SOLUTIONS

EQUITY VALUATION: APPLICATIONS AND PROCESSES

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.

RETURN CONCEPTS

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

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

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

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

For Boeing, the required return is

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

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

$r =$ T-bill rate
+ (Sensitivity to equity market factor × Equity risk premium)
+ (Sensitivity to size factor × Size risk premium)
+ (Sensitivity to value factor × Value risk premium)

For TerraNova Energy, the required return is

$$r = 4.7\% + (1.20 \times 4.5\%) + (-0.50 \times 2.7\%) + (-0.15 \times 4.3\%)$$
$$= 4.7\% + 5.4\% - 1.35\% - 0.645\%$$
$$= 8.1\%$$

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:

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

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 being 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:

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

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:

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

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   Unlever 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:

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

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

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

    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.

INTRODUCTION TO INDUSTRY AND COMPANY ANALYSIS

SOLUTIONS

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

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

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

4. A is correct. The Russell system uses three tiers, whereas the other two systems are based on four tiers or levels.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

26. B is correct. As displayed in Exhibit 4, the alcoholic beverage industry is concentrated and possesses strong pricing power.

27. A is correct. The oil services industry has medium barriers to entry because a company with a high level of technological innovation could obtain a niche market in a specific area of expertise.

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

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

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

INDUSTRY AND COMPANY ANALYSIS

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 × (1 + Nominal GDP − 0.50%)	$53.9 million × (1 + 0.036 − 0.005) = $53.9 million × 1.031 =	$55.57 million
2013 cost of sales = 2013 net sales × CoS/net sales	$55.57 × 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%
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	10.3	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%

Revenue growth = (1 + Price increase for revenue) × (1 + Volume growth) − 1
Revenue growth = (1.05) × (0.97) − 1 = 1.85%

   COGS increase = (1 + Price increase for COGS) × (1 + Volume growth) − 1
   COGS increase = (1.08) × (0.97) − 1 = 4.76%

      Forecasted revenue = Base revenue × Revenue growth increase
      Forecasted revenue = 100 × 1.0185 = 101.85

         Forecasted COGS = Base COGS × COGS increase
         Forecasted COGS = 30 × 1.0476 = 31.43

      Forecasted gross profit = Forecasted revenue − Forecasted COGS
      Forecasted gross profit = 101.85 − 31.43 = 70.42

   Forecasted gross profit margin = Forecasted gross profit/Forecasted revenue
   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:

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

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.

DISCOUNTED DIVIDEND VALUATION

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,

$$V_0 = \frac{D_1}{(1+r)^1} + \frac{D_2 + P_2}{(1+r)^2} = \frac{4}{(1+0.11)^1} + \frac{5+250}{(1+0.11)^2}$$

$$= \frac{4}{1.11} + \frac{255}{1.11^2} = 3.60 + 206.96 = 210.57$$

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 being 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:

$$V_0 = \frac{D_0(1+g)}{r-g}$$

$$24 = \frac{1.00(1+g)}{0.10-g}$$

$$2.4 - 24g = 1.00 + g$$

$$25g = 1.4$$

$$g = 0.056 \text{ or } 5.6 \text{ percent}$$

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, 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:

$$\frac{P_0}{E_0} = \frac{(1-b)(1+g)}{r-g}$$

$$= \frac{0.35(1+0.045)}{0.08-0.045}$$

$$= 10.45$$

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.

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

Where

$$D_6 = D_0(1 + g_S)^6 = 9(1.14)^6 = 19.7548$$
$$r = 0.16$$
$$H = 10/2 = 5$$
$$g_S = 0.14$$
$$g_L = 0.10$$
$$V_6 = \frac{19.7548(1.10) + 19.7548(5)(0.14 - 0.10)}{0.16 - 0.10} = 428.02$$

$$\text{PV of } V_6 = 428.02/1.16^6 = 175.68$$
$$\text{PV of } D_1 = 9(1.14)/1.16 = 8.8448$$
$$\text{PV of } D_2 = 9(1.14)^2/1.16^2 = 8.6923$$
$$\text{PV of } D_3 = 9(1.14)^3/1.16^3 = 8.5425$$
$$\text{PV of } D_4 = 9(1.14)^4/1.16^4 = 8.3952$$
$$\text{PV of } D_5 = 9(1.14)^5/1.16^5 = 8.2504$$
$$\text{PV of } D_6 = 9(1.14)^6/1.16^6 = 8.1082$$

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

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

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

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 divi-
dend growth rates of 0.05 and 0.10, respectively, which gives an expected return of 7.4
percent as shown below:

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

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

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

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 re-
turn 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:

$$
\begin{aligned}
\text{P (Profit margin)} &= \text{NI/Sales} = 18{,}688/214{,}091 = 0.0873 \\
\text{R (Retention)} &= b = (\text{EPS} - \text{DPS})/\text{EPS} = (8.77 - 2.26)/8.77 \\
&= 0.7423 \\
\text{A (Asset turnover)} &= \text{Sales/Average total assets} \\
&= 214{,}091/0.5(148{,}786 + 132{,}628) = 1.5215 \\
\text{T (Leverage)} &= \text{Average total assets/Average shareholders' equity} \\
&= (148{,}786 + 132{,}628)/(77{,}088 + 68{,}935) = 1.9272
\end{aligned}
$$

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

	Needed for Solution to B	Solution to A		
Item	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 = 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

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

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 ± 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,

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

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 = $ 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	C$0.175(1.14)	C$0.1995	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				C$17.6528

23. C is correct. As shown in the above table, the value of the second stage = PV of V_8 = C$15.9095. The total value is 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 = $ C$0.4992. So, $0.4992/E_8 = 0.30$, which means that $E_8 = 0.4992/0.30 = 1.6640$.

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

25. A is correct. As computed earlier, $V_8 = 17(1.6640) = $ 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 = $ C$16.2352.

26. C is correct. Using the H-model

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

where

$D_0 = 0.175$

$r = 0.0872$

$H = 4$

$g_S = 0.14$

$g_L = 0.07$

$V_0 = \dfrac{0.175(1.07)+0.175(4)(0.14-0.07)}{0.0872-0.07} = 13.7355$

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.

FREE CASH FLOW VALUATION

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

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

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

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

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

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

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

To find FCFF from CFO:

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

To find FCFF from EBIT:

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

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

$$FCFE = EBIT(1 - Tax\ rate) + Dep - Int(1 - Tax\ rate) - FCInv$$
$$- WCInv + Net\ borrowing$$
$$FCFE = 605(1 - 0.40) + 180 - 130(1 - 0.40) - 349 - 38 + 50$$
$$FCFE = 363 + 180 - 78 - 349 - 38 + 50 = \$128\ million$$

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

$$FCFE = EBITDA(1 - Tax\ rate) + Dep(Tax\ rate)$$
$$- Int(1 - Tax\ rate) - FCInv - WCInv + Net\ borrowing$$
$$FCFE = 785(1 - 0.40) + 180(0.40) - 130(1 - 0.40) - 349 - 38 + 50$$
$$FCFE = 471 + 72 - 78 - 349 - 38 + 50 = \$128\ million$$

4. A. FCF = Net income + Depreciation and amortization − Cash dividends − 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, FCFF = NI + NCC + Int(1 − Tax rate) − FCInv − 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. FCF = Cash flow from operations (from the statement of cash flows) − Capital expenditures. Comparing this definition of free cash flow with Equation 8, FCFF = CFO + Int(1 − Tax rate) − 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 FCFF, but it generally understates the actual FCFF by the amount of after-tax interest expense.

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

$$Firm\ value = \frac{FCFF_1}{WACC - g} = \frac{FCFF_0(1 + g)}{WACC - g} = \frac{1.7(1.07)}{0.11 - 0.07}$$
$$= \frac{1.819}{0.04} = \$45.475\ billion$$

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

$$Equity = 45.475 - 15 = \$30.475\ billion$$

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

$$PV = \frac{FCFE_1}{r-g} = \frac{FCFE_0(1+g)}{r-g} = \frac{1.3(1.075)}{0.13-0.075} = \frac{1.3975}{0.055}$$

$$= \$25.409 \text{ billion}$$

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

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

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

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:

$$FCFE = \text{Net income} - (1-DR)(\text{Capital expenditures} - \text{Depreciation})$$

$$- (1-DR)(\text{Investment in working capital})$$

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 Taiwan Dollars)	2009	2010	2011	2012	2013
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 × 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 TMI Manufacturing has 17 billion outstanding shares, the value per ordinary share is $2.398.

7. A. The FCFF is (in euros)

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

$$FCFF = 250 + 90 + 150(1 - 0.30) - 170 - 40$$

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

The weighted-average cost of capital is

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

The value of the firm (in euro) is

$$Firm\ value = \frac{FCFF_1}{WACC - g} = \frac{FCFF_0(1 + g)}{WACC - g} = \frac{235(1.06)}{0.1032 - 0.06}$$

$$= \frac{249.1}{0.0432} = 5,766.20\ million$$

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

B. The free cash flow to equity is

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

$$FCFE = 250 + 90 - 170 - 40 + 0.40(170 - 90 + 40)$$

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

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,

$$Equity\ value = \frac{FCFE_1}{r - g} = \frac{FCFE_0(1 + g)}{r - g} = \frac{178(1.07)}{0.13 - 0.07}$$

$$= \frac{190.46}{0.06} = €3,174.33\ million$$

The value per share is V_0 = €3,174.33 million/10 million = €317.43 per share.

8. The WACC for PHB Company is

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

The firm value is

$$Firm\ value = FCFF_0(1 + g)/(WACC - g)$$

$$Firm\ value = 28(1.04)/(0.08435 - 0.04) = 29.12/0.04435$$

$$= \$656.60\ million$$

The value of equity is the firm value minus the value of debt minus the value of preferred stock: 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 million/8 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

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

The weighted-average cost of capital is

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

B.

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

$$\text{Firm value} = \frac{1.1559(1.04)}{0.0889 - 0.04} = \$24.583$$

C. Equity value = Firm value − Market value of debt
Equity value = 24.583 − 3.192 = $21.391 billion

D. Value per share = Equity value/Number of shares
Value per share = $21.391 billion/1.852 billion = $11.55

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

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

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

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

To estimate FCFE, we use Equation 15:

$$FCFE = \text{Net income} - (1 - DR)(FCInv - \text{Depreciation})$$
$$- (1 - DR)(WCInv)$$

which can be written

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

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:

$$V_3 = \frac{FCFE_4}{r - g} = \frac{918.19}{0.122 - 0.08} = \$21,861.67 \text{ million}$$

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.

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

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 million)/(84 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:

$$DPS_0 = \text{Cash dividends/Shares outstanding} = \$22,470/13,000$$
$$= \$1.7285$$
$$DPS_1 = DPS_0 \times 1.17 = \$2.0223$$
$$DPS_2 = DPS_0 \times 1.17^2 = \$2.3661$$
$$DPS_3 = DPS_0 \times 1.17^3 = \$2.7683$$
$$DPS_4 = DPS_0 \times 1.17^3 \times 1.09 = \$3.0175$$

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

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

$$\text{Value per share} = DPS_1/(1+r) + DPS_2/(1+r)^2 + DPS_3/(1+r)^3$$
$$+ \left[DPS_4/(r - g_{stable}) \right]/(1+r)^3$$

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

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):

$$\text{Net income} = \$37,450$$
$$\text{Depreciation} = \$10,500$$
$$\text{Capital expenditures} = \$15,000$$
$$\text{Change in working capital} = \$5,500$$
$$\text{New debt issuance} - \text{Principal repayments} = \text{Change in debt}$$
$$\text{outstanding} = \$4,000$$
$$FCFE_0 = \text{Net income} + \text{Depreciation} - \text{Capital expenditures} -$$
$$\text{Change in working capital} - \text{Principal repayments} \ +$$
$$\text{New debt issues}$$
$$FCFE_0 = \$37,450 + \$10,500 - \$15,000 - \$5,500 + \$4,000$$
$$= \$31,450$$
$$FCFE_0 \text{ per share} = \$31,450/13,000 = \$2.4192$$
$$FCFE_1 = FCFE_0 \times 1.17 = \$2.8305$$
$$FCFE_2 = FCFE_0 \times 1.17^2 = \$3.3117$$
$$FCFE_3 = FCFE_0 \times 1.17^3 = \$3.8747$$
$$FCFE_4 = FCFE_0 \times 1.17^3 \times 1.09 = \$4.2234$$

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

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

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

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	$\text{FCFE}_5/(r-g)$ = 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 $TV_4 = FCFE_5/(r - g)$. 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

<u>$40</u> million pension fund surplus

$145 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 − Payout ratio, or 1.0 − 0.2 = 0.8. The sustainable growth rate is 0.8 × 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. FCFF = NI + NCC + Interest expense (1 − Tax rate) − FCInv − WCInv. In this case:

NI = $485 million

NCC = Depreciation expense = $270 million

Interest expense (1 − Tax rate) = 195 (1 − 0.32) = $132.6 million

FCInv = Net purchase of fixed assets = Increase in gross fixed assets
        = 4,275 − 3,752 = $523 million

WCInv = Increase in accounts receivable + Increase in inventory
            − Increase in accounts payable − Increase in accrued liabilities

        = (770 − 711) + (846 − 780) − (476 − 443) − (149 − 114)

        = $57 million

FCFF = 485 + 270 + 132.6 − 523 − 57 = 307.6, or $308 million

21. B is correct. FCFE = NI + NCC − FCInv − WCInv + Net borrowing. In this case:

> NI = \$485 million
>
> NCC = Depreciation expense = \$270 million
>
> FCInv = Net purchase of fixed assets = Increase in gross fixed assets
>
> $\qquad$ = 4,275 − 3,752 = \$523 million
>
> WCInv = Increase in accounts receivable + Increase in
>
> $\qquad$ inventory − Increase in accounts payable − Increase
>
> $\qquad$ in accrued liabilities
>
> $\qquad$ = (770 − 711) + (846 − 780) − (476 − 443) − (149 − 114)
>
> $\qquad$ = \$57 million
>
> Net borrowing = Increase in notes payable + Increase in long-term debt
>
> $\qquad$ = (465 − 450) + (1,575 − 1,515) = \$75 million
>
> FCFE = 485 + 270 − 523 − 57 + 75 = \$250 million

An alternative calculation is

> FCFE = FCFF − Int(1 − Tax rate) + Net borrowing
>
> FCFE = 307.6 − 195(1 − 0.32) + (15 + 60) = \$250 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.

MARKET-BASED VALUATION: PRICE AND ENTERPRISE VALUE MULTIPLES

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 × $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:

   $$P/E = \left[\text{Payout ratio} \times (1+g) \right] / (r-g)$$
   $$= (0.30 \times 1.13)/(0.14 - 0.13) = 33.9$$

   P/E based on next year's earnings:

   $$P/E = \text{Payout ratio}/(r-g)$$
   $$= 0.30/(0.14 - 0.13) = 30$$

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 = Benchmark value of P/E × E_n = 12 × \$3.00 = \$36.0.
    B. In the expression for sustainable growth rate $g = b \times$ ROE, you can use $(1 - 0.45) = 0.55 = b$, and 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: P/S = (\$10 price per share)/[(\$1 billion sales)/(20 million shares)] = \$10/(\$1,000,000,000/20,000,000) = 0.2
        Trymye: P/S = (\$20 price per share)/[(\$1.6 billion sales)/(30 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 × 5.5% = 11.5%.
    B. The dividend payout ratio is €0.91/€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 = €49.5 million + €3 million + €2 million + €8 million = €62.5 million

      Per-share EBITDA = (€62.5 million)/(5 million shares) = €12.5

      P/EBITDA for RGI = €150/€12.5 = 12

      EBITDA for NCI = €8 million + €5 million + €3 million + €4 million = €20 million

      Per-share EBITDA = (€20 million)/(2 million shares) = €10

      P/EBITDA for NCI = €100/€10 = 10

   B. For RGI:

      Market value of equity = €150 × 5 million = €750 million

      Market value of debt = €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 billion/1.638821 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 cyclicality 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.

RESIDUAL INCOME VALUATION

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	

$$\text{Equity charge} = \text{Equity capital} \times \text{Required return on equity}$$
$$= \left(1/3\right)\left(\$3,000,000\right) \times 0.10$$
$$= \$1,000,000 \times 0.10 = \$100,000$$

$$\text{Residual income} = \text{Net income} - \text{Equity charge}$$
$$= \$108,000 - \$100,000 = \$8,000$$

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 × 6%), VIM's residual income is \$8,000, which is calculated (as in Problem 1) as follows:

$$\text{Residual income} = \text{Net income} - \text{Equity charge}$$
$$= \left[(\text{EBIT} - \text{Interest})(1 - \text{Tax rate})\right]$$
$$\quad - \left[(\text{Equity capital})(\text{Required return on equity})\right]$$
$$= \left[(\$300,000 - \$120,000)(1 - 0.40)\right]$$
$$\quad - \left[(\$1,000,000)(0.10)\right]$$
$$= \$108,000 - \$100,000$$
$$= \$8,000$$

Therefore, residual income per share is \$0.16 per share (\$8,000/50,000 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).

$$\text{Intrinsic value} = \text{Book value per share} + \text{PV of expected future income}$$
$$\text{per-share residual income}$$
$$= \$20 + \$1.60 = \$21.60$$

3. With $g = b \times \text{ROE} = (1 - 0.80)(0.15) = (0.20)(0.15) = 0.03$,

$$\text{P/B} = (\text{ROE} - g)/(r - g)$$
$$= (0.15 - 0.03)/(0.12 - 0.03)$$
$$= 0.12/0.09 = 1.33$$

or

$$\text{P/B} = 1 + (\text{ROE} - r)/(r - g)$$
$$= 1 + (0.15 - 0.12)/(0.12 - 0.03)$$
$$= 1.33$$

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,

Net income = Pretax income × (1 − Tax rate)
            = \$5.1 million × (1 − 0.4)
            = \$5.1 × 0.6 = \$3.06 million

Equity charge = Total equity × Cost of equity capital
            = (0.1 × \$450 million) × 12%
            = \$45 million × 0.12 = \$5,400,000

Residual   = Net income − Equity charge
income   = \$3,0600,000 - \$5,400,000 = −\$2,340,000

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,

$$NOPAT/Assets = €10 \text{ million} / €100 \text{ million} = 10\%$$

$$WACC = \text{Percent of debt} \times \text{After-tax cost of debt}$$

$$+ \text{Percent of equity} \times \text{Cost of equity}$$

$$= (0.5)(0.09)(0.6) + (0.5)(0.12)$$

$$= (0.5)(0.054) + (0.5)(0.12) = 0.027 + 0.06 = 0.087$$

$$= 8.7\%$$

Therefore, SWI's residual income was positive. Specifically, residual income equals €1.3 million $[(0.10 - 0.087) \times €100 \text{ million}]$.

6. A. $EVA = NOPAT - WACC \times \text{Beginning book value of assets}$

$$= \$100 - (11\%) \times (\$200 + \$300) = \$100 - (11\%)(\$500) = \$45$$

B. $RI_t = E_t - rB_{t-1}$

$$= €5.00 - (11\%)(€30.00) = €5.00 - €3.30 = €1.70$$

C. $RI_t = (ROE_t - r) \times B_{t-1}$

$$= (18\% - 12\%) \times (€30) = €1.80$$

7. A.   Economic value added = Net operating profit after taxes − (Cost of capital × Total capital) = \$100 million − (14% × \$700 million) = \$2 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 stock price × 84 million shares − \$700 million = \$1.48 billion

8. A.   Because the dividend is a perpetuity, the no-growth form of the DDM is applied as follows:

$$V_0 = D/r$$

$$= \$0.60/0.12 = \$5 \text{ per share}$$

B.   According to the residual income model, V_0 = Book value per share + Present value of expected future per-share residual income.

Residual income is calculated as:

$$RI_t = E - rB_{t-1}$$

$$= \$0.60 - (0.12)(\$6) = -\$0.12$$

Present value of perpetual stream of residual income is calculated as:

$$RI_t/r = -\$0.12/0.12 = -\$1.00$$

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, $V_0 = B_0 +$ Present value of expected future per-share residual income.

Residual income is calculated as:

$$\begin{aligned}
RI_t &= E - rB_{t-1} \\
&= \$2 - (0.125)(\$10) = \$0.75
\end{aligned}$$

Present value of stream of residual income is calculated as:

$$RI_t/r = 0.75/0.125 = \$6$$

The value is calculated as:

$$V_0 = \$10 + \$6 = \$16 \text{ per share}$$

10. A. $V_0 =$ 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	$10.00	$12.50	$ 0.00
Net income	$ 4.00	$ 5.00	$ 8.00
Less equity charge ($r \times$ Book value)	0.80	1.00	1.25
Residual income	$ 3.20	$ 4.00	$ 6.75

Under the residual income model,

$V_0 = B_0 +$ Present value of expected future per-share residual income

$V_0 = \$8.00 + \$3.20/1.1 + \$4.00/(1.1)^2 + \$6.75/(1.1)^3$

$V_0 = 8.00 + \$2.909 + \$3.306 + \$5.071 = \$19.286$

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) × BV	$3.20	$4.00	$6.75

Under the residual income model,

$V_0 = B_0 +$ Present value of expected future per-share residual income
$V_0 = \$8.00 + \$3.20/1.1 + \$4.00/(1.1)^2 + \$6.75/(1.1)^3$
$V_0 = 8.00 + \$2.909 + \$3.306 + \$5.071 = \$19.286$

Note: Because the residual incomes for each year are necessarily the same in Parts B and C, the results for stock valuation are identical.

11.

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 × 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 × (ROE − r) = $30 × (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) × (1.1)^4 = 0.90 × 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."

13. $V_0 = B_0 + (\text{ROE} - r)B_0/(r - g)$

$\quad = \$20 + (0.18 - 0.14)(\$20)/(0.14 - 0.10)$

$\quad = \$20 + \$20 = \$40$

Given the current market price is \$35 and the estimated value is \$40, Simms will probably conclude that the shares are somewhat undervalued.

14. $V_0 = B_0 + (\text{ROE} - r)B_0/(r - g)$

$\quad = \$30 + (0.15 - 0.12)(\$30)/(0.12 - 0.10)$

$\quad = \$30 + \$45 = \$75$ per share

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
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
						$2.51

Using the finite horizon form of residual income valuation,

$\quad V_0 = B_0 + \text{Sum of discounted RIs} + \text{Premium (also discounted to present)}$

$\quad\quad = \$10 + \$2.51 + (0.20)(20.14)/(1.10)^5$

$\quad\quad = \$10 + \$2.51 + \$2.50 = \$15.01$

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:

$$r = R_F + \beta_i \left[E(R_M) - R_F \right] = 5\% + (0.60)(5.5\%) = 8.30\%$$

For Year 1 in the table above,

$$\text{Residual income} = \text{RI}_t = E - rB_{t-1}$$
$$= 2.116 - (8.30\%)(9.62)$$
$$= 2.116 - 0.798 = \$1.318$$

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% $[R_F + \beta_i[E(R_M) - RF] = 5\% + (0.80)(5.5\%)]$. 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 $B_0 + [(\text{ROE} - r)B_0/(r-g)]$. 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:

$$V_0 = B_0 + \sum_{t=1}^{T-1} \frac{\left(E_t - rB_{t-1}\right)}{\left(1+r\right)^t} + \frac{\left(E_T - rB_{T-1}\right)}{\left(1+r-\omega\right)\left(1+r\right)^{T-1}}$$

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 × 0.10 = R0.76	R8.42 × 0.10 = R0.842	R9.21 × 0.10 = R0.921	R10.05 × 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 × 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:

$$\text{PV of Terminal Value} = \frac{\text{R1.608}}{\left(1+0.10-0.70\right)\left(1.10\right)^3} = \text{R3.0203}$$

Then, intrinsic value per share is:

$$V_0 = \text{R}7.60 + \frac{\text{R}2.52}{(1.10)} + \frac{\text{R}2.31}{(1.10)^2} + \frac{\text{R}1.98}{(1.10)^3} + \text{R}3.0203 = \text{R}16.31$$

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:

$$V_0 = \text{R}7.60 + \frac{\text{R}2.52}{(1.10)} + \frac{\text{R}2.31}{(1.10)^2} + \frac{\text{R}1.98}{(1.10)^3} = \text{R}13.29$$

PRIVATE COMPANY VALUATION

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 the 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 million)(1.055)]/(0.18 − 0.055) = $1.899 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 × 5.0 percent = $100,000, and the return required for fixed assets is $5,500,000 × 8.0 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 Lack of control discount = 1 − [1/ (1 + 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 (Pro rata control value) × (1 − DLOC) × (1 − DLOM). A combined discount of approximately 35 percent is calculated as 1 − (1 − 13%) × (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 × 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 $V = FCFE_1/(r - g) = 2.5/(0.115 - 0.03) = \$29.41$ 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:
    Return on working capital $= 0.08 \times \$10,000,000 = \$800,000$
    Return on fixed assets $= 0.12 \times \$45,000,000 = \$5,400,000$
    Return on intangibles $= \$35,000,000 - \$800,000 - \$5,400,000 = \$28,800,000$
    Value of intangibles using CCM $= \$28,800,000/(0.20 - 0.06) = \$205.71$ 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:

$$1 - (1 - 0.20)(1 - 0.15) = 1 - 0.68 = 32 \text{ percent}$$