appropriate to value Tata Chemicals.
- During the last five years (fiscal year ending 31 March 2004 to fiscal year ending 31 March 2008), the company has paid dividends per share of Rs. 5.50, 6.50, 7.00, 8.00, and 9.00, respectively. These dividends suggest an average annual growth rate in DPS of just above 13 percent. Gupta has decided to use a three-stage DDM with a linearly declining growth rate in Stage 2. He considers Tata Chemicals to be an average growth company, and estimates Stage 1 (the growth stage) to be 6 years and Stage 2 (the transition stage) to be 10 years. He estimates the growth rate to be 14 percent in Stage 1 and 10 percent in Stage 3. Gupta has estimated the required return on equity for Tata Chemicals to be 16 percent. Estimate the current value of the stock.
- 11** You are analyzing the stock of Ansell Limited (ANN), a healthcare company, as of late June 2008. The stock price is A\$9.74. The company's dividend per share for the fiscal year ending 30 June 2008 was A\$0.27. You expect the dividend to increase by 10 percent for the next three years and then increase by 8 percent per year forever. You estimate the required return on equity of Ansell Limited to be 12 percent.
- A** Estimate the value of ANN using a two-stage dividend discount model.
- B** Judge whether ANN is undervalued, fairly valued, or overvalued.
- 12** Sime Natural Cosmetics Ltd. has a dividend yield of 2 percent based on the current dividend and a mature phase dividend growth rate of 5 percent a year. The current dividend growth rate is 10 percent a year, but the growth rate is expected to decline linearly to its mature phase value during the next six years.
- A** If Sime Natural Cosmetics is fairly priced in the marketplace, what is the expected rate of return on its shares?
- B** If Sime were in its mature growth phase right now, would its expected return be higher or lower, holding all other facts constant?
- 13** Kazuo Uto is analyzing the stock of Brother Industries, Ltd., a diversified Japanese company that produces a wide variety of products. Brother distributes its products under its own name and under original-equipment manufacturer agreements with other companies. Uto has concluded that a multistage DDM is appropriate to value the stock of Brother Industries and the company will reach a mature stage in four years. The ROE of the company has declined from 16.7 percent in the fiscal year ending in 2004 to 12.7 percent in the fiscal year ending in 2008. The dividend payout ratio has increased from 11.5 percent in 2004 to 22.3 percent in 2008. Uto has estimated that in the mature phase Brother's ROE will be 11 percent, which is approximately equal to estimated required return on equity. He has also estimated that the payout ratio in the mature phase will be 40 percent, which is significantly greater than its payout ratio in 2008 but less than the average payout of about 50 percent for Japanese companies.
- A** Calculate the sustainable growth rate for Brother in the mature phase.

- B** With reference to the formula for the sustainable growth rate, a colleague of Uto asserts that the greater the earnings retention ratio, the greater the sustainable growth rate because g is a positive function of b . The colleague argues that Brother should decrease payout ratio. Explain the flaw in that argument.
- 14** An analyst following Chevron Corp. wants to estimate the sustainable growth rate for the company by using the PRAT model. For this purpose, the analyst has compiled the data in the following table. Assets and equity values are for the end of the year; the analyst uses averages of beginning and ending balance sheet values in computing ratios based on total assets and shareholders' equity. For example average total assets for 2007 would be computed as $(148,786 + 132,628)/2 = \$140,707$. *Note:* All numbers except for EPS and DPS are in \$ millions.

Item	2007	2006	2005	2004
Net income	\$18,688	\$17,138	\$14,099	\$13,328
Sales	214,091	204,892	193,641	150,865
Total assets	148,786	132,628	125,833	93,208
Shareholders' equity	77,088	68,935	62,676	45,230
EPS	8.77	7.80	6.54	6.28
DPS	2.26	2.01	1.75	1.53

Source: Financial statements from Chevron's website.

- A** Compute the average value of each PRAT component during 2005–2007.
- B** Using the overall mean value of the average component values calculated in Part A, estimate the sustainable growth rate for Chevron.
- C** Judge whether Chevron has reached a mature growth stage.
- 15** Casey Hyunh is trying to value the stock of Resources Limited. To easily see how a change in one or more of her assumptions affects the estimated value of the stock, she is using a spreadsheet model. The model has projections for the next four years based on the following assumptions.
- Sales will be \$300 million in Year 1.
 - Sales will grow at 15 percent in Years 2 and 3 and 10 percent in Year 4.
 - Operating profits (EBIT) will be 17 percent of sales in each year.
 - Interest expense will be \$10 million per year.
 - Income tax rate is 30 percent.
 - Earnings retention ratio would stay at 0.60.
 - The per-share dividend growth rate will be constant from Year 4 forward and this final growth rate will be 200 basis points less than the growth rate from Year 3 to Year 4.

The company has 10 million shares outstanding. Hyunh has estimated the required return on Resources' stock to be 13 percent.

- A** Estimate the value of the stock at the end of Year 4 based on the above assumptions.

- B Estimate the current value of the stock using the above assumptions.
- C Hyunh is wondering how a change in the projected sales growth rate would affect the estimated value. Estimate the current value of the stock if the sales growth rate in Year 3 is 10 percent instead of 15 percent.

The following information relates to Questions 16–21

Jacob Daniel is the chief investment officer at a US pension fund sponsor, and Steven Rae is an analyst for the pension fund who follows consumer/noncyclical stocks. At the beginning of 2009, Daniel asks Rae to value the equity of Tasty Foods Company for its possible inclusion in the list of approved investments. Tasty Foods Company is involved in the production of frozen foods that are sold under its own brand name to retailers.

Rae is considering if a dividend discount model would be appropriate for valuing Tasty Foods. He has compiled the information in the following table for the company's EPS and DPS during the last five years. The quarterly dividends paid by the company have been added to arrive at the annual dividends. Rae has also computed the dividend payout ratio for each year as DPS/EPS and the growth rates in EPS and DPS.

Year	EPS (\$)	DPS (\$)	Payout Ratio	Growth in EPS (%)	Growth in DPS (%)
2008	2.12	0.59	0.278	2.9	3.5
2007	2.06	0.57	0.277	2.5	5.6
2006	2.01	0.54	0.269	6.3	5.9
2005	1.89	0.51	0.270	6.2	6.3
2004	1.78	0.48	0.270		

Rae notes that the EPS of the company has been increasing at an average rate of 4.48 percent per year. The dividend payout ratio has remained fairly stable and dividends have increased at an average rate of 5.30 percent. In view of a history of dividend payments by the company and the understandable relationship dividend policy bears to the company's earnings, Rae concludes that the DDM is appropriate to value the equity of Tasty Foods. Further, he expects the moderate growth rate of the company to persist and decides to use the Gordon growth model.

Rae uses the CAPM to compute the return on equity. He uses the annual yield of 4 percent on the 10-year Treasury bond as the risk-free return. He estimates the expected US equity risk premium, with the S&P 500 Index used as a proxy for the market, to be 6.5 percent per year. The estimated beta of Tasty Foods against the S&P 500 Index is 1.10. Accordingly, Rae's estimate for the required return on equity for Tasty Foods is $0.04 + 1.10(0.065) = 0.1115$ or 11.15 percent.

Using the past growth rate in dividends of 5.30 percent as his estimate of the future growth rate in dividends, Rae computes the value of Tasty Foods stock. He shows his analysis to Alex Renteria, his colleague at the pension fund who specializes in the frozen foods industry. Renteria concurs with the valuation approach used by Rae but disagrees with the future growth rate he used. Renteria believes that the stock's current price of \$8.42 is the fair value of the stock.

- 16 Which of the following is *closest* to Rae's estimate of the stock's value?
- A \$10.08.
 - B \$10.54.

- C \$10.62.
- 17 What is the stock's justified trailing P/E based on the stock's value estimated by Rae?
- A 5.01.
B 5.24.
C 5.27.
- 18 Rae considers a security trading within a band of ± 10 percent of his estimate of intrinsic value to be within a "fair value range." By that criterion, the stock of Tasty Foods is:
- A undervalued.
B fairly valued.
C overvalued.
- 19 The beta of Tasty Foods stock of 1.10 used by Rae in computing the required return on equity was based on monthly returns for the last 10 years. If Rae uses daily returns for the last 5 years, the beta estimate is 1.25. If a beta of 1.25 is used, what would be Rae's estimate of the value of the stock of Tasty Foods?
- A \$8.64.
B \$9.10.
C \$20.13.
- 20 Alex Renteria has suggested that the market price of Tasty Foods stock is its fair value. What is the implied growth rate of dividends given the stock's market price? Use the required return on equity based on a beta of 1.10.
- A 3.87%.
B 5.30%.
C 12.1%.
- 21 If Alex Renteria is correct that the current price of Tasty Foods stock is its fair value, what is expected capital gains yield on the stock?
- A 3.87%.
B 4.25%.
C 5.30%.

The following information relates to Questions 22–27

Assorted Fund, a UK-based globally diversified equity mutual fund, is considering adding Talisman Energy Inc. to its portfolio. Talisman is an independent upstream oil and gas company headquartered in Calgary, Canada. It is one of the largest oil and gas companies in Canada and has operations in several countries. Brian Dobson, an analyst at the mutual fund, has been assigned the task of estimating a fair value of Talisman. Dobson is aware of several approaches that could be used for this purpose. After carefully considering the characteristics of the company and its competitors, he believes the company will have extraordinary growth for the next few years and normal growth thereafter. So, he has concluded that a two-stage DDM is the most appropriate for valuing the stock.

Talisman pays semi-annual dividends. The total dividends during 2006, 2007, and 2008 have been C\$0.114, C\$0.15, and C\$0.175, respectively. These imply a growth rate of 32 percent in 2007 and 17 percent in 2008. Dobson believes that the growth rate will be 14 percent in the next year. He has estimated that the first stage will include the next eight years.

Dobson is using the CAPM to estimate the required return on equity for Talisman. He has estimated that the beta of Talisman, as measured against the S&P/TSX Composite Index (formerly TSE 300 Composite Index), is 0.84. The Canadian risk-free rate, as measured by the annual yield on the 10-year government bond, is 4.1 percent. The equity risk premium for the Canadian market is estimated at 5.5 percent. Based on these data, Dobson has estimated that the required return on Talisman stock is $0.041 + 0.84(0.055) = 0.0872$ or 8.72 percent. Dobson is doing the analysis in January 2009 and the stock price at that time is C\$17.

Dobson realizes that even within the two-stage DDM, there could be some variations in the approach. He would like to explore how these variations affect the valuation of the stock. Specifically, he wants to estimate the value of the stock for each of the following approaches separately.

- I. The dividend growth rate will be 14 percent throughout the first stage of eight years. The dividend growth rate thereafter will be 7 percent.
 - II. Instead of using the estimated stable growth rate of 7 percent in the second stage, Dobson wants to use his estimate that eight years later Talisman's stock will be worth 17 times its earnings per share (trailing P/E of 17). He expects that the earnings retention ratio at that time will be 0.70.
 - III. In contrast to the first approach above in which the growth rate declines abruptly from 14 percent in the eighth year to 7 percent in the ninth, the growth rate would decline linearly from 14 percent in the first year to 7 percent in the ninth.
- 22 What is the terminal value of the stock based on the first approach?
- A C\$17.65.
 - B C\$31.06.
 - C C\$33.09.
- 23 In the first approach, what proportion of the total value of the stock is represented by the value of second stage?
- A 0.10.
 - B 0.52.
 - C 0.90.
- 24 What is the terminal value of the stock based on the second approach (earnings multiple)?
- A C\$12.12.
 - B C\$28.29.
 - C C\$33.09.
- 25 What is the current value of the stock based on the second approach?
- A C\$16.24.
 - B C\$17.65.
 - C C\$28.29.
- 26 Based on the third approach (the H-model), the stock is:
- A undervalued.
 - B fairly valued.

C overvalued.

- 27 Dobson is wondering what the consequences would be if the duration of the first stage was assumed to be 11 years instead of 8, with all the other assumptions/estimates remaining the same. Considering this change, which of the following is true?
- A In the second approach, the proportion of the total value of the stock represented by the second stage would not change.
 - B The total value estimated using the third approach would increase.
 - C Using this new assumption and the first approach will lead Dobson to conclude that the stock is overvalued.

The following information relates to Questions 28–36

Gianna Peters is an investment analyst who focuses on dividend-paying stocks. Peters uses a discounted cash flow (DCF) approach to stock selection. She is meeting with her staff to evaluate portfolio holdings based on a bottom-up screening of stocks listed in the United State and Canada. Peters and her staff begin by reviewing the characteristics of the following portfolio candidates.

Company ABC

A Canadian company in the consumer staples sector with a required rate of return of 7.35%. Recent media reports suggest that ABC might be a takeover candidate. Peters and her team estimate that if the incumbent Canadian prime minister's party retains its power, the company's current annual dividend of C\$0.65 per share will grow 12% a year for the next four years and then stabilize at a 3.5% growth rate a year indefinitely. However, if a new government takes office in Canada, then the team estimates that ABC will likely not experience the elevated 12% short-run growth because of new regulatory and tax changes, and instead will grow by 3.5% indefinitely.

Company XYZ

A mid-sized US company in the utilities sector with a required rate of return of 10%. Peters and her team believe that because of a recent restructuring, the company is unlikely to pay dividends for the next three years. However, the team expects XYZ to pay an annual dividend of US\$1.72 per share beginning four years from now. Thereafter, the dividend is expected to grow indefinitely at 4% even though the current price implies a growth rate of 6% during this same period.

Company JZY

A large US company in the telecom sector with a required rate of return of 8%. The stock is currently trading at US\$32.76 per share with an implied earnings growth rate of 5.3%. Peters believes that because JZY is mature and has a stable capital structure, the company will grow at its sustainable growth rate. Over the past 10 years, the company's return on equity (ROE) has averaged 8.17% and its payout ratio has averaged 40%. Recently, the company paid an annual dividend of US\$0.84 per share.

Peters asks a newly hired analyst, Kurt Thomas, to comment on the evaluation approach for these three stocks. Thomas makes the following statements:

- 1 A free cash flow valuation model would not be appropriate to evaluate Company ABC if the firm becomes a takeover candidate.
- 2 A dividend discount model cannot be applied to Company XYZ if dividends are suspended for a few years.
- 3 A dividend discount model is suitable for evaluating the stock of Company JZY because of the historically consistent payout ratio.

Peters then asks the team to examine the growth opportunities of three Canadian stocks currently held in the portfolio. These stocks are listed in Exhibit 1. Peters believes that the stocks are fairly valued.

Exhibit 1 Selected Stock Characteristics

Stock	Required Rate of Return	Next Year's Forecasted EPS (C\$)	Current Price per Share (C\$)
ABTD	10.5%	7.30	80.00
BKKQ	8.0%	2.12	39.00
CPMN	12.0%	1.90	27.39

- 28 Which of the following statements made by Thomas is *correct*?
 - A Statement 1
 - B Statement 2
 - C Statement 3
- 29 Assuming the incumbent government retains office in Canada, Peters and her team estimate that the current value of Company ABC stock would be *closest* to:
 - A C\$22.18.
 - B C\$23.60.
 - C C\$25.30.
- 30 Assuming a new government takes office in Canada, Peters and her team estimate that the current intrinsic value of Company ABC would be *closest* to:
 - A C\$9.15.
 - B C\$16.88.
 - C C\$17.47.
- 31 Assume that a new government takes office in Canada. If Peters and her team use the Gordon growth model and assume that Company ABC stock is fairly valued, then which of the following would *most likely* be true?
 - A The total return of ABC stock will be 10.85%.
 - B The dividend yield of ABC stock will be 3.85%.
 - C The stock price of ABC will grow at 7.35% annually.
- 32 If the team uses the dividend discount model, the current intrinsic value of Company XYZ stock would be *closest* to:
 - A US\$19.58.
 - B US\$20.36.

- C US\$21.54.
- 33 The dividend growth rate implied in the stock price of Company XYZ suggests that XYZ's stock price is *most likely*:
- A undervalued.
 - B fairly valued.
 - C overvalued.
- 34 Based on the relationship between the implied growth rate and the sustainable growth rate, Peters' team should conclude that Company JZY's stock price is *most likely*:
- A undervalued.
 - B fairly valued.
 - C overvalued.
- 35 Based on Exhibit 1, the stock with the largest present value of growth opportunities (PVGO) is:
- A ABTD.
 - B BKKQ.
 - C CPMN.
- 36 Based on Exhibit 1, the growth component of the leading P/E is largest for:
- A ABTD.
 - B BKKQ.
 - C CPMN.

The following information relates to Questions 37–46

June Withers is analyzing four stocks in the processed food industry as of 31 December 2017. All stocks pay a dividend at the end of each year.

Ukon Corporation

Withers estimates a required rate of return for Ukon Corporation of 8% and notes that the dividend for 2017 was EUR 2.315 per share. Her first valuation approach is a basic two-stage dividend discount model (DDM), with dividends growing at a rate of 5% from 2018 through 2021, after which time dividends will grow at a sustainable rate of 3%. Her second valuation approach is the H-model, assuming that dividend growth of 5% in 2018 declines linearly during the years 2019 through 2021 to the 3% growth rate after 2021. Her dividend growth assumptions are summarized in Exhibit 1.

Exhibit 1 Ukon Corporation Dividend Growth Assumptions, by Model

Model	Time Period	Rate
Two-stage DDM	2018 through 2021	5%
	Beginning 2022	3%

Exhibit 1 (Continued)

Model	Time Period	Rate
H-model	2018	5%
	2019 through 2021	Declining linearly to 3.5%
	Beginning 2022	3%

Venus Company

Withers has assembled the data on Venus Company in Exhibit 2. After analyzing competitive pressures and financial conditions in the industry, she predicts that Venus Company will lose market share because of new entrants, but will stabilize within a few years. The required rate of return for Venus Company is 8%. Beginning with a per share dividend of USD 3.15 in 2017, she develops two scenarios regarding the growth of dividends of Venus Company. The scenarios are in Exhibit 2 and are summarized as follows:

- In Scenario 1, the growth rate will fall in a linear manner over the years 2018 through 2021 from 8% to 4%. Using the H-model, she calculates a value of USD 58.79 per share of Venus Company stock.
- In Scenario 2, the growth rate falls from 8% in 2017 to 6% in 2018 and 2019, to 5% in 2020 and 2021, and then to a sustainable rate of 3% for 2022 and beyond.

Exhibit 2 Venus Company Dividend Growth Scenarios

Scenarios	Time Period	Rate
Scenario 1	2018 through 2021	Declining linearly to 4%
	Beginning 2022	Remaining stable at 4%
Scenario 2	2018 and 2019	6%
	2020 and 2021	5%
	Beginning 2022	Remaining stable at 3%

Wakuni Corporation

Withers evaluates Wakuni Corporation and uses recent financial data from Exhibit 3 to calculate a sustainable growth based on the DuPont model. In addition to this estimate, she performs a sensitivity analysis on the sustainable growth rate whereby the dividend payout ranges from 0% to 10% and the return on equity ranges from 8% to 12%.

Exhibit 3 Selected Data for Wakuni Corporation (JPY billions)

Net income	43,923
Sales	423,474
Total assets, average during year	486,203
Shareholders' equity, beginning of year	397,925
Dividends paid	1,518

Xavier Corporation

In her analysis of the stock of Xavier Corporation, Withers observes that it has a dividend of USD 2 per share and a stock price of USD 52. Two analyst interns have offered estimates of the company's required rate of return and dividend growth rate, as shown in Exhibit 4.

Exhibit 4 Xavier Corporation Required Rate of Return and Dividend Growth Rates (Estimates)

	Intern 1	Intern 2
Required rate of return	8.3%	7.8%
Growth rate, first four years	5.0%	4.8%
Growth rate, beyond first four years	3.6%	4.0%

- 37 Based on Exhibit 1, when Withers applies the first valuation approach to Ukon Corporation, the estimated value of the stock at the end of the first stage represents the:
- A present value of the dividends beyond year 2021.
 - B present value of the dividends for years 2018 through 2021.
 - C sum of the present value of the dividends for 2018 through 2021 and the present value of dividends beyond year 2021.
- 38 Using her first valuation approach and Exhibit 1, Withers's forecast of the per share stock value of Ukon Corporation at the end of 2017 should be *closest to*:
- A EUR 48.
 - B EUR 50.
 - C EUR 51.
- 39 Using Withers's assumptions for the H-model and the basic two-stage dividend discount model, the forecasted Ukon stock price at the end of the year 2021 for the H-model should be:
- A lower than the basic two-stage model.
 - B the same as the basic two-stage model.
 - C higher than the basic two-stage model.
- 40 Under her Scenario 1 and based on Exhibit 2, the required rate of return that Withers used for Venus Company stock valuation is *closest to*:
- A 8.0%.
 - B 9.6%.
 - C 10.0%.
- 41 Under Scenario 2 and based on Exhibit 2, Withers estimates that the value of the Venus Company stock to be *closest to*:
- A USD 69.73.
 - B USD 71.03.
 - C USD 72.98.
- 42 Using the data in Exhibit 3, Withers can estimate the sustainable growth of the Wakuni Corporation as being *closest to*:

- A 10.66%.
 - B 11.04%.
 - C 14.05%.
- 43 Withers's sensitivity analysis of Wakuni Corporation should produce a range of sustainable growth estimates between:
- A 0.0% and 1.2%.
 - B 7.2% and 12.0%.
 - C 8.0% and 13.3%.
- 44 Based on Exhibit 4 and Intern 1's analysis, Xavier Corporation's sustainable dividend payout ratio is *closest* to:
- A 43.4%.
 - B 44.6%.
 - C 56.6%.
- 45 Based on Exhibit 4, Intern 2 should conclude that the Xavier stock is:
- A underpriced.
 - B fairly priced.
 - C overpriced.
- 46 Based on Exhibit 4 and Intern 1's estimate of the required rate of return and the dividend growth rate for the first four years, the growth rate beyond the first four years consistent with the current price of USD 52 is *closest* to:
- A 3.80%.
 - B 4.17%.
 - C 4.23%.
-

The following information relates to Questions 47–53

BJL Financial provides clients with professional investment management services that are tailored to the specific needs of each client. The firm's portfolio manager, Angelique Kwaza, has called a meeting with the senior analyst, Samira Khan, to discuss the quarterly rebalancing of three client portfolios. The valuation model used in the analyses is the discounted dividend model.

- Client 1 has a portfolio with significant exposure to dividend-paying stocks.
- Client 2 is interested in including preferred stock in the portfolio.
- Client 3 has a growth-oriented equity-only portfolio.

Khan has identified two utilities (ABC and XYZ) for possible inclusion in Client 1's portfolio, as shown in Exhibit 1. She uses a discount rate of 7% for both common stocks.

Exhibit 1 Candidate Stocks for Client 1

Stocks	Company Description
ABC	<ul style="list-style-type: none"> ■ ABC is a publicly traded utility with an expected constant growth rate for earnings and dividends of 3.5%. ■ The most recent year's dividend payout is 70%. The expected dividend payout in future years is 60%. ■ The common stock price is \$14.49 per share.
XYZ	<ul style="list-style-type: none"> ■ XYZ is a publicly traded utility with several nonregulated business subsidiaries. ■ The company generates 3% growth in dividends and has an annual dividend payout of 80%. No changes in dividend growth or payout are expected. ■ The common stock price is \$10 per share. ■ The current year earnings are \$0.45 per share, and next year's earnings are expected to be \$0.50 per share.

Kwaza asks Khan to investigate the most appropriate models for valuing utility companies. She tells Khan about the following points mentioned in various research reports on the utilities sector.

Report 1: A resurgence in domestic manufacturing activity will generate long-term growth in earnings and dividends that exceeds the cost of equity.

Report 2: Share repurchases are expected to increase. The report expresses confidence in the forecasts regarding the magnitude and timing of these repurchases.

Report 3: The report forecasts earnings growth of 4.5%. The key growth drivers are increases in population and business creation associated with stable GDP growth of 2.75%.

For Client 2's portfolio, Khan has identified the non-callable perpetual preferred stocks of Standard Company and Main Company.

- The Standard Company's preferred stock pays 2.75% on a par value of \$100. Khan believes it to be fairly valued at a market price of \$49.60.
- The perpetual preferred stock of Main Company has a par value of \$50 per share and pays an annual dividend of 5.5%. Khan estimates a capitalization rate at 6%. The current market price of Main Company preferred stock is \$42.

Finally, Khan has identified three stocks, shown in Exhibit 2, as likely candidates for Client 3's portfolio.

Exhibit 2 Candidate Stocks for Client 3

Stocks	Company Description
BIOK	<ul style="list-style-type: none"> ■ BIOK is a profitable biotech firm that currently pays an annual dividend of \$1.20 per share. ■ The current annual dividend growth rate is 15%. ■ Patent protection runs out in eight years, after which dividend growth will likely decline at a steady rate over three years before stabilizing at a mature growth rate.
CCAX	<ul style="list-style-type: none"> ■ CCAX builds communication software for state and federal prisons and detention facilities. ■ The company is expected to hold its cash dividends steady at \$0.56 per share for six years as it builds out facilities and acquires properties. ■ Dividends are expected to grow at the nominal GDP growth rate after the next six years.
HLTV	<ul style="list-style-type: none"> ■ HLTV is a health care equipment and services firm that is expected to maintain a stable dividend payout ratio. ■ Earnings are forecast to grow over the next two years by 27% annually. ■ After that, earnings will likely grow by 12% annually for another 10 years before stabilizing at a mature growth rate.

- 47 Based on the Gordon growth model, the justified leading P/E for ABC stock is *closest* to:
- A 17.1.
B 17.7.
C 20.0.
- 48 Based on its justified leading P/E and the Gordon growth model, XYZ stock is:
- A undervalued.
B fairly valued.
C overvalued.
- 49 Which sector report *best* describes a situation in which the Gordon growth model could be used to value utility stocks?
- A Report 1
B Report 2
C Report 3
- 50 Based on Khan's estimate of the capitalization rate, Main Company's preferred stock is:
- A undervalued.
B fairly valued.
C overvalued.
- 51 The capitalization rate of the preferred stock of Standard Company is *closest* to:
- A 2.75%.
B 4.96%.
C 5.54%.
- 52 Based on Exhibit 2, which stock can most appropriately be valued using a three-stage DDM with the second and third stages being treated as an H-model?

- A BLOK
 - B CCAX
 - C HLTV
- 53 Which of the following models is *most* appropriate for valuing HLTV?
- A H-model
 - B Three-stage DDM
 - C Gordon growth model

SOLUTIONS

- 1 Both companies are dividend-paying and have an established history of dividend payments that can provide some help in forecasting future dividends. In the case of GE, EPS has been increasing steadily from 2000 to 2007 and DPS has shown increases consistent with this trend. For example, EPS increased by \$0.23 from 2005 to 2006 and DPS increased by \$0.12. Then EPS increased by \$0.18 from 2006 to 2007 and DPS increased by \$0.12. The payout ratios have also been increasing gradually during the period examined. Dividends appear to be at least somewhat predictable given earnings forecasts. Overall, the DDM seems to be an appropriate model for valuing GE. In the case of GM, however, dividends do not have a discernable relationship to the company's profitability. For example, DPS was \$2 in 2000 when GM was doing well and had an EPS of \$6.68, but DPS continued to be \$2 in 2005 when EPS was -\$18.50. The company continued to pay dividends in 2007, which was the third consecutive year of a negative EPS: in 2007, EPS had fallen to -\$68.45. The lack of a clear relationship of dividends to operating results suggests that the DDM is not appropriate for valuing GM.
- 2 A Discounting the expected dividend of £5 in 2010 and the expected stock price of £250 at the end of 2010,

$$V_1 = \frac{D_2 + P_2}{(1 + r)^1} = \frac{5 + 250}{(1 + 0.11)^1} = \frac{255}{1.11} = 229.73$$

- B One way to answer this question is to use a DDM for two holding periods. Accordingly, discounting the expected dividend of £5 in 2010 and the expected stock price of £250 at the end of 2010 for two periods, and discounting the expected dividend of £4 in 2009 for one period,

$$\begin{aligned} V_0 &= \frac{D_1}{(1 + r)^1} + \frac{D_2 + P_2}{(1 + r)^2} = \frac{4}{(1 + 0.11)^1} + \frac{5 + 250}{(1 + 0.11)^2} \\ &= \frac{4}{1.11} + \frac{255}{1.11^2} = 3.60 + 206.96 = 210.57 \end{aligned}$$

based on full precision, or £210.56 with intermediate rounding. Another way to answer this question is to use the answer to Part A and a DDM for one holding period. Accordingly, discounting the expected dividend of £4 in 2009 and the expected stock price of £229.73 at the end of 2009 for one period,

$$V_0 = \frac{D_1 + V_1}{(1 + r)^1} = \frac{4 + 229.73}{(1 + 0.11)^1} = \frac{233.73}{1.11} = 210.57$$

- 3 A The growth rate from 2005 to 2007 is $(15.50/9)^{1/2} - 1 = 0.312$ or 31.2 percent. The consensus predicted growth rate from 2007 to 2009 is $(20.20/15.50)^{1/2} - 1 = 0.142$ or 14.2 percent. Thus, the consensus forecast is for a sharp decline in the dividend growth rate for 2008 to 2009.
- B Half of the growth rate computed in Part A = $14.2/2 = 7.1$ percent. Based on this growth rate, $D_1 = £15.50(1.071) = £16.60$, rounded. Using the Gordon growth model,

$$V_0 = \frac{D_1}{r - g} = \frac{16.60}{0.11 - 0.071} = 425.64$$

or 425.65 based on not rounding the numerator.

- C** The estimated value of BSY would decrease as r increases and increase as g increases, all else equal.
- 4** Applying the Gordon growth model with the assumed 5.9 percent dividend growth rate results in an estimated value of \$12,435.7 billion for the S&P 500 Index.

$$V_0 = \frac{D_1}{r - g} = \frac{246.6(1 + 0.059)}{0.08 - 0.059} = \$12,435.7 \text{ billion}$$

- 5** The preferred stock pays 4.5 percent of \$100 or \$4.50 in annual dividends. The dividend is fixed; so $g = 0$. Therefore, using the Gordon growth model with zero growth,

$$V_0 = \frac{D_1}{r} = \frac{4.50}{0.056} = \$80.36$$

- 6** This problem can be addressed using the Gordon growth model with constant expected negative growth. The estimated value of the stock is

$$V_0 = \frac{D_1}{r - g} = \frac{4}{0.11 - (-0.08)} = 21.05$$

- 7** Using the CAPM, the required rate of return on Maspeth Robotics shares is 4 percent + 1.2(5%) = 10 percent. Therefore, the constant dividend growth rate implied by a market price of €24 is 5.6 percent as shown below:

$$\begin{aligned} V_0 &= \frac{D_0(1 + g)}{r - g} \\ 24 &= \frac{1.00(1 + g)}{0.10 - g} \\ 2.4 - 24g &= 1.00 + g \\ 25g &= 1.4 \\ g &= 0.056 \text{ or } 5.6 \text{ percent} \end{aligned}$$

- 8 A** With $b = 0.60$, the dividend payout ratio = $1 - b = 1 - 0.60 = 0.40$. Sustainable growth rate $g = b(\text{ROE}) = 0.60(0.14) = 0.084$ or 8.4 percent.
- B** The company paid a dividend per share of $1 - b(\text{EPS}) = 0.40(\$2) = \$0.80$ in 2008. The estimated value at the beginning of 2009 is

$$V_0 = \frac{D_1}{r - g} = \frac{0.80(1 + 0.0840)}{0.1100 - 0.0840} = \$33.35$$

- C** If the company was a no-growth company, that is it paid out all its earnings and did not reinvest any, its earnings would stay the same. The value of such a company would be the value of a perpetuity, which is $D/r = E/r = \$2/0.11 = \18.18 . This amount is the no-growth value per share. So, $\text{PVGO} = \$33.35 - \$18.18 = \$15.17$.
- D** The fraction of the company's value that comes from its growth opportunities is $15.17/33.35 = 0.4549$ or 45.49 percent.

- 9 The payout ratio is $A\$0.70/A\$2.00 = 0.35 = 1 - b$, where b is the earnings retention ratio. Therefore, the justified trailing P/E based on fundamentals is 10.45, as shown below:

$$\begin{aligned}\frac{P_0}{E_0} &= \frac{(1-b)(1+g)}{r-g} \\ &= \frac{0.35(1+0.045)}{0.08-0.045} \\ &= 10.45\end{aligned}$$

Because the market trailing P/E of 14 is greater than 10.45, Stellar Baking Company shares appear to be overvalued (i.e., selling at a higher than warranted P/E).

- 10 The dividends in Stages 2 and 3 can be valued with the H-model, which estimates their value at the beginning of Stage 2. In this case, V_6 would capture the value of Stages 2 and 3 dividends. V_6 would then be discounted to the present. Also, the present values of dividends D_1 through D_6 need to be added to the present value of V_6 .

$$V_6 = \frac{D_6(1 + g_L) + D_6H(g_S - g_L)}{r - g_L}$$

where

$$D_6 = D_0(1 + g_S)^6 = 9(1.14)^6 = 19.7548$$

$$r = 0.16$$

$$H = 10/2 = 5$$

$$g_S = 0.14$$

$$g_L = 0.10$$

$$V_6 = \frac{19.7548(1.10) + 19.7548(5)(0.14 - 0.10)}{0.16 - 0.10} = 428.02$$

$$\text{PV of } V_6 = 428.02 / 1.16^6 = 175.68$$

$$\text{PV of } D_1 = 9(1.14) / 1.16 = 8.8448$$

$$\text{PV of } D_2 = 9(1.14)^2 / 1.16^2 = 8.6923$$

$$\text{PV of } D_3 = 9(1.14)^3 / 1.16^3 = 8.5425$$

$$\text{PV of } D_4 = 9(1.14)^4 / 1.16^4 = 8.3952$$

$$\text{PV of } D_5 = 9(1.14)^5 / 1.16^5 = 8.2504$$

$$\text{PV of } D_6 = 9(1.14)^6 / 1.16^6 = 8.1082$$

$$\begin{aligned}\text{Value of stock} &= 8.8448 + 8.6923 + 8.5425 + 8.3952 + 8.2504 + 8.1082 + \\ &\quad 175.68 = \text{Rs. } 226.51\end{aligned}$$

- 11 A Let r be the required rate of return. Also let $t = 0$ indicate the middle of 2008. Because the dividend growth rate becomes constant from the middle of 2011 ($t = 3$), the value of the mature phase can be expressed as

$$V_3 = D_4 / (r - g) = D_4 / (r - 0.08)$$

Also,

$$D_1 = 0.27(1.10) = 0.2970$$

$$D_2 = 0.27(1.10)^2 = 0.3267$$

$$D_3 = 0.27(1.10)^3 = 0.3594$$

$$D_4 = D_3(1.08) = 0.3594(1.08) = 0.3881$$

V_0 can be expressed as

$$\begin{aligned} V_0 = 9.74 &= \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{V_3}{(1+r)^3} \\ &= \frac{0.2970}{1+0.12} + \frac{0.3267}{(1+0.12)^2} + \frac{0.3594}{(1+0.12)^3} + \frac{0.3881}{(0.12-0.08)(1+0.12)^3} \\ &= 0.2652 + 0.2604 + 0.2558 + 6.9064 \\ \text{A\$} &= 7.69 \end{aligned}$$

- B** Because ANN's estimated value of A\$7.69 is less than the market price of A\$9.74, ANN appears to be overvalued at the market price.
- 12 A** Use the H-model expression, with $H = 6/2 = 3$ and long-term and short-term dividend growth rates of 0.05 and 0.10, respectively, which gives an expected return of 7.4 percent as shown below:

$$\begin{aligned} r &= \left(\frac{D_0}{P_0} \right) [(1 + g_L) + H(g_S - g_L)] + g_L \\ &= 0.02[(1 + 0.05) + 3(0.10 - 0.05)] + 0.05 \\ &= 0.024 + 0.05 \\ &= 0.074 \end{aligned}$$

- B** In this case the long- and short-term dividend growth rates are identical and the expected return is lower:

$$\begin{aligned} r &= \left(\frac{D_0}{P_0} \right) [(1 + g_L) + H(g_S - g_L)] + g_L \\ &= 0.02[(1 + 0.05) + 3(0.05 - 0.05)] + 0.05 \\ &= 0.021 + 0.05 \\ &= 0.071 \end{aligned}$$

It is intuitive that a higher dividend growth rate is associated with a higher expected return if all the other facts (such as the assumed required rate of return) are held constant.

- 13 A** The formula for sustainable growth rate is

$$g = (b \text{ in the mature phase}) \times (\text{ROE in the mature phase})$$

Because the dividend payout ratio in the mature phase is estimated to be 40 percent or 0.40, the retention ratio b is expected to be $1 - 0.40 = 0.60$. Therefore, given the 11 percent per year forecasted ROE,

$$g = 0.60(11\%) = 6.6\%$$

- B** Based on the formula for sustainable growth rate, as b increases, growth rate increases, holding all else constant. However, all else may not be constant. In particular, the return accruing to additional investments may be lower,

leading to a lower overall ROE. If that is the case and Brother lowers the payout ratio to below 0.40 (thus increasing b to above 0.60), ROE would be expected to decline, which may lead to a lower growth rate.

- 14 A** The four components of PRAT are computed for 2007 as follows:

$$P \text{ (Profit margin)} = \text{NI/Sales} = 18,688/214,091 = 0.0873$$

$$\begin{aligned} R \text{ (Retention)} &= b = (\text{EPS} - \text{DPS})/\text{EPS} = (8.77 - 2.26)/8.77 \\ &= 0.7423 \end{aligned}$$

$$\begin{aligned} A \text{ (Asset turnover)} &= \text{Sales/Average total assets} \\ &= 214,091/0.5(148,786 + 132,628) = 1.5215 \end{aligned}$$

$$\begin{aligned} T \text{ (Leverage)} &= \text{Average total assets/Average shareholders' equity} \\ &= (148,786 + 132,628)/(77,088 + 68,935) = 1.9272 \end{aligned}$$

The components are similarly computed for the other years and summarized in the following table. Their average values are also included.

Item	Needed for Solution to B	Solution to A		
	Average	2007	2006	2005
P (Profit margin)	0.0812	0.0873	0.0836	0.0728
R (Retention)	0.7390	0.7423	0.7423	0.7324
A (Asset turnover)	1.6250	1.5215	1.5855	1.7681
T (Leverage)	1.9736	1.9272	1.9638	2.0299

- B** Using the average values for each component,

$$g = \text{PRAT} = (0.0812)(0.7390)(1.6250)(1.9736) = 0.1924 \text{ or } 19.2 \text{ percent}$$

The sustainable growth rate for Chevron based on the PRAT expression is 19.2 percent.

- C** Given that the high value of g does not seem sustainable indefinitely, it appears that the company has not reached the mature phase yet.

- 15 A** The following table provides the details from the spreadsheet model. The constant growth rate after Year 4 is 2 percent less than that in Year 4. So,

$$g = 0.1180 - 0.0200 = 0.098 \text{ or } 9.8 \text{ percent.}$$

$$V_4 = D_4(1 + g)/(r - g) = 1.80(1.098)/(0.13 - 0.098) = \$61.76$$

Year	1	2	3	4
Sales (\$ millions)	300.00	345.00	396.75	436.43
EBIT	51.00	58.65	67.45	74.19
Interest (\$ millions)	10.00	10.00	10.00	10.00
EBT	41.00	48.65	57.45	64.19
Taxes (30%)	12.30	14.60	17.23	19.26
Net income	28.70	34.06	40.21	44.93
Dividends	11.48	13.62	16.09	17.97
DPS	1.15	1.36	1.61	1.80
Growth rate of DPS		18.26%	18.38%	11.80%
PV of DPS	1.02	1.07	1.12	1.10
$V_4 = D_4(1 + g)/(r - g)$				61.76
PV of V_4				\$37.87

- B** $V_0 = \text{Sum of PV of DPS and PV of } V_4 = 1.02 + 1.07 + 1.12 + 1.10 + 61.76 / (1 + 0.13)^4 = \42.18
- C** The following table provides the details if the sales growth rate in Year 3 is 10 percent:

Year	1	2	3	4
Sales (\$ millions)	300.00	345.00	379.50	417.45
EBIT	51.00	58.65	64.52	70.97
Interest (\$ millions)	10.00	10.00	10.00	10.00
EBT	41.00	48.65	54.52	60.97
Taxes (%)	12.30	14.60	16.35	18.29
Net income	28.70	34.06	38.16	42.68
Dividends	11.48	13.62	15.26	17.07
DPS	1.15	1.36	1.53	1.71
Growth rate of DPS		18.26%	12.50%	11.76%
PV of DPS	1.02	1.07	1.06	1.05
$V_4 = D_4(1 + g)/(r - g)$				57.93
PV of V_4				\$35.53

$$\begin{aligned}
 V_0 &= \text{Sum of PV of DPS and PV of } V_4 \\
 &= 1.02 + 1.07 + 1.06 + 1.05 + 35.53 \\
 &= \$39.73
 \end{aligned}$$

- 16** C is correct. Using the Gordon growth model,

$$V_0 = \frac{D_1}{r - g} = \frac{0.59(1 + 0.0530)}{0.1115 - 0.0530} = \$10.62$$

- 17** A is correct. The justified trailing P/E or P_0/E_0 is V_0/E_0 , where V_0 is the fair value based on the stock's fundamentals. The fair value V_0 computed earlier is \$10.62 and E_0 is \$2.12. So, the justified trailing P/E is $10.62/2.12 = 5.01$.
- 18** A is correct. Rae's estimate of the intrinsic value is \$10.62. So, the band Rae is looking at is $\$10.62 \pm 0.10(\$10.62)$, which runs from $\$10.62 + \$1.06 = \$11.68$ on the upside to $\$10.62 - \$1.06 = \$9.56$ on the downside. Because \$8.42 is below \$9.56, Rae would consider Tasty Foods to be undervalued.
- 19** B is correct. Using a beta of 1.25, Rae's estimate for the required return on equity for Tasty Foods is $0.04 + 1.25(0.065) = 0.1213$ or 12.13 percent. The estimated value of the stock is

$$V_0 = \frac{D_1}{r - g} = \frac{0.59 \times (1 + 0.0530)}{0.1213 - 0.0530} = \$9.10$$

- 20** A is correct. The price of the stock is \$8.42. If this price is also the fair value of the stock,

$$\begin{aligned}
 V_0 &= 8.42 = \frac{D_1}{r - g} = \frac{0.59 \times (1 + g)}{0.1115 - g} \\
 0.9388 - 8.42g &= 0.59 + 0.59g \\
 9.01g &= 0.3488 \\
 g &= 0.0387 \text{ or } 3.87 \text{ percent}
 \end{aligned}$$

- 21 A is correct. If the stock is fairly priced in the market as per the Gordon growth model, the stock price is expected to increase at g , the expected growth rate in dividends. The implied growth rate in dividends, if price is the fair value, is 3.87 percent. Therefore, the expected capital gains yield is 3.87 percent.
- 22 B is correct. The following table provides the calculations needed to compute the value of the stock using the first approach, including the calculations for the terminal value V_8 . As the table shows, the terminal value $V_8 = \text{C\$}31.0550$.

Time	Value	Calculation	D_t or V_t	Present Values $D_t/(1.0872)^t$ or $V_t/(1.0872)^t$
1	D_1	$\text{C\$}0.175(1.14)$	$\text{C\$}0.1995$	$\text{C\$}0.1835$
2	D_2	$0.175(1.14)^2$	0.2274	0.1924
3	D_3	$0.175(1.14)^3$	0.2593	0.2018
4	D_4	$0.175(1.14)^4$	0.2956	0.2116
5	D_5	$0.175(1.14)^5$	0.3369	0.2218
6	D_6	$0.175(1.14)^6$	0.3841	0.2326
7	D_7	$0.175(1.14)^7$	0.4379	0.2439
8	D_8	$0.175(1.14)^8$	0.4992	0.2557
8	V_8	$0.175(1.14)^8(1.07)/(0.0872 - 0.07)$	31.0550	15.9095
Total				$\text{C\$}17.6528$

- 23 C is correct. As shown in the above table, the value of the second stage = PV of $V_8 = \text{C\$}15.9095$. The total value is $\text{C\$}17.6528$. As a proportion, the second stage represents $15.9095/17.6528 = 0.90$ of the total value.
- 24 B is correct.

$$V_8/E_8 = 17$$

$$D_8/E_8 = 1 - 0.70 = 0.30$$

From the table with the calculation details for the solution to Problem 22, $D_8 = \text{C\$}0.4992$. So, $0.4992/E_8 = 0.30$, which means that $E_8 = 0.4992/0.30 = 1.6640$.

$$V_8/E_8 = 17 \text{ implies that } V_8/1.6640 = 17, \text{ which gives } V_8 = 17(1.6640) = \text{C\$}28.2880.$$

- 25 A is correct. As computed earlier, $V_8 = 17(1.6640) = \text{C\$}28.2880$.

$$\text{PV of } V_8 = 28.2880/1.0872^8 = 14.4919$$

From the table with the calculation details for the solution to Problem 22,

$$\text{Sum of PV of } D_1 \text{ through } D_8 = 1.7433$$

So, the value of stock $V_0 = 14.4919 + 1.7433 = \text{C\$}16.2352$.

- 26 C is correct. Using the H-model

$$V_0 = \frac{D_0(1 + g_L) + D_0H(g_S - g_L)}{r - g_L}$$

where

$$D_0 = 0.175$$

$$r = 0.0872$$

$$H = 4$$

$$\begin{aligned}
 g_S &= 0.14 \\
 g_L &= 0.07 \\
 V_0 &= \frac{0.175(1.07) + 0.175(4)(0.14 - 0.07)}{0.0872 - 0.07} = 13.7355
 \end{aligned}$$

The market price is C\$17, which is greater than C\$13.7355. So, the stock is overvalued in the market.

- 27** B is correct. If the extraordinary growth rate of 14 percent is expected to continue for a longer duration, the stock's value would increase. Choice A is false because given that the first stage is longer (11 years instead of 8), the terminal value is being calculated at a later point in time. So, its present value would be smaller. Moreover, the first stage has more years and contributes more to the total value. Overall, the proportion contributed by the second stage would be smaller. Choice C is false because the intrinsic value of the stock would be higher and the appropriate conclusion would be that the stock would be undervalued to a greater extent based on the first approach.
- 28** C is correct. A dividend discount model is especially useful when dividend policy bears an understandable and consistent relationship to the company's profitability. The relatively consistent dividend payout ratio suggests Company JZY would be a suitable candidate for a dividend discount model.
- 29** B is correct. The value of ABC stock can be computed as follows:

Given: Dividend (D_0) = C\$0.65, Return (r) = 7.35%, Short-term growth (g_S) = 12% for 4 years, Long-term growth (g_L) = 3.5% thereafter.

Then:

$$\begin{aligned}
 D_1 &= D_0(1 + g_S)^1 = 0.65(1.12) = \text{C\$}0.7280 \\
 D_2 &= D_0(1 + g_S)^2 = 0.65(1.12)^2 = \text{C\$}0.8154 \\
 D_3 &= D_0(1 + g_S)^3 = 0.65(1.12)^3 = \text{C\$}0.9132 \\
 D_4 &= D_0(1 + g_S)^4 = 0.65(1.12)^4 = \text{C\$}1.0228 \\
 P_4 &= [D_4(1 + g_L)]/(r - g_L) = [D_4(1.035)]/(0.0735 - 0.035) = \text{C\$}27.4960. \\
 V_0 &= D_1/(1 + r)^1 + \dots + D_4/(1 + r)^4 + P_4/(1 + r)^4. \\
 V_0 &= [0.7280/(1.0735)^1] + [0.8154/(1.0735)^2] + [0.9132/(1.0735)^3] + \\
 &\quad [1.0228/(1.0735)^4] + [27.4960/(1.0735)^4] \\
 &= \text{C\$}23.5984 \text{ (rounded to C\$}23.60\text{)}.
 \end{aligned}$$

- 30** C is correct. The value of ABC would be calculated using the Gordon growth model as follows:
- $$V_0 = [D_0(1 + g)]/(r - g) = [0.65(1.035)]/(0.0735 - 0.035) = \text{C\$}17.47.$$
- 31** B is correct. In the Gordon growth model, Total return = Dividend yield + Capital gains yield (i.e., constant growth rate). When a stock is fairly valued, the expected total return will equal the required return or discount rate (i.e., 7.35%). In the case of ABC, the total return is 7.35% and the capital gains yield is 3.5%. Therefore, the dividend yield is 7.35% - 3.5% = 3.85%
- 32** C is correct. The current value of XYZ stock would be calculated as follows:

$$V_0 = [P_3/(1 + r)^3], \text{ where } P_3 = D_4/(r - g).$$

Given $D_4 = 1.72$, $r = 10\%$, and $g = 4\%$,

$$V_0 = [1.72/(0.10 - 0.04)]/(1.10)^3 = \text{US\$}21.54.$$

- 33** C is correct. The dividend growth rate implied in the stock price of XYZ (i.e., 6%) is greater than the growth rate assumed by the analyst (i.e., 4%), suggesting that XYZ is overvalued.
- 34** C is correct. The sustainable growth rate of JZY stock = $g = \text{Retention ratio} \times \text{ROE} = 0.60 \times 0.0817 = 4.9\%$. JZY stock's implied growth rate of 5.3% is higher than the sustainable growth rate of 4.9%. Consequently, the stock is overvalued—that is, the intrinsic value of the stock will be less than its current market price.

The current intrinsic value of JZY stock is as follows:

$$\begin{aligned} V_0 &= [D_0(1 + g)] / (r - g) \\ &= [0.84 (1.0490)] / (0.08 - 0.0490) \\ &= \text{US\$}28.42 < \text{US\$}32.76. \end{aligned}$$

- 35** B is correct. BKKQ has the largest PVGO, which is calculated as follows:

$$\text{PVGO (ABTD)} = P_0 - E_1/r = 80.00 - [7.30/0.105] = \text{C\$}10.48,$$

$$\text{PVGO (BKKQ)} = P_0 - E_1/r = 39.00 - [2.12/0.08] = \text{C\$}12.50,$$

$$\text{PVGO (CPMN)} = P_0 - E_1/r = 27.39 - [1.90/0.12] = \text{C\$}11.56,$$

where P_0 is the current price per share, E_1 is the forecasted earnings per share, and r is the required rate of return.

- 36** C is correct. The leading P/E is calculated as follows:

$$P_0/E_1 = [1/r] + [\text{PVGO}/E_1],$$

where, $1/r$ captures the no-growth component of P/E and PVGO/E_1 captures the growth component of the P/E.

PVGO is computed as follows:

$$\text{PVGO (ABTD)} = P_0 - E_1/r = 80.00 - [7.30/0.105] = \text{C\$}10.48,$$

$$\text{PVGO (BKKQ)} = P_0 - E_1/r = 39.00 - [2.12/0.08] = \text{C\$}12.50,$$

$$\text{PVGO (CPMN)} = P_0 - E_1/r = 27.39 - [1.90/0.12] = \text{C\$}11.56,$$

where, P_0 is the current price per share, E_1 is the forecasted earnings per share, and r is the required rate of return.

The growth component of the P/E for each stock $[\text{PVGO}/E_1]$ is:

$$\text{ABTD: } 10.48/7.30 = 1.44\times$$

$$\text{BKKQ: } 12.50/2.12 = 5.90\times$$

$$\text{CPMN: } 11.56/1.90 = 6.08\times$$

- 37** A is correct because the estimated value of the stock at the end of the first stage of a basic two-stage DDM (terminal value) is the present value of all dividends beyond the first stage. The first stage is 2018 through 2021, and the second stage begins in 2022, so the terminal value (that is, the value of the stock at the end of 2021) is the present value of future dividends beyond 2021.
- 38** C is correct based on Withers's assumptions applied to the dividend valuation model.

The stock value as of the end of 2017 equals the present value of all future dividends in 2018 through 2021 plus the present value of the terminal value at the end of 2021. The forecasted stock value equals EUR 51.254:

Year	Dividend	Terminal Value	D_t or V_t	Present Value of D_t or V_t
2018	$2.315(1.05) = 2.431$		2.431	2.251
2019	$2.431(1.05) = 2.553$		2.553	2.189
2020	$2.553(1.05) = 2.681$		2.681	2.128
2021	$2.681(1.05) = 2.815$	57.980	60.795	44.686
2022	$2.815(1.03) = 2.899$			
Total				51.254

The terminal value at the end of 2021 is calculated using the dividend in the first year beyond the first stage, divided by the difference between the required rate of return and the growth rate in the second stage.

$$\text{Terminal value at end of 2021} = \frac{2.815(1.03)}{(0.08 - 0.03)} = 57.980$$

- 39 A is correct. During the first stage, the basic two-stage model has higher (i.e., 5%) growth than the H-model, in which growth is declining linearly from 5.0% to 3.5%. Higher growth rates result in higher forecasted dividends and stock prices at the beginning of the sustained growth phase. Because the long-term dividend growth rates are the same for both models, the difference in forecasted stock price arises from growth rate differences in the first stage.

Therefore, the dividend at the end of the first stage will be lower for the H-model than for the basic two-stage DDM, and the terminal value will be lower in the H-model than in the two-stage model. Specifically, the 2021 dividends will be 2.734 (i.e., $2.315 \times 1.05 \times 1.045 \times 1.04 \times 1.035$) for the H-model versus 2.815 [i.e., $2.315 \times (1.05)^4$] for the basic two-stage DDM.

- 40 C is correct, based on Exhibit 2 and the H-model.

Estimate the required rate of return using Equation 21:

$$r = \frac{D_0}{P_0} [(1 + g_L) + H(g_S - g_L)] + g_L$$

Substitute the following:

$$\begin{aligned} D_0 &= 3.15 \\ g_S &= 8\% \\ g_L &= 4\% \\ H &= 4 \div 2 = 2 \end{aligned}$$

The model thus produces

$$\begin{aligned} r &= \frac{3.15}{58.79} [(1 + 0.04) + 2(0.08 - 0.04)] + 0.04 \\ &= (0.053581 \times 1.12) + 0.04 \\ &= 0.060010 + 0.04 = 0.10001 \approx 10\% \end{aligned}$$

- 41 B is correct based on the present value of forecasted dividends. The dividend at the end of 2017, based on case material, is USD 3.15 per share.

Year	Dividend per Share, Prior Year	Growth Rate during Year	Dividend per Share, Current Year	Terminal Value	D_t or V_t	Present Value of D_t or V_t
2018	3.150	6%	3.339		3.339	3.092
2019	3.339	6%	3.539		3.539	3.034
2020	3.539	5%	3.716		3.716	2.950
2021	3.716	5%	3.902	80.381	84.283	61.951
					Total	71.027

$$\text{Terminal value at the end of 2021} = \frac{3.902(1.03)}{(0.08 - 0.03)} = 80.381$$

- 42 A is correct, based on the use of average total assets and beginning-of-year shareholders' equity.

$$g = \frac{\text{Net income} - \text{Dividends}}{\text{Net income}} \times \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Shareholders' equity}}$$

To calculate sustainable growth,

$$\begin{aligned}
 g &= \frac{43,923 - 1,518}{43,923} \times \frac{43,923}{423,474} \times \frac{423,474}{486,203} \times \frac{486,203}{397,925} \\
 &= 96.544\% \times 10.372\% \times 87.100\% \times 122.200\% \\
 &= 10.658\%
 \end{aligned}$$

- 43 B is correct because the sustainable growth is the product of the return on equity and the retention ratio. If the payout ratio ranges from 0% to 10%, the percentage of earnings retained by the firm ranges from 100% to 90%.

Sensitivity: Sustainable Growth Rates

Return on Equity	Retention Ratio	
	90%	100%
8%	7.2%	8.0%
12%	10.8%	12.0%

- 44 C is correct because it is based on the sustainable growth rate and the required rate of return:

$$\begin{aligned}
 \text{Sustainable growth rate} &= (b \text{ in mature phase}) \times (\text{Return on equity}) \\
 &= (1 - \text{Dividend payout}) \times (\text{Return on equity}) \\
 0.036 &= (1 - \text{Dividend payout}) \times 0.083
 \end{aligned}$$

Solving for the dividend payout ratio, the dividend payout = 56.627% \approx 56.6%.

- 45 A is correct. Intern 2 values Xavier stock at USD 56.372 per share, which is higher than the current price of USD 52.

$$D_1 = 2.000 \times (1.048)^1 = 2.096$$

$$D_2 = 2.000 \times (1.048)^2 = 2.197$$

$$D_3 = 2.000 \times (1.048)^3 = 2.302$$

$$D_4 = 2.000 \times (1.048)^4 = 2.413$$

$$D_5 = 2.000 \times (1.048)^4 \times 1.04 = 2.510$$

Value per share =

$$\begin{aligned} & \frac{2.096}{(1 + 0.078)^1} + \frac{2.197}{(1 + 0.078)^2} + \frac{2.302}{(1 + 0.078)^3} + \frac{2.413 + \frac{2.510}{(0.078 - 0.04)}}{(1 + 0.078)^4} \\ & = \text{USD } 56.372 \end{aligned}$$

- 46** B is correct. The candidate can arrive at the answer one of two ways. The first way is to use Equation 19 and solve for g_L :

$$P_0 = \left[\sum_{t=1}^n \frac{D_0(1 + g_S)^t}{(1 + r)^t} \right] + \left[\frac{D_0(1 + g_S)^n(1 + g_L)}{(1 + r)^n(r - g_L)} \right]$$

Insert the known values:

$$\begin{aligned} \text{USD } 52 &= \sum_{t=1}^4 \frac{2(1 + 0.05)^t}{(1 + 0.083)^t} + \frac{2(1 + 0.05)^4(1 + g_L)}{(1 + 0.083)^4(0.083 - g_L)} \\ &= 7.4089 + \frac{2.431(1 + g_L)}{1.37567(0.083 - g_L)} \end{aligned}$$

Solve for g_L :

$$g_L = 4.172\%.$$

Check:

$$7.4089 + \frac{2.431(1 + 0.04127)}{1.3757(0.083 - 0.04172)} = 7.4089 + 44.5830 \approx 52.00$$

The second way is to use Equation 19 and substitute the different choices to determine the value that produces a value of USD 52 per share:

$$\text{USD } 52 = \sum_{t=1}^4 \frac{2(1 + 0.05)^t}{(1 + 0.083)^t} + \frac{2(1 + 0.05)^4(1 + 0.0417)}{(1 + 0.083)^4(0.083 - 0.0417)}$$

- 47** A is correct. The justified leading P/E is calculated as

$$\frac{P_0}{E_1} = \frac{(1 - b)}{(r - g)}$$

where b is the retention ratio, $1 - b$ is the dividend payout ratio, r is the discount rate, and g is the long-term growth rate.

ABC's dividend payout rate, $1 - b$, is given as 0.60. For Company ABC, the justified leading P/E is

$$\frac{P_0}{E_1} = \frac{(1 - b)}{(r - g)} = \frac{(0.60)}{(0.07 - 0.035)} \approx 17.1$$

- 48** B is correct. The justified leading P/E is calculated as

$$\frac{P_0}{E_1} = \frac{(1 - b)}{(r - g)}$$

where b is the retention ratio, $1 - b$ is the dividend payout ratio, r is the discount rate, and g is the long-term growth rate.

The justified leading P/E is

$$\frac{P_0}{E_1} = \frac{0.8}{(0.07 - 0.03)} = 20$$

XYZ's actual leading P/E is

$$\frac{P_0}{E_1} = \frac{\$10}{\$0.50} = 20$$

Because the justified leading P/E equals the actual leading P/E, the stock is fairly valued.

- 49 B is correct because the Gordon growth model can accurately value companies that are repurchasing shares when the analyst can appropriately adjust the dividend growth rate for the impact of share repurchases.

- 50 A is correct. The value of a share of Main Company's preferred stock is

$$V_0 = \frac{D}{r} = \frac{\$50 \times 0.055}{0.06} = \frac{\$2.75}{0.06} = \$45.83$$

The current price of a share of Main Company's preferred stock is \$42, so the stock is currently undervalued.

- 51 C is correct. The value of non-callable fixed-rate perpetual preferred stock is calculated as

$$V_0 = \frac{D}{r} \rightarrow r = \frac{D}{V_0}$$

where D is the constant dividend per share and r is the discount rate. The discount rate of a perpetuity is often called the capitalization rate.

For Standard Company, the dividend is $D = 2.75\% \times \$100 = \2.75 .

Therefore,

$$r = \frac{\$2.75}{\$49.60} = 5.54\%$$

- 52 A is correct because the dividend growth is declining linearly during the second stage of a three-stage DDM used to value BIOC. As noted in the text, a three-stage valuation clearly has an H-model process in the second and third stages. In contrast, abrupt—rather than linearly declining—dividend growth rates are implied for CCAX and HLTV.
- 53 B is correct because HLTV is forecast to have three growth stages: the growth phase (2 years at 27%), the transition phase (10 years at 12%), and the mature phase. Because the earnings growth has three stages and the dividend payout ratio is stable, a three-stage DDM is appropriate.

PRACTICE PROBLEMS

- 1 Indicate the effect on this period's FCFF and FCFE of a change in each of the items listed here. Assume a \$100 increase in each case and a 40 percent tax rate.
 - A Net income.
 - B Cash operating expenses.
 - C Depreciation.
 - D Interest expense.
 - E EBIT.
 - F Accounts receivable.
 - G Accounts payable.
 - H Property, plant, and equipment.
 - I Notes payable.
 - J Cash dividends paid.
 - K Proceeds from issuing new common shares.
 - L Common shares repurchased.
- 2 LaForge Systems, Inc. has net income of \$285 million for the year 2008. Using information from the company's financial statements given here, show the adjustments to net income that would be required to find:
 - A FCFF.
 - B FCFE.
 - C In addition, show the adjustments to FCFF that would result in FCFE.

LaForge Systems, Inc. Balance Sheet (in Millions)

Years Ended 31 December	2007	2008
Assets		
Current assets		
Cash and equivalents	\$210	\$248
Accounts receivable	474	513
Inventory	520	564
Total current assets	1,204	1,325
Gross fixed assets	2,501	2,850
Accumulated depreciation	(604)	(784)
Net fixed assets	1,897	2,066
Total assets	\$3,101	\$3,391
Liabilities and shareholders' equity		
Current liabilities		
Accounts payable	\$295	\$317
Notes payable	300	310
Accrued taxes and expenses	76	99

(Continued)

Years Ended 31 December	2007	2008
Total current liabilities	671	726
Long-term debt	1,010	1,050
Common stock	50	50
Additional paid-in capital	300	300
Retained earnings	1,070	1,265
Total shareholders' equity	1,420	1,615
Total liabilities and shareholders' equity	\$3,101	\$3,391

Statement of Income	31
In Millions, except Per-Share Data	December 2008
Total revenues	\$2,215
Operating costs and expenses	1,430
EBITDA	785
Depreciation	180
EBIT	605
Interest expense	130
Income before tax	475
Taxes (at 40 percent)	190
Net income	285
Dividends	90
Addition to retained earnings	195

Statement of Cash Flows In Millions	31
	December 2008
Operating activities	
Net income	\$285
Adjustments	
Depreciation	180
Changes in working capital	
Accounts receivable	(39)
Inventories	(44)
Accounts payable	22
Accrued taxes and expenses	23
Cash provided by operating activities	\$427
Investing activities	
Purchases of fixed assets	349
Cash used for investing activities	\$349
Financing activities	
Notes payable	\$(10)
Long-term financing issuances	(40)

(continued)

(Continued)

Statement of Cash Flows In Millions	31 December 2008
Common stock dividends	90
Cash used for financing activities	\$40
Cash and equivalents increase (decrease)	38
Cash and equivalents at beginning of year	210
Cash and equivalents at end of year	\$248
Supplemental cash flow disclosures	
Interest paid	\$130
Income taxes paid	\$190

Note: The statement of cash flows shows the use of a convention by which the positive numbers of \$349 and \$40 for cash used for investing activities and cash used for financing activities, respectively, are understood to be subtractions, because “cash used” is an outflow.

- 3 For LaForge Systems, whose financial statements are given in Problem 2, show the adjustments from the current levels of CFO (which is \$427 million), EBIT (\$605 million), and EBITDA (\$785 million) to find:
 - A FCFE.
 - B FCFE.
- 4 The term “free cash flow” is frequently applied to cash flows that differ from the definition for FCFE that should be used to value a firm. Two such definitions of free cash flow are given below. Compare these two definitions for free cash flow with the technically correct definition of FCFE used in the reading.
 - A $FCF = \text{Net income} + \text{Depreciation and amortization} - \text{Cash dividends} - \text{Capital expenditures}$.
 - B $FCF = \text{Cash flow from operations (from the statement of cash flows)} - \text{Capital expenditures}$.
- 5 Proust Company has FCFE of \$1.7 billion and FCFE of \$1.3 billion. Proust’s WACC is 11 percent, and its required rate of return for equity is 13 percent. FCFE is expected to grow forever at 7 percent, and FCFE is expected to grow forever at 7.5 percent. Proust has debt outstanding of \$15 billion.
 - A What is the total value of Proust’s equity using the FCFE valuation approach?
 - B What is the total value of Proust’s equity using the FCFE valuation approach?
- 6 Quinton Johnston is evaluating NYL Manufacturing Company, Ltd. In 2017, when Johnston is performing his analysis, the company is unprofitable. Furthermore, NYL pays no dividends on its common shares. Johnston decides to value NYL Manufacturing by using his forecasts of FCFE. Johnston gathers the following facts and assumptions:
 - The company has 17.0 billion shares outstanding.
 - Sales will be \$5.5 billion in 2018, increasing at 28 percent annually for the next four years (through 2022).

- Net income will be 32 percent of sales.
- Investment in fixed assets will be 35 percent of sales; investment in working capital will be 6 percent of sales; depreciation will be 9 percent of sales.
- 20 percent of the net investment in assets will be financed with debt.
- Interest expenses will be only 2 percent of sales.
- The tax rate will be 10 percent. NYL Manufacturing's beta is 2.1; the risk-free government bond rate is 6.4 percent; the equity risk premium is 5.0 percent.
- At the end of 2022, Johnston projects NYL terminal stock value at 18 times earnings.

What is the value of one ordinary share of NYL Manufacturing Company?

- 7 Do Pham is evaluating Phaneuf Accelérateur by using the FCFF and FCFE valuation approaches. Pham has collected the following information (currency in euros):
- Phaneuf has net income of €250 million, depreciation of €90 million, capital expenditures of €170 million, and an increase in working capital of €40 million.
 - Phaneuf will finance 40 percent of the increase in net fixed assets (capital expenditures less depreciation) and 40 percent of the increase in working capital with debt financing.
 - Interest expenses are €150 million. The current market value of Phaneuf's outstanding debt is €1,800 million.
 - FCFF is expected to grow at 6.0 percent indefinitely, and FCFE is expected to grow at 7.0 percent.
 - The tax rate is 30 percent.
 - Phaneuf is financed with 40 percent debt and 60 percent equity. The before-tax cost of debt is 9 percent, and the before-tax cost of equity is 13 percent.
 - Phaneuf has 10 million outstanding shares.
- A Using the FCFF valuation approach, estimate the total value of the firm, the total market value of equity, and the per-share value of equity.
- B Using the FCFE valuation approach, estimate the total market value of equity and the per-share value of equity.
- 8 PHB Company currently sells for \$32.50 per share. In an attempt to determine whether PHB is fairly priced, an analyst has assembled the following information:
- The before-tax required rates of return on PHB debt, preferred stock, and common stock are, respectively, 7.0 percent, 6.8 percent, and 11.0 percent.
 - The company's target capital structure is 30 percent debt, 15 percent preferred stock, and 55 percent common stock.
 - The market value of the company's debt is \$145 million, and its preferred stock is valued at \$65 million.
 - PHB's FCFF for the year just ended is \$28 million. FCFF is expected to grow at a constant rate of 4 percent for the foreseeable future.
 - The tax rate is 35 percent.
 - PHB has 8 million outstanding common shares.

What is PHB's estimated value per share? Is PHB's stock underpriced?

- 9 Watson Dunn is planning to value BCC Corporation, a provider of a variety of industrial metals and minerals. Dunn uses a single-stage FCFF approach. The financial information Dunn has assembled for his valuation is as follows:
- The company has 1,852 million shares outstanding.
 - The market value of its debt is \$3.192 billion.
 - The FCFF is currently \$1.1559 billion.
 - The equity beta is 0.90; the equity risk premium is 5.5 percent; the risk-free rate is 5.5 percent.
 - The before-tax cost of debt is 7.0 percent.
 - The tax rate is 40 percent.
 - To calculate WACC, he will assume the company is financed 25 percent with debt.
 - The FCFF growth rate is 4 percent.

Using Dunn's information, calculate the following:

- A WACC.
 - B Value of the firm.
 - C Total market value of equity.
 - D Value per share.
- 10 Kenneth McCoin is valuing McNish Corporation and performing a sensitivity analysis on his valuation. He uses a single-stage FCFE growth model. The base-case values for each of the parameters in the model are given, together with possible low and high estimates for each variable, in the following table.

Variable	Base-Case Value	Low Estimate	High Estimate
Normalized FCFE ₀	\$0.88	\$0.70	\$1.14
Risk-free rate	5.08%	5.00%	5.20%
Equity risk premium	5.50%	4.50%	6.50%
Beta	0.70	0.60	0.80
FCFE growth rate	6.40%	4.00%	7.00%

- A Use the base-case values to estimate the current value of McNish Corporation.
 - B Calculate the range of stock prices that would occur if the base-case value for FCFE₀ were replaced by the low estimate and the high estimate for FCFE₀. Similarly, using the base-case values for all other variables, calculate the range of stock prices caused by using the low and high values for beta, the risk-free rate, the equity risk premium, and the growth rate. Based on these ranges, rank the sensitivity of the stock price to each of the five variables.
- 11 An aggressive financial planner who claims to have a superior method for picking undervalued stocks is courting one of your clients. The planner claims that the best way to find the value of a stock is to divide EBITDA by the risk-free bond rate. The planner is urging your client to invest in NewMarket, Inc. The planner says that NewMarket's EBITDA of \$1,580 million divided by the long-term government bond rate of 7 percent gives a total value of \$22,571.4 million. With 318 million outstanding shares, NewMarket's value per share found by using this method is \$70.98. Shares of NewMarket currently trade for \$36.50.

- A** Provide your client with an alternative estimate of NewMarket's value per share based on a two-stage FCFE valuation approach. Use the following assumptions:
- Net income is currently \$600 million. Net income will grow by 20 percent annually for the next three years.
 - The net investment in operating assets (capital expenditures less depreciation plus investment in working capital) will be \$1,150 million next year and grow at 15 percent for the following two years.
 - Forty percent of the net investment in operating assets will be financed with net new debt financing.
 - NewMarket's beta is 1.3; the risk-free bond rate is 7 percent; the equity risk premium is 4 percent.
 - After three years, the growth rate of net income will be 8 percent and the net investment in operating assets (capital expenditures minus depreciation plus increase in working capital) each year will drop to 30 percent of net income.
 - Debt is, and will continue to be, 40 percent of total assets.
 - NewMarket has 318 million shares outstanding.

B Criticize the valuation approach that the aggressive financial planner used.

- 12** Bron has EPS of \$3.00 in 2002 and expects EPS to increase by 21 percent in 2003. EPS are expected to grow at a decreasing rate for the following five years, as shown in the following table.

	2003	2004	2005	2006	2007	2008
Growth rate for EPS	21%	18%	15%	12%	9%	6%
Net capital expenditures per share	\$5.00	\$5.00	\$4.50	\$4.00	\$3.50	\$1.50

In 2008, the growth rate will be 6 percent and is expected to stay at that rate thereafter. Net capital expenditures (capital expenditures minus depreciation) will be \$5.00 per share in 2002 and then follow the pattern predicted in the table. In 2008, net capital expenditures are expected to be \$1.50 and will then grow at 6 percent annually. The investment in working capital parallels the increase in net capital expenditures and is predicted to equal 25 percent of net capital expenditures each year. In 2008, investment in working capital will be \$0.375 and is predicted to grow at 6 percent thereafter. Bron will use debt financing to fund 40 percent of net capital expenditures and 40 percent of the investment in working capital. The required rate of return for Bron is 12 percent.

Estimate the value of a Bron share using a two-stage FCFE valuation approach.

- 13** The management of Telluride, an international diversified conglomerate based in the United States, believes that the recent strong performance of its wholly owned medical supply subsidiary, Sundanci, has gone unnoticed. To realize Sundanci's full value, Telluride has announced that it will divest Sundanci in a tax-free spin-off.

Sue Carroll, CFA, is director of research at Kesson and Associates. In developing an investment recommendation for Sundanci, Carroll has gathered the information shown in Exhibits 1 and 2.

Exhibit 1 Sundanci Actual 2007 and 2008 Financial Statements for Fiscal Years Ending 31 May (Dollars in Millions except Per-Share Data)

Income Statement	2007	2008
Revenue	\$474	\$598
Depreciation	20	23
Other operating costs	368	460
Income before taxes	86	115
Taxes	26	35
Net income	60	80
Dividends	18	24
EPS	\$0.714	\$0.952
Dividends per share	\$0.214	\$0.286
Common shares outstanding	84.0	84.0
Balance Sheet	2007	2008
Current assets (includes \$5 cash in 2007 and 2008)	\$201	\$326
Net property, plant, and equipment	474	489
Total assets	675	815
Current liabilities (all non-interest-bearing)	57	141
Long-term debt	0	0
Total liabilities	57	141
Shareholders' equity	618	674
Total liabilities and equity	675	815
Capital expenditures	34	38

Exhibit 2 Selected Financial Information

Required rate of return on equity	14%
Industry growth rate	13%
Industry P/E	26

Abbey Naylor, CFA, has been directed by Carroll to determine the value of Sundanci's stock by using the FCFE model. Naylor believes that Sundanci's FCFE will grow at 27 percent for two years and at 13 percent thereafter. Capital expenditures, depreciation, and working capital are all expected to increase proportionately with FCFE.

- A Calculate the amount of FCFE per share for 2008 by using the data from Exhibit 1.
 - B Calculate the current value of a share of Sundanci stock based on the two-stage FCFE model.
 - C Describe limitations that the two-stage DDM and FCFE models have in common.
- 14 John Jones, CFA, is head of the research department of Peninsular Research. One of the companies he is researching, Mackinac Inc., is a US-based manufacturing company. Mackinac has released the June 2007 financial statements shown in Exhibits 1, 2, and 3.

Exhibit 1 Mackinac Inc. Annual Income Statement
30 June 2007 (in Thousands, except Per-Share Data)

Sales	\$250,000
Cost of goods sold	125,000
Gross operating profit	125,000
Selling, general, and administrative expenses	50,000
EBITDA	75,000
Depreciation and amortization	10,500
EBIT	64,500
Interest expense	11,000
Pretax income	53,500
Income taxes	16,050
Net income	\$37,450
Shares outstanding	13,000
EPS	\$2.88

Exhibit 2 Mackinac Inc. Balance Sheet 30 June 2007 (in Thousands)

Current Assets

Cash and equivalents	\$20,000
Receivables	40,000
Inventories	29,000
Other current assets	23,000
Total current assets	\$112,000

Noncurrent Assets

Property, plant, and equipment	\$145,000
Less: Accumulated depreciation	43,000
Net property, plant, and equipment	102,000

(continued)

Exhibit 2 (Continued)

Investments	70,000	
Other noncurrent assets	36,000	
Total noncurrent assets		208,000
Total assets		\$320,000
Current Liabilities		
Accounts payable	\$41,000	
Short-term debt	12,000	
Other current liabilities	17,000	
Total current liabilities		\$ 70,000
Noncurrent Liabilities		
Long-term debt	100,000	
Total noncurrent liabilities		100,000
Total liabilities		170,000
Shareholders' Equity		
Common equity	40,000	
Retained earnings	110,000	
Total equity		150,000
Total liabilities and equity		\$320,000

**Exhibit 3 Mackinac Inc. Statement of Cash Flows
30 June 2007 (in Thousands)**

Cash Flow from Operating Activities		
Net income		\$37,450
Depreciation and amortization		10,500
Change in Working Capital		
(Increase) decrease in receivables	(\$5,000)	
(Increase) decrease in inventories	(8,000)	
Increase (decrease) in payables	6,000	
Increase (decrease) in other current liabilities	1,500	
Net change in working capital		(5,500)
Net cash from operating activities		\$42,450
Cash Flow from Investing Activities		
Purchase of property, plant, and equipment	(\$15,000)	
Net cash from investing activities		(\$15,000)
Cash Flow from Financing Activities		
Change in debt outstanding	\$4,000	
Payment of cash dividends	(22,470)	
Net cash from financing activities		(18,470)
Net change in cash and cash equivalents		\$8,980

Exhibit 3 (Continued)

Cash at beginning of period	11,020
Cash at end of period	<u>\$20,000</u>

Mackinac has announced that it has finalized an agreement to handle North American production of a successful product currently marketed by a company headquartered outside North America. Jones decides to value Mackinac by using the DDM and FCFE models. After reviewing Mackinac's financial statements and forecasts related to the new production agreement, Jones concludes the following:

- Mackinac's earnings and FCFE are expected to grow 17 percent a year over the next three years before stabilizing at an annual growth rate of 9 percent.
 - Mackinac will maintain the current payout ratio.
 - Mackinac's beta is 1.25.
 - The government bond yield is 6 percent, and the market equity risk premium is 5 percent.
- A** Calculate the value of a share of Mackinac's common stock by using the two-stage DDM.
- B** Calculate the value of a share of Mackinac's common stock by using the two-stage FCFE model.
- C** Jones is discussing with a corporate client the possibility of that client acquiring a 70 percent interest in Mackinac. Discuss whether the DDM or FCFE model is more appropriate for this client's valuation purposes.
- 15** SK Telecom Company is a cellular telephone paging and computer communication services company in Seoul, South Korea. The company is traded on the Korea, New York, and London stock exchanges. Sol Kim has estimated the normalized FCFE for SK Telecom to be 1,300 Korean won (per share) for the year just ended. The real country return for South Korea is 6.50 percent. To estimate the required return for SK Telecom, Kim makes the following adjustments to the real country return: an industry adjustment of +0.60 percent, a size adjustment of -0.10 percent, and a leverage adjustment of +0.25 percent. The long-term real growth rate for South Korea is estimated to be 3.5 percent, and Kim expects the real growth rate of SK Telecom to track the country rate.
- A** What is the real required rate of return for SK Telecom?
- B** Using the single-stage FCFE valuation model and real values for the discount rate and FCFE growth rate, estimate the value of one share of SK Telecom.
- 16** Lawrence McKibben is preparing a valuation of QuickChange Auto Centers, Inc. McKibben has decided to use a three-stage FCFE valuation model and the following estimates. The FCFE per share for the current year is \$0.75. The FCFE is expected to grow at 10 percent for next year, then at 26 percent annually for the following three years, and then at 6 percent in Year 5 and thereafter. QuickChange's estimated beta is 2.00, and McKibben believes that current

market conditions dictate a 4.5 percent risk-free rate of return and a 5.0 percent equity risk premium. Given McKibben's assumptions and approach, estimate the value of a share of QuickChange.

- 17 Clay Cooperman has valued the operating assets of Johnson Extrusion at \$720 million. The company also has short-term cash and securities with a market value of \$60 million that are not needed for Johnson's operations. The noncurrent investments have a book value of \$30 million and a market value of \$45 million. The company also has an overfunded pension plan, with plan assets of \$210 million and plan liabilities of \$170 million. Johnson Extrusion has \$215 million of notes and bonds outstanding and 100 million outstanding shares. What is the value per share of Johnson Extrusion stock?

The following information relates to Questions 18–23

Ryan Leigh is preparing a presentation that analyzes the valuation of the common stock of two companies under consideration as additions to his firm's recommended list, Emerald Corporation and Holt Corporation. Leigh has prepared preliminary valuations of both companies using a FCFE model and is also preparing a value estimate for Emerald using a dividend discount model. Holt's 2007 and 2008 financial statements, contained in Exhibits 1 and 2, are prepared in accordance with US GAAP.

Exhibit 1 Holt Corporation Consolidated Balance Sheets (US\$ Millions)

	As of 31 December	
	2008	2007
Assets		
Current assets		
Cash and cash equivalents	\$ 372	\$315
Accounts receivable	770	711
Inventories	846	780
Total current assets	1,988	1,806
Gross fixed assets	4,275	3,752
Less: Accumulated depreciation	1,176	3,099
Total assets	\$5,087	\$4,652
Liabilities and shareholders' equity		
Current liabilities		
Accounts payable	\$ 476	\$443
Accrued taxes and expenses	149	114
Notes payable	465	450
Total current liabilities	1,090	1,007
Long-term debt	1,575	1,515
Common stock	525	525

Exhibit 1 (Continued)

Retained earnings	1,897	1,605
Total liabilities and shareholders' equity	\$5,087	\$4,652

Exhibit 2 Holt Corporation Consolidated Income Statement for the Year Ended 31 December 2008 (US\$ Millions)

Total revenues	\$3,323
Cost of goods sold	1,287
Selling, general, and administrative expenses	858
Earnings before interest, taxes, depreciation, and amortization (EBITDA)	1,178
Depreciation expense	270
Operating income	908
Interest expense	195
Pretax income	713
Income tax (at 32 percent)	228
Net income	\$ 485

Leigh presents his valuations of the common stock of Emerald and Holt to his supervisor, Alice Smith. Smith has the following questions and comments:

- 1 "I estimate that Emerald's long-term expected dividend payout rate is 20 percent and its return on equity is 10 percent over the long term."
- 2 "Why did you use a FCFE model to value Holt's common stock? Can you use a DDM instead?"
- 3 "How did Holt's FCFE for 2008 compare with its FCFF for the same year? I recommend you use a FCFF model to value Holt's common stock instead of using a FCFE model because Holt has had a history of leverage changes in the past."
- 4 "In the last three years, about 5 percent of Holt's growth in FCFE has come from decreases in inventory."

Leigh responds to each of Smith's points as follows:

- 1 "I will use your estimates and calculate Emerald's long-term, sustainable dividend growth rate."
- 2 "There are two reasons why I used the FCFE model to value Holt's common stock instead of using a DDM. The first reason is that Holt's dividends have differed significantly from its capacity to pay dividends. The second reason is that Holt is a takeover target and once the company is taken over, the new owners will have discretion over the uses of free cash flow."

- 3 “I will calculate Holt’s FCFF for 2008 and estimate the value of Holt’s common stock using a FCFF model.”
- 4 “Holt is a growing company. In forecasting either Holt’s FCFE or FCFF growth rates, I will not consider decreases in inventory to be a long-term source of growth.”
- 18 Which of the following long-term FCFE growth rates is *most* consistent with the facts and stated policies of Emerald?
- A 5 percent or lower.
 - B 2 percent or higher.
 - C 8 percent or higher.
- 19 Do the reasons provided by Leigh support his use of the FCFE model to value Holt’s common stock instead of using a DDM?
- A Yes.
 - B No, because Holt’s dividend situation argues in favor of using the DDM.
 - C No, because FCFE is not appropriate for investors taking a control perspective.
- 20 Holt’s FCFF (in millions) for 2008 is *closest* to:
- A \$308.
 - B \$370.
 - C \$422.
- 21 Holt’s FCFE (in millions) for 2008 is *closest* to:
- A \$175.
 - B \$250.
 - C \$364.
- 22 Leigh’s comment about not considering decreases in inventory to be a source of long-term growth in free cash flow for Holt is:
- A inconsistent with a forecasting perspective.
 - B mistaken because decreases in inventory are a use rather than a source of cash.
 - C consistent with a forecasting perspective because inventory reduction has a limit, particularly for a growing firm.
- 23 Smith’s recommendation to use a FCFF model to value Holt is:
- A logical, given the prospect of Holt changing capital structure.
 - B not logical because a FCFF model is used only to value the total firm.
 - C not logical because FCFE represents a more direct approach to free cash flow valuation.
-

The following information relates to questions 24–30

Yandie Izzo manages a dividend growth strategy for a large asset management firm. Izzo meets with her investment team to discuss potential investments in three companies: Company A, Company B, and Company C. Statements of cash flow for the three companies are presented in Exhibit 1.

Exhibit 1 Statements of Cash Flow, Most Recent Fiscal Year End (Amounts in Millions of Dollars)

	Company A	Company B	Company C
Cash Flow from Operating Activities			
Net Income	4,844	1,212	15,409
Adjustments			
Depreciation	500	288	3,746
Other non-cash expenses	1,000	—	—
Changes in working capital			
(Increase) Decrease accounts receivable	(452)	(150)	(536)
(Increase) Decrease inventories	—	(200)	(803)
Increase (Decrease) accounts payable	(210)	100	(3)
Increase (Decrease) other current liabilities	540	14	350
Net cash from operating activities	6,222	1,264	18,163
Cash Flow from Investing Activities			
(Purchase) Sale of fixed assets	2,379	(1,000)	(3,463)
Net cash from investing activities	2,379	(1,000)	(3,463)
Cash Flow from Financing Activities			
Increase (Decrease) notes payable	25	3000	1,238
Increase (Decrease) long-term debt	(1,500)	(1,000)	(1,379)
Payment of common stock dividends	(1,000)	(237)	(15,000)
Net cash from financing activities	(2,475)	1,763	(15,141)
Net change in cash and cash equivalents	6,126	2,027	(441)
Cash and equivalents at beginning of year	50	100	3,000
Cash and equivalents at end of year	6,176	2,127	2,559
Supplemental Cash Flow Disclosures			
Interest	(353)	(50)	(552)
Income taxes	(1,605)	(648)	(3,787)

Izzo's team first discusses key characteristics of Company A. The company has a history of paying modest dividends relative to FCFE, has a stable capital structure, and is owned by a controlling investor.

The team also considers the impact of Company A's three non-cash transactions in the most recent year on its FCFE, including the following:

Transaction 1: A \$900 million loss on a sale of equipment

Transaction 2: An impairment of intangibles of \$400 million

Transaction 3: A \$300 million reversal of a previously recorded restructuring charge

In addition, Company A's annual report indicates that the firm expects to incur additional non-cash charges related to restructuring over the next few years.

To value the three companies' shares, one team member suggests valuing the companies' shares using net income as a proxy for FCFE. Another team member proposes forecasting FCFE using a sales-based methodology based on the following equation:

$$\text{FCFE} = \text{NI} - (1 - \text{DR})(\text{FCInv} - \text{Dep}) - (1 - \text{DR})(\text{WCInv})$$

Izzo's team ultimately decides to use actual free cash flow to value the three companies' shares. Selected data and assumptions are provided in Exhibit 2.

Exhibit 2 Supplemental Data and Valuation Assumptions

	Company A	Company B	Company C
Tax rate	35%	35%	30%
Beta	1.00	0.90	1.10
Before-tax cost of debt	6%	7%	6%
Target debt ratio	50%	30%	40%
Market data:			
Risk-free rate: 3%			
Market risk premium: 7%			

The team calculates the intrinsic value of Company B using a two-stage FCFE model. FCFE growth rates for the first four years are estimated at 10%, 9%, 8%, and 7%, respectively, before declining to a constant 6% starting in the fifth year.

To calculate the intrinsic value of Company C's equity, the team uses the FCFF approach assuming a single-stage model where FCFF is expected to grow at 5% indefinitely.

- 24** Based on Company A's key characteristics, which discounted cash flow model would *most likely* be used by the investment team to value Company A's shares?
- A** DDM
B FCFE
C FCFF
- 25** Which non-cash transaction should be subtracted from net income in arriving at Company A's FCFE?
- A** Transaction 1
B Transaction 2
C Transaction 3
- 26** Based on Exhibit 1, Company A's FCFE for the most recent year is *closest* to:
- A** \$5,318 million.
B \$6,126 million.
C \$7,126 million.
- 27** Based on Exhibit 1, using net income as a proxy for Company B's FCFE would result in an intrinsic value that is:

- A lower than the intrinsic value if actual FCFE were used.
 - B equal to the intrinsic value if actual FCFE were used.
 - C higher than the intrinsic value if actual FCFE were used.
- 28 Based on Exhibit 1, using the proposed sales-based methodology to forecast FCFE would produce an inaccurate FCFE projection for which company?
- A Company A
 - B Company B
 - C Company C
- 29 Based on Exhibits 1 and 2 and the proposed two-stage FCFE model, the intrinsic value of Company B's equity is *closest* to:
- A \$70,602 million.
 - B \$73,588 million.
 - C \$79,596 million.
- 30 Based on Exhibits 1 and 2 and the proposed single-stage FCFF model, the intrinsic value of Company C's equity is *closest* to:
- A \$277,907 million.
 - B \$295,876 million.
 - C \$306,595 million.
-

The following information relates to questions 31–36

Gurmeet Singh, an equity portfolio manager at a wealth management company, meets with junior research analyst Cindy Ho to discuss potential investments in three companies: Sienna Limited, Colanari Manufacturing, and Bern Pharmaceutical.

Singh and Ho review key financial data from Sienna's most recent annual report, which are presented in Exhibits 1 and 2, to assess the company's ability to generate free cash flow.

Exhibit 1: Selected Data from Sienna Limited's Statement of Income for the Year Ended 31 December 2016 (Amounts in Millions of Euros)

EBITDA	4,000
Depreciation expense	800
Operating income (EBIT)	3,200
Interest expense	440
Tax rate	35%

Exhibit 2: Sienna Limited's Statement of Cash Flows for the Year Ended 31 December 2016 (Amounts in Millions of Euros)

Cash flow from operations	
Net income	1,794
Plus: Depreciation	800
Increase in accounts receivable	(2,000)
Increase in inventory	(200)
Increase in accounts payable	1,000
Cash flow from operations	1,394
Cash flow from investing activities	
Purchases of PP&E	(1,000)
Cash flow from financing activities	
Borrowing (repayment)	500
Total cash flow	894

Singh and Ho also discuss the impact of dividends, share repurchases, and leverage on Sienna's free cash flow. Ho tells Singh the following:

- Statement 1 Changes in leverage do not impact free cash flow.
- Statement 2 Transactions between the company and its shareholders, such as the payment of dividends or share repurchases, do affect free cash flow.

Singh and Ho next analyze Colanari. Last year, Colanari had FCFF of €140 million. Singh instructs Ho to perform a FCFF sensitivity analysis of Colanari's firm value using the three sets of estimates presented in Exhibit 3. In her analysis, Ho assumes a tax rate of 35% and a stable capital structure of 30% debt and 70% equity.

Exhibit 3: Sensitivity Analysis for Colanari Valuation

Variable	Base-Case Estimate	Low Estimate	High Estimate
FCFF growth rate	4.6%	4.2%	5.0%
Before-tax cost of debt	4.9%	3.9%	5.9%
Cost of equity	11.0%	10.0%	12.0%

Finally, Singh and Ho analyze Bern. Selected financial information on Bern is presented in Exhibit 4.

Exhibit 4: Selected Financial Data on Bern Pharmaceutical

	Market Value	Required Return
Debt	€15,400 million	6.0%
Preferred stock	€4,000 million	5.5%
Common stock	€18,100 million	11.0%

Exhibit 4: (Continued)

	Market Value	Required Return
FCFF, most recent year	€3,226 million	
Corporate tax rate	26.9%	

Singh notes that Bern has two new drugs that are currently in clinical trials awaiting regulatory approval. In addition to its operating assets, Bern owns a parcel of land from a decommissioned manufacturing facility with a current market value of €50 million that is being held for investment. Singh and Ho elect to value Bern under two scenarios:

- Scenario 1 Value Bern assuming the two new drugs receive regulatory approval. In this scenario, FCFF is forecast to grow at 4.5% into perpetuity.
- Scenario 2 Value Bern assuming the two new drugs do not receive regulatory approval. In this scenario, FCFF is forecast using a stable growth in FCFF of 1.5% for the next three years and then 0.75% thereafter into perpetuity.

- 31 Based on Exhibits 1 and 2, Sienna's FCFF in 2016 is:
- A €680 million.
 - B €1,200 million.
 - C €3,080 million.
- 32 Based on Exhibits 1 and 2, Sienna's FCFE in 2016 is:
- A €894 million.
 - B €1,466 million.
 - C €2,894 million.
- 33 Which of Ho's statements regarding free cash flow is (are) correct?
- A Statement 1 only
 - B Statement 2 only
 - C Neither Statement 1 nor Statement 2
- 34 Based on Exhibit 3, Ho's FCFF sensitivity analysis should conclude that Colanari's value is *most* sensitive to the:
- A FCFF growth rate.
 - B before-tax cost of debt.
 - C required rate of return for equity.
- 35 Based on Exhibit 4, Bern's firm value under Scenario 1 is *closest* to:
- A €100,951.3 million.
 - B €105,349.1 million.
 - C €105,399.1 million.
- 36 Based on Exhibit 4, Singh and Ho should conclude that under Scenario 2, shares of Bern are:
- A undervalued.

- B** fairly valued.
- C** overvalued.

SOLUTIONS

1

For a \$100 increase in:	Change in FCFF (in US Dollars)	Change in FCFE (in US Dollars)
A. Net income	+100	+100
B. Cash operating expenses	−60	−60
C. Depreciation	+40	+40
D. Interest expense	0	−60
E. EBIT	+60	+60
F. Accounts receivable	−100	−100
G. Accounts payable	+100	+100
H. Property, plant, and equipment	−100	−100
I. Notes payable	0	+100
J. Cash dividends paid	0	0
K. Proceeds from new shares issued	0	0
L. Share repurchases	0	0

2 A Free cash flow to the firm, found with Equation 7, is

$$\begin{aligned}\text{FCFF} &= \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv} \\ \text{FCFF} &= 285 + 180 + 130(1 - 0.40) - 349 - (39 + 44 - 22 - 23) \\ \text{FCFF} &= 285 + 180 + 78 - 349 - 38 = \$156 \text{ million}\end{aligned}$$

B Free cash flow to equity, found with Equation 10, is

$$\begin{aligned}\text{FCFE} &= \text{NI} + \text{NCC} - \text{FCInv} - \text{WFCInv} + \text{Net borrowing} \\ \text{FCFE} &= 285 + 180 - 349 - (39 + 44 - 22 - 23) + (10 + 40) \\ \text{FCFE} &= 285 + 180 - 349 - 38 + 50 = \$128 \text{ million}\end{aligned}$$

C To find FCFE from FCFF, one uses the relationship in Equation 9:

$$\begin{aligned}\text{FCFE} &= \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \\ \text{FCFE} &= 156 - 130(1 - 0.40) + (10 + 40) \\ \text{FCFE} &= 156 - 78 + 50 = \$128 \text{ million}\end{aligned}$$

3 A To find FCFF from CFO, EBIT, or EBITDA, the analyst can use Equations 8, 12, and 13.

To find FCFF from CFO:

$$\begin{aligned}\text{FCFF} &= \text{CFO} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} \\ \text{FCFF} &= 427 + 130(1 - 0.40) - 349 = 427 + 78 - 349 = \$156 \text{ million}\end{aligned}$$

To find FCFF from EBIT:

$$\begin{aligned}\text{FCFF} &= \text{EBIT}(1 - \text{Tax rate}) + \text{Dep} - \text{FCInv} - \text{WCInv} \\ \text{FCFF} &= 605(1 - 0.40) + 180 - 349 - 38 \\ \text{FCFF} &= 363 + 180 - 349 - 38 = \$156 \text{ million}\end{aligned}$$

Finally, to obtain FCFF from EBITDA:

$$\text{FCFF} = \text{EBITDA}(1 - \text{Tax rate}) + \text{Dep}(\text{Tax rate}) - \text{FCInv} - \text{WCInv}$$

$$\text{FCFF} = 785(1 - 0.40) + 180(0.40) - 349 - 38$$

$$\text{FCFF} = 471 + 72 - 349 - 38 = \$156 \text{ million}$$

- B** The simplest approach is to calculate FCFF from CFO, EBIT, or EBITDA as was done in Part A and then to find FCFE by making the appropriate adjustments to FCFF:

$$\text{FCFE} = \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing.}$$

$$\text{FCFE} = 156 - 130(1 - 0.40) + 50 = 156 - 78 + 50 = \$128 \text{ million}$$

The analyst can also find FCFE by using CFO, EBIT, or EBITDA directly. Starting with CFO and using Equation 11, FCFE is found to be

$$\text{FCFE} = \text{CFO} - \text{FCInv} + \text{Net borrowing}$$

$$\text{FCFE} = 427 - 349 + 50 = \$128 \text{ million}$$

Starting with EBIT, on the basis of Equations 9 and 12, FCFE is

$$\begin{aligned} \text{FCFE} &= \text{EBIT}(1 - \text{Tax rate}) + \text{Dep} - \text{Int}(1 - \text{Tax rate}) - \text{FCInv} \\ &\quad - \text{WCInv} + \text{Net borrowing} \end{aligned}$$

$$\text{FCFE} = 605(1 - 0.40) + 180 - 130(1 - 0.40) - 349 - 38 + 50$$

$$\text{FCFE} = 363 + 180 - 78 - 349 - 38 + 50 = \$128 \text{ million}$$

Finally, starting with EBITDA, on the basis of Equations 9 and 13, FCFE is

$$\begin{aligned} \text{FCFE} &= \text{EBITDA}(1 - \text{Tax rate}) + \text{Dep}(\text{Tax rate}) \\ &\quad - \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv} + \text{Net borrowing} \end{aligned}$$

$$\text{FCFE} = 785(1 - 0.40) + 180(0.40) - 130(1 - 0.40) - 349 - 38 + 50$$

$$\text{FCFE} = 471 + 72 - 78 - 349 - 38 + 50 = \$128 \text{ million}$$

- 4 A** $\text{FCF} = \text{Net income} + \text{Depreciation and amortization} - \text{Cash dividends} - \text{Capital expenditures}$. This definition of free cash flow is sometimes used to determine how much “discretionary” cash flow management has at its disposal. Management discretion concerning dividends is limited by investor expectations that dividends will be maintained. Comparing this definition with Equation 7, $\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv}$, we find that FCFF includes a reduction for investments in working capital and the addition of after-tax interest expense. Common stock dividends are not subtracted from FCFF because dividends represent a distribution of the cash available to investors. (If a company pays preferred dividends and they were previously taken out when net income available to common shareholders was calculated, they are added back in Equation 7 to include them in FCFF.)
- B** $\text{FCF} = \text{Cash flow from operations (from the statement of cash flows)} - \text{Capital expenditures}$. Comparing this definition of free cash flow with Equation 8, $\text{FCFF} = \text{CFO} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv}$, highlights the relationship of CFO to FCFF: The primary point is that when Equation 8 is used, after-tax interest is added back to CFO to arrive at the cash flow to all investors. Then FCInv is subtracted to arrive at the amount of that cash flow that is “free” in the sense of available for distribution to those investors after taking care of capital investment needs. If preferred dividends were subtracted to obtain net income (in CFO), they would also have to be

added back in. This definition is commonly used to approximate FCFE, but it generally understates the actual FCFE by the amount of after-tax interest expense.

- 5 A The firm value is the present value of FCFF discounted at the WACC, or

$$\begin{aligned}\text{Firm value} &= \frac{\text{FCFF}_1}{\text{WACC} - g} = \frac{\text{FCFF}_0(1 + g)}{\text{WACC} - g} = \frac{1.7(1.07)}{0.11 - 0.07} \\ &= \frac{1.819}{0.04} = \$45.475 \text{ billion}\end{aligned}$$

The market value of equity is the value of the firm minus the value of debt:

$$\text{Equity} = 45.475 - 15 = \$30.475 \text{ billion}$$

- B Using the FCFE valuation approach, we find the present value of FCFE discounted at the required rate of return on equity to be

$$\begin{aligned}\text{PV} &= \frac{\text{FCFE}_1}{r - g} = \frac{\text{FCFE}_0(1 + g)}{r - g} = \frac{1.3(1.075)}{0.13 - 0.075} = \frac{1.3975}{0.055} \\ &= \$25.409 \text{ billion}\end{aligned}$$

The value of equity using this approach is \$25.409 billion.

- 6 The required rate of return found with the CAPM is

$$r = E(R_i) = R_F + \beta_i[E(R_M) - R_F] = 6.4\% + 2.1(5.0\%) = 16.9\%$$

The following table shows the values of sales, net income, capital expenditures less depreciation, and investments in working capital. FCFE equals net income less the investments financed with equity:

$$\begin{aligned}\text{FCFE} &= \text{Net income} - (1 - \text{DR})(\text{Capital expenditures} - \text{Depreciation}) \\ &\quad - (1 - \text{DR})(\text{Investment in working capital})\end{aligned}$$

where DR is the debt ratio (debt financing as a percentage of debt and equity). Because 20 percent of net new investments are financed with debt, 80 percent of the investments are financed with equity, which reduces FCFE by 80 percent of (Capital expenditures – Depreciation) and 80 percent of the investment in working capital.

(All Data in Billions of US Dollars)	2018	2019	2020	2021	2022
Sales (growing at 28%)	5.500	7.040	9.011	11.534	14.764
Net income = 32% of sales	1.760	2.253	2.884	3.691	4.724
FCInv – Dep = (35% – 9%) × Sales	1.430	1.830	2.343	2.999	3.839
WCInv = (6% of Sales)	0.330	0.422	0.541	0.692	0.886
0.80 × (FCInv – Dep + WCInv)	1.408	1.802	2.307	2.953	3.780
FCFE = NI – 0.80 × (FCInv – Dep + WCInv)	0.352	0.451	0.577	0.738	0.945
PV of FCFE discounted at 16.9%	0.301	0.330	0.361	0.395	0.433
Terminal stock value		85.032			
PV of terminal value discounted at 16.9%		38.950			
Total PV of FCFE		1.820			
Total value of equity		40.770			

The terminal stock value is 18.0 times the earnings in 2013, or $18 \times 4.724 = \$85.03$ billion. The present value of the terminal value (\$38.95 billion) plus the present value of the first five years' FCFE (\$1.82 billion) is \$40.77 billion. Because NYL Manufacturing has 17 billion outstanding shares, the value per ordinary share is \$2.398.

7 A The FCFF is (in euros)

$$\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv}$$

$$\text{FCFF} = 250 + 90 + 150(1 - 0.30) - 170 - 40$$

$$\text{FCFF} = 250 + 90 + 105 - 170 - 40 = 235 \text{ million}$$

The weighted-average cost of capital is

$$\text{WACC} = 9\%(1 - 0.30)(0.40) + 13\%(0.60) = 10.32\%$$

The value of the firm (in euros) is

$$\begin{aligned} \text{Firm value} &= \frac{\text{FCFF}_1}{\text{WACC} - g} = \frac{\text{FCFF}_0(1 + g)}{\text{WACC} - g} = \frac{235(1.06)}{0.1032 - 0.06} \\ &= \frac{249.1}{0.0432} = 5,766.20 \text{ million} \end{aligned}$$

The total value of equity is the total firm value minus the value of debt, $\text{Equity} = €5,766.20 \text{ million} - €1,800 \text{ million} = €3,966.20 \text{ million}$. Dividing by the number of shares gives the per share estimate of $V_0 = €3,966.20 \text{ million} / 10 \text{ million} = €396.62$ per share.

B The free cash flow to equity is

$$\text{FCFE} = \text{NI} + \text{NCC} - \text{FCInv} - \text{WCInv} + \text{Net borrowing}$$

$$\text{FCFE} = 250 + 90 - 170 - 40 + 0.40(170 - 90 + 40)$$

$$\text{FCFE} = 250 + 90 - 170 - 40 + 48 = €178 \text{ million}$$

Because the company is borrowing 40 percent of the increase in net capital expenditures $(170 - 90)$ and working capital (40), net borrowing is €48 million.

The total value of equity is the FCFE discounted at the required rate of return of equity,

$$\begin{aligned} \text{Equity value} &= \frac{\text{FCFE}_1}{r - g} = \frac{\text{FCFE}_0(1 + g)}{r - g} = \frac{178(1.07)}{0.13 - 0.07} \\ &= \frac{190.46}{0.06} = €3,174.33 \text{ million} \end{aligned}$$

The value per share is $V_0 = €3,174.33 \text{ million} / 10 \text{ million} = €317.43$ per share.

8 The WACC for PHB Company is

$$\text{WACC} = 0.30(7.0\%)(1 - 0.35) + 0.15(6.8\%) + 0.55(11.0\%) = 8.435\%$$

The firm value is

$$\text{Firm value} = \text{FCFF}_0(1 + g) / (\text{WACC} - g)$$

$$\begin{aligned} \text{Firm value} &= 28(1.04) / (0.08435 - 0.04) = 29.12 / 0.04435 \\ &= \$656.60 \text{ million} \end{aligned}$$

The value of equity is the firm value minus the value of debt minus the value of preferred stock: $\text{Equity} = 656.60 - 145 - 65 = \446.60 million. Dividing this amount by the number of shares gives the estimated value per share of $\$446.60 \text{ million} / 8 \text{ million shares} = \55.82 .

The estimated value for the stock is greater than the market price of \$32.50, so the stock appears to be undervalued.

- 9 A The required return on equity is

$$r = E(R_i) = R_F + \beta_i [E(R_M) - R_F] = 5.5\% + 0.90(5.5\%) = 10.45\%$$

The weighted-average cost of capital is

$$\text{WACC} = 0.25(7.0\%)(1 - 0.40) + 0.75(10.45\%) = 8.89\%$$

B

$$\begin{aligned} \text{Firm value} &= \frac{\text{FCFF}_0(1 + g)}{\text{WACC} - g} \\ \text{Firm value} &= \frac{1.1559(1.04)}{0.0889 - 0.04} = \$24.583 \end{aligned}$$

- C Equity value = Firm value – Market value of debt

$$\text{Equity value} = 24.583 - 3.192 = \$21.391 \text{ billion}$$

- D Value per share = Equity value/Number of shares

$$\text{Value per share} = \$21.391 \text{ billion} / 1.852 \text{ billion} = \$11.55$$

- 10 A The required rate of return for McInish found with the CAPM is

$$r = E(R_i) = R_F + \beta_i [E(R_M) - R_F] = 5.08\% + 0.70(5.50\%) = 8.93\%$$

The value per share is

$$V_0 = \frac{\text{FCFE}_0(1 + g)}{r - g} = \frac{0.88(1.064)}{0.0893 - 0.064} = \$37.01$$

- B The following table shows the calculated price for McInish based on the base-case values for all values except the variable being changed from the base-case value.

Variable	Estimated Price with Low Value (\$)	Estimated Price with High Value (\$)	Range (Rank) (\$)
Normalized FCFE ₀	29.44	47.94	18.50 (3)
Risk-free rate	38.22	35.33	2.89 (5)
Equity risk premium	51.17	28.99	22.18 (2)
Beta	47.29	30.40	16.89 (4)
FCFE growth rate	18.56	48.79	30.23 (1)

As the table shows, the value of McInish is most sensitive to the changes in the FCFE growth rate, with the price moving over a wide range. McInish's stock price is least sensitive to alternative values of the risk-free rate.

Alternative values of beta, the equity risk premium, or the initial FCFE value also have a large impact on the value of the stock, although the effects of these variables are smaller than the effect of the growth rate.

- 11 A** Using the CAPM, the required rate of return for NewMarket is

$$r = E(R_i) = R_F + \beta_i[E(R_M) - R_F] = 7\% + 1.3(4\%) = 12.2\%$$

To estimate FCFE, we use Equation 15:

$$\begin{aligned} \text{FCFE} &= \text{Net income} - (1 - \text{DR})(\text{FCInv} - \text{Depreciation}) \\ &\quad - (1 - \text{DR})(\text{WCInv}) \end{aligned}$$

which can be written

$$\begin{aligned} \text{FCFE} &= \text{Net income} - (1 - \text{DR})(\text{FCInv} - \text{Depreciation} + \text{WCInv}) \\ &= \text{Net income} - (1 - \text{DR})(\text{Net investment in operating assets}) \end{aligned}$$

The following table shows that net income grows at 20 percent annually for Years 1, 2, and 3 and then grows at 8 percent for Year 4. The net investment in operating assets is \$1,150 million in Year 1 and grows at 15 percent annually for Years 2 and 3. Debt financing is 40 percent of this investment. FCFE is NI – Net investment in operating assets + New debt financing. Finally, the present value of FCFE for Years 1, 2, and 3 is found by discounting at 12.2 percent.

(in \$ Millions)	Year			
	1	2	3	4
Net income	720.00	864.00	1,036.80	1,119.74
Net investment in operating assets	1,150.00	1,322.50	1,520.88	335.92
New debt financing	460.00	529.00	608.35	134.37
FCFE	30.00	70.50	124.27	918.19
PV of FCFE discounted at 12.2%	26.74	56.00	87.98	

In Year 4, net income is 8 percent larger than in Year 3. In Year 4, the investment in operating assets is 30 percent of net income and debt financing is 40 percent of this investment. The FCFE in Year 4 is \$918.19 million. The value of FCFE after Year 3 is found by using the constant-growth model:

$$V_3 = \frac{\text{FCFE}_4}{r - g} = \frac{918.19}{0.122 - 0.08} = \$21,861.67 \text{ million}$$

The present value of V_3 discounted at 12.2 percent is \$15,477.64 million. The total value of equity, the present value of the first three years' FCFE plus the present value of V_3 , is \$15,648.36 million. Dividing this by the number of outstanding shares (318 million) gives a value per share of \$49.21. For the first three years, NewMarket has a small FCFE because of the large investments it is making during the high-growth phase. In the normal-growth phase, FCFE is much larger because the investments required are much smaller.

- B** The planner's estimate of the share value of \$70.98 is much higher than the FCFE model estimate of \$49.21 for several reasons. First, taxes and interest expenses have a prior claim to the company's cash flow and should be taken out of the cash flows used in estimating the value of equity because these amounts are not available to equityholders. The planner did not do this. Second, EBITDA does not account for the company's reinvestments in operating assets. So, EBITDA overstates the funds available to stockholders if reinvestment needs exceed depreciation charges, which is the case for growing companies such as NewMarket.

Third, EBITDA does not account for the company's capital structure. Using EBITDA to represent a benefit to stockholders (as opposed to stockholders and bondholders combined) is a mistake.

Finally, dividing EBITDA by the bond rate commits a major error. The risk-free bond rate is an inappropriate discount rate for risky equity cash flows; the proper measure is the required rate of return on the company's equity. Dividing by a fixed rate also assumes, erroneously, that the cash flow stream is a fixed perpetuity. EBITDA cannot be a perpetual stream because if it were distributed, the stream would eventually decline to zero (lacking capital investments). NewMarket is actually a growing company, so assuming it to be a nongrowing perpetuity is a mistake.

- 12 The following table develops the information to calculate FCFE per share (amounts are in US dollars).

	2003	2004	2005	2006	2007	2008
Growth rate for EPS	21%	18%	15%	12%	9%	6%
EPS	3.630	4.283	4.926	5.517	6.014	6.374
Capital expenditure per share	5.000	5.000	4.500	4.000	3.500	1.500
Investment in WC per share	1.250	1.250	1.125	1.000	0.875	0.375
New debt financing = 40% of (Capital expenditure + WCInv)	2.500	2.500	2.250	2.000	1.750	0.750
FCFE = NI – Capital expenditure – WCInv + New debt financing	–0.120	0.533	1.551	2.517	3.389	5.249
PV of FCFE discounted at 12%	–0.107	0.425	1.104	1.600	1.923	

Earnings per share for 2002 are \$3.00, and the EPS estimates for 2003 through 2008 in the table are found by increasing the previous year's EPS by that year's growth rate. The net capital expenditures each year were specified by the analyst. The increase in working capital per share is equal to 25 percent of net capital expenditures. Finally, debt financing is 40 percent of that year's total net capital expenditures and investment in working capital. For example, in 2003, the per-share amount for net capital expenditures plus investment in working capital is \$5.00 + \$1.25 = \$6.25. Debt financing is 40 percent of \$6.25, or \$2.50. Debt financing for 2004 through 2008 is found in the same way.

FCFE equals net income minus net capital expenditures minus investment in working capital plus new debt financing. Notice that FCFE is negative in 2003 because of large capital investments and investments in working capital. As these investments decline relative to net income, FCFE becomes positive and substantial.

The present values of FCFE from 2003 through 2007 are given in the bottom row of the table. These five present values sum to \$4.944 per share. Because FCFE from 2008 onward will grow at a constant 6 percent, the constant-growth model can be used to value these cash flows.

$$V_{2007} = \frac{\text{FCFE}_{2008}}{r - g} = \frac{5.249}{0.12 - 0.06} = \$87.483$$

The present value of this stream is $\$87.483/(1.12)^5 = \49.640 . The value per share is the present value of the first five FCFEs (2003–2007) plus the present value of the FCFE after 2007, or $\$4.944 + \$49.640 = \$54.58$.

- 13 A** FCFE is defined as the cash flow remaining after the company meets all financial obligations, including debt payment, and covers all capital expenditure and working capital needs. Sundanci's FCFE for the year 2008 is calculated as follows:

Net income	= \$80 million
Plus: Depreciation expense	= 23
Less: Capital expenditures	= 38
Less: Investment in WC	= 41
Equals: FCFE	= \$24 million

Thus, FCFE per share equals $(\$24 \text{ million}) / (84 \text{ million shares}) = \0.286 .

- B** The FCFE model requires forecasts of FCFE for the high-growth years (2009 and 2010) plus a forecast for the first year of stable growth (2011) to allow for an estimate of the terminal value in 2010 based on constant perpetual growth. Because all of the components of FCFE are expected to grow at the same rate, the values can be obtained by projecting the FCFE at the common rate. (Alternatively, the components of FCFE can be projected and aggregated for each year.)

The following table provides the process for estimating Sundanci's current value on a per-share basis.

Free Cash Flow to Equity					
Base assumptions:					
Shares outstanding (millions)	84				
Required return on equity, r	14%				
	Actual 2008		Projected 2009	Projected 2010	Projected 2011
			$g = 27\%$	$g = 27\%$	$g = 13\%$
	Total	Per share			
Earnings after tax	\$80	\$0.952	\$1.2090	\$1.5355	\$1.7351
Plus: Depreciation expense	\$23	\$0.274	\$0.3480	\$0.4419	\$0.4994
Less: Capital expenditures	\$38	\$0.452	\$0.5740	\$0.7290	\$0.8238
Less: Increase in net working capital	\$41	\$0.488	\$0.6198	\$0.7871	\$0.8894
Equals: FCFE	\$24	\$0.286	\$0.3632	\$0.4613	\$0.5213
Terminal value ^a				\$52.1300	
Total cash flows to equity ^b			\$0.3632	\$52.5913	
Discounted value ^c			\$0.3186	\$40.4673	
Current value per share ^d	\$40.7859				

^a Projected 2010 terminal value = Projected 2011 FCFE / $(r - g)$.

^b Projected 2010 total cash flows to equity = Projected 2010 FCFE + Projected 2010 terminal value.

^c Discounted values obtained by using $r = 14$ percent.

^d Current value per share = Discounted value 2009 + Discounted value 2010.

- C** The following limitations of the DDM *are* addressed by the FCFE model: The DDM uses a strict definition of cash flow to equity; that is, cash flows to equity are the dividends on the common stock. The FCFE model expands the definition of cash flow to include the balance of residual cash flows after

all financial obligations and investment needs have been met. Thus, the FCFE model explicitly recognizes the company's investment and financing policies as well as its dividend policy. In instances of a change of corporate control, and thus the possibility of changing dividend policy, the FCFE model provides a better estimate of value.

Both two-stage valuation models allow for two distinct phases of growth—an initial finite period when the growth is abnormal followed by a stable growth period that is expected to last forever. These two-stage models share the same limitations with respect to the growth assumptions:

First, the analyst must confront the difficulty of defining the duration of the extraordinary growth period. A long period of high growth will produce a higher valuation, and the analyst may be tempted to assume an unrealistically long period of extraordinary growth.

Second, the analyst must realize that assuming a sudden shift from high growth to lower, stable growth is unrealistic. The transformation is more likely to occur gradually over time.

Third, because value is quite sensitive to the steady-state growth assumption, overestimating or underestimating this rate can lead to large errors in value.

The two models also share other limitations—notably, difficulties in accurately estimating required rates of return.

- 14 A** When a two-stage DDM is used, the value of a share of Mackinac, dividends per share (DPS), is calculated as follows:

$$\begin{aligned} \text{DPS}_0 &= \text{Cash dividends} / \text{Shares outstanding} = \$22,470 / 13,000 \\ &= \$1.7285 \end{aligned}$$

$$\text{DPS}_1 = \text{DPS}_0 \times 1.17 = \$2.0223$$

$$\text{DPS}_2 = \text{DPS}_0 \times 1.17^2 = \$2.3661$$

$$\text{DPS}_3 = \text{DPS}_0 \times 1.17^3 = \$2.7683$$

$$\text{DPS}_4 = \text{DPS}_0 \times 1.17^3 \times 1.09 = \$3.0175$$

When the CAPM is used, the required return on equity, r , is

$$\begin{aligned} r &= \text{Government bond rate} + (\text{Beta} \times \text{Equity risk premium}) \\ &= 0.06 + (1.25 \times 0.05) = 0.1225 \text{ or } 12.25 \text{ percent} \end{aligned}$$

$$\begin{aligned} \text{Value per share} &= \text{DPS}_1 / (1 + r) + \text{DPS}_2 / (1 + r)^2 + \text{DPS}_3 / (1 + r)^3 \\ &\quad + \left[\text{DPS}_4 / (r - g_{\text{stable}}) \right] / (1 + r)^3 \end{aligned}$$

$$\begin{aligned} \text{Value per share} &= \$2.0223 / 1.1225 + \$2.3661 / 1.1225^2 \\ &\quad + \$2.7683 / 1.1225^3 \\ &\quad + \left[\$3.0175 / (0.1225 - 0.09) \right] / 1.1225^3 \\ &= \$1.8016 + \$1.8778 + \$1.9573 + \$65.6450 \\ &= \$71.28 \end{aligned}$$

- B** When the two-stage FCFE model is used, the value of a share of Mackinac is calculated as follows (in \$ thousands except per-share data):

$$\text{Net income} = \$37,450$$

$$\text{Depreciation} = \$10,500$$

$$\text{Capital expenditures} = \$15,000$$

$$\text{Change in working capital} = \$5,500$$

$$\text{New debt issuance} - \text{Principal repayments} = \text{Change in debt outstanding} = \$4,000$$

$$\text{FCFE}_0 = \text{Net income} + \text{Depreciation} - \text{Capital expenditures} - \text{Change in working capital} - \text{Principal repayments} + \text{New debt issues}$$

$$\text{FCFE}_0 = \$37,450 + \$10,500 - \$15,000 - \$5,500 + \$4,000 = \$31,450$$

$$\text{FCFE}_0 \text{ per share} = \$31,450/13,000 = \$2.4192$$

$$\text{FCFE}_1 = \text{FCFE}_0 \times 1.17 = \$2.8305$$

$$\text{FCFE}_2 = \text{FCFE}_0 \times 1.17^2 = \$3.3117$$

$$\text{FCFE}_3 = \text{FCFE}_0 \times 1.17^3 = \$3.8747$$

$$\text{FCFE}_4 = \text{FCFE}_0 \times 1.17^3 \times 1.09 = \$4.2234$$

From the answer to A, $r = 12.25$ percent.

$$\text{Value per share} = \text{FCFE}_1/(1+r) + \text{FCFE}_2/(1+r)^2 + \text{FCFE}_3/(1+r)^3 + [\text{FCFE}_4/(r - g_{\text{stable}})]/(1+r)^3$$

$$\begin{aligned} \text{Value per share} &= \$2.8305/1.1225 + \$3.3117/1.1225^2 \\ &\quad + \$3.8747/1.1225^3 \\ &\quad + [\$4.2234/(0.1225 - 0.09)]/1.1225^3 \\ &= \$2.5216 + \$2.6283 + \$2.7395 + \$91.8798 \\ &= \$99.77 \end{aligned}$$

- C** The FCFE model is best for valuing companies for takeovers or in situations that have a reasonable chance of a change in corporate control. Because controlling stockholders can change the dividend policy, they are interested in estimating the maximum residual cash flow after meeting all financial obligations and investment needs. The DDM is based on the premise that the only cash flows received by stockholders are dividends. FCFE uses a more expansive definition to measure what a company can afford to pay out as dividends.

- 15 A** The real required rate of return for SK Telecom is

Country return (real)	6.50%
Industry adjustment	+0.60%
Size adjustment	-0.10%
Leverage adjustment	+0.25%
Required rate of return	7.25%

- B** The real growth rate of FCFE is expected to be the same as the country rate of 3.5 percent. The value of one share is

$$V_0 = \frac{\text{FCFE}_0(1 + g_{\text{real}})}{r_{\text{real}} - g_{\text{real}}} = \frac{1,300(1.035)}{0.0725 - 0.035} = 35,880 \text{ Korean won}$$

- 16** The required return for QuickChange, found by using the CAPM, is $r = E(R_i) = R_F + \beta_i[E(R_M) - R_F] = 4.5\% + 2.0(5.0\%) = 14.5\%$. The estimated future values of FCFE are given in the following exhibit (amounts in US dollars):

Year t	Variable	Calculation	Value in Year t	Present Value at 14.5%
1	FCFE ₁	0.75(1.10)	0.825	0.721
2	FCFE ₂	0.75(1.10)(1.26)	1.040	0.793
3	FCFE ₃	0.75(1.10)(1.26) ²	1.310	0.873
4	FCFE ₄	0.75(1.10)(1.26) ³	1.650	0.960
4	TV ₄	FCFE ₅ / ($r - g$) = 0.75(1.10)(1.26) ³ (1.06)/(0.145 - 0.06) = 1.749/0.085	20.580	11.974
0	Total value =	PV of FCFE for Years 1–4 + PV of Terminal value		15.32

The FCFE grows at 10 percent for Year 1 and then at 26 percent for Years 2–4. These calculated values for FCFE are shown in the exhibit. The present values of the FCFE for the first four years discounted at the required rate of return are given in the last column of the table. After Year 4, FCFE will grow at 6 percent forever, so the constant-growth FCFE model is used to find the terminal value at Time 4, which is $TV_4 = \text{FCFE}_5 / (r - g)$. TV_4 is discounted at the required return for four periods to find its present value, as shown in the table. Finally, the total value of the stock, \$15.32, is the sum of the present values of the first four years' FCFE per share plus the present value of the terminal value per share.

- 17** The total value of nonoperating assets is

\$60	million short-term securities
\$45	million market value of noncurrent assets
\$40	million pension fund surplus
<u>\$145</u>	million nonoperating assets

The total value of the firm is the value of the operating assets plus the value of the nonoperating assets, or \$720 million plus \$145 million = \$865 million. The equity value is the value of the firm minus the value of debt, or \$865 million – \$215 million = \$650 million. The value per share is \$650 million/100 million shares = \$6.50 per share.

- 18** C is correct. The sustainable growth rate is return on equity (ROE) multiplied by the retention ratio. ROE is 10 percent, and the retention ratio is $1 - \text{Payout ratio}$, or $1.0 - 0.2 = 0.8$. The sustainable growth rate is $0.8 \times 10\% = 8\%$. FCFE growth should be at least 8 percent per year in the long term.
- 19** A is correct. Justifications for choosing the FCFE model over the DDM include:
- The company pays dividends but its dividends differ significantly from the company's capacity to pay dividends (the first reason given by Leigh).
 - The investor takes a control perspective (the second reason given by Leigh).
- 20** A is correct. $\text{FCFF} = \text{NI} + \text{NCC} + \text{Interest expense} (1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv}$. In this case:

$$\text{NI} = \$485 \text{ million}$$

$$\text{NCC} = \text{Depreciation expense} = \$270 \text{ million}$$

$$\text{Interest expense} (1 - \text{Tax rate}) = 195 (1 - 0.32) = \$132.6 \text{ million}$$

$$\begin{aligned} \text{FCInv} &= \text{Net purchase of fixed assets} = \text{Increase in gross fixed assets} \\ &= 4,275 - 3,752 = \$523 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{WCInv} &= \text{Increase in accounts receivable} + \text{Increase in inventory} - \text{Increase in} \\ &\quad \text{accounts payable} - \text{Increase in accrued liabilities} \\ &= (770 - 711) + (846 - 780) - (476 - 443) - (149 - 114) \\ &= \$57 \text{ million} \end{aligned}$$

$$\text{FCFF} = 485 + 270 + 132.6 - 523 - 57 = 307.6, \text{ or } \$308 \text{ million}$$

- 21 B is correct. $\text{FCFE} = \text{NI} + \text{NCC} - \text{FCInv} - \text{WCInv} + \text{Net borrowing}$. In this case:

$$\text{NI} = \$485 \text{ million}$$

$$\text{NCC} = \text{Depreciation expense} = \$270 \text{ million}$$

$$\begin{aligned} \text{FCInv} &= \text{Net purchase of fixed assets} = \text{Increase in gross fixed} \\ &\quad \text{assets} \\ &= 4,275 - 3,752 = \$523 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{WCInv} &= \text{Increase in accounts receivable} + \text{Increase in} \\ &\quad \text{inventory} - \text{Increase in accounts payable} - \text{Increase} \\ &\quad \text{in accrued liabilities} \\ &= (770 - 711) + (846 - 780) - (476 - 443) - (149 - 114) \\ &= \$57 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{Net borrowing} &= \text{Increase in notes payable} + \text{Increase in long-term debt} \\ &= (465 - 450) + (1,575 - 1,515) = \$75 \text{ million} \end{aligned}$$

$$\text{FCFE} = 485 + 270 - 523 - 57 + 75 = \$250 \text{ million}$$

An alternative calculation is

$$\text{FCFE} = \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing}$$

$$\text{FCFE} = 307.6 - 195(1 - 0.32) + (15 + 60) = \$250 \text{ million}$$

- 22 C is correct. Inventory cannot be reduced below zero. Furthermore, sales growth tends to increase inventory.
- 23 A is correct. The FCFF model is often selected when the capital structure is expected to change because FCFF estimation may be easier than FCFE estimation in the presence of changing financial leverage.
- 24 B is correct. Company A has a history of paying modest dividends relative to FCFE. An FCFF or FCFE model provides a better estimate of value over a DDM model when dividends paid differ significantly from the company's capacity to pay dividends. Also, Company A has a controlling investor; with control comes discretion over the uses of free cash flow. Therefore, there is the possibility that the controlling shareholder could change the dividend policy. Finally, Company A has a stable capital structure; using FCFE is a more direct and simpler method to value a company's equity than using FCFF when a company's capital structure is stable.
- 25 C is correct. The applicable non-cash adjustments to net income in arriving at FCFE are as follows:

Non-Cash Item	Adjustment to Net Income	Amount (millions)
Transaction 1: Loss on sale of equipment	Added back	+900
Transaction 2: Impairment of intangibles	Added back	+400
Transaction 3: Reversal of restructuring charge	Subtracted	−300

In the case of Transaction 1, a loss reduces net income and thus must be added back in arriving at FCFE. Similarly, an impairment of intangibles (Transaction 2) reduces net income and thus must be added back in arriving at FCFE. Transaction 3 (reversal of a restructuring charge) would increase net income and thus must be subtracted in arriving at FCFE.

- 26** C is correct. FCFE for Company A for the most recent year is calculated as follows:

Net income	\$4,844
Plus: Net non-cash charges	1,500
Less: Investment in working capital	122
Plus: Proceeds from sale of fixed capital	2,379
Less: Net borrowing repayment	1,475
FCFE (millions)	\$7,126

Net non-cash charges are found by adding depreciation to other non-cash expenses:

$$\$500 \text{ million} + \$1,000 \text{ million} = \$1,500 \text{ million.}$$

Investment in working capital is calculated by netting the increase in accounts receivable, the decrease in accounts payable, and the increase in other current liabilities:

$$-\$452 \text{ million} - \$210 \text{ million} + \$540 \text{ million} = -\$122 \text{ million (outflow).}$$

Net borrowing repayment is calculated by netting the increase in notes payable and the decrease in long-term debt:

$$\$25 \text{ million} - \$1,500 \text{ million} = -\$1,475 \text{ million (outflow).}$$

- 27** A is correct. FCFE is significantly higher than net income for Company B:

$$\text{Net income} = \$1,212 \text{ million.}$$

FCFE for Company B is calculated as:

Net income	\$1,212
Plus: Net non-cash charges	288
Less: Investment in WC	236
Less: Investment in fixed assets	1,000
Plus: Net borrowing	2,000
FCFE (millions)	\$2,264

Investment in working capital is calculated by adding the increase in accounts receivable, the increase in inventories, the increase in accounts payable, and the increase in other current liabilities: $-\$150 \text{ million} - \$200 \text{ million} + \$100 \text{ million}$

+ \$14 million = −\$236 million. Net borrowing is calculated by adding the increase in notes payable to the decrease in long-term debt: \$3,000 million − \$1,000 million = \$2,000 million.

Therefore, using net income of \$1,212 million as a proxy for FCFE (\$2,264 million) for Company B would result in a much lower valuation estimate than if actual FCFE were used.

- 28** A is correct. In addition to significant non-cash charges other than depreciation in the most recent year, the annual report indicates that Company A expects to recognize additional non-cash charges related to restructuring over the next few years. The given equation for forecasting assumes that the only non-cash charge is depreciation. When the company being analyzed has significant non-cash charges other than depreciation expense, this sales-based methodology will result in a less accurate estimate of FCFE than one obtained by forecasting all the individual components of FCFE.
- 29** C is correct.

FCFE for the most recent year for Company B is:

Net income	\$1,212
Plus: Net non-cash charges	288
Less: Investment in WC	236
Less: Investment in fixed assets	1,000
Plus: Net borrowing	2,000
FCFE (millions)	\$2,264

The required rate of return on equity for Company B is

$$r = E(R_i) = R_F + \beta_i[E(R_M) - R_F] = 3\% + 0.90(7\%) = 9.3\%.$$

The most recent FCFE grows for the next four years at annual growth rates of 10%, 9%, 8%, and 7%, respectively, and then 6% thereafter:

t	g	Calculation	FCFE (millions)
1	10%	\$2,264.00 × 1.10	\$2,490.40
2	9%	\$2,490.40 × 1.09	\$2,714.54
3	8%	\$2,714.54 × 1.08	\$2,931.70
4	7%	\$2,931.70 × 1.07	\$3,136.92
5	6%	\$3,136.92 × 1.06	\$3,325.13

The present value of FCFE for the first four years is calculated as follows:

$$PV = \frac{2,490.40}{1.093^1} + \frac{2,714.54}{1.093^2} + \frac{2,931.70}{1.093^3} + \frac{3,136.92}{1.093^4}$$

$$PV = 2,278.50 + 2,272.25 + 2,245.22 + 2,197.97 = 8,993.94$$

The present value of the terminal value is calculated as follows:

$$PV \text{ of } TV_4 = \frac{3,325.13}{(0.093 - 0.06)(1.093)^4} = 70,601.58$$

So, the estimated total market value of the equity is 8,993.94 + 70,601.58 = 79,595.52 ≈ \$79,596 million.

- 30** C is correct. Company C's firm value is calculated as follows:

The required rate of return on equity for Company C is

$$r = E(R_i) = R_F + \beta_i[E(R_M) - R_F] = 3\% + 1.1(7\%) = 10.7\%.$$

WACC

$$= \frac{\text{MV(Debt)}}{\text{MV(Debt)} + \text{MV(Equity)}} r_d (1 - \text{Tax rate}) + \frac{\text{MV(Equity)}}{\text{MV(Debt)} + \text{MV(Equity)}} r_e$$

$$\text{WACC} = 0.40(6\%)(1 - 0.30) + 0.60(10.7\%) = 1.68\% + 6.42\% = 8.10\%$$

FCFF for the most recent year for Company C is calculated as follows:

Net income	\$15,409.00
Plus: Net non-cash charges	3,746.00
Less: Investment in working capital	992.00
Less: Investment in fixed capital	3,463.00
Plus: Interest expense \times (1 – Tax rate)	386.40
FCFF (in millions)	\$15,086.40

Investment in working capital is found by adding the increase in accounts receivable, the increase in inventories, the decrease in accounts payable, and the increase in other current liabilities: $-\$536 \text{ million} - \$803 \text{ million} - \$3 \text{ million} + \$350 \text{ million} = -\$992 \text{ million}$.

FCFF is expected to grow at 5.0% indefinitely. Thus,

$$\begin{aligned} \text{Firm value} \\ &= \frac{\text{FCFF}_1}{\text{WACC} - g} = \frac{\text{FCFF}_0(1 + g)}{\text{WACC} - g} = \frac{15,086.4(1.05)}{0.081 - 0.05} = \$510,990.97 \text{ million} \end{aligned}$$

The value of equity is the value of the firm minus the value of debt. The value of debt is found by multiplying the target debt ratio by the total firm value:

$$\text{Debt value} = 0.40(\$510,990.97) = \$204,396.39$$

Therefore, equity value = $\$510,990.97 - \$204,396.39 = \$306,594.58 \text{ million}$.

31 A is correct. Sienna's FCFF in 2016 is calculated as

$$\begin{aligned} \text{FCFF} &= \text{EBIT}(1 - \text{Tax rate}) + \text{Dep} - \text{FCInv} - \text{WCInv}. \\ \text{FCInv} &= \text{Purchases of PP\&E} = 1,000 \text{ (outflow)}. \\ \text{WCInv} &= \text{Increase in accounts receivable (outflow)} + \text{Increase in} \\ &\quad \text{inventory (outflow)} + \text{Increase in accounts payable (inflow)}. \\ \text{WCInv} &= -2,000 \text{ (outflow)} + -200 \text{ (outflow)} + 1,000 \text{ (inflow)} = \\ &\quad -1,200 \text{ (outflow)}. \\ \text{FCFF} &= 3,200(1 - 0.35) + 800 - 1,000 - 1,200. \\ \text{FCFF} &= €680 \text{ million}. \end{aligned}$$

FCFF can also be computed from CFO:

$$\begin{aligned} \text{FCFF} &= \text{CFO} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv}. \\ \text{FCFF} &= 1,394 + 440(1 - 0.35) - 1,000. \\ \text{FCFF} &= €680 \text{ million}. \end{aligned}$$

32 A is correct. Sienna's FCFE in 2016 is calculated as

$$\begin{aligned} \text{FCFE} &= \text{CFO} - \text{FCInv} + \text{Net borrowing}. \\ &= 1,394 - 1,000 + 500 \\ &= €894 \text{ million}. \end{aligned}$$

Alternatively, FCFE may be calculated as

$$\begin{aligned}\text{FCFE} &= \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing.} \\ &= 680 - 440(1 - 0.35) + 500 \\ &= \text{€}894 \text{ million.}\end{aligned}$$

- 33** C is correct. Transactions between the company and its shareholders (through cash dividends, share repurchases, and share issuances) do not affect free cash flow. However, leverage changes, such as the use of more debt financing, have some impact on free cash flow because they increase the interest tax shield (reduce corporate taxes because of the tax deductibility of interest) and reduce the cash flow available to equity.
- 34** C is correct. Colanari's valuation is most sensitive to the cost of equity (r_e) because the range of estimated values is larger than the valuation ranges estimated from the sensitivity analysis of both the FCFF growth rate (GFCFF) and the before-tax cost of debt (r_d).

Variable	Base Case	Low Estimate	High Estimate	Valuation with Low Estimate (€ millions)	Valuation with High Estimate (€ millions)	Range (€ millions)
GFCFF	4.6%	4.2%	5.0%	3,274.16	4,021.34	747.18
r_d	4.9%	3.9%	5.9%	3,793.29	3,445.24	348.05
r_e	11.0%	10.0%	12.0%	4,364.18	3,079.38	1,284.80

$$\text{WACC} = [w_d \times r_d(1 - \text{Tax rate})] + (w_e \times r_e).$$

$$\text{Firm value} = \text{FCFF}_0(1 + g)/(\text{WACC} - g).$$

Cost of equity sensitivity

Using the base case estimates for the FCFF growth rate and the before-tax cost of debt and using the low estimate for the cost of equity (r_e) of 10.0%, the valuation estimate is

$$\text{WACC} = [(0.30)(0.049)(1 - 0.35)] + (0.70)(0.10) = 7.96\%.$$

$$\text{Firm value} = 140 \text{ million}(1 + 0.046)/(0.0796 - 0.046) = \text{€}4,364.18 \text{ million.}$$

Using the base case estimates for the FCFF growth rate and the before-tax cost of debt and using the high estimate for the cost of equity (r_e) of 12.0%, the valuation estimate is

$$\text{WACC} = [(0.30)(0.049)(1 - 0.35)] + (0.70)(0.120) = 9.36\%.$$

$$\text{Firm value} = 140 \text{ million}(1 + 0.046)/(0.0936 - 0.046) = \text{€}3,079.38 \text{ million.}$$

Therefore, the range in valuation estimates from using the highest and lowest estimates of the cost of equity is €1,284.80 million.

FCFF growth rate sensitivity

Using the base case estimates for the cost of equity and the before-tax cost of debt and using the low estimate for the FCFF growth rate (GFCFF) of 4.2%, the valuation estimate is

$$\text{WACC} = [(0.30)(0.049)(1 - 0.35)] + (0.70)(0.11) = 8.66\%.$$

$$\text{Firm value} = 140 \text{ million}(1 + 0.042)/(0.0866 - 0.042) = \text{€}3,274.16 \text{ million.}$$

Using the base case estimates for the cost of equity and the before-tax cost of debt and using the high estimate for the FCFF growth rate (GFCFF) of 5.0%, the valuation estimate is

$$WACC = [(0.30)(0.049)(1 - 0.35)] + (0.70)(0.11) = 8.66\%.$$

$$\text{Firm value} = 140 \text{ million}(1 + 0.05)/(0.0866 - 0.05) = \text{€}4,021.34 \text{ million}.$$

Therefore, the range in valuation estimates from using the highest and lowest estimates of the FCFF growth rate is €747.18 million.

Before-tax cost of debt sensitivity

Using the base case estimates for the FCFF growth rate and the cost of equity and using the low estimate for the before-tax cost of debt (r_d) of 3.9%, the valuation estimate is

$$WACC = [(0.30)(0.039)(1 - 0.35)] + (0.70)(0.11) = 8.46\%.$$

$$\text{Firm value} = 140 \text{ million}(1 + 0.046)/(0.0846 - 0.046) = \text{€}3,793.29 \text{ million}.$$

Using the base case estimates for the FCFF growth rate and the cost of equity and using the high estimate for the before-tax cost of debt (r_d) of 5.9%, the valuation estimate is

$$WACC = [(0.30)(0.059)(1 - 0.35)] + (0.70)(0.11) = 8.85\%.$$

$$\text{Firm value} = 140 \text{ million}(1 + 0.046)/(0.0885 - 0.046) = \text{€}3,445.24 \text{ million}.$$

Therefore, the range in valuation estimates from using the highest and lowest estimates of the before-tax cost of debt is €348.05 million.

- 35** C is correct. Based on Scenario 1, where Bern receives regulatory approval for its new drugs, the growth rate in FCFF for Bern will be constant at 4.5%. Therefore, a constant growth valuation model can be used to calculate firm value.

Bern's weighted average cost of capital is calculated as

$$WACC = [w_d \times r_d(1 - \text{Tax rate})] + (w_p \times r_p) + (w_e \times r_e).$$

The total market value of the firm is the sum of the debt, preferred stock, and common stock market values: 15,400 + 4,000 + 18,100 = 37,500.

$$WACC = [(15,400/37,500)(0.060)(1 - 0.269)] + (4,000/37,500)(0.055) + (18,100/37,500)(0.11) = 7.70\%.$$

$$\text{Value of operating assets} = \text{FCFF}_0(1 + g)/(WACC - g).$$

$$\text{Value of operating assets} = 3,226 \text{ million}(1 + 0.045)/(0.0770 - 0.045) = \text{€}105,349.06 \text{ million}.$$

Total value of the company = Value of operating assets + Value of non-operating assets.

$$\text{Total value of the company} = 105,349.06 \text{ million} + 50 \text{ million} = \text{€}105,399.06 \text{ million}.$$

- 36** A is correct.

The total market value of the firm is the sum of the debt, preferred stock, and common stock market values: 15,400 + 4,000 + 18,100 = 37,500 million.

$$\begin{aligned} WACC &= [w_d \times r_d(1 - \text{Tax rate})] + (w_p \times r_p) + (w_e \times r_e) \\ &= [(15,400/37,500)(0.060)(1 - 0.269)] + (4,000/37,500)(0.055) + (18,100/37,500)(0.11). \end{aligned}$$

$$= 7.70\%.$$

Under the assumption that Bern has a low growth rate because it did not receive regulatory approval for its new drugs, the value of Bern can be analyzed using a two-stage valuation model.

$$\text{Company value} = \sum_{t=1}^n \frac{\text{FCFF}_t}{(1 + \text{WACC})^t} + \frac{\text{FCFF}_{n+1}}{(\text{WACC} - g)} \frac{1}{(1 + \text{WACC})^n}$$

Year	0	1	2	3	4
g		1.50%	1.50%	1.50%	0.75%
FCFF _{n} (€ millions)	3,226	3,274.39	3,323.51	3,373.36	3,398.66
Present Value Factor		0.928529	0.862167	0.800547	
Present Value (€ millions)		3,040.37	2,865.42	2,700.53	

The terminal value at the end of Year 3 is $\text{TV}_3 = \text{FCFF}_4 / (\text{WACC} - g_4)$.

$$\text{TV}_3 = 3,398.66 / (0.0770 - 0.0075) = \text{€}48,921.38 \text{ million.}$$

$$\begin{aligned} \text{The total value of operating assets} &= (3,040.37 + 2,865.42 + 2,700.53) \\ &\quad + 48,921.38 / (1 + 0.0770)^3 \\ &= 8,606.32 + 39,163.88 \\ &= \text{€}47,770.20 \text{ million.} \end{aligned}$$

$$\begin{aligned} \text{Value of Bern's common stock} &= \text{Value of operating assets} + \\ &\quad \text{Value of non-operating assets} - \text{Market} \\ &\quad \text{value of debt} - \text{Preferred stock.} \\ &= 47,770.20 + 50.00 - 15,400 - 4,000 \\ &= \text{€}28,420.20 \text{ million.} \end{aligned}$$

Since the current market value of Bern's common stock (€18,100 million) is less than the estimated value (€28,420.20 million), the shares are undervalued.



PRACTICE PROBLEMS

- 1 As of February 2008, you are researching Jonash International, a hypothetical company subject to cyclical demand for its services. Jonash shares closed at \$57.98 on 2 February 2007. You believe the 2003–2006 period reasonably captures average profitability:

Measure	2007	2006	2005	2004	2003
EPS	E\$3.03	\$1.45	\$0.23	\$2.13	\$2.55
BV per share	E\$19.20	\$16.21	\$14.52	\$13.17	\$11.84
ROE	E16.0%	8.9%	1.6%	16.3%	21.8%

- A Define normalized EPS.
- B Calculate a normalized EPS for Jonash based on the method of historical average EPS and then calculate the P/E based on normalized EPS.
- C Calculate a normalized EPS for Jonash based on the method of average ROE and the P/E based on normalized EPS.
- 2 An analyst plans to use P/E and the method of comparables as a basis for recommending purchasing shares of one of two peer-group companies in the business of manufacturing personal digital assistants. Neither company has been profitable to date, and neither is expected to have positive EPS over the next year. Data on the companies' prices, trailing EPS, and expected growth rates in sales (five-year compounded rates) are given in the following table:

Company	Price	Trailing EPS	P/E	Expected Growth (Sales)
Hand	\$22	−\$2.20	NM	45%
Somersault	\$10	−\$1.25	NM	40%

Unfortunately, because the earnings for both companies have been negative, their P/Es are not meaningful. On the basis of this information, address the following:

- A Discuss how the analyst might make a relative valuation in this case.
- B State which stock the analyst should recommend.
- 3 May Stewart, CFA, a retail analyst, is performing a P/E-based comparison of two hypothetical jewelry stores as of early 2009. She has the following data for Hallwhite Stores (HS) and Ruffany (RUF).
- HS is priced at \$44. RUF is priced at \$22.50.
 - HS has a simple capital structure, earned \$2.00 per share (basic and diluted) in 2008, and is expected to earn \$2.20 (basic and diluted) in 2009.
 - RUF has a complex capital structure as a result of its outstanding stock options. Moreover, it had several unusual items that reduced its basic EPS in 2008 to \$0.50 (versus the \$0.75 that it earned in 2007).
 - For 2009, Stewart expects RUF to achieve net income of \$30 million. RUF has 30 million shares outstanding and options outstanding for an additional 3,333,333 shares.
- A Which P/E (trailing or forward) should Stewart use to compare the two companies' valuation?

- B** Which of the two stocks is relatively more attractive when valued on the basis of P/Es (assuming that all other factors are approximately the same for both stocks)?
- 4** You are researching the valuation of the stock of a company in the food-processing industry. Suppose you intend to use the mean value of the forward P/Es for the food-processing industry stocks as the benchmark value of the multiple. This mean P/E is 18.0. The forward or expected EPS for the next year for the stock you are studying is \$2.00. You calculate $18.0 \times \$2.00 = \36 , which you take to be the intrinsic value of the stock based only on the information given here. Comparing \$36 with the stock's current market price of \$30, you conclude the stock is undervalued.
- A** Give two reasons why your conclusion that the stock is undervalued may be in error.
- B** What additional information about the stock and the peer group would support your original conclusion?
- 5** Suppose an analyst uses an equity index as a comparison asset in valuing a stock. In making a decision to recommend purchase of an individual stock, which price multiple(s) would cause concern about the impact of potential overvaluation of the equity index?
- 6** Christie Johnson, CFA, has been assigned to analyze Sundanci. Johnson assumes that Sundanci's earnings and dividends will grow at a constant rate of 13 percent. Exhibits 1 and 2 provide financial statements for the most recent two years (2007 and 2008) and other information for Sundanci.

Exhibit 1 Sundanci Actual 2007 and 2008 Financial Statements for Fiscal Years Ending 31 May (in Millions except Per-Share Data)

Income Statement	2007	2008
Revenue	\$474	\$598
Depreciation	20	23
Other operating costs	368	460
Income before taxes	86	115
Taxes	26	35
Net income	60	80
Dividends	18	24
Earnings per share	\$0.714	\$0.952
Dividends per share	\$0.214	\$0.286
Common shares outstanding	84.0	84.0
Balance Sheet	2007	2008
Current assets	\$201	\$326
Net property, plant, and equipment	474	489
Total assets	675	815
Current liabilities	57	141

Exhibit 1 (Continued)

Balance Sheet	2007	2008
Long-term debt	0	0
Total liabilities	57	141
Shareholders' equity	618	674
Total liabilities and equity	675	815
Other Information		
Capital expenditures	34	38

Exhibit 2 Selected Financial Information

Required rate of ROE	14%
Growth rate of industry	13%
Industry P/E	26

- A** Based on information in Exhibits 1 and 2 and on Johnson's assumptions for Sundanci, calculate justified trailing and forward P/E's for this company.
- B** Identify, within the context of the constant dividend growth model, how *each* of the following fundamental factors would affect the P/E:
- The risk (beta) of Sundanci increases substantially.
 - The estimated growth rate of Sundanci's earnings and dividends increases.
 - The equity risk premium increases.
- Note:* A change in a fundamental factor is assumed to happen in isolation; interactive effects between factors are ignored. That is, every other item of the company is unchanged.
- 7** Tom Smithfield is valuing the stock of a food-processing business. He feels confident explicitly projecting earnings and dividends to three years (to $t = 3$). Other information and estimates are as follows:
- Required rate of return = 0.09.
 - Average dividend payout rate for mature companies in the market = 0.45.
 - Industry average ROE = 0.10.
 - $E_3 = \$3.00$.
 - Industry average P/E = 12.
- On the basis of this information, answer the following questions:
- A** Compute terminal value (V_3) based on comparables.
- B** Contrast your answer in Part A to an estimate of terminal value based on the Gordon growth model.
- 8** Discuss three types of stocks or investment situations for which an analyst could appropriately use P/B in valuation.

- 9 Aratatech is a multinational distributor of semiconductor chips and related products to businesses. Its leading competitor around the world is Trymye Electronics. Aratatech has a current market price of \$10.00, 20 million shares outstanding, annual sales of \$1 billion, and a 5 percent profit margin. Trymye has a market price of \$20.00, 30 million shares outstanding, annual sales of \$1.6 billion, and a profit margin of 4.9 percent. Based on the information given, answer the following questions:
- A Which of the two companies has a more attractive valuation based on P/S?
- B Identify and explain one advantage of P/S over P/E as a valuation tool.
- 10 Wilhelm Müller, CFA, has organized the selected data on four food companies that appear below (TTM stands for trailing 12 months):

Measure	Hoppelli Foods	Telli Foods	Drisket Co.	Whiteline Foods
Stock price	\$25.70	\$11.77	\$23.65	\$24.61
Shares outstanding (thousands)	138,923	220,662	108,170	103,803
Market cap (\$ millions)	3,570	2,597	2,558	2,555
Enterprise value (\$ millions)	3,779	4,056	3,846	4,258
Sales (\$ millions)	4,124	10,751	17,388	6,354
Operating income (\$ millions)	285	135	186	396
Operating profit margin	6.91%	1.26%	1.07%	6.23%
Net income (\$ millions)	182	88	122	252
TTM EPS	\$1.30	\$0.40	\$1.14	\$2.43
Return on equity	19.20%	4.10%	6.40%	23.00%
Net profit margin	4.41%	0.82%	0.70%	3.97%

On the basis of the data given, answer the following questions:

- A Calculate the trailing P/E and EV/Sales for each company.
- B Explain, on the basis of fundamentals, why these stocks have different EV/S multiples.
- 11 John Jones, CFA, is head of the research department at Peninsular Research. Peninsular has a client who has inquired about the valuation method best suited for comparing companies in an industry with the following characteristics:
- Principal competitors within the industry are located in the United States, France, Japan, and Brazil.
 - The industry is currently operating at a cyclical low, with many companies reporting losses.

Jones recommends that the client consider the following valuation ratios:

- 1 P/E.
- 2 P/B.
- 3 EV/S.

Determine which *one* of the three valuation ratios is most appropriate for comparing companies in this industry. Support your answer with *one* reason that makes that ratio superior to either of the other two ratios in this case.

- 12 Giantin Growing AG (GG) is currently selling for €38.50, with TTM EPS and dividends per share of €1.36 and €0.91, respectively. The company's P/E is 28.3, P/B is 7.1, and P/S is 2.9. The ROE is 27.0 percent, and the profit margin on sales is 10.24 percent. The Treasury bond rate is 4.9 percent, the equity risk premium is 5.5 percent, and GG's beta is 1.2.
- What is GG's required rate of return, based on the capital asset pricing model (CAPM)?
 - Assume that the dividend and earnings growth rates are 9 percent. What trailing P/E, P/B, and P/S multiples would be justified in light of the required rate of return in Part A and current values of the dividend payout ratio, ROE, and profit margin?
 - Given that the assumptions and constant growth model are appropriate, state and justify whether GG, based on fundamentals, appears to be fairly valued, overvalued, or undervalued.
- 13 Jorge Zaldys, CFA, is researching the relative valuation of two companies in the aerospace/defense industry, NCI Heavy Industries (NCI) and Relay Group International (RGI). He has gathered relevant information on the companies in the following table.

EBITDA Comparisons (in € Millions except Per-Share and Share-Count Data)

Company	RGI	NCI
Price per share	150	100
Shares outstanding	5 million	2 million
Market value of debt	50	100
Book value of debt	52	112
Cash and investments	5	2
Net income	49.5	12
Net income from continuing operations	49.5	8
Interest expense	3	5
Depreciation and amortization	8	4
Taxes	2	3

Using the information in the table, answer the following questions:

- Calculate P/EBITDA for NCI and RGI.
 - Calculate EV/EBITDA for NCI and RGI.
 - Which company should Zaldys recommend as relatively undervalued? Justify the selection.
- 14 Define the major alternative cash flow concepts, and state one limitation of each.
- 15 Data for two hypothetical companies in the pharmaceutical industry, DriveMed and MAT Technology, are given in the following table. For both companies, expenditures on fixed capital and working capital during the previous year reflect anticipated average expenditures over the foreseeable horizon.

Measure	DriveMed	MAT Technology
Current price	\$46.00	\$78.00
Trailing CF per share	\$3.60	\$6.00
P/CF	12.8	13.0
Trailing FCFE per share	\$1.00	\$5.00
P/FCFE	46.0	15.6
Consensus five-year growth forecast	15%	20%
Beta	1.25	1.25

On the basis of the information supplied, discuss the valuation of MAT Technology relative to DriveMed. Justify your conclusion.

- 16** Your value-oriented investment management firm recently hired a new analyst, Bob Westard, because of his expertise in the life sciences and biotechnology areas. At the firm's weekly meeting, during which each analyst proposes a stock idea for inclusion in the firm's approved list, Westard recommends Hitech Clothing International (HCI). He bases his recommendation on two considerations. First, HCI has pending patent applications but a P/E that he judges to be low in light of the potential earnings from the patented products. Second, HCI has had high relative strength versus the S&P 500 over the past month.
- A** Explain the difference between Westard's two approaches—that is, the use of price multiples and the relative-strength approach.
- B** State which, if any, of the bases for Westard's recommendation is consistent with the investment orientation of your firm.
- 17** Kirstin Kruse, a portfolio manager, has an important client who wants to alter the composition of her equity portfolio, which is currently a diversified portfolio of 60 global common stocks. Because of concerns about the economy and based on the thesis that the consumer staples sector will be less hurt than others in a recession, the client wants to add a group of stocks from the consumer staples sector. In addition, the client wants the stocks to meet the following criteria:
- Stocks must be considered large cap (i.e., have a large market capitalization).
 - Stocks must have a dividend yield of at least 4.0 percent.
 - Stocks must have a forward P/E no greater than 15.

The following table shows how many stocks satisfied each screen, which was run in July 2008.

Screen	Number Satisfying
Consumer staples sector	277
Large cap (> \$9.7 billion in this database)	446
Dividend yield of at least 4.0%	1,609
P/E less than 15	2,994
All four screens	6

The stocks meeting all four screens were Altria Group, Inc.; British American Tobacco (the company's ADR); Reynolds American, Inc.; Tesco PLC (the ADR); Unilever N.V. (the ADR); and Unilever PLC (the ADR).

- A** Critique the construction of the screen.
- B** Do these criteria identify appropriate additions to this client's portfolio?

Questions 18–24 relate to Mark Cannan

Mark Cannan is updating research reports on two well-established consumer companies before first quarter 2011 earnings reports are released. His supervisor, Sharolyn Ritter, has asked Cannan to use market-based valuations when updating the reports.

Delite Beverage is a manufacturer and distributor of soft drinks and recently acquired a major water bottling company in order to offer a broader product line. The acquisition will have a significant impact on Delite's future results.

You Fix It is a United States retail distributor of products for home improvement, primarily for those consumers who choose to do the work themselves. The home improvement industry is cyclical; the industry was adversely affected by the recent downturn in the economy, the level of foreclosures, and slow home sales. Although sales and earnings at You Fix It weakened, same store sales are beginning to improve as consumers undertake more home improvement projects. Poor performing stores were closed, resulting in significant restructuring charges in 2010.

Before approving Cannan's work, Ritter wants to discuss the calculations and choices of ratios used in the valuation of Delite and You Fix It. The data used by Cannan in his analysis is summarized in Exhibit 1.

Exhibit 1 Select Financial Data for Delite Beverage and You Fix It

	Delite Beverage	You Fix It
2010 Earnings per share (EPS)	\$3.44	\$1.77
2011 estimated EPS	\$3.50	\$1.99
Book value per share end of year	\$62.05	\$11.64
Current share price	\$65.50	\$37.23
Sales (billions)	\$32.13	\$67.44
Free cash flow per share	\$2.68	\$0.21
Shares outstanding end of year	2,322,034,000	1,638,821,000

Cannan advises Ritter that he is considering three different approaches to value the shares of You Fix It:

- Approach 1 Price-to-book (P/B) ratio
- Approach 2 Price-to-earnings (P/E) ratio using trailing earnings
- Approach 3 Price-to-earnings ratio using normalized earnings

Cannan tells Ritter that he calculated the price-to-sales ratio (P/S) for You Fix It, but chose not to use it in the valuation of the shares. Cannan states to Ritter that it is more appropriate to use the P/E ratio rather than the P/S ratio because:

- Reason 1 Earnings are more stable than sales.
- Reason 2 Earnings are less easily manipulated than sales.
- Reason 3 The P/E ratio reflects financial leverage whereas the P/S ratio does not.

Cannan also informs Ritter that he did not use a price-to-cash flow multiple in valuing the shares of Delite or You Fix It. The reason is that he could not identify a cash flow measure that would both account for working capital and non-cash revenues, and also be after interest expense and thus not be mismatched with share price. Ritter advises Cannan that such a cash flow measure does exist.

Ritter provides Cannan with financial data on three close competitors as well as the overall beverage sector, which includes other competitors, in Exhibit 2. She asks Cannan to determine, based on the price-to-earnings growth (PEG) ratio, whether Delite shares are overvalued, fairly valued, or undervalued.

Exhibit 2 Beverage Sector Data

	Forward P/E	Earnings Growth
Delite	—	12.41%
Fresh Iced Tea Company	16.59	9.52%
Nonutter Soda	15.64	11.94%
Tasty Root Beer	44.10	20%
Beverage sector average	16.40	10.80%

After providing Ritter his answer, Cannan is concerned about the inclusion of Tasty Root Beer in the comparables analysis. Specifically, Cannan asks Ritter:

“I feel we should mitigate the effect of large outliers, but not the impact of small outliers (i.e., those close to zero), when calculating the beverage sector P/E. What measure of central tendency would you suggest we use to address this concern?”

Ritter requests that Cannan incorporate their discussion points before submitting the reports for final approval.

- 18 Based on the information in Exhibit 1, the *most appropriate* price-to-earnings ratio to use in the valuation of Delite is *closest* to:
 - A 18.71.
 - B 19.04.
 - C 24.44.
- 19 Based upon the information in Exhibit 1, the price-to-sales ratio for You Fix It is *closest* to:
 - A 0.28.
 - B 0.55.
 - C 0.90.
- 20 Which valuation approach would be *most* appropriate in valuing shares of You Fix It?
 - A Approach 1
 - B Approach 2
 - C Approach 3
- 21 Cannan's preference to use the P/E ratio over the P/S ratio is *best* supported by:
 - A Reason 1
 - B Reason 2
 - C Reason 3
- 22 The cash flow measure that Ritter would *most likely* recommend to address Cannan's concern is:
 - A free cash flow to equity.
 - B earnings plus non-cash charges.

- C earnings before interest, tax, depreciation, and amortization.
- 23 Based upon the information in Exhibits 1 and 2, Cannan would most likely conclude that Delite's shares are:
- A overvalued.
- B undervalued.
- C fairly valued.
- 24 The measure of central tendency that Ritter will *most likely* recommend is the:
- A median.
- B harmonic mean.
- C arithmetic mean.

The following information relates to Questions 25–30

Andrea Risso is a junior analyst with AquistareFianco, an independent equity research firm. Risso's supervisor asks her to update, as of 1 January 2015, a quarterly research report for Centralino S.p.A., a telecommunications company headquartered in Italy. On that date, Centralino's common share price is €50 and its preferred shares trade for €5.25 per share.

Risso gathers information on Centralino. Exhibit 1 presents earnings and dividend data, and Exhibit 2 presents balance sheet data. Net sales were €3.182 billion in 2014. Risso estimates a required return of 15% for Centralino and forecasts growth in dividends of 6% into perpetuity.

Exhibit 1 Earnings and Dividends for Centralino, 2011–2015

	2011	2012	2013	2014	2015(E)
Earnings per share (EPS, €)	4.93	5.25	4.46	5.64	6.00
Dividends per share (DPS, €)	2.45	2.60	2.60	2.75	2.91
Return on equity (ROE)	13.01%	13.71%	11.58%	14.21%	14.96%

Note: The data for 2011–2014 are actual and for 2015 are estimated.

Exhibit 2 Summary Balance Sheet for Centralino, Year Ended 31 December 2014

Assets (€ millions)		Liabilities and Shareholders' Equity (€ millions)	
Cash and cash equivalents	102	Current liabilities	259
Accounts receivable	305	Long-term debt	367
Inventory	333	Total liabilities	626
Total current assets	740	Preferred shares	80
Property and equipment, net	913	Common shares	826
Total assets	1,653	Retained earnings	121

Exhibit 2 (Continued)

Assets (€ millions)	Liabilities and Shareholders' Equity (€ millions)
	Total shareholders' equity 1,027
	Total liabilities and shareholders' equity 1,653

Notes: The market value of long-term debt is equal to its book value. Shares outstanding are 41.94 million of common shares and 16.00 million of preferred shares.

Exhibit 3 presents forward price-to-earnings ratios (P/E) for Centralino's peer group. Risso assumes no differences in fundamentals among the peer group companies.

Exhibit 3 Peer Group Forward P/Es

Company	Forward P/E
Brinaregalo	5.9
Camporio	8.3
Esperto	3.0
Fornodissione	15.0
Radoresto	4.6

Risso also wants to calculate normalized EPS using the average return on equity method. She determines that the 2011–2014 time period in Exhibit 1 represents a full business cycle for Centralino.

- 25** Based on Exhibit 1, the trailing P/E for Centralino as of 1 January 2015, ignoring any business-cycle influence, is *closest to*:
- A** 8.3.
B 8.9.
C 9.9.
- 26** Based on Exhibit 1 and Risso's estimates of return and dividend growth, Centralino's justified forward P/E based on the Gordon growth dividend discount model is *closest to*:
- A** 5.4.
B 5.7.
C 8.3.
- 27** Based on Exhibit 2, the price-to-book multiple for Centralino is *closest to*:
- A** 2.0.
B 2.2.
C 2.5.
- 28** Based on Exhibit 2, the multiple of enterprise value to sales for Centralino as of 31 December 2014 is *closest to*:
- A** 0.67.
B 0.74.
C 0.77.

- 29 Based on Exhibit 1 and using the harmonic mean of the peer group forward P/Es shown in Exhibit 3 as a valuation indicator, the common shares of Centralino are:
- A undervalued.
 - B fairly valued.
 - C overvalued.
- 30 Based on Exhibits 1 and 2, the normalized earnings per share for Centralino as calculated by Risso should be *closest* to:
- A €2.96.
 - B €3.21.
 - C €5.07.

The following information relates to Questions 31–37

Cátia Pinho is a supervisor in the equity research division of Suite Securities. Pinho asks Flávia Silveira, a junior analyst, to complete an analysis of Adesivo S.A., Enviado S.A., and Gesticular S.A.

Pinho directs Silveira to use a valuation metric that would allow for a meaningful ranking of relative value of the three companies' shares. Exhibit 1 provides selected financial information for the three companies.

Exhibit 1 Selected Financial Information for Adesivo, Enviado, and Gesticular (Brazilian Real, R\$)

	Adesivo	Enviado	Gesticular
Stock's current price	14.72	72.20	132.16
Diluted EPS (last four quarters)	0.81	2.92	−0.05
Diluted EPS (next four quarters)	0.91	3.10	2.85
Dividend rate (annualized most recent dividend)	0.44	1.24	0.00

Silveira reviews underlying trailing EPS for Adesivo. Adesivo has basic trailing EPS of R\$0.84. Silveira finds the following note in Adesivo's financial statements:

“On a per share basis, Adesivo incurred in the last four quarters

- i. from a lawsuit, a non-recurring gain of R\$0.04; and
- ii. from factory integration, a non-recurring cost of R\$0.03 and a recurring cost of R\$0.01 in increased depreciation.”

Silveira notes that Adesivo is forecasted to pay semiannual dividends of R\$0.24 next year. Silveira estimates five-year earnings growth rates for the three companies, which are presented in Exhibit 2.

Exhibit 2 Earnings Growth Rate Estimates over Five Years

Company	Earnings Growth Rate Estimate (%)
Adesivo	16.67
Enviado	21.91
Gesticular	32.33

Pinho asks Silveira about the possible use of the price-to-sales ratio (P/S) in assessing the relative value of the three companies. Silveira tells Pinho:

- Statement 1 The P/S is not affected by revenue recognition practices.
 Statement 2 The P/S is less subject to distortion from expense accounting than is the P/E.

Pinho asks Silveira about using the Fed and Yardeni models to assess the value of the equity market. Silveira states:

- Statement 3 The Fed model concludes that the market is undervalued when the market's current earnings yield is greater than the 10-year Treasury bond yield.
 Statement 4 The Yardeni model includes the consensus five-year earnings growth rate forecast for the market index.

Silveira also analyzes the three companies using the enterprising value (EV)-to-EBITDA multiple. Silveira notes that the EBITDA for Gesticular for the most recent year is R\$560 million and gathers other selected information on Gesticular, which is presented in Exhibit 4.

Exhibit 4 Selected Information on Gesticular at Year-End (R\$ millions)

Market Value of Debt	Market Value of Common Equity	Market Value of Preferred Equity	Cash	Short-Term Investments
1,733	6,766	275	581	495

Pinho asks Silveira about the use of momentum indicators in assessing the shares of the three companies. Silveira states:

- Statement 5 Relative-strength indicators compare an equity's performance during a period with the performance of some group of equities or its own past performance.
 Statement 6 In the calculation of standardized unexpected earnings (SUE), the magnitude of unexpected earnings is typically scaled by the standard deviation of analysts' earnings forecasts.

31 Based on Pinho's directive and the data from the last four quarters presented in Exhibit 1, the valuation metric that Silveira should use is the:

- A price-to-earnings ratio (P/E).
 B production-to-demand ratio (P/D).
 C earnings-to-price ratio (E/P).

- 32 Based on Exhibit 1 and the note to Adesivo's financial statements, the trailing P/E for Adesivo using underlying EPS is *closest* to:
- A 17.7.
 - B 18.2.
 - C 18.4.
- 33 Based on Exhibits 1 and 2, which company's shares are the most attractively priced based on the five-year forward P/E-to-growth ratio (PEG)?
- A Adesivo
 - B Enviado
 - C Gesticular
- 34 Which of Silveira's statements concerning the use of the P/S is correct?
- A Statement 1 only
 - B Statement 2 only
 - C Both Statement 1 and Statement 2
- 35 Which of Silveira's statements concerning the Fed and Yardeni models is correct?
- A Statement 3 only
 - B Statement 4 only
 - C Both Statement 3 and Statement 4
- 36 Based on Exhibit 4, Gesticular's EV/EBITDA multiple is *closest* to:
- A 11.4.
 - B 13.7.
 - C 14.6.
- 37 Which of Silveira's statements concerning momentum indicators is correct?
- A Statement 5 only
 - B Statement 6 only
 - C Both Statement 5 and Statement 6

SOLUTIONS

- 1 **A** Normalized EPS is the level of earnings per share that the company could currently achieve under midcyclical conditions.
- B** Averaging EPS over the 2003–2006 period, we find that $(\$2.55 + \$2.13 + \$0.23 + \$1.45)/4 = \$1.59$. According to the method of historical average EPS, Jonash's normalized EPS is \$1.59. The P/E based on this estimate is $\$57.98/\$1.59 = 36.5$.
- C** Averaging ROE over the 2003–2006 period, we find that $(0.218 + 0.163 + 0.016 + 0.089)/4 = 0.1215$. For current BV per share, you would use the estimated value of \$19.20 for year-end 2007. According to the method of average ROE, $0.1215 \times \$19.20 = \2.33 is the normalized EPS. The P/E based on this estimate is $\$57.98/\$2.33 = 24.9$.
- 2 **A** The analyst can rank the two stocks by earnings yield (E/P). Whether EPS is positive or negative, a lower E/P reflects a richer (higher) valuation and a ranking from high to low E/P has a meaningful interpretation.

In some cases, an analyst might handle negative EPS by using normalized EPS in its place. Neither business, however, has a history of profitability. When year-ahead EPS is expected to be positive, forward P/E is positive. Thus, the use of forward P/Es sometimes addresses the problem of trailing negative EPS. Forward P/E is not meaningful in this case, however, because next year's earnings are expected to be negative.
- B** Hand has an E/P of -0.100 , and Somersault has an E/P of -0.125 . A higher earnings yield has an interpretation that is similar to that of a lower P/E, so Hand appears to be relatively undervalued. The difference in earnings yield cannot be explained by differences in sales growth forecasts. In fact, Hand has a higher expected sales growth rate than Somersault. Therefore, the analyst should recommend Hand.
- 3 **A** Because investing looks to the future, analysts often favor forward P/E when earnings forecasts are available, as they are here. A specific reason to use forward P/Es is the fact given that RUF had some unusual items affecting EPS for 2008. The data to make appropriate adjustments to RUF's 2008 EPS are not given. In summary, Stewart should use forward P/Es.
- B** Because RUF has a complex capital structure, the P/Es of the two companies must be compared on the basis of diluted EPS.

For HS, forward P/E = $\$44/2.20 = 20$.
 For RUF, forward P/E per diluted share
 = $\$22.50/(30,000,000/33,333,333) = 25$.
 Therefore, HS has the more attractive valuation at present.

The problem illustrates some of the considerations that should be taken into account in using P/Es and the method of comparables.
- 4 **A** Your conclusion may be in error because of the following:
 - The peer-group stocks themselves may be overvalued; that is, the mean P/E of 18 may be too high in terms of intrinsic value. If so, using 18 as a multiplier of the stock's expected EPS will lead to an estimate of stock value in excess of intrinsic value.

- The stock's fundamentals may differ from those of the mean food-processing industry stock. For example, if the stock's expected growth rate is lower than the mean industry growth rate and its risk is higher than the mean, the stock may deserve a lower P/E than the industry mean.

In addition, mean P/E may be influenced by outliers.

B The following additional evidence would support the original conclusion:

- Evidence that stocks in the industry are, at least on average, fairly valued (that stock prices reflect fundamentals).
- Evidence that no significant differences exist in the fundamental drivers of P/E for the stock being compared and the average industry stock.

5 In principle, the use of any price multiple for valuation is subject to the concern stated. If the stock market is overvalued, an asset that appears to be fairly or even undervalued in relation to an equity index may also be overvalued.

6 A The formula for calculating the justified forward P/E for a stable-growth company is the payout ratio divided by the difference between the required rate of return and the growth rate of dividends. If the P/E is being calculated on trailing earnings (Year 0), the payout ratio is increased by 1 plus the growth rate. According to the 2007 income statement, the payout ratio is $18/60 = 0.30$; the 2008 income statement gives the same number ($24/80 = 0.30$). Thus,

P/E based on trailing earnings:

$$\begin{aligned} \text{P/E} &= [\text{Payout ratio} \times (1 + g)] / (r - g) \\ &= (0.30 \times 1.13) / (0.14 - 0.13) = 33.9 \end{aligned}$$

P/E based on next year's earnings:

$$\begin{aligned} \text{P/E} &= \text{Payout ratio} / (r - g) \\ &= 0.30 / (0.14 - 0.13) = 30 \end{aligned}$$

B

Fundamental Factor	Effect on P/E	Explanation (Not Required in Question)
The risk (beta) of Sundanci increases substantially.	Decrease	P/E is a decreasing function of risk—that is, as risk increases, P/E decreases. Increases in the risk of Sundanci stock would be expected to lower its P/E.
The estimated growth rate of Sundanci's earnings and dividends increases.	Increase	P/E is an increasing function of the growth rate of the company—that is, the higher the expected growth, the higher the P/E. Sundanci would command a higher P/E if the market price were to incorporate expectations of a higher growth rate.
The equity risk premium increases.	Decrease	P/E is a decreasing function of the equity risk premium. An increased equity risk premium increases the required rate of return, which lowers the price of a stock relative to its earnings. A higher equity risk premium would be expected to lower Sundanci's P/E.

7 A $V_n = \text{Benchmark value of P/E} \times E_n = 12 \times \$3.00 = \$36.0$.

- B** In the expression for sustainable growth rate $g = b \times \text{ROE}$, you can use $(1 - 0.45) = 0.55 = b$, and $\text{ROE} = 0.10$ (the industry average), obtaining $0.55 \times 0.10 = 0.055$. Given the required rate of return of 0.09, you obtain the estimate $\$3.00(0.45)(1.055)/(0.09 - 0.055) = \40.69 . In this case, the estimate of terminal value obtained from the Gordon growth model is higher than the estimate based on multiples. The two estimates may differ for a number of reasons, including the sensitivity of the Gordon growth model to the values of the inputs.
- 8** Although the measurement of book value has a number of widely recognized shortcomings, P/B may still be applied fruitfully in several circumstances:
- The company is not expected to continue as a going concern. When a company is likely to be liquidated (so ongoing earnings and cash flow are not relevant), the value of its assets less its liabilities is of utmost importance. Naturally, the analyst must establish the fair value of these assets.
 - The company is composed mainly of liquid assets, which is the case for finance, investment, insurance, and banking institutions.
 - The company's EPS is highly variable or negative.
- 9 A** Aratatech: $\text{P/S} = (\$10 \text{ price per share})/[(\$1 \text{ billion sales})/(20 \text{ million shares})]$
 $= \$10/(\$1,000,000,000/20,000,000) = 0.2$
 Trymye: $\text{P/S} = (\$20 \text{ price per share})/[(\$1.6 \text{ billion sales})/(30 \text{ million shares})]$
 $= \$20/(\$1,600,000,000/30,000,000) = 0.375$
 Aratatech has a more attractive valuation than Trymye based on its lower P/S but comparable profit margin.
- B** One advantage of P/S over P/E is that companies' accounting decisions typically have a much greater impact on reported earnings than they are likely to have on reported sales. Although companies are able to make a number of legitimate business and accounting decisions that affect earnings, their discretion over reported sales (revenue recognition) is limited. Another advantage is that sales are almost always positive, so using P/S eliminates issues that arise when EPS is zero or negative.
- 10 A** The P/Es are:
- | | |
|-----------|---------------------|
| Hoppelli | $25.70/1.30 = 19.8$ |
| Telli | $11.77/0.40 = 29.4$ |
| Drisket | $23.65/1.14 = 20.7$ |
| Whiteline | $24.61/2.43 = 10.1$ |
- The EV/S multiples for each company are:
- | | |
|-----------|------------------------|
| Hoppelli | $3,779/4,124 = 0.916$ |
| Telli | $4,056/10,751 = 0.377$ |
| Drisket | $3,846/17,388 = 0.221$ |
| Whiteline | $4,258/6,354 = 0.670$ |
- B** The data for the problem include measures of profitability, such as operating profit margin, ROE, and net profit margin. Because EV includes the market values of both debt and equity, logically the ranking based on EV/S should be compared with a pre-interest measure of profitability, namely, operating profit margin. The ranking of the stocks by EV/S from highest to lowest and the companies' operating margins are:

Company	EV/S	Operating Profit Margin (%)
Hoppelli	0.916	6.91
Whiteline	0.670	6.23
Telli	0.377	1.26
Drisket	0.221	1.07

The differences in EV/S appear to be explained, at least in part, by differences in cost structure as measured by operating profit margin.

- 11 For companies in the industry described, EV/S would be superior to either of the other two ratios. Among other considerations, EV/S is:
- more useful than P/E in valuing companies with negative earnings;
 - better than either P/E or P/B for comparing companies in different countries that are likely to use different accounting standards (a consequence of the multinational nature of the industry);
 - less subject to manipulation than earnings (i.e., through aggressive accounting decisions by management, who may be more motivated to manage earnings when a company is in a cyclical low, rather than in a high, and thus likely to report losses).
- 12 A Based on the CAPM, the required rate of return is $4.9\% + 1.2 \times 5.5\% = 11.5\%$.
- B The dividend payout ratio is $\text{€}0.91/\text{€}1.36 = 0.669$. The justified values for the three valuation ratios should be

$$\frac{P_0}{E_0} = \frac{(1-b) \times (1+g)}{r-g} = \frac{0.669 \times 1.09}{0.115 - 0.09} = \frac{0.7293}{0.025} = 29.2$$

$$\frac{P_0}{B_0} = \frac{ROE - g}{r - g} = \frac{0.27 - 0.09}{0.115 - 0.09} = \frac{0.18}{0.025} = 7.2$$

$$\frac{P_0}{S_0} = \frac{PM \times (1-b) \times (1+g)}{r-g} = \frac{0.1024 \times 0.669 \times 1.09}{0.115 - 0.09} = \frac{0.0747}{0.025} = 3.0$$

- C The justified trailing P/E is higher than the trailing P/E (29.2 versus 28.3), the justified P/B is higher than the actual P/B (7.2 versus 7.1), and the justified P/S is higher than the actual P/S (3.0 versus 2.9). Therefore, based on these three measures, GG appears to be slightly undervalued.
- 13 A EBITDA = Net income (from continuing operations) + Interest expense + Taxes + Depreciation + Amortization
- EBITDA for RGI = $\text{€}49.5 \text{ million} + \text{€}3 \text{ million} + \text{€}2 \text{ million} + \text{€}8 \text{ million} = \text{€}62.5 \text{ million}$
- Per-share EBITDA = $(\text{€}62.5 \text{ million})/(5 \text{ million shares}) = \text{€}12.5$
- P/EBITDA for RGI = $\text{€}150/\text{€}12.5 = 12$
- EBITDA for NCI = $\text{€}8 \text{ million} + \text{€}5 \text{ million} + \text{€}3 \text{ million} + \text{€}4 \text{ million} = \text{€}20 \text{ million}$
- Per-share EBITDA = $(\text{€}20 \text{ million})/(2 \text{ million shares}) = \text{€}10$
- P/EBITDA for NCI = $\text{€}100/\text{€}10 = 10$

B For RGI:

Market value of equity = $\text{€}150 \times 5 \text{ million} = \text{€}750 \text{ million}$

Market value of debt = $\text{€}50$

Total market value = €750 million + €50 = €800 million

EV = €800 million – €5 million (cash and investments) = €795 million

Now, Zaldys would divide EV by total (as opposed to per-share) EBITDA:

EV/EBITDA for RGI = (€795 million)/(€62.5 million) = 12.72

For NCI:

Market value of equity = €100 × 2 million = €200 million

Market value of debt = €100

Total market value = €200 million + €100 = €300 million

EV = €300 million – €2 million (cash and investments) = €298 million

Now, Zaldys would divide EV by total (as opposed to per-share) EBITDA:

EV/EBITDA for NCI = (€298 million)/(€20 million) = 14.9

- C** Zaldys should select RGI as relatively undervalued.

First, it is correct that NCI *appears* to be relatively undervalued based on P/EBITDA, because NCI has a lower P/EBITDA multiple:

- P/EBITDA = €150/€12.5 = 12 for RGI.
- P/EBITDA = €100/€10 = 10 for NCI.

RGI is relatively undervalued on the basis of EV/EBITDA, however, because RGI has the lower EV/EBITDA multiple:

- EV/EBITDA = (€795 million)/(€62.5 million) = 12.72 for RGI.
- EV/EBITDA = (€298 million)/(€20 million) = 14.9 for NCI.

EBITDA is a pre-interest flow; therefore, it is a flow to both debt and equity and the EV/EBITDA multiple is more appropriate than the P/EBITDA multiple. Zaldys would rely on EV/EBITDA to reach his decision if the two ratios conflicted. Note that P/EBITDA does not take into account differences in the use of financial leverage. Substantial differences in leverage exist in this case (NCI uses much more debt), so the preference for using EV/EBITDA rather than P/EBITDA is supported.

- 14** The major concepts are as follows:

- EPS plus per-share depreciation, amortization, and depletion (CF)
Limitation: Ignores changes in working capital and noncash revenue; not a free cash flow concept.
- Cash flow from operations (CFO)
Limitation: Not a free cash flow concept, so not directly linked to theory.
- Free cash flow to equity (FCFE)
Limitation: Often more variable and more frequently negative than other cash flow concepts.
- Earnings before interest, taxes, depreciation, and amortization (EBITDA)
Limitation: Ignores changes in working capital and noncash revenue; not a free cash flow concept. Relative to its use in P/EBITDA, EBITDA is mismatched with the numerator because it is a pre-interest concept.

- 15** MAT Technology is relatively undervalued compared with DriveMed on the basis of P/FCFE. MAT Tech's P/FCFE multiple is 34 percent the size of DriveMed's FCFE multiple (15.6/46 = 0.34, or 34 percent). The only comparison slightly in DriveMed's favor, or approximately equal for both companies,

is the comparison based on P/CF (i.e., 12.8 for DriveMed versus 13.0 for MAT Technology). However, FCFE is more strongly grounded in valuation theory than P/CF. Because DriveMed's and MAT Technology's expenditures for fixed capital and working capital during the previous year reflected anticipated average expenditures over the foreseeable horizon, you would have additional confidence in the P/FCFE comparison.

- 16 A** Relative strength is based strictly on price movement (a technical indicator). As used by Westard, the comparison is between the returns on HCI and the returns on the S&P 500. In contrast, the price multiple approaches are based on the relationship of current price, not to past prices, but to some measure of value such as EPS, book value, sales, or cash flow.
- B** Only the reference to the P/E in relationship to the pending patent applications in Westard's recommendation is consistent with the company's value orientation. High relative strength would be relevant for a portfolio managed with a growth/momentum investment style.
- 17 A** As a rule, a screen that includes a maximum P/E ratio should include criteria requiring positive earnings; otherwise, the screen could select companies with negative P/E ratios. The screen may be too narrowly focused on value measures. It did not include criteria related to expected growth, required rate of return, risk, or financial strength.
- B** The screen results in a very concentrated portfolio. The screen selected both of the parent companies of the Unilever Group: Unilever NV and Unilever PLC, which operate as a single business entity despite having separate legal identities and separate stock exchange listings. Thus, owning both stocks would provide no diversification benefits. In addition, the screen selected three tobacco companies, which typically pay high dividends. Again, owning all three stocks would provide little diversification.
- 18 A** is correct. The forward P/E ratio should be used given the recent significant acquisition of the water bottling company. Since a major change such as an acquisition or divestiture can affect results, the forward P/E, also known as the leading P/E or prospective P/E, is the most appropriate P/E to use for Delite. Earnings estimates for 2011 should incorporate the performance of the water bottling company. The forward P/E is calculated as the current price divided by the projected earnings per share, or $\$65.50/\$3.50 = 18.71$.
- 19 C** is correct. The price-to-sales ratio is calculated as price per share divided by annual net sales per share.
- Price per share = \$37.23
- Annual net sales per share = $\$67.44 \text{ billion} / 1.638821 \text{ billion shares} = \41.15
- Price-to-sales ratio (P/S) = $\$37.23/\$41.15 = 0.90$
- 20 C** is correct. You Fix It is in the cyclical home improvement industry. The use of normalized earnings should address the problem of cyclicity in You Fix It earnings by estimating the level of earnings per share that the company could achieve currently under mid-cyclical conditions.
- 21 C** is correct. The price to sales (P/S) ratio fails to consider differences in cost structures. Also, while share price reflects the effect of debt financing on profitability and risk, sales is a pre-financing income measure and does not incorporate the impact of debt in the firm's capital structure. Earnings reflect operating and financial leverage, and thus the price-to-earnings (P/E) ratio incorporates the impact of debt in the firm's capital structure.

- 22** A is correct. Free cash flow to equity (FCFE) is defined as cash flow available to shareholders after deducting all operating expenses, interest and debt payments as well as investments in working and fixed capital. Cannan's requirement that the cash flow include interest expense, working capital and noncash revenue is satisfied by FCFE.
- 23** C is correct. The P/E-to-growth (PEG) ratio is calculated by dividing a stock's P/E by the expected earnings growth rate, expressed as a percent. To calculate Delite's PEG ratio, first calculate the P/E ratio: $\$65.50/\$3.50 = 18.71$. In this case, the forward earnings should be used given the recent acquisition of the water bottling company. Next, calculate Delite's PEG ratio: $18.71/12.41 = 1.51$. Comparing Delite's PEG ratio of 1.51 to the PEG ratio of 1.74 ($16.59/9.52$) for Fresh Iced Tea, 1.31 ($15.64/11.94$) for Nonutter Soda, and to the beverage sector average of 1.52 ($16.40/10.80$), it appears that Delite's shares are fairly valued. This is determined by the fact that Delite's PEG ratio is in the middle of the range of PEG ratios and very close to the sector average. Therefore, the shares appear to be fairly valued.
- 24** B is correct. The harmonic mean is sometimes used to reduce the impact of large outliers—which are typically the major concern in using the arithmetic mean multiple—but not the impact of small outliers (i.e., those close to zero). The harmonic mean may aggravate the impact of small outliers, but such outliers are bounded by zero on the downside.
- 25** B is correct. The trailing P/E ratio is calculated as follows:

Stock's current price/Most recent four quarters' EPS

$$€50/€5.64 = 8.9$$

- 26** A is correct. The justified forward P/E is calculated as follows:

$$\begin{aligned} \frac{P_0}{E_1} &= \frac{D_1/E_1}{r - g} \\ &= \frac{(2.91/6.00)}{(0.15 - 0.06)} = 5.4 \end{aligned}$$

- 27** B is correct. Price to book is calculated as the current market price per share divided by book value per share. Book value per share is common shareholders' equity divided by the number of common shares outstanding. Common shareholders' equity is calculated as total shareholders' equity minus the value of preferred stock

Thus:

$$\text{Common shareholders' equity} = €1,027 - €80 = €947 \text{ million}$$

$$\text{Book value per share} = €947 \text{ million} / 41.94 \text{ million} = €22.58$$

$$\text{Price-to-book ratio (P/B) for Centralino} = €50/€22.58 = 2.2$$

- 28** C is correct. Enterprise value (EV) is calculated as follows:

$$\begin{aligned} \text{EV} &= \text{Market value of common equity} + \\ &\quad \text{Market value of preferred stock} + \text{Market value of debt} \\ &\quad - \text{Cash, cash equivalents, and short-term investments} \\ &= (\$50 \times 41.94 \text{ million}) + (\$5.25 \times 16.00 \text{ million}) + \$367 - \$102 \\ &= \$2,446 \text{ million (or } €2.446 \text{ billion)}. \end{aligned}$$

$$\text{So, EV/Sales} = €2.446 \text{ billion} / €3.182 \text{ billion} = 0.77.$$

- 29 C is correct. The harmonic mean is calculated as follows:

$$x_H = \frac{n}{\sum_{i=1}^n \left(\frac{1}{x_i} \right)} = \frac{5}{\left(\frac{1}{5.9} \right) + \left(\frac{1}{8.3} \right) + \left(\frac{1}{3.0} \right) + \left(\frac{1}{15.0} \right) + \left(\frac{1}{4.6} \right)} = 5.5$$

The forward P/E for Centralino is €50/€6.00 = 8.3. Because Centralino's forward P/E is higher than the harmonic mean of the peer group, the shares of Centralino appear relatively overvalued.

- 30 A is correct. Based on the method of average ROE, normalized EPS are calculated as the average ROE from the most recent full business cycle multiplied by current book value per share. The most recent business cycle was 2011–2014, and the average ROE over that period was

$$\frac{0.1301 + 0.1371 + 0.1158 + 0.1421}{4} = 0.131$$

The book value of (common) equity, or simply book value, is the value of shareholders' equity less any value attributable to the preferred stock: €1,027 million – €80 million = €947 million.

Current book value per share (BVPS) is calculated as €947 million/41.94 million = €22.58.

So, normalized EPS is calculated as

$$\text{Average ROE} \times \text{BVPS} = 0.131 \times €22.58 = €2.96.$$

- 31 C is correct. The E/P based on trailing earnings would offer the most meaningful ranking of the shares. Using E/P places Gesticular's negative EPS in the numerator rather than the denominator, leading to a more meaningful ranking.
- 32 C is correct. The EPS figure that Silveira should use is diluted trailing EPS of R\$0.81, adjusted as follows:

- 1 Subtract the R\$0.04 non-recurring legal gain.
- 2 Add R\$0.03 for the non-recurring factory integration charge.

No adjustment needs to be made for the R\$0.01 charge related to depreciation because it is a recurring charge.

Therefore, underlying trailing EPS = R\$0.81 – R\$0.04 + R\$0.03 = R\$0.80 and trailing P/E using underlying trailing EPS = R\$14.72/R\$0.80 = 18.4.

- 33 A is correct. The forward PEG for the three companies are calculated as:

$$\text{Forward P/E} = \text{Stock's Current Price/Forecasted EPS}$$

$$\text{Forward PEG} = \text{Forward P/E / Expected earnings growth rate (in percentage terms)}$$

$$\text{Adesivo forward P/E} = \text{R\$14.72/R\$0.91} = 16.18$$

$$\text{Adesivo forward PEG} = 16.18/16.67 = 0.97$$

$$\text{Enviado forward P/E} = \text{R\$72.20/R\$3.10} = 23.29$$

$$\text{Enviado forward PEG} = 23.29/21.91 = 1.06$$

$$\text{Gesticular forward P/E} = \text{R\$132.16/R\$2.85} = 46.37$$

$$\text{Gesticular forward PEG} = 46.37/32.33 = 1.43$$

Adesivo has the lowest forward PEG of 0.97, indicating that it is the most undervalued of the three equities based on the forward PEG ratio.

- 34 B is correct. Statement 2 is correct because sales, as the top line of the income statement, are less subject to accounting distortion or manipulation than are other fundamentals, such as earnings. Statement 1 is incorrect because sales figures can be distorted by revenue recognition practices, in particular those tending to speed up the recognition of revenues.
- 35 C is correct. The Fed model considers the equity market to be undervalued when the market's current earnings yield is greater than the 10-year Treasury bond yield. The Yardeni model incorporates the consensus five-year earnings growth rate forecast for the market index, a variable missing in the Fed model.
- 36 B is correct. The EV for Gesticular is calculated as follows:

$$\begin{aligned}\text{EV} &= \text{Market value of debt} + \text{Market value of com-} \\ &\quad \text{mon equity} + \text{Market value of preferred equity} \\ &\quad - \text{Cash and short-term investments}\end{aligned}$$

$$\begin{aligned}\text{EV} &= \text{R\$1,733 million} + \text{R\$6,766 million} + \text{R\$275 million} - \\ &\quad \text{R\$581 million} - \text{R\$495 million} \\ &= \text{R\$7,698 million}\end{aligned}$$

$$\text{EV/EBITDA} = \text{R\$7,698 million} / \text{R\$560 million} = 13.7$$

- 37 A is correct. Relative-strength indicators compare an equity's performance with the performance of a group of equities or with its own past performance. SUE is unexpected earnings scaled by the standard deviation in past unexpected earnings (not the standard deviation of analysts' earnings forecasts, which is used in the calculation of the scaled earnings surprise).

PRACTICE PROBLEMS

- 1 Based on the following information, determine whether Vertically Integrated Manufacturing (VIM) earned any residual income for its shareholders:
 - VIM had total assets of \$3,000,000, financed with twice as much debt capital as equity capital.
 - VIM's pretax cost of debt is 6 percent and cost of equity capital is 10 percent.
 - VIM had EBIT of \$300,000 and was taxed at a rate of 40 percent.

Calculate residual income by using the method based on deducting an equity charge.
- 2 Use the following information to estimate the intrinsic value of VIM's common stock using the residual income model:
 - VIM had total assets of \$3,000,000, financed with twice as much debt capital as equity capital.
 - VIM's pretax cost of debt is 6 percent and cost of equity capital is 10 percent.
 - VIM had EBIT of \$300,000 and was taxed at a rate of 40 percent. EBIT is expected to continue at \$300,000 indefinitely.
 - VIM's book value per share is \$20.
 - VIM has 50,000 shares of common stock outstanding.
- 3 Palmetto Steel, Inc. (PSI) maintains a dividend payout ratio of 80 percent because of its limited opportunities for expansion. Its return on equity is 15 percent. The required rate of return on PSI equity is 12 percent, and its long-term growth rate is 3 percent. Compute the justified P/B based on forecasted fundamentals, consistent with the residual income model and a constant growth rate assumption.
- 4 Because New Market Products (NMP) markets consumer staples, it is able to make use of considerable debt in its capital structure; specifically, 90 percent of the company's total assets of \$450,000,000 are financed with debt capital. Its cost of debt is 8 percent before taxes, and its cost of equity capital is 12 percent. NMP achieved a pretax income of \$5.1 million in 2006 and had a tax rate of 40 percent. What was NMP's residual income?
- 5 In 2007, Smithson–Williams Investments (SWI) achieved an operating profit after taxes of €10 million on total assets of €100 million. Half of its assets were financed with debt with a pretax cost of 9 percent. Its cost of equity capital is 12 percent, and its tax rate is 40 percent. Did SWI achieve a positive residual income?
- 6 Calculate the economic value added (EVA) or residual income, as requested, for each of the following:
 - A NOPAT = \$100
 Beginning book value of debt = \$200
 Beginning book value of equity = \$300
 WACC = 11 percent
 Calculate EVA.
 - B Net income = €5.00

Dividends = €1.00

Beginning book value of equity = €30.00

Required rate of return on equity = 11 percent

Calculate residual income.

- C** Return on equity = 18 percent

Required rate of return on equity = 12 percent

Beginning book value of equity = €30.00

Calculate residual income.

- 7** Jim Martin is using economic value added (EVA) and market value added (MVA) to measure the performance of Sundanci. Martin uses the fiscal year 2000 information below for his analysis.

- Adjusted net operating profit after tax (NOPAT) is \$100 million.
- Total capital is \$700 million (no debt).
- Closing stock price is \$26.
- Total shares outstanding is 84 million.
- The cost of equity is 14 percent.

Calculate the following for Sundanci. Show your work.

A EVA for fiscal year 2000.

B MVA as of fiscal year-end 2000.

- 8** Protected Steel Corporation (PSC) has a book value of \$6 per share. PSC is expected to earn \$0.60 per share forever and pays out all of its earnings as dividends. The required rate of return on PSC's equity is 12 percent. Calculate the value of the stock using the following:

A Dividend discount model.

B Residual income model.

- 9** Notable Books (NB) is a family controlled company that dominates the retail book market. NB has book value of \$10 per share, is expected to earn \$2.00 forever, and pays out all of its earnings as dividends. Its required return on equity is 12.5 percent. Value the stock of NB using the following:

A Dividend discount model.

B Residual income model.

- 10** Simonson Investment Trust International (SITI) is expected to earn \$4.00, \$5.00, and \$8.00 for the next three years. SITI will pay annual dividends of \$2.00, \$2.50, and \$20.50 in each of these years. The last dividend includes a liquidating payment to shareholders at the end of Year 3 when the trust terminates. SITI's book value is \$8 per share and its required return on equity is 10 percent.

A What is the current value per share of SITI according to the dividend discount model?

B Calculate per-share book value and residual income for SITI for each of the next 3 years and use those results to find the stock's value using the residual income model.

C Calculate return on equity and use it as an input to the residual income model to calculate SITI's value.

- 11** Foodsco Incorporated (FI), a leading distributor of food products and materials to restaurants and other institutions, has a remarkably steady track record in terms of both return on equity and growth. At year-end 2007, FI had a book

value of \$30 per share. For the foreseeable future, the company is expected to achieve a ROE of 15 percent (on trailing book value) and to pay out one-third of its earnings in dividends. The required return is 12 percent. Forecast FI's residual income for the year ending 31 December 2012.

- 12** Lendex Electronics (LE) had a great deal of turnover of top management for several years and was not followed by analysts during this period of turmoil. Because the company's performance has been improving steadily for the past three years, technology analyst Steve Kent recently reinitiated coverage of LE. A meeting with management confirmed Kent's positive impression of LE's operations and strategic plan. Kent decides LE merits further analysis.

Careful examination of LE's financial statements revealed that the company had negative other comprehensive income from changes in the value of available-for-sale securities in each of the past five years. How, if at all, should this observation about LE's other comprehensive income affect the figures that Kent uses for the company's ROE and book value for those years?

- 13** Retail fund manager Seymour Simms is considering the purchase of shares in upstart retailer Hot Topic Stores (HTS). The current book value of HTS is \$20 per share, and its market price is \$35. Simms expects long-term ROE to be 18 percent, long-term growth to be 10 percent, and cost of equity to be 14 percent. What conclusion would you expect Simms to arrive at if he uses a single-stage residual income model to value these shares?
- 14** Dayton Manufactured Homes (DMH) builds prefabricated homes and mobile homes. Favorable demographics and the likelihood of slow, steady increases in market share should enable DMH to maintain its ROE of 15 percent and growth rate of 10 percent through time. DMH has a book value of \$30 per share and the required rate of return on its equity is 12 percent. Compute the value of its equity using the single-stage residual income model.
- 15** Use the following inputs and the finite horizon form of the residual income model to compute the value of Southern Trust Bank (STB) shares as of 31 December 2007:
- ROE will continue at 15 percent for the next five years (and 10 percent thereafter) with all earnings reinvested (no dividends paid).
 - Cost of equity equals 10 percent.
 - $B_0 = \$10$ per share (at year-end 2007).
 - Premium over book value at the end of five years will be 20 percent.
- 16** Shunichi Kobayashi is valuing United Parcel Service (NYSE: UPS). Kobayashi has made the following assumptions:
- Book value per share is estimated at \$9.62 on 31 December 2007.
 - EPS will be 22 percent of the beginning book value per share for the next eight years.
 - Cash dividends paid will be 30 percent of EPS.
 - At the end of the eight-year period, the market price per share will be three times the book value per share.
 - The beta for UPS is 0.60, the risk-free rate is 5.00 percent, and the equity risk premium is 5.50 percent.

The current market price of UPS is \$59.38, which indicates a current P/B of 6.2.

- A** Prepare a table that shows the beginning and ending book values, net income, and cash dividends annually for the eight-year period.
- B** Estimate the residual income and the present value of residual income for the eight years.

- C Estimate the value per share of UPS stock using the residual income model.
 - D Estimate the value per share of UPS stock using the dividend discount model. How does this value compare with the estimate from the residual income model?
- 17 Boeing Company (NYSE: BA) has a current stock price of \$49.86. It also has a P/B of 3.57 and book value per share of \$13.97. Assume that the single-stage growth model is appropriate for valuing the company. Boeing's beta is 0.80, the risk-free rate is 5.00 percent, and the equity risk premium is 5.50 percent.
- A If the growth rate is 6 percent and the ROE is 20 percent, what is the justified P/B for Boeing?
 - B If the growth rate is 6 percent, what ROE is required to yield Boeing's current P/B?
 - C If the ROE is 20 percent, what growth rate is required for Boeing to have its current P/B?

The following information relates to Questions 18–25

Mangoba Nkomo, CFA, a senior equity analyst with Robertson-Butler Investments, South Africa, has been assigned a recent graduate, Manga Mahlangu, to assist in valuations. Mahlangu is interested in pursuing a career in equity analysis. In their first meeting, Nkomo and Mahlangu discuss the concept of residual income and its commercial applications. Nkomo asks Mahlangu to determine the market value added for a hypothetical South African firm using the data provided in Exhibit 1.

Exhibit 1 Hypothetical Firm Data (amounts in South African Rand)

Current share price	R25.43
Book value per share	R20.00
Total shares outstanding	30 million
Cost of equity	13%
Market value of debt	R55 million
Accounting book value of total capital	R650 million
Intrinsic share value of equity derived from residual income model	R22.00

Nkomo also shares his valuation report of the hypothetical firm with Mahlangu. Nkomo's report concludes that the intrinsic value of the hypothetical firm, based on the residual income model, is R22.00 per share. To assess Mahlangu's knowledge of residual income valuation, Nkomo asks Mahlangu two questions about the hypothetical firm:

- Question 1 What conclusion can we make about future residual earnings given the current book value per share and my estimate of intrinsic value per share?
- Question 2 Suppose you estimated the intrinsic value of a firm's shares using a constant growth residual income model, and you found that your estimate of intrinsic value equaled the book value per share. What would that finding imply about that firm's return on equity?

Satisfied with Mahlangu's response, Nkomo requests that Mahlangu use the single-stage residual income (RI) model to determine the intrinsic value of the equity of Jackson Breweries, a brewery and bottling company, using data provided in Exhibit 2.

Exhibit 2 Jackson Breweries Data (amounts in South African Rand)

Constant long-term growth rate	9.5%
Constant long-term ROE	13%
Current market price per share	R150.70
Book value per share	R55.81
Cost of equity	11%

Nkomo also wants to update an earlier valuation of Amersheen, a food retailer. The valuation report, which was completed at the end of 2010, concluded an intrinsic value per share of R11.00 for Amersheen. The share price at that time was R8.25. Nkomo points out to Mahlangu that, in late 2010, Amersheen announced a significant restructuring charge, estimated at R2 million, that would be reported as part of operating earnings in Amersheen's 2010 annual income statement. Nkomo asks Mahlangu the following question about the restructuring charge:

Question 3 What was the correct way to treat the estimated R2 million restructuring charge in my 2010 valuation report?

Satisfied with Mahlangu's response, Nkomo mentions to Mahlangu that Amersheen recently (near the end of 2011) completed the acquisition of a chain of convenience stores. Nkomo requests that Mahlangu complete, as of the beginning of 2012, an updated valuation of Amersheen under two scenarios:

- Scenario 1 Estimate the value of Amersheen shares using a multistage residual income (RI) model with the data provided in Exhibit 3. Under Scenario 1, expected ROE in 2015 is 26% but it is assumed that the firm's ROE will slowly decline towards the cost of equity thereafter.
- Scenario 2 Estimate the value of Amersheen shares using a multistage residual income (RI) model with the data provided in Exhibit 3 but assume that, at the end of 2014, share price is expected to equal book value per share.

Exhibit 3 Amersheen Data (amounts in South African Rand)

Long-term growth rate starting in 2015	9.0%
Expected ROE in 2015	26%
Current market price per share	R16.55
Book value per share, beginning of 2012	R7.60
Cost of equity	10%
Persistence factor	0.70

Exhibit 3 (Continued)

	2012	2013	2014
Expected earnings per share	R3.28	R3.15	R2.90
Expected dividend per share	R2.46	R2.36	R2.06

- 18 Based upon the information in Exhibit 1, the market value added of the hypothetical firm is *closest* to:
- A R65 million.
 - B R113 million.
 - C R168 million.
- 19 The *most* appropriate response to Nkomo's Question 1 would be that the present value of future residual earnings is expected to be:
- A zero.
 - B positive.
 - C negative.
- 20 The *most* appropriate response to Nkomo's Question 2 would be that the firm's return on equity (ROE) is:
- A equal to the firm's cost of equity.
 - B lower than the firm's cost of equity.
 - C higher than the firm's cost of equity.
- 21 Based upon the information in Exhibit 2, the intrinsic value per share of the equity of Jackson Breweries is *closest* to:
- A R97.67.
 - B R130.22.
 - C R186.03.
- 22 If Nkomo's 2010 year-end estimate of Amersheen shares' intrinsic value was accurate, then Amersheen's shares were *most likely*:
- A overvalued.
 - B undervalued.
 - C fairly valued.
- 23 The *most* appropriate treatment of the estimated restructuring charge, in response to Nkomo's Question 3, would be:
- A an upward adjustment to book value.
 - B an upward adjustment to the cost of equity.
 - C to exclude it from the estimate of net income.
- 24 Under Scenario 1, the intrinsic value per share of the equity of Amersheen is *closest* to:
- A R13.29.
 - B R15.57.
 - C R16.31.
- 25 Under Scenario 2, the intrinsic value per share of the equity of Amersheen is *closest* to:
- A R13.29.

- B R15.57.
C R16.31.

The following information relates to Questions 26–35

Elena Castovan is a junior analyst with Contralith Capital, a long-only equity investment manager. She has been asked to value three stocks on Contralith's watch list: Portous, Inc. (PTU), SSX Financial (SSX), and Tantechi Ltd. (TTCI).

During their weekly meeting, Castovan and her supervisor, Ariana Beckworth, discuss characteristics of residual income (RI) models. Castovan tells Beckworth the following.

- Statement 1 The present value of the terminal value in RI models is often a larger portion of the total intrinsic value than it is in other DCF valuation models.
- Statement 2 The RI model's use of accounting income assumes that the cost of debt capital is appropriately reflected by interest expense.
- Statement 3 RI models cannot be readily applied to companies that do not have positive expected near-term free cash flows.

Beckworth asks Castovan why an RI model may be more appropriate for valuing PTU than the dividend discount model or a free cash flow model. Castovan tells Beckworth that, over her five-year forecast horizon, she expects PTU to perform the following actions.

- Reason 1 Pay dividends that are unpredictable
- Reason 2 Generate positive and fairly predictable free cash flows
- Reason 3 Report significant amounts of other comprehensive income

At the conclusion of their meeting, Beckworth asks Castovan to value SSX using RI models. Selected financial information on SSX is presented in Exhibit 1.

Exhibit 1 SSX Financial (SSX) Selected Financial Data

Total assets (millions)	€4,000.00
Capital structure	60% debt/40% equity
EBIT (millions)	€700.00
Tax rate	35.00%
Return on equity (ROE)	23.37%
Pretax cost of debt ^a	5.20%
Cost of equity	15.00%
Market price per share	€48.80
Price-to-book ratio	2.10

^a Interest expense is tax-deductible.

Castovan's final assignment is to determine the intrinsic value of TTCI using both a single-stage and a multistage RI model. Selected data and assumptions for TTCI are presented in Exhibit 2.

Exhibit 2 Tantechi Ltd. (TTCI) Selected Financial Data and Assumptions

Book value per share	€45.25
Market price per share	€126.05
Constant long-term ROE	12.00%
Constant long-term earnings growth rate	4.50%
Cost of equity	8.70%

For the multistage model, Castovan forecasts TTCI's ROE to be higher than its long-term ROE for the first three years. Forecasted earnings per share and dividends per share for TTCI are presented in Exhibit 3. Starting in Year 4, Castovan forecasts TTCI's ROE to revert to the constant long-term ROE of 12% annually. The terminal value is based on an assumption that residual income per share will be constant from Year 3 into perpetuity.

Exhibit 3 Tantechi Ltd. (TTCI) Forecasts of Earnings and Dividends

	Year 1	Year 2	Year 3
Earnings per share (€)	7.82	8.17	8.54
Dividends per share (€)	1.46	1.53	1.59

Beckworth questions Castovan's assumption regarding the implied persistence factor used in the multistage RI valuation. She tells Castovan that she believes that a persistence factor of 0.10 is appropriate for TTCI.

- 26 Which of Castovan's statements regarding residual income models is correct?
- A Statement 1
 - B Statement 2
 - C Statement 3
- 27 Which of Castovan's reasons *best* justifies the use of a residual income model to value PTU?
- A Reason 1
 - B Reason 2
 - C Reason 3
- 28 The forecasted item described in Reason 3 will *most likely* impact:
- A earnings per share.
 - B dividends per share.
 - C book value per share.
- 29 Based on Exhibit 1, residual income for SSX is *closest* to:
- A €40.9 million.
 - B €90.2 million.

- C €133.9 million.
- 30 Based on Exhibit 1 and the single-stage residual income model, the implied growth rate of earnings for SSX is *closest* to:
- A 5.8%.
 - B 7.4%.
 - C 11.0%.
- 31 Based on the single-stage RI model and Exhibit 2, Castovan should conclude that TTCI is:
- A undervalued.
 - B fairly valued.
 - C overvalued.
- 32 Based on Exhibit 2, the justified price-to-book ratio for TTCI is *closest* to:
- A 1.79.
 - B 2.27.
 - C 2.79.
- 33 Based on Exhibits 2 and 3 and the multistage RI model, Castovan should estimate the intrinsic value of TTCI to be *closest* to:
- A €54.88.
 - B €83.01.
 - C €85.71.
- 34 The persistence factor suggested by Beckworth will lead to a multistage value estimate of TTCI's shares that is:
- A less than Castovan's multistage value estimate.
 - B equal to Castovan's multistage value estimate.
 - C greater than Castovan's multistage value estimate.
- 35 The *best* justification for Castovan to use Beckworth's suggested persistence factor is that TTCI has:
- A a low dividend payout.
 - B extreme accounting rates of return.
 - C a strong market leadership position.

SOLUTIONS

- 1 Yes, VIM earned a positive residual income of \$8,000.

EBIT	\$300,000	
Interest	120,000	(\$2,000,000 × 6%)
Pretax income	\$180,000	
Tax expense	72,000	
Net income	\$108,000	

$$\begin{aligned}
 \text{Equity charge} &= \text{Equity capital} \times \text{Required return on equity} \\
 &= (1/3)(\$3,000,000) \times 0.10 \\
 &= \$1,000,000 \times 0.10 = \$100,000
 \end{aligned}$$

$$\begin{aligned}
 \text{Residual income} &= \text{Net income} - \text{Equity charge} \\
 &= \$108,000 - \$100,000 = \$8,000
 \end{aligned}$$

- 2 According to the residual income model, the intrinsic value of a share of common stock equals book value per share plus the present value of expected future per-share residual income. Book value per share was given as \$20. Noting that debt is \$2,000,000 $[(2/3)(\$3,000,000)]$ so that interest is \$120,000 $(\$2,000,000 \times 6\%)$, VIM's residual income is \$8,000, which is calculated (as in Problem 1) as follows:

$$\begin{aligned}
 \text{Residual income} &= \text{Net income} - \text{Equity charge} \\
 &= [(\text{EBIT} - \text{Interest})(1 - \text{Tax rate})] - [(\text{Equity capital}) \\
 &\quad (\text{Required return on equity})] \\
 &= [(\$300,000 - \$120,000)(1 - 0.40)] - [(\$1,000,000)(0.10)] \\
 &= \$108,000 - \$100,000 \\
 &= \$8,000
 \end{aligned}$$

Therefore, residual income per share is \$0.16 per share $(\$8,000/50,000 \text{ shares})$. Because EBIT is expected to continue at the current level indefinitely, the expected per-share residual income of \$0.16 is treated as a perpetuity. The present value of \$0.16 is discounted at the required return on equity of 10 percent, so the present value of the residual income is \$1.60 $(\$0.16/0.10)$.

$$\begin{aligned}
 \text{Intrinsic value} &= \text{Book value per share} + \\
 &\quad \text{PV of expected future income per-share residual income} \\
 &= \$20 + \$1.60 = \$21.60
 \end{aligned}$$

- 3 With $g = b \times \text{ROE} = (1 - 0.80)(0.15) = (0.20)(0.15) = 0.03$,

$$\begin{aligned}
 P/B &= (\text{ROE} - g)/(r - g) \\
 &= (0.15 - 0.03)/(0.12 - 0.03) \\
 &= 0.12/0.09 = 1.33
 \end{aligned}$$

or

$$\begin{aligned}
 P/B &= 1 + (\text{ROE} - r)/(r - g) \\
 &= 1 + (0.15 - 0.12)/(0.12 - 0.03) \\
 &= 1.33
 \end{aligned}$$

- 4 In this problem (unlike Problems 1 and 2), interest expense has already been deducted in arriving at NMP's pretax income of \$5.1 million.

Therefore,

$$\begin{aligned}\text{Net income} &= \text{Pretax income} \times (1 - \text{Tax rate}) \\ &= \$5.1 \text{ million} \times (1 - 0.4) \\ &= \$5.1 \times 0.6 = \$3.06 \text{ million}\end{aligned}$$

$$\begin{aligned}\text{Equity charge} &= \text{Total equity} \times \text{Cost of equity capital} \\ &= (0.1 \times \$450 \text{ million}) \times 12\% \\ &= \$45 \text{ million} \times 0.12 = \$5,400,000\end{aligned}$$

$$\begin{aligned}\text{Residual income} &= \text{Net income} - \text{Equity charge} \\ &= \$3,060,000 - \$5,400,000 = -\$2,340,000\end{aligned}$$

NMP had negative residual income of $-\$2,340,000$.

- 5 To achieve a positive residual income, a company's net operating profit after taxes as a percentage of its total assets can be compared with its weighted average cost of capital (WACC). For SWI,

$$\begin{aligned}\text{NOPAT/Assets} &= €10 \text{ million}/€100 \text{ million} = 10\% \\ \text{WACC} &= \text{Percent of debt} \times \text{After-tax cost of debt} + \\ &\quad \text{Percent of equity} \times \text{Cost of equity} \\ &= (0.5)(0.09)(0.6) + (0.5)(0.12) \\ &= (0.5)(0.054) + (0.5)(0.12) = 0.027 + 0.06 = 0.087 \\ &= 8.7\%\end{aligned}$$

Therefore, SWI's residual income was positive. Specifically, residual income equals $€1.3 \text{ million} [(0.10 - 0.087) \times €100 \text{ million}]$.

- 6 A $\text{EVA} = \text{NOPAT} - \text{WACC} \times \text{Beginning book value of assets}$
 $= \$100 - (11\%) \times (\$200 + \$300) = \$100 - (11\%)(\$500) = \45
 B $\text{RI}_t = E_t - rB_{t-1}$
 $= €5.00 - (11\%)(€30.00) = €5.00 - €3.30 = €1.70$
 C $\text{RI}_t = (\text{ROE}_t - r) \times B_{t-1}$
 $= (18\% - 12\%) \times (€30) = €1.80$
 7 A Economic value added = Net operating profit after taxes - (Cost of capital \times Total capital) = $\$100 \text{ million} - (14\% \times \$700 \text{ million}) = \$2 \text{ million}$. In the absence of information that would be required to calculate the weighted average cost of debt and equity, and given that Sundanci has no long-term debt, the only capital cost used is the required rate of return on equity of 14 percent.
 B Market value added = Market value of capital - Total capital = $\$26 \text{ stock price} \times 84 \text{ million shares} - \$700 \text{ million} = \$1.48 \text{ billion}$
 8 A Because the dividend is a perpetuity, the no-growth form of the DDM is applied as follows:

$$\begin{aligned}V_0 &= D/r \\ &= \$0.60/0.12 = \$5 \text{ per share}\end{aligned}$$

- B According to the residual income model, $V_0 = \text{Book value per share} + \text{Present value of expected future per-share residual income}$.

Residual income is calculated as:

$$\begin{aligned}\text{RI}_t &= E - rB_{t-1} \\ &= \$0.60 - (0.12)(\$6) = -\$0.12\end{aligned}$$

Present value of perpetual stream of residual income is calculated as:

$$\text{RI}_t/r = -\$0.12/0.12 = -\$1.00$$

The value is calculated as:

$$V_0 = \$6.00 - \$1.00 = \$5.00 \text{ per share}$$

- 9 A According to the DDM, $V_0 = D/r$ for a no-growth company.

$$V_0 = \$2.00/0.125 = \$16 \text{ per share}$$

- B Under the residual income model, $V_0 = B_0 + \text{Present value of expected future per-share residual income.}$

Residual income is calculated as:

$$\begin{aligned} \text{RI}_t &= E - rB_{t-1} \\ &= \$2 - (0.125)(\$10) = \$0.75 \end{aligned}$$

Present value of stream of residual income is calculated as:

$$\text{RI}_t/r = 0.75/0.125 = \$6$$

The value is calculated as:

$$V_0 = \$10 + \$6 = \$16 \text{ per share}$$

- 10 A $V_0 = \text{Present value of the future dividends}$

$$\begin{aligned} &= \$2/1.10 + \$2.50/(1.1)^2 + \$20.50/(1.1)^3 \\ &= \$1.818 + \$2.066 + \$15.402 = \$19.286 \end{aligned}$$

- B The book values and residual incomes for the next three years are as follows:

Year	1	2	3
Beginning book value	\$ 8.00	\$10.00	\$12.50
Retained earnings (Net income – Dividends)	2.00	2.50	(12.50)
Ending book value	<u>\$10.00</u>	<u>\$12.50</u>	<u>\$ 0.00</u>
Net income	\$ 4.00	\$ 5.00	\$ 8.00
Less equity charge ($r \times \text{Book value}$)	0.80	1.00	1.25
Residual income	<u>\$ 3.20</u>	<u>\$ 4.00</u>	<u>\$ 6.75</u>

Under the residual income model,

$$\begin{aligned} V_0 &= B_0 + \text{Present value of expected future per-share residual income} \\ V_0 &= \$8.00 + \$3.20/1.1 + \$4.00/(1.1)^2 + \$6.75/(1.1)^3 \\ V_0 &= 8.00 + \$2.909 + \$3.306 + \$5.071 = \$19.286 \end{aligned}$$

C

Year	1	2	3
Net income (NI)	\$4.00	\$5.00	\$8.00
Beginning book value (BV)	8.00	10.00	12.50
Return on equity (ROE) = NI/BV	50%	50%	64%
ROE – r	40%	40%	54%
Residual income (ROE – r) \times BV	\$3.20	\$4.00	\$6.75

Under the residual income model,

$$\begin{aligned} V_0 &= B_0 + \text{Present value of expected future per-share residual income} \\ V_0 &= \$8.00 + \$3.20/1.1 + \$4.00/(1.1)^2 + \$6.75/(1.1)^3 \\ V_0 &= 8.00 + \$2.909 + \$3.306 + \$5.071 = \$19.286 \end{aligned}$$

Note: Because the residual incomes for each year are necessarily the same in Parts B and C, the results for stock valuation are identical.

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Year	2008	2009	2012
Beginning book value	\$30.00	\$33.00	\$43.92
Net income = ROE × Book value	4.50	4.95	6.59
Dividends = payout × Net income	1.50	1.65	2.20
Equity charge ($r \times$ Book value)	3.60	3.96	5.27
Residual income = Net income – Equity charge	0.90	0.99	1.32
Ending book value	\$33.00	\$36.30	\$48.32

The table shows that residual income in Year 2008 is \$0.90, which equals Beginning book value \times (ROE $- r$) = $\$30 \times (0.15 - 0.12)$. The Year 2009 column shows that residual income grew by 10 percent to \$0.99, which follows from the fact that growth in residual income relates directly to the growth in net income as this example is configured. When both net income and dividends are a function of book value and return on equity is constant, then growth, g , can be predicted from (ROE)(1 – Dividend payout ratio). In this case, $g = 0.15 \times (1 - 0.333) = 0.10$ or 10 percent. Net income and residual income will grow by 10 percent annually.

Therefore, residual income in Year 2012 = (Residual income in Year 2008) \times $(1.1)^4 = 0.90 \times 1.4641 = \1.32 .

- 12 When such items as changes in the value of available-for-sale securities bypass the income statement, they are generally assumed to be nonoperating items that will fluctuate from year to year, although averaging to zero in a period of years. The evidence suggests, however, that changes in the value of available-for-sale securities are not averaging to zero but are persistently negative. Furthermore, these losses are bypassing the income statement. It appears that the company is either making an inaccurate assumption or misleading investors in one way or another. Accordingly, Kent might adjust LE's income downward by the amount of loss for other comprehensive income for each of those years. ROE would then decline commensurately. LE's book value would *not* be misstated because the decline in the value of these securities was already recognized and appears in the shareholders' equity account "Accumulated Other Comprehensive Income."

$$\begin{aligned}
 13 \quad V_0 &= B_0 + (\text{ROE} - r)B_0 / (r - g) \\
 &= \$20 + (0.18 - 0.14)(\$20) / (0.14 - 0.10) \\
 &= \$20 + \$20 = \$40
 \end{aligned}$$

Given the current market price is \$35 and the estimated value is \$40, Simms will probably conclude that the shares are somewhat undervalued.

$$\begin{aligned}
 14 \quad V_0 &= B_0 + (\text{ROE} - r)B_0 / (r - g) \\
 &= \$30 + (0.15 - 0.12)(\$30) / (0.12 - 0.10) \\
 &= \$30 + \$45 = \$75 \text{ per share}
 \end{aligned}$$

15

Year	Net Income (Projected)	Ending Book Value	ROE (%)	Equity Charge (in Currency)	Residual Income	PV of RI
2007		\$10.00				
2008	\$1.50	11.50	15	\$1.00	\$0.50	\$0.45

Year	Net Income (Projected)	Ending Book Value	ROE (%)	Equity Charge (in Currency)	Residual Income	PV of RI
2009	1.73	13.23	15	1.15	0.58	0.48
2010	1.99	15.22	15	1.32	0.67	0.50
2011	2.29	17.51	15	1.52	0.77	0.53
2012	2.63	20.14	15	1.75	0.88	0.55
						<u>\$2.51</u>

Using the finite horizon form of residual income valuation,

$$\begin{aligned}
 V_0 &= B_0 + \text{Sum of discounted RIs} + \text{Premium (also discounted to present)} \\
 &= \$10 + \$2.51 + (0.20)(20.14)/(1.10)^5 \\
 &= \$10 + \$2.51 + \$2.50 = \$15.01
 \end{aligned}$$

- 16 A** Columns (a) through (d) in the table show calculations for beginning book value, net income, dividends, and ending book value.

	(a)	(b)	(c)	(d)	(e)	(f)
Year	Beginning Book Value	Net Income	Dividends	Ending Book Value	Residual Income	PV of RI
1	\$9.620	\$2.116	\$0.635	\$11.101	\$1.318	\$1.217
2	11.101	2.442	0.733	12.811	1.521	1.297
3	12.811	2.818	0.846	14.784	1.755	1.382
4	14.784	3.252	0.976	17.061	2.025	1.472
5	17.061	3.753	1.126	19.688	2.337	1.569
6	19.688	4.331	1.299	22.720	2.697	1.672
7	22.720	4.998	1.500	26.219	3.113	1.781
8	26.219	5.768	1.730	30.257	3.592	1.898
Total						\$12.288

For each year, net income is 22 percent of beginning book value. Dividends are 30 percent of net income. The ending book value equals the beginning book value plus net income minus dividends.

- B** Column (e) shows Residual income, which equals Net income – Cost of equity (%) × Beginning book value.

To find the cost of equity, use the CAPM:

$$r = R_F + \beta_i[E(R_M) - R_F] = 5\% + (0.60)(5.5\%) = 8.30\%$$

For Year 1 in the table above,

$$\begin{aligned}
 \text{Residual income} &= RI_t = E - rB_{t-1} \\
 &= 2.116 - (8.30\%)(9.62) \\
 &= 2.116 - 0.798 = \$1.318
 \end{aligned}$$

This same calculation is repeated for Years 2 through 8.

The final column of the table, (f), gives the present value of the calculated residual income, discounted at 8.30 percent.

- C To find the stock value with the residual income method, use this equation:

$$V_0 = B_0 + \sum_{t=1}^T \frac{(E_t - rB_{t-1})}{(1+r)^t} + \frac{P_T - B_T}{(1+r)^T}$$

- In this equation, B_0 is the current book value per share of \$9.62.
 - The second term, the sum of the present values of the eight years' residual income is shown in the table, \$12.288.
 - To estimate the final term, the present value of the excess of the terminal stock price over the terminal book value, use the assumption that the terminal stock price is assumed to be 3.0 times the terminal book value. So, by assumption, the terminal stock price is \$90.771 [$P_T = 3.0(30.257)$]. $P_T - B_T$ is \$60.514 ($90.771 - 30.257$), and the present value of this amount discounted at 8.30 percent for eight years is \$31.976.
 - Summing the relevant terms gives a stock price of \$53.884 ($V_0 = 9.62 + 12.288 + 31.976$).
- D The appropriate DDM expression expresses the value of the stock as the sum of the present value of the dividends plus the present value of the terminal value:

$$V_0 = \sum_{t=1}^T \frac{D_t}{(1+r)^t} + \frac{P_T}{(1+r)^T}$$

Discounting the dividends from the table shown in the solution to Part A above at 8.30 percent gives:

Year	Dividend	PV of Dividend
1	\$0.635	\$0.586
2	0.733	0.625
3	0.846	0.666
4	0.976	0.709
5	1.126	0.756
6	1.299	0.805
7	1.500	0.858
8	1.730	0.914
All		\$5.919

- The present value of the eight dividends is \$5.92. The estimated terminal stock price, calculated in the solution to Part C above is \$90.771, which equals \$47.964 discounted at 8.30 percent for eight years.
 - The value for the stock, the present value of the dividends plus the present value of the terminal stock price, is $V_0 = 5.92 + 47.964 = \$53.884$.
 - The stock values estimated with the residual income model and the dividend discount model are identical. Because they are based on similar financial assumptions, this equivalency is expected. Even though the two models differ in their timing of the recognition of value, their final results are the same.
- 17 A The justified P/B can be found with the following formula:

$$\frac{P_0}{B_0} = 1 + \frac{\text{ROE} - r}{r - g}$$

ROE is 20 percent, g is 6 percent, and r is 9.4% [$R_F + \beta_i[E(R_M) - R_F] = 5\% + (0.80)(5.5\%)$]. Substituting in the values gives a justified P/B of

$$\frac{P_0}{B_0} = 1 + \frac{0.20 - 0.094}{0.094 - 0.06} = 4.12$$

The assumed parameters give a justified P/B of 4.12, slightly above the current P/B of 3.57.

- B** To find the ROE that would result in a P/B of 3.57, we substitute 3.57, r , and g into the following equation:

$$\frac{P_0}{B_0} = 1 + \frac{\text{ROE} - r}{r - g}$$

This yields

$$3.57 = 1 + \frac{\text{ROE} - 0.094}{0.094 - 0.06}$$

Solving for ROE requires several steps to finally derive a ROE of 0.18138 or 18.1 percent. This value of ROE is consistent with a P/B of 3.57.

- C** To find the growth rate that would result with a P/B of 3.57, use the expression given in Part B, but solve for g instead of ROE:

$$\frac{P_0}{B_0} = 1 + \frac{\text{ROE} - r}{r - g}$$

Substituting in the values gives:

$$3.57 = 1 + \frac{0.20 - 0.094}{0.094 - g}$$

The growth rate g is 0.05275 or 5.3 percent. Assuming that the single-stage growth model is applicable to Boeing, the current P/B and current market price can be justified with values for ROE or g that are not much different from the starting values of 20 percent and 6 percent, respectively.

- 18** C is correct. Market value added equals the market value of firm minus total accounting book value of total capital.

Market value added = Market value of company – Accounting book value of total capital

Market value of firm = Market value of debt + Market value of equity

Market value of firm = R55 million + (30,000,000 × R25.43)

Market value of firm = R55 million + R762.9 million = R817.9 million

Market value added = R817.9 million – R650 million = R167.9 million,
or approximately R168 million.

- 19** B is correct. The intrinsic value of R22.00 is greater than the current book value of R20.00. The residual income model states that the intrinsic value of a stock is its book value per share plus the present value of expected (future) per share residual income. The higher intrinsic value per share, relative to book value per share, indicates that the present value of expected per share residual income is positive.

- 20 A is correct because the intrinsic value is the book value per share, B_0 , plus the expected residual income stream or $B_0 + [(ROE - r)B_0/(r-g)]$. If ROE equals the cost of equity (r), then $V_0 = B_0$. This implies that ROE is equal to the cost of the equity, and therefore there is no residual income contribution to the intrinsic value. As a result, intrinsic value would be equal to book value.
- 21 B is correct. With a single-stage residual income (RI) model, the intrinsic value, V_0 , is calculated assuming a constant return on equity (ROE) and a constant earnings growth (g).

$$V_0 = B_0 + B_0 \frac{(ROE - r)}{(r - g)}$$

$$V_0 = R55.81 + R55.81 \frac{(0.13 - 0.11)}{(0.11 - 0.095)}$$

$$V_0 = R130.22$$

- 22 B is correct. The share price of R8.25 was lower than the intrinsic value of R11.00. Shares are considered undervalued when the current share price is less than intrinsic value per share.
- 23 C is correct. The restructuring charge is a nonrecurring item and not indicative of future earnings. In applying a residual income model, it is important to develop a forecast of future residual income based upon recurring items. Using the net income reported in Amersheen's 2010 net income statement to model subsequent future earnings, without adjustment for the restructuring charge, would understate the firm's future earnings. By upward adjusting the firm's net income, by adding back the R2 million restructuring charge to reflect the fact that the charge is nonrecurring, future earnings will be more accurately forecasted.
- 24 C is correct. As the multistage residual income model results in an intrinsic value of R16.31.

This variation of the multistage residual income model, in which residual income fades over time, is:

$$V_0 = B_0 + \sum_{t=1}^{T-1} \frac{(E_t - rB_{t-1})}{(1+r)^t} + \frac{(E_T - rB_{T-1})}{(1+r-\omega)(1+r)^{T-1}}$$

where ω is the persistence factor.

The first step is to calculate residual income per share for years 2012–2015:

	2012	2013	2014	2015
Beginning book value per share	R7.60 (given)	$R7.60 + R3.28 - R2.46$ = R8.42	$R8.42 + R3.15 - R2.36$ = R9.21	$R9.21 + 2.90 - R2.06$ = R10.05
ROE	$R3.28/R7.60$ = 0.4316	$R3.15/R8.42$ = 0.3741	$R2.90/R9.21$ = 0.3149	26% (given)
Retention rate	$1 - (R2.46/R3.28)$ = 0.25	$1 - (R2.36/R3.15)$ = 0.2508	$1 - (R2.06/R2.90)$ = 0.2897	N/A
Growth rate	0.4316×0.25 = 0.1079	0.3741×0.2508 = 0.0938	0.3149×0.2897 = 0.0912	9% (given)
Equity charge per share	$R7.60 \times 0.10$ = R0.76	$R8.42 \times 0.10$ = R0.842	$R9.21 \times 0.10$ = R0.921	$R10.05 \times 0.10$ = R1.005
Residual income per share	$R3.28 - R0.76$ = R2.52	$R3.15 - R0.842$ = R2.31	$R2.90 - 0.921$ = R1.98	$[0.26 \times R10.05] - R1.005$ = R1.608

ROE = earnings / book value

Growth rate = ROE × retention rate

Retention rate = 1 – (dividends/earnings)

Book value_t = book value_{t-1} + earnings_{t-1} – dividends_{t-1}

Residual income per share = EPS – equity charge per share

Equity charge per share = book value per share_t × cost of equity

Using the residual income per share for 2015 of R1.608, the second step is to calculate the present value of the terminal value:

$$\text{PV of Terminal Value} = \frac{\text{R1.608}}{(1 + 0.10 - 0.70)(1.10)^3} = \text{R3.0203}$$

Then, intrinsic value per share is:

$$V_0 = \text{R7.60} + \frac{\text{R2.52}}{(1.10)} + \frac{\text{R2.31}}{(1.10)^2} + \frac{\text{R1.98}}{(1.10)^3} + \text{R3.0203} = \text{R16.31}$$

- 25** A is correct. As the multistage residual income model results in an intrinsic value of R13.29. The multistage residual income model, is:

$$V_0 = B_0 + \sum_{t=1}^T \frac{(E_t - rB_{t-1})}{(1+r)^t} + \frac{(P_T - B_T)}{(1+r)^T}$$

The first step is to calculate residual income per share for years 2012–2014:

	2012	2013	2014
Beginning book value per share	R7.60 (given)	R7.60 + R3.28 – R2.46 = R8.42	R8.42 + R3.15 – R2.36 = R9.21
ROE	R3.28/R7.60 = 0.4316	R3.15/R8.42 = 0.3741	R2.90/R9.21 = 0.3149
Retention rate	1 – (R2.46/R3.28) = 0.25	1 – (R2.36/R3.15) = 0.2508	1 – (R2.06/R2.90) = 0.2897
Growth rate	0.4316 × 0.25 = 0.1079	0.3741 × 0.2508 = 0.0938	0.3149 × 0.2897 = 0.0912
Equity charge per share	R7.60 × 0.10 = R0.76	R8.42 × 0.10 = R0.842	R9.21 × 0.10 = R0.921
Residual income per share	R3.28 – R0.76 = R2.52	R3.15 – R0.842 = R2.31	R2.90 – 0.921 = R1.98

ROE = earnings / book value

Growth rate = ROE × retention rate

Retention rate = 1 – (dividends/earnings)

Book value_t = book value_{t-1} + earnings_{t-1} – dividends_{t-1}

Residual income per share = EPS – equity charge per share

Equity charge per share = book value per share_t × cost of equity

Under Scenario 2, at the end of 2014, it is assumed that share price will be equal to book value per share. This results in the second term in the equation above, the present value of the terminal value, being equal to zero.

Then, intrinsic value per share is:

$$V_0 = \text{R7.60} + \frac{\text{R2.52}}{(1.10)} + \frac{\text{R2.31}}{(1.10)^2} + \frac{\text{R1.98}}{(1.10)^3} = \text{R13.29}$$

- 26** B is correct. The residual income model's use of accounting income assumes that the cost of debt capital is reflected appropriately by interest expense.

- 27** A is correct. Dividend payments are forecasted to be unpredictable over Castovan's five-year forecast horizon. A residual income model is appropriate when a company does not pay dividends or when its dividends are not predictable, which is the case for PTU.
- 28** C is correct. Other Comprehensive Income (OCI) bypasses the income statement and goes directly to the statement of stockholders' equity (which is a violation of the clean surplus relationship). Therefore, book value per share for PTU will be impacted by forecasted OCI.
- 29** C is correct. The residual income can be calculated using net income and the equity charge or using net operating profit after taxes (NOPAT) and the total capital charge.

$$\text{Residual income} = \text{Net income} - \text{Equity charge}$$

Calculation of Net Income (values in millions):

EBIT	€700.0	
Less Interest expense	€124.8	(= €4,000 × 0.60 × 0.052)
Pretax income	€575.2	
Less Income tax expense	€201.3	(= €575.20 × 0.35)
Net income	€373.9	

$$\text{Equity charge} = \text{Total assets} \times \text{Equity weighting} \times \text{Cost of equity}$$

$$\text{Equity charge} = €4,000 \text{ million} \times 0.40 \times 0.15 = €240 \text{ million}$$

Therefore, residual income = €373.9 million – €240 million = €133.9 million.

Alternatively, residual income can be calculated from NOPAT as follows.

$$\text{Residual income} = \text{NOPAT} - \text{Total capital charge}$$

$$\text{NOPAT} = \text{EBIT} \times (1 - \text{Tax rate})$$

$$\text{NOPAT} = €700 \text{ million} \times (1 - 0.35) = €455 \text{ million}$$

The total capital charge is as follows.

$$\begin{aligned} \text{Equity charge} &= \text{Total assets} \times \text{Equity weighting} \times \text{Cost of equity} \\ &= €4,000 \text{ million} \times 0.40 \times 0.15 \\ &= €240 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{Debt charge} &= \text{Total assets} \times \text{Debt weighting} \times \text{Pretax cost of debt} \times (1 - \text{Tax rate}) \\ &= €4,000 \text{ million} \times 0.60 \times 0.052(1 - 0.35) \\ &= €81.1 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{Total capital charge} &= €240 \text{ million} + €81.1 \text{ million} \\ &= €321.1 \text{ million} \end{aligned}$$

Therefore, residual income = €455 million – €321.1 million = €133.9 million.

- 30** B is correct. The implied growth rate of earnings from the single-stage RI model is calculated by solving for g in the following equation:

$$V_0 = B_0 + \left(\frac{\text{ROE} - r}{r - g} \right) B_0$$

Book value per share can be calculated using the given price-to-book ratio and market price per share as follows.

$$\begin{aligned}\text{Book value per share } (B_0) &= \text{Market price per share} / \text{Price-to-book ratio} \\ &= €48.80 / 2.10 = €23.24\end{aligned}$$

Then, solve for the implied growth rate.

$$€48.80 = €23.24 + \left(\frac{0.2337 - 0.15}{0.15 - g} \right) €23.24$$

$$g = 7.4\%$$

- 31** C is correct. Using the single-stage RI model, the intrinsic value of TTCI is calculated as

$$\begin{aligned}V_0 &= B_0 + \left(\frac{\text{ROE} - r}{r - g} \right) B_0 \\ &= €45.25 + \left(\frac{0.12 - 0.087}{0.087 - 0.045} \right) €45.25 \\ &= €80.80\end{aligned}$$

The intrinsic value of €80.80 is less than the market price of €126.05, so Castovan should conclude that the stock is overvalued.

- 32** A is correct. The justified price-to-book ratio is calculated as

$$\begin{aligned}\frac{P}{B} &= 1 + \left(\frac{\text{ROE} - r}{r - g} \right) \\ &= 1 + \left(\frac{0.12 - 0.087}{0.087 - 0.045} \right) = 1.79\end{aligned}$$

- 33** C is correct. Residual income per share for the next three years is calculated as follows.

	Year 1	Year 2	Year 3
Beginning book value per share	45.25	51.61	58.25
Earnings per share	7.82	8.17	8.54
Less dividends per share	1.46	1.53	1.59
Change in retained earnings	6.36	6.64	6.95
Ending book value per share	51.61	58.25	65.20
Earnings per share	7.82	8.17	8.54
Less per share equity charge*	3.94	4.49	5.07
Residual income	3.88	3.68	3.47

* Per share equity charge = Beginning book value per share × Cost of equity

Year 1 per share equity charge = 45.25 × 0.087 = 3.94

Year 2 per share equity charge = 51.61 × 0.087 = 4.49

Year 3 per share equity charge = 58.25 × 0.087 = 5.07

Because Castovan forecasts that residual income per share will be constant into perpetuity, equal to Year 3 residual income per share, the present value of the terminal value is calculated using a persistence factor of 1.

$$\begin{aligned}\text{Present value of terminal value} &= \frac{8.54 - (0.087 \times 58.25)}{(1 + 0.087 - 1)(1 + 0.087)^2} \\ &= \frac{3.47}{(0.087)(1.087)^2} \\ &= 33.78\end{aligned}$$

So, the intrinsic value of TTCI is then calculated as follows.

$$V_0 = €45.25 + \frac{3.88}{1.087} + \frac{3.68}{1.087^2} + 33.78 = €85.71$$

- 34** A is correct. In Castovan's multistage valuation, she assumes that TTCI's residual income will remain constant in perpetuity after Year 3. This perpetuity assumption implies a persistence factor of 1 in the calculation of the terminal value. A persistence factor of 0.10 indicates that TTCI's residual income is forecasted to decline at an average rate of 90% per year. This assumption would lead to a lower valuation than Castovan's multistage value estimate, which assumes that residual income will remain constant in perpetuity after Year 3.
- 35** B is correct. Beckworth's suggested persistence factor for TTCI is 0.10, which is quite low. Companies with extreme accounting rates of return typically have low persistence factors. Companies with strong market leadership positions and low dividend payouts are likely to have high persistence factors.

PRACTICE PROBLEMS

- 1 Two companies are considering the acquisition of Target Company. Buyer A is a strategic buyer and Buyer B is a financial buyer. The following information pertains to Target Company:
 - Sales = £28,000,000
 - Reported EBITDA = £4,500,000
 - Reported executive compensation = £1,000,000
 - Normalized executive compensation = £500,000
 - Reduced SG&A from eliminating duplicate general and administrative functions = £600,000Calculate the pro forma EBITDA estimates that the strategic and financial buyers would each develop in an acquisitions analysis of Target Company.
- 2 Using the build-up method and assuming that no adjustment for industry risk is required, calculate an equity discount rate for a small company, given the following information:
 - Equity risk premium = 5.0 percent
 - Mid-cap equity risk premium = 3.5 percent
 - Small stock risk premium = 4.2 percent
 - Income return on long-term bonds = 5.1 percent
 - Total return on intermediate-term bonds = 5.3 percent
 - Company-specific risk premium = 3.0 percent
 - 20-year Treasury bond yield as of the valuation date = 4.5 percent
- 3 Using the capitalized cash flow method (CCM), calculate the fair market value of 100 percent of the equity of a hypothetical company, given the following information:
 - Current year's reported free cash flow to equity = \$1,400,000
 - Current year's normalized free cash flow to equity = \$1,800,000
 - Long-term interest bearing debt = \$2,000,000
 - Weighted average cost of capital = 15 percent
 - Equity discount rate = 18 percent
 - Long-term growth rate of FCFE = 5.5 percent
- 4 You have been asked to value Pacific Corporation, Inc., using an excess earnings method, given the following information:
 - Working capital balance = \$2,000,000
 - Fair value of fixed assets = \$5,500,000
 - Book value of fixed assets = \$4,000,000
 - Normalized earnings of firm = \$1,000,000
 - Required return on working capital = 5.0 percent
 - Required return on fixed assets = 8.0 percent
 - Required return on intangible assets = 15.0 percent
 - Weighted average cost of capital = 10.0 percent
 - Long-term growth rate of residual income = 5.0 percent

Based on this information:

- A What is the value of Pacific's intangible assets?
 - B What is the market value of invested capital?
- 5 An appraiser has been asked to determine the combined level of valuation discounts for a small equity interest in a private company. The appraiser concluded that an appropriate control premium is 15 percent. A discount for lack of marketability was estimated at 25 percent. Given these factors, what is the combined discount?

The following information relates to Questions 6–11

Alan Chin, the chief executive officer of Thunder Corporation, has asked his chief financial officer, Constance Ebinosa, to prepare a valuation of Thunder for the purpose of selling the company to a private investment partnership. Thunder is a profitable \$200 million annual sales US domiciled manufacturer of generic household products. Customers consist of several grocery store chains in the United States. Competitors include large companies such as Procter & Gamble, Clorox, and Unilever. Thunder has been in business for 15 years and is privately owned by the original shareholders, none of whom are employed by the company. The company's senior management has been in charge of the company's operations for most of the past 15 years and expects to remain in that capacity after any sale.

The partnership has expectations about Thunder similar to the current shareholders and management of Thunder. These investors expect to hold Thunder for an intermediate period of time and then bring the company public when market conditions are more favorable than currently.

Chin is concerned about what definition of value should be used when analyzing Thunder. He notes that the stock market has been very volatile recently. He also wonders whether fair market value can be realistically estimated when the most similar recent private market transactions may not have been at arm's length.

Chin asks Ebinosa whether there will be differences in the process of valuing a private company like Thunder compared with a public company. Ebinosa replies that differences do exist and mentions several factors an analyst must consider.

Ebinosa also explains that several approaches are available for valuing private companies. She mentions that one possibility is to use an asset-based approach because Thunder has a relatively large and efficient factory and warehouse for its products. A real estate appraiser can readily determine the value of these facilities. A second method would be the market approach and using an average of the price-to-earnings multiples for Procter & Gamble and Clorox. A third possibility is a discounted free cash flow approach. The latter would focus on a continuation of Thunder's trend of slow profitable growth during the past ten years.

The private investment partnership has mentioned that they are likely to use an income approach as one of their methods. Ebinosa decides to validate the estimates they make. She assumes for the next 12 months that Thunder's revenues increase by the long-term annual growth rate of 3 percent. She also makes the following assumptions to calculate the free cash flow to the firm for the next 12 months:

- Gross profit margin is 45 percent.
- Depreciation is 2 percent of revenues.
- Selling, general, and administrative expenses are 24 percent of revenues.

- Capital expenditures equal 125 percent of depreciation to support the current level of revenues.
- Additional capital expenditures of 15 percent of incremental revenues are needed to fund future growth.
- Working capital investment equals 8 percent of incremental revenues.
- Marginal tax rate on EBIT is 35 percent.

Chin knows that if an income approach is used then the choice of discount rate may have a large influence on the estimated value. He makes two statements regarding discount rate estimates:

- 1 If the CAPM method is used to estimate the discount rate with a beta estimate based on public companies with operations and revenues similar to Thunder, then a small stock premium should be added to the estimate.
- 2 The weighted average cost of capital of the private investment partnership should be used to value Thunder.

Ebinosa decides to calculate a value of Thunder's equity using the capitalized cash flow method (CCM) and decides to use the build-up method to estimate Thunder's required return on equity. She makes the following assumptions:

- Growth of FCFE is at a constant annual rate of 3 percent.
 - Free cash flow to equity for the year ahead is \$2.5 million.
 - Risk free rate is 4.5 percent.
 - Equity risk premium is 5.0 percent.
 - Size premium is 2.0 percent.
- 6 Given Chin's concerns, the *most appropriate* definition of value for Thunder is:
 - A intrinsic value.
 - B investment value.
 - C fair market value.
 - 7 The *least likely* factor that would be a source of differences in valuing Thunder compared with valuing a publicly traded company is:
 - A access to public debt markets.
 - B agency problems.
 - C the size of the company.
 - 8 Ebinosa can *best* value Thunder using the:
 - A excess earnings approach.
 - B asset-based approach.
 - C discounted free cash flow approach.
 - 9 The free cash flow to the firm is *closest* to:
 - A \$23,031,000.
 - B \$25,441,000.
 - C \$36,091,000.
 - 10 Regarding the two statements about discount rate estimates, Chin is:
 - A correct with respect to adding the small stock premium and correct with respect to the weighted average cost of capital.
 - B correct with respect to adding the small stock premium and incorrect with respect to the weighted average cost of capital.

- C** incorrect with respect to adding the small stock premium and incorrect with respect to the weighted average cost of capital.
- 11 The indicated value of Thunder's equity using the build-up method and the capitalized cash flow method (CCM) based on free cash flow to equity is *closest* to:
- A** \$29.41 million.
B \$38.46 million.
C \$125.00 million.

The following information relates to Questions 12–17¹

The Senior Vice President of Acquisitions for Northland Industries, Angela Lanton, and her head analyst, Michael Powell, are evaluating several potential investments. Northland is a diversified holding company for numerous businesses. One of Northland's divisions is a manufacturer of fine papers and that division has alerted Lanton about Oakstar Timber, a supplier that may be available for purchase. Oakstar's sole owner, Felix Tanteromo, has expressed interest in exchanging his ownership of Oakstar for a combination of cash and Northland Industries securities.

Oakstar's main asset is 10,000 hectares of timberland in the western part of Canada. The land is a combination of new and old growth Douglas fir trees. The value of this timberland has been steadily increasing since Oakstar acquired it. Oakstar manages the land on a sustained yield basis (i.e., so it continues to produce timber indefinitely) and contracts with outside forestry companies to evaluate, harvest, and sell the timber. Oakstar's income is in the form of royalties (fees paid to Oakstar based on the number of cubic meters harvested). Oakstar's balance sheet as of 31 December 2008 is as follows.

Oakstar Timber Balance Sheet	
Year Ended 31 December 2008	
Assets	
Cash	\$500,000
Inventory	25,000
Accounts receivable	50,000
Plant and equipment (cost less depreciation)	750,000
Land	10,000,000
Total assets	\$11,325,000
Liabilities and Equity	
Accounts payables	\$75,000
Long-term bank loan	1,500,000
Common stock	9,750,000
Total liabilities and equity	\$11,325,000

¹ Currency in Canadian dollars.

In addition to the balance sheet, Powell is gathering other data to assist in valuing Oakstar and has found information on recent sales of timberland in the western part of Canada. Douglas fir properties have averaged \$6,178 per hectare for tracts that are not contiguous and do not have a developed road system for harvesting the timber. For tracts with these features, as possessed by Oakstar, the average price is \$8,750 per hectare. Properties near urban areas and having potential for residential and recreational second home development command up to \$20,000 per hectare. Oakstar's land lacks this potential. Lanton believes these values would form the basis of an asset-based valuation for Oakstar, with the additional assumption that other assets and liabilities on the balance sheet are assumed to be worth their stated values.

The second company under evaluation, FAMCO, Inc., is a family-owned electronic manufacturing company with annual sales of \$120 million. The family wants to monetize the value of their ownership in FAMCO with a view to later investing part of the proceeds in a diversified stock portfolio. Lanton has asked Powell to obtain data for both an income-based and market-based valuation. Powell has obtained the recent annual income statement and additional data needed to calculate normalized earnings as follows.

FAMCO, Inc. Income Statement Year Ending 31 December 2008		
Revenues		\$120,000,000
Gross profit		85,000,000
Selling, general, and administrative expenses		23,000,000
Pro forma EBITDA		\$62,000,000
Depreciation and amortization		3,500,000
Pro forma earnings before interest and taxes		\$58,500,000
Less: Interest		1,000,000
Earnings before taxes (EBT)		\$57,500,000
Pro forma taxes on EBT	40%	23,000,000
Operating income after tax		\$34,500,000

Additional data for FAMCO is provided in the following table. Included are estimates by Powell of the compensation paid to family members and the smaller amount of salary expense for replacement employees if Northland acquires the company (reflecting perceived above-market compensation of the family group executives). He believes the current debt of FAMCO can be replaced with a more optimal level of debt at a lower interest rate. These will be reflected in a normalized income statement.

FAMCO, Inc.	
Current debt level	\$10,000,000
Current interest rate	10%
Salaries of employed family members	\$7,000,000
Salaries of replacement employees	\$5,400,000
New debt level	\$25,000,000
New interest rate	8%

Powell also recognizes that a value needs to be assigned to FAMCO's intangibles consisting of patents and other intangible assets. Powell prepares an additional estimate of excess earnings and intangibles value using the capitalized cash flow method. He projects the following data for 2009:

FAMCO, Inc.—Intangibles Valuation Data

Working capital balance	\$10,000,000
Fair value of fixed assets	\$45,000,000
Normalized income to the company	\$35,000,000
Required return on working capital	8%
Required return on fixed assets	12%
Required return on intangible assets	20%
Weighted average cost of capital	14.5%
Future growth rate	6%

Lanton asks Powell to also use the market approach to valuation with a focus on the guideline transactions method. Powell prepares a table showing relevant information regarding three recent guideline transactions and market conditions at the time of the transactions. Powell's assumptions about FAMCO include its expected fast growth and moderate level of risk.

Target Firm	Target's Risk	Target's Growth	Consideration	Market Conditions
Firm 1	High	Slow	Cash	Normal, rising trend
Firm 2	Moderate	Fast	Stock	Prices near peak
Firm 3	Moderate	Fast	Cash	Normal, rising trend

Although Northland is interested in acquiring all of the stock of FAMCO, the acquisition of a 15 percent equity interest in FAMCO is also an option. Lanton asks Powell about the valuation of small equity interests in private entities and notes that control and marketability are important factors that lead to adjustments in value estimates for small equity interests. Powell mentions that the control premium paid for the most similar guideline firm used in the analysis suggests a discount for lack of control of 20 percent. The discount for lack of marketability was estimated at 15 percent.

- 12 Which of the following statements concerning asset-based valuation as applied to Oakstar is *most* accurate? The approach is applicable:
- A only when a guideline public company for the valuation is not available.
 - B because natural resources with determinable market values constitute the majority of Oakstar's total value.
 - C because as a passive collector of royalties, Oakstar has no meaningful capital expenditures and free cash flow is irrelevant.
- 13 Using an asset-based approach, the value (net of debt) of Oakstar is *closest* to:
- A \$62,250,000.
 - B \$87,250,000.
 - C \$199,750,000.
- 14 The normalized earnings after tax for FAMCO is *closest* to:
- A \$32,940,000.
 - B \$34,260,000.
 - C \$34,860,000.
- 15 Using the excess earnings method, the value of the intangibles is *closest* to:
- A \$144.0 million.
 - B \$205.7 million.

- C** \$338.8 million.
- 16** The guideline transaction that is *most likely* applicable to FAMCO is:
 - A** Firm 1.
 - B** Firm 2.
 - C** Firm 3.
- 17** The total discount for both control and marketability is *closest* to:
 - A** 15 percent.
 - B** 32 percent.
 - C** 35 percent.

SOLUTIONS

- 1 A strategic buyer seeks to eliminate unnecessary expenses. The strategic buyer would adjust the reported EBITDA by the amount of the officers' excess compensation. A strategic buyer could also eliminate redundant manufacturing costs estimated at £600,000. The pro forma EBITDA a strategic buyer might use in its acquisition analysis is the reported EBITDA of £4,500,000 plus the nonmarket compensation expense of £500,000 plus the operating synergies (cost savings) of £600,000. The adjusted EBITDA for the strategic buyer is $£4,500,000 + £500,000 + £600,000 = £5,600,000$. The financial buyer would also make the adjustment to normalize officers' compensation but would not be able to eliminate redundant manufacturing expenses. Thus, adjusted EBITDA for the financial buyer would be $£4,500,000 + £500,000 = £5,000,000$.
- 2 The build-up method is substantially similar to the extended CAPM except that beta is excluded from the calculation. The equity return requirement is calculated as risk-free rate plus equity risk premium for large capitalization stocks plus small stock risk premium plus company-specific risk premium: $4.5 + 5.0 + 4.2 + 3.0 = 16.7$ percent. Although practice may vary, in this case, there was no adjustment for industry risk.
- 3 There are FCFF and FCFE variations of the CCM. In this problem, the data permit the application of just the FCFE variation. According to that variation, the estimated value of equity equals the normalized free cash flow to equity estimate for next period divided by the capitalization rate for equity. The capitalization rate is the required rate of return for equity less the long-term growth rate in free cash flow to equity. Using the current \$1.8 million of free cash flow to equity, the 18 percent equity discount rate, and the long-term growth rate of 5.5 percent yields a value indication of $[(\$1.8 \text{ million})(1.055)] / (0.18 - 0.055) = \$1.899 \text{ million} / 0.125 = \15.19 million .
- 4 The excess earnings consist of any remaining income after returns to working capital and fixed assets are considered. Fair value estimates and rate of return requirements for working capital and fixed assets are provided. The return required for working capital is $\$2,000,000 \times 5.0 \text{ percent} = \$100,000$ and the return required for fixed assets is $\$5,500,000 \times 8.0 \text{ percent} = \$440,000$, or \$540,000 in total.
 - A The residual income for intangible assets is \$460,000 (the normalized earnings of \$1,000,000 less the \$540,000 required return for working capital and fixed assets). The value of intangible assets can then be calculated using the capitalized cash flow method. The intangibles value is \$4,830,000 based on \$483,000 of year-ahead residual income available to the intangibles capitalized at 10.0 percent (15.0 percent discount rate for intangibles less 5.0 percent long-term growth rate of residual income).
 - B The market value of invested capital is the total of the values of working capital, fixed assets, and intangible assets. This value is $\$2,000,000 + \$5,500,000 + \$4,830,000 = \$12,330,000$.
- 5 The valuation of a small equity interest in a private company would typically be calculated on a basis that reflects the lack of control and lack of marketability of the interest. The control premium of 15 percent must first be used to provide an indication of a discount for lack of control (DLOC). A lack of control discount can be calculated using the formula $\text{Lack of control discount} = 1 - [1 / (1 + \text{Control premium})]$. In this case, a lack of control discount of approximately 13 percent is calculated as $1 - [1 / (1 + 15\%)]$. The discount for lack of

marketability (DLOM) was specified. Valuation discounts are applied sequentially and are not added. The formula is $(\text{Pro rata control value}) \times (1 - \text{DLOC}) \times (1 - \text{DLOM})$. A combined discount of approximately 35 percent is calculated as $1 - (1 - 13\%) \times (1 - 25\%) = 0.348$ or 34.8 percent.

- 6 A is correct. Both the current shareholders and the future shareholders (the private investment group) share the same expectations. It is most reasonable to assume that both are concerned with Thunder's intrinsic value, which market prices should reflect when the company is brought public under less volatile market conditions.
- 7 B is correct. The size of Thunder and its probable lack of access to public debt markets are potential factors affecting the valuation of Thunder compared with a public company. Given that the separation of ownership and control at Thunder is similar to that at public companies, however, agency problems are not a distinguishing factor in its valuation.
- 8 C is correct. The excess earnings method would rarely be applied to value the equity of a company particularly when it is not needed to value intangibles. The asset-based approach is less appropriate because it is infrequently used to estimate the business enterprise value of operating companies. By contrast, the free cash flow method is broadly applicable and readily applied in this case.
- 9 A is correct. Using Ebinosa's assumptions:

Revenues ($\$200,000,000 \times 1.03 =$)		\$206,000,000
Gross profit	45% ^a	92,700,000
Selling, general, and administrative expenses	24% ^a	49,440,000
Pro forma EBITDA		43,260,000
Depreciation	2% ^a	4,120,000
Pro forma EBIT		39,140,000
Pro forma taxes on EBIT	35% ^b	13,699,000
Operating income after tax		25,441,000
Plus: Depreciation		4,120,000
Less: Capital expenditures on current sales	125% ^c	5,150,000
Less: Capital expenditures to support future sales	15% ^d	900,000
Less: Working capital requirement	8% ^d	480,000
Free cash flow to the firm		\$23,031,000

^a Percent of revenues

^b Percent of EBIT

^c Percent of depreciation

^d Percent of incremental revenues

- 10 C is correct. Both statements by Chin are incorrect. If the CAPM is used with public companies with similar operations and similar revenue size, as stated, then the calculation likely captures the small stock premium and should not be added to the estimate. Small stock premiums are associated with build-up models and the expanded CAPM, rather than the CAPM *per se*. The correct weighted average cost of capital should reflect the risk of Thunder's cash flows not the risk of the acquirer's cash flows.
- 11 A is correct. The return on equity is the sum of the risk free rate, equity risk premium, and the size premium for a total of $4.5 + 5.0 + 2.0 = 11.5$ percent. The value of the firm using the CCM is $V = \text{FCFE}_1 / (r - g) = 2.5 / (0.115 - 0.03) = \29.41 million.

- 12** B is correct. Oakstar's primary asset is timberland whose market value can be determined from comparable land sales.
- 13** B is correct. In the absence of market value data for assets and liabilities, the analyst usually must use book value data (the reading explicitly makes the assumption that book values accurately reflect market values as well). Except for timberland, market values for assets are not available. Thus, all other assets are assumed to be valued by their book values, which sum to $\$500,000 + \$25,000 + \$50,000 + \$750,000 = \$1,325,000$. The value of the land is determined by the value of $\$8,750$ per hectare for properties comparable to Oakstar's. Thus, the value of Oakstar's land is $\$8,750 \times 10,000 = \$87,500,000$. Liabilities are assumed to be worth the sum of their book value or $\$1,575,000$. Thus, Estimated value = Total assets – Liabilities = $\$1,325,000 + \$87,500,000 - \$1,575,000 = \$87,250,000$.
- 14** C is correct. The new interest level is $\$2,000,000$ instead of $\$1,000,000$. SG&A expenses are reduced by $\$1,600,000$ ($= \$5,400,000 - \$7,000,000$) to $\$21,400,000$ by salary expense savings. Other than a calculation of a revised provision for taxes, no other changes to the income statement results in normalized earnings before tax of $\$58,100,000$ and normalized earnings after tax of $\$34,860,000$.
- 15** B is correct:
- $$\text{Return on working capital} = 0.08 \times \$10,000,000 = \$800,000$$
- $$\text{Return on fixed assets} = 0.12 \times \$45,000,000 = \$5,400,000$$
- $$\text{Return on intangibles} = \$35,000,000 - \$800,000 - \$5,400,000 = \$28,800,000$$
- $$\text{Value of intangibles using CCM} = \$28,800,000 / (0.20 - 0.06) = \$205.71 \text{ million.}$$
- 16** C is correct. Firm 3 matches FAMCO in both risk and growth. Firm 1 fails on these factors. In addition, Firm 3 is a better match to FAMCO than Firm 2 because the offer for Firm 3 was a cash offer in normal market conditions whereas Firm 2 was a stock offer in a boom market and the value does not reflect risk and growth in the immediate future.
- 17** B is correct. Both discounts apply and they are multiplicative rather than additive:
- $$1 - (1 - 0.20)(1 - 0.15) = 1 - 0.68 = 32 \text{ percent}$$