

$$FCFF = CFO + \text{Int} (1 - \text{Tax Rate}) - \text{FCInv}$$

**US GAAP versus IAS Treatment of Interest and Dividends**

	US GAAP	IAS
Interest received	Operating	Operating or Investing
Interest paid	Operating	Operating or Financing
Dividends received	Operating	Operating or Investing
Dividends paid	Financing	Operating or Financing

**Noncash Items and FCFF**

Noncash Items	Adjustment to NI to arrive at FCFF
Depreciation	Add back
Amortisation of intangibles	Add back
Restructuring charges (expense)	Add back
Restructuring charges (income resulting from reversal)	Subtracted
Losses	Add back
Gains	Subtracted
Amortisation of long term bond discounts	Add back
Amortisation of long term bond premiums	Subtracted

Profit on disposal

**Calculating FCFE from FCFF**

$$FCFE = FCFF$$

Less: Interest expense (1-Tax Rate)

Plus: Net borrowing

*statement - cash flow from financing.*

This equation can be written compactly as:

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

Discounted cash flow models are used widely by analysts to value companies.

- Free cash flow to the firm (FCFF) and free cash flow to equity (FCFE) are the cash flows available to all of the investors in the company and to common stockholders, respectively.
- Analysts like to use free cash flow as return (either FCFF or FCFE)
  - o if the company is not dividend paying,
  - o if the company is dividend paying but dividends differ significantly from the company's capacity to pay dividends,
  - o if free cash flows align with profitability within a reasonable forecast period with which the analyst is comfortable, or
  - o if the investor takes a control perspective.

- The FCFF valuation approach estimates the value of the firm as the present value of future FCFF discounted at the weighted average cost of capital (WACC):

$$\text{Firm Value} = \sum_{t=1}^{\infty} \frac{FCFF_t}{(1 + \text{WACC})^t}$$

The value of equity is the value of the firm minus the value of the firm's debt.

$$\text{Equity value} = \text{Firm value} - \text{Market value of debt}$$

*From Bal sheet. fair val = market val*

Dividing the total value of equity by the number of outstanding shares gives the value per share.

The WACC formula is

*wacc - after tax.*

$$\text{WACC} = \frac{\text{MV (Debt)}}{\text{MV (Debt)} + \text{MV (Equity)}} r_D (1 - \text{Tax Rate}) + \frac{\text{MV (Equity)}}{\text{MV (Debt)} + \text{MV (Equity)}} r_E$$

*Revaluation of Fixed Assets.*

The value of the firm if FCFF is growing at a constant rate is

$$\text{Firm Value} = \frac{FCFF_1}{\text{WACC} - g} = \frac{FCFF_0(1+g)}{\text{WACC} - g}$$

With the FCFE valuation approach, the value of equity can be found by discounting FCFE at the required rate of return on equity (r):

$$\text{Equity Value} = \sum_{t=1}^{\infty} \frac{FCFE_t}{(1+r)^t}$$

Dividing the total value of equity by the number of outstanding shares gives the value per share.

- The value of equity if FCFE is growing at a constant rate is

$$\text{Equity Value} = \frac{FCFE_1}{r - g} = \frac{FCFE_0(1+g)}{r - g}$$

- FCFF and FCFE are frequently calculated starting with net income:

$$\begin{aligned} \text{FCFF} &= \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv} \\ \text{FCFE} &= \text{NI} + \text{NCC} - \text{FCInv} - \text{WCInv} + \text{Net borrowing} \end{aligned}$$



- FCFF and FCFE are related to each other as follows:

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

- FCFF and FCFE can be calculated starting from cash flow from operations:

$$\begin{aligned} \text{FCFF} &= \text{CFO} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} \\ \text{FCFE} &= \text{CFO} - \text{FCInv} + \text{Net borrowing} \end{aligned}$$

- FCFF can also be calculated from EBIT or EBITDA

$$\begin{aligned} \text{FCFF} &= \text{EBIT}(1 - \text{Tax rate}) + \text{Dep} - \text{FCInv} - \text{WCInv} \\ \text{FCFF} &= \text{EBITDA}(1 - \text{Tax rate}) + \text{Dep}(\text{Tax rate}) - \text{FCInv} - \text{WCInv} \end{aligned}$$

- FCFE can then be found by using  $\text{FCFE} = \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing}$ .

- o Finding CFO, FCFF, and FCFE can require careful interpretation of corporate financial statements. In some cases, the needed information may not be transparent.
- o Earnings components such as net income, EBIT, EBITDA, and CFO should not be used as cash flow measures to value a firm. These earnings components either double-count or ignore parts of the cash flow stream.
- o More-complicated capital structures, such as those with preferred stock, are easily adapted to find FCFF or FCFE.

A general expression for the two-stage FCFF valuation model is

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

A general expression for the two-stage FCFE valuation model is

$$\text{Equity Value} = \sum_{t=1}^n \frac{\text{FCFE}_t}{(1 + r)^t} + \frac{\text{FCFE}_{n+1}}{r - g} \frac{1}{(1 + r)^n}$$

One common two-stage model assumes a constant growth rate in each stage, and a second common model assumes declining growth in Stage 1 followed by a long-run sustainable growth rate in Stage 2.

- To forecast FCFF and FCFE, analysts build a variety of models of varying complexity. A common approach is to forecast sales, with profitability, investments, and financing derived from changes in sales.

- Three-stage models are often considered to be good approximations for cash flow streams that, in reality, fluctuate from year to year.
- Nonoperating assets such as excess cash and marketable securities, noncurrent investment securities, and nonperforming assets are usually segregated from the company's operating assets. They are valued separately and then added to the value of the company's operating assets to find total firm value.



## PROBLEMS

1. Indicate the effect on this period's FCFF and FCFE of a change in each of the items listed below. Assume a \$100 increase in each case and a 40 percent tax rate.

- A. Net income
- B. Cash operating expenses
- C. Depreciation
- D. Interest expense
- E. EBIT
- F. Accounts receivable
- G. Accounts payable
- H. Property, plant, and equipment
- I. Notes payable
- J. Cash dividends paid
- K. Proceeds from issuing new common shares
- L. Common stock share repurchases

2. LaForge Systems, Inc. has net income of \$285 million for the year 2003. Using information from the company's financial statements below, show the adjustments to net income that would be required to find:

- A. FCFF, and
- B. FCFE.
- C. In addition, show the adjustments to FCFF that would result in FCFE.

LaForge Systems, Inc.			
Balance Sheet			
In millions	31-Dec	2002	2003
<b>Assets</b>			
<b>Current assets</b>			
Cash and equivalents		210	248
Accounts receivable		474	513
Inventory		520	564
<b>Total current assets</b>		<b>1,204</b>	<b>1,325</b>
Gross fixed assets		2,501	2,850
Accumulated depreciation		-604	-784
<b>Net fixed assets</b>		<b>1,897</b>	<b>2,066</b>
<b>Total assets</b>		<b>3,101</b>	<b>3,391</b>
<b>Liabilities and shareholders' equity</b>			
<b>Current liabilities</b>			
Accounts payable		295	317
Notes payable		300	310
Accrued taxes and expenses		76	99
<b>Total current liabilities</b>		<b>671</b>	<b>726</b>
Long-term debt		1,010	1,050
Common stock		50	50
Additional paid-in capital		300	300
Retained earnings		1,070	1,265
<b>Total shareholders' equity</b>		<b>1,420</b>	<b>1,616</b>
<b>Total liabilities and shareholders' equity</b>		<b>3,101</b>	<b>3,391</b>

<b>Statement of Income</b>		
In millions, except per share data	31-Dec	2003
Total revenues		2,215
Operating costs and expenses		1,430
EBITDA		785
Depreciation		180
EBIT		605
Interest expense		130
Income before tax		475
Taxes (at 40 percent)		190
Net income		285
Dividends		90
Addition to retained earnings		195
<b>Statement of Cash Flows</b>		
In millions	31-Dec	2003
<b>Operating activities</b>		
Net income		285
Adjustments		
Depreciation		180
Changes in working capital		
Accounts receivable		-39
Inventories		-44
Accounts payable		22
Accrued taxes and expenses		23
<b>Cash provided by operating activities</b>		<b>427</b>
<b>Investing activities</b>		
Purchases of fixed assets		349
<b>Cash used for investing activities</b>		<b>349</b>
<b>Financing activities</b>		
Notes payable		-10
Long-term financing issuances		-40
Common stock dividends		90
<b>Cash used for financing activities</b>		<b>40</b>
Cash and equivalents increase (decrease)		38
Cash and equivalents at beginning of year		210
<b>Cash and equivalents at end of year</b>		<b>248</b>
<b>Supplemental cash flow disclosures</b>		
Interest paid		130
Income taxes paid		190

3. For LaForge Systems, whose financial statements are given in Problem 2 above, show the adjustments from the current levels of CFO (which is 427), EBIT (605), and EBITDA (785) to find

- A. FCFF, and  
 B. FCFE.

4. The term "free cash flow" is frequently applied to cash flows that differ from the definition for FCFF that should be used to value a firm. Two such definitions of "free cash flow" are given below. Compare the definitions given for FCF to FCFF.

A. FCF = Net income + Depreciation and amortization - Cash dividends - Capital expenditures.

B. FCF = Cash flow from operations (from the statement of cash flows) - Capital expenditures.

5. Proust Company has FCFF of \$1.7 billion and FCFE of \$1.3 billion. Proust's WACC is 11 percent and its required rate of return for equity is 13 percent. FCFF is expected to grow forever at 7 percent and FCFE is expected to grow forever at 7.5 percent. Proust has debt outstanding of \$15 billion.

- A. What is the total value of Proust's equity using the FCFF valuation approach?  
 B. What is the total value of Proust's equity using the FCFE valuation approach?

6. Quinton Johnston is evaluating Taiwan Semiconductor Manufacturing Co., Ltd., (NYSE: TSM) headquartered in Hsinchu, Taiwan. In 2001, when Johnston is performing his analysis, the company and indeed, the whole industry is unprofitable. Furthermore, TSM pays no dividends on its common shares. Johnston decides to value TSM using his forecasts of FCFE and makes the following assumptions:

- The company has 17.0 billion outstanding shares.
- Sales will be \$5.5 billion in 2002, increasing at 28 percent annually for the next four years (through 2006).
- Net income will be 32 percent of sales.
- Investment in fixed assets will be 35 percent of sales, investment in working capital will be 6 percent of sales, and depreciation will be 9 percent of sales.
- 20 percent of the investment in assets will be financed with debt.
- Interest expenses will be only 2 percent of sales.
- The tax rate will be 10 percent.
- TSM's beta is 2.1, the risk-free government bond rate is 6.4 percent, and the equity risk premium is 5.0 percent.
- At the end of 2006, Johnston projects TSM will sell for 18 times earnings.

What is the value of one ordinary share of Taiwan Semiconductor Manufacturing Co., Ltd.?

7. Do Pham is evaluating Phaneuf Accelérateur using the FCFF and FCFE valuation approaches. Pham has collected the following information (currently in Euro):

- Phaneuf has net income of 250 million, depreciation of 90 million, capital expenditures of 170 million, and an increase in working capital of 40 million.
- Phaneuf will finance 40 percent of the increase in net fixed assets (capital expenditures less depreciation) and 40 percent of the increase in working capital with debt financing.
- Interest expenses are 150 million. The current market value of Phaneuf's outstanding debt is 1,800 million.
- FCFF is expected to grow at 6.0 percent indefinitely, and FCFE is expected to grow at 7.0 percent.
- The tax rate is 30 percent.
- Phaneuf is financed with 40 percent debt and 60 percent equity. The before-tax cost of debt is 9 percent and the before-tax cost of equity is 13 percent.
- Phaneuf has 10 million outstanding shares.

- A. Using the FCFF valuation approach, estimate the total value of the firm, the total market value of equity, and the value per share.  
 B. Using the FCFE valuation approach, estimate the total market value of equity and the value per share.

8. PHB Company currently sells for \$32.50 per share. In an attempt to determine if PHB is fairly priced, an analyst has assembled the following information:

- The before-tax required rates of return on PHB debt, preferred stock, and common stock are 7.0 percent, 6.8 percent, and 11.0 percent, respectively.
- The company's target capital structure is 30 percent debt, 15 percent preferred stock, and 55 percent common stock.
- The market value of the company's debt is \$145 million, and its preferred stock is valued at \$65 million.
- PHB's FCFF for the year just ended is \$28 million. FCFF is expected to grow at a constant rate of 4 percent for the foreseeable future.
- The tax rate is 35 percent.
- PHB has 8 million outstanding common shares

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

9. Watson Dunn is planning to value BHP Billiton Ltd. (NYSE: BHP) using a singlestage FCFF approach. BHP Billiton, headquartered in Melbourne, Australia, provides a variety of industrial metals and minerals. The financial information Dunn has assembled for his valuation is as follows:

- The company has 1,852 million shares outstanding.
- Market value of debt is \$3.192 billion.
- FCFF is currently \$1.1559 billion.
- Equity beta is 0.90, the equity risk premium is 5.5 percent, and the risk-free rate is 5.5 percent.
- The before-tax cost of debt is 7.0 percent.
- The tax rate is 40 percent.
- To calculate WACC, assume the company is financed 25 percent with debt.
- FCFF growth rate is 4 percent.

Using Dunn's information, calculate the following:

- A. WACC  
 B. Value of the firm  
 C. Total market value of equity  
 D. Value per share

10. Kenneth McCoin is valuing McDonald's Corporation and performing a sensitivity analysis on his valuation. He uses a single-stage FCFE growth model. The "base case" values for each of the parameters in the model are given in the table below, along with possible "low" and "high" estimates for each variable.

Variable	Base Case Value	Low Estimate	High Estimate
Normalized FCFE	\$0.88	\$0.70	\$1.14
Risk-free rate	5.08%	5.00%	5.20%
Equity risk premium	5.50%	4.50%	6.50%
Beta	0.7	0.6	0.8
FCFE	6.40%	4.00%	7.00%

- A. Use the base case values to estimate the current value of McDonald's Corporation.  
 B. Calculate the range of stock prices that would occur if the base case value for FCFE were replaced by the low and high estimate for FCFE. Similarly, using the base case values for all other variables, calculate the range of stock prices caused by the using the low and high values for beta, the risk-free rate, the equity risk premium, and the growth rate. Rank the sensitivity of the stock price to each of the five variables based on these ranges.

11. An aggressive financial planner who claims to have a superior method for picking undervalued stocks is courting one of your clients. The planner claims that the best way to find the value of a stock is to divide EBITDA by the risk-free bond rate. The planner is urging your client to invest in Alcan, Inc. (NYSE: AL). Alcan is the parent of a group of companies engaged in all aspects of the aluminum business. The planner says that Alcan's EBITDA of \$1,580 million divided by the long-term government bond rate of 7 percent gives a total value of \$22,571 million. With 318 million outstanding shares, Alcan's value per share using this method is \$70.98. Shares of Alcan currently trade for \$36.50, and the planner wants your client to make a large investment in Alcan through him.

A. Provide your client with an alternative valuation of Alcan based on a two-stage FCFE valuation approach. Use the following assumptions:

- Net income is currently \$600 million. Net income will grow by 20 percent annually for the next three years.
- The net investment in operating assets (capital expenditures less depreciation plus investment in working capital) will be \$1,150 million next year and grow at 15 percent for the following two years.
- Forty percent of the net investment in operating assets will be financed with net new debt financing.
- Alcan's beta is 1.3, the risk-free bond rate is 7 percent, and the equity risk premium is 4 percent.
- After three years, the growth rate of net income will be 8 percent and the net investment in operating assets (capital expenditures minus depreciation plus increase in working capital) each year will drop to 30 percent of net income.
- Debt is, and will continue to be, 40 percent of total assets.
- Alcan has 318 million outstanding shares.

Find the value per share of Alcan

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

12. Bron has earnings per share of \$3.00 in 2002 and expects earnings per share to increase by 21 percent in 2003. Earnings per share are expected to grow at a decreasing rate for the following five years, as shown in the table below. In 2008, the growth rate will be 6 percent and is expected to stay at that rate thereafter. Net capital expenditures (capital expenditures minus depreciation) will be \$5.00 per share in 2002 and then follow the pattern predicted in the table. In 2008, net capital expenditures are expected to be \$1.50 and will then grow at 6 percent annually. The investment in working capital parallels the increase in net capital expenditures and is predicted to equal 25 percent of net capital expenditures each year. In 2008, investment in working capital will be \$0.375 and is predicted to grow at 6 percent thereafter. Bron will use debt financing to fund 40 percent of net capital expenditures and 40 percent of the investment in working capital.

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

The required rate of return for Bron is 12 percent. Find the value per share using a two-stage FCFE valuation approach.

13. (Adapted from CFA Level 11 exam, 2000) The management of Telluride, an international diversified conglomerate based in the United States, believes that the recent strong performance of its wholly owned medical supply subsidiary, Sundanci, has gone unnoticed. To realize Sundanci's full value, Telluride announced that it will divest Sundanci in a tax-free spinoff.

Sue Carroll, CFA, is Director of Research at Kesson and Associates. In developing an investment recommendation for Sundanci, Carroll has gathered the information shown in Tables 3-16 and 3-17 below.

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

- A. Calculate the amount of FCFE per share for 2000 using the data from Table 3.16 below. Show your work.
- B. Calculate the current value of a share of Sundanci stock based on the two-stage FCFE model. Show your work.
- C. Describe limitations that the two-stage DDM and FCFE models have in common.

**Table 3-16 Summarized Actual 1999 and 2000 Financial Statements for Fiscal Years Ending 31 May (In millions except per share data)**

<b>INCOME STATEMENT</b>			
	1999	2000	
Revenue	474	598	
Depreciation	20	23	
Other operating costs	368	460	
Income before taxes	86	115	
Taxes	26	35	
Net income	60	80	
Dividends	18	24	
Earnings per share	\$0.714	\$0.952	
Dividends per share	\$0.214	\$0.286	
Common shares outstanding	84	84	
<b>BALANCE SHEET</b>			
	1999	2000	
Current assets (including \$5 cash 1999 and 2000)	201	326	
Net Property plant and equipment	474	489	
Total assets	675	815	
Current liabilities (all non interest bearing)	57	141	
Long term debt	0	0	
Total liabilities	57	141	
Shareholders equity	618	674	
Total liabilities and equity	675	815	
Capital expenditures	34	38	

**TABLE 3-17 Selected Financial Information**

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

14. (Adapted from CFA Level I exam, 2001) John Jones, CFA, is head of the research department of Peninsular Research. One of the companies he is researching, Mackinac Inc., is a U.S.-based manufacturing company. Mackinac has released its June 2001 financial statements, shown in Tables 3-16, 3-19, and 3-20.

Mackinac has announced that it has finalized an agreement to handle North American production of a successful product currently marketed by a foreign company. Jones decides to value Mackinac using the dividend discount model (DDM) and the free cash flow-to-equity (FCFE) model. After reviewing Mackinac's financial statements above and forecasts related to the new production agreement, Jones concludes the following:

- Mackinac's earnings and FCFE are expected to grow 17 percent a year over the next three years before stabilizing at an annual growth rate of 9 percent.
- Mackinac will maintain the current payout ratio.
- Mackinac's beta is 1.25.
- The government bond yield is 6 percent, and the market equity risk premium is 5 percent.

A. Calculate the value of a share of Mackinac's common stock using the two-stage DDM. Show your calculations.

B. Calculate the value of a share of Mackinac's common stock using the two-stage FCFE model. Show your calculations.

C. Jones is discussing with a corporate client the possibility of that client acquiring a 70 percent interest in Mackinac. Discuss whether the DDM or FCFE model is more appropriate for this client's valuation purposes.

**TABLE 3-18 Mackinac Inc. Annual Income Statement 30 June 2001 (In thousands except for per share data)**

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

**TABLE 3-19 Mackinac Inc. Balance Sheet 30 June 2001 (in thousands)**

<b>Current Assets</b>		
Cash and equivalents	20,000	
Receivables	40,000	
Inventories	29,000	
Other current assets	23,000	
<b>Total current assets</b>		<b>112,000</b>
<b>Noncurrent Assets</b>		
Property, plant, and equipment	145,000	
Less: Accumulated depreciation	-43,000	
Net property, plant, and equipment	102,000	
Investments	70,000	
Other noncurrent assets	36,000	
<b>Total noncurrent assets</b>		<b>208,000</b>
<b>Total assets</b>		<b>320,000</b>
<b>Current Liabilities</b>		
Accounts payable	41,000	
Short-term debt	12,000	
Other current liabilities	17,000	
<b>Total current liabilities</b>		<b>70,000</b>
<b>Noncurrent Liabilities</b>		
Long-term debt	100,000	
<b>Total noncurrent liabilities</b>		<b>100,000</b>
<b>Total liabilities</b>		<b>170,000</b>
<b>Shareholders' Equity</b>		
Common equity	40,000	
Retained earnings	110,000	
<b>Total equity</b>		<b>150,000</b>
<b>Total liabilities and equity</b>		<b>320,000</b>

**TABLE 3-20 Mackinac Inc. Cash Flow Statement 30 June 2001 (in thousands)**

<b>Cash Flow from Operating Activities</b>		
Net income		37,450
Depreciation and amortization		10,500
<b>Change in Working Capital</b>		
(Increase) Decrease in receivables	-5,000	
(Increase) Decrease in inventories	-8,000	
Increase (Decrease) in payables	6,000	
Increase (Decrease) in other current liabilities	1,500	
Net change in working capital		-6,500
<b>Net cash from operating activities</b>		<b>42,450</b>
<b>Cash Flow from Investing Activities</b>		
Purchase of property, plant, and equipment	-15,000	
<b>Net cash from investing activities</b>		<b>-15,000</b>
<b>Cash Flow from Financing Activities</b>		
Change in debt outstanding	4,000	
Payment of cash dividends	-22,470	
<b>Net cash from financing activities</b>		<b>-18,470</b>
Net change in cash and cash equivalents		8,980
Cash at beginning of period		11,020
<b>Cash at end of period</b>		<b>20,000</b>

15. SK Telecom Co. is a cellular telephone paging and computer communication services company in Seoul, South Korea. The company is traded on the Korea, New York, and London stock exchanges (NYSE: SKM). Sol Kim has estimated the normalized FCFE for SK Telecom to be 1,300 Korean won (per share) for the year just ended. The real country return for South Korea is 6.50 percent. To estimate the required return for SK Telecom, the adjustments to the real country return are an industry adjustment of +0.60 percent, a size adjustment of -0.10 percent, and a leverage adjustment of +0.25 percent. The long-term real growth rate for South Korea is estimated at 3.5 percent, and Kim expects the real growth rate of SK Telecom to track the country rate.

A. What is the real required rate of return for SK Telecom?

B. Using the single-stage FCFE valuation model and real values for the discount rate and FCFE growth rate, estimate the value of one share of SK Telecom.

16. Lawrence McKibben is preparing a valuation of Tele Norte Leste Participacoes SA (NYSE: TNE), a telecom services company headquartered in Rio de Janeiro, Brazil. McKibben has decided to use a three-stage FCFE valuation model and the following estimates. The FCFE per share for the current year is \$0.75. FCFE is expected to grow at 10 percent for next year, then at 26 percent annually for the following three years, and then grow at 6 percent in Year 5 and thereafter. TNE's estimated beta is 2.00, and McKibben feels that current market conditions dictate a 4.5 percent risk-free rate of return and a 5.0 percent equity risk premium. Given McKibben's assumptions and approach, what is the value of Tele Norte Leste Participacoes?

17. Clay Cooperman has valued the operating assets of Johnson Extrusion at \$720 million. The company also has short-term cash and securities with a market value of \$60 million. The noncurrent investments have a book value of \$30 million and a market value of \$45 million. The company also has an overfunded pension plan, with plan assets of \$210 million and plan liabilities of \$170 million. Johnson Extrusion has \$215 million of notes and bonds outstanding and 100 million outstanding shares. What is the value per share?

## SUMMARY CHAPTER 4 MARKET BASED VALUATION: PRICE MULTIPLES

*Theory questions*

- Price multiples are ratios of a stock's price to some measure of value per share.
- Momentum indicators relate either price or a fundamental to the time series of their own past values (or in some cases to their expected value).
- Price multiples are most frequently applied to valuation using the method of comparables. This method involves using a price multiple to evaluate whether an asset is relatively undervalued, fairly valued, or overvalued in relation to a benchmark value of the multiple.
- The benchmark value of the multiple may be the multiple of a similar company or the median or average value of the multiple for a peer group of companies, an industry, an economic sector, an equity index, or the median or average own past values of the multiple.
- The economic rationale for the method of comparables is the law of one price.
- Price multiples may also be applied to valuation using the method based on forecasted fundamentals. Discounted cash flow models provide the basis and rationale for this method. Fundamentals also interest analysts who use the method of comparables because differences between a price multiple and its benchmark value may be explained by differences in fundamentals.
- The key idea behind the use of P/E's is that earning power is a chief driver of investment value and EPS is probably the primary focus of security analysts' attention. EPS, however, is frequently subject to distortion, often volatile, and sometimes negative.
- The two alternative definitions of P/E are trailing P/E, based on the most recent four quarters of EPS, and leading P/E, based on next year's expected earnings.
- Analysts address the problem of cyclicity by normalizing EPS—that is, calculating the level of EPS that the business could achieve currently under mid-cyclical conditions (normal EPS).
- Two methods to normalize EPS are the method of historical average EPS (over the most recent full cycle) and the method of average ROE (average ROE multiplied by current book value per share).
- Earnings yield (E/P) is the reciprocal of the P/E. When stocks have negative EPS, a ranking by earnings yield is meaningful whereas a ranking by P/E is not.
- Historical trailing P/E's should be calculated with EPS lagged a sufficient amount of time to avoid look-ahead bias. The same principle applies to other multiples calculated on a trailing basis.
- The fundamental drivers of P/E are expected earnings growth rate(s) and the required rate of return. The justified P/E based on fundamentals bears a positive relationship to the first factor and an inverse relationship to the second factor.
- PEG (P/E to growth) is a tool to incorporate the impact of earnings growth on P/E. PEG is calculated as the ratio of the P/E to the consensus growth forecast. Stocks with lower PEG's are more attractive than stocks with higher PEG's, all else equal.

## Chapter 3 – Free Cash Flow Valuation

### Solutions

1.

\$100 increase in:	Change in FCFF	Change in FCFE
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. Shares issued	0	0
L. Share repurchases	0	0

2.

A. Free cash flow to the firm, found with Equation 3-7, is

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

$$\text{FCFF} = 285 + 180 + 130(1 - 0.40) - 349 - (39 + 44 - 22 - 23)$$

$$\text{FCFF} = 285 + 180 + 78 - 349 - 38 = \$156 \text{ million}$$

B. Free cash flow to equity, found with Equation 3-10, is

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

$$\text{FCFE} = 285 + 180 - 349 - (39 + 44 - 22 - 23) + (10 + 40)$$

$$\text{FCFE} = 285 + 180 - 349 - 38 + 50 = \$128 \text{ million}$$

C. To find FCFE from FCFF, use the relationship in Equation 3-9

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

$$\text{FCFE} = 156 - 130(1 - 0.40) + (10 + 40)$$

$$\text{FCFE} = 156 - 78 + 50 = \$128 \text{ million}$$

3.

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

To get 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 get 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:

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

$$\begin{aligned} \text{FCFF} &= 785(1 - 0.40) + 180(0.40) - 349 - 38 \\ \text{FCFF} &= 471 + 72 - 349 - 38 = \$156 \text{ million} \end{aligned}$$

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

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

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

You can also find FCFE using CFO, EBIT, or EBITDA directly. Starting with CFO, using Equation 3-11, FCFE is

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

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

Starting with EBIT, FCFE (found with an equation derived in Footnote 9) is

$$\text{FCFE} = \text{EBIT}(1 - \text{Tax rate}) + \text{Dep} - \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WClnv} + \text{Net borrowing}$$

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

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

Finally, starting with EBITDA, FCFE (found with an equation derived in Footnote 9) is

$$\text{FCFE} = \text{EBITDA}(1 - \text{Tax rate}) + \text{Dep}(\text{Tax rate}) - \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WClnv} + \text{Net borrowing}$$

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

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

4

A. FCF = Net income + Depreciation and amortization – Cash dividends – Capital expenditures. This definition of FCF 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 3-7,

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

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 doing so represents a distribution of the cash *available* to investors. (If a company pays preferred dividends, they are added back in Equation 3-7 to include them in FCFF if they had previously been taken out when calculating net income available to common.)

B. FCF = Cash flow from operations (from the statement of cash flows) – Capital expenditures. Comparing this definition of FCF with Equation 3-8 can highlight the relation to FCFF:

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

The primary difference is that after-tax interest is added back in order to arrive at the cash flow available to investors. If preferred dividends had been subtracted to obtain net income (in CFO), they would also have to be added back in. This definition is commonly used to approximate FCFE, and it generally understates the actual FCFE by the amount of after-tax interest expense.

5. A. The firm value is the present value of FCFE discounted at the weighted-average cost of capital (WACC), or

$$\text{Firm} = \frac{\text{FCFE}_1}{\text{WACC} - g} = \frac{\text{FCFE}_0(1+g)}{\text{WACC} - g} = \frac{1.70(.07)}{0.11 - 0.07} = \frac{1.819}{0.04} = 45.475$$

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

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

- B. Using the FCFE valuation approach, the present value of FCFE, discounted at the required rate of return on equity, is

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

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

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

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

The table below 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:

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

Because 20 percent of new investments are financed with debt, 80 percent of the investments are financed with equity, reducing FCFE by 80 percent of (Capital expenditures - Depreciation) and 80 percent of the investment in working capital.

All data in \$ billions						
	2002	2003	2004	2005	2006	
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% <i>CRN</i>	0.301	0.330	0.361	0.395	0.433	
Terminal stock value						
PV of Terminal value discounted at 16.9%		85.032				
Total PV of FCFE		38.950				
Total value of firm		1.820				40.770

The terminal stock value is 18.0 times the earnings in 2006, or  $18 \times 4.724 = \$85.03$  billion. The present value of the terminal value (\$38.95 billion) plus the present value of the first five years' FCFE (\$1.82 billion) is \$40.77 billion. Because there are 17 billion outstanding shares, the value per ordinary share is \$2.398.

(Taiwan Semiconductor Manufacturing Co. has ADRs trading on the New York Stock Exchange, where one ADR equals five ordinary shares. So the ADR price would be  $5(2.398) = \$11.99$  per ADR.)

7.

A. The free cash flow to the firm is

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

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

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

The weighted-average cost of capital is

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

The value of the firm is

$$\text{Firm value} = \frac{FCFF}{WACC - g} = \frac{FCFF_0(1+g)}{WACC - g} = \frac{235(1.06)}{0.1032 - 0.06} = \frac{249.1}{0.0432} = 5,766.20$$

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

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

$$\begin{aligned} \text{FCFE} &= 250 + 90 - 170 - 40 + 0.40(170 - 90 + 40) \\ \text{FCFE} &= 250 + 90 - 170 - 40 + 48 = 178. \end{aligned}$$

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

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

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

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

8. The weighted-average cost of capital for PHB Company is  
 $\text{WACC} = 0.30(7.0\%)(1 - 0.35) + 0.15(6.8\%) + 0.55(11.0\%) = 8.435\%$

The firm value is

$$\begin{aligned} \text{Firm value} &= \text{FCFF}_0(1 + g)/(\text{WACC} - g) \\ \text{Firm value} &= 28(1.04)/(0.08435 - 0.04) = 29.12/0.04435 = \$656.60 \end{aligned}$$

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 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  
 $r = E(R_i) = R_f + \beta_i[E(R_M) - R_f] = 5.5\% + 0.90(5.5\%) = 10.45\%$   
 The weighted-average cost of capital is  
 $\text{WACC} = 0.25(7.0\%)(1 - 0.40) + 0.75(10.45\%) = 8.89\%$
- B. Firm value =  $\text{FCFF}_0(1 + g)/(\text{WACC} - g)$   
 Firm value =  $1.1559(1.04)/(0.0889 - 0.04) = \$24.583$  billion
- 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 =  $21.391/1.852 = \$11.55$ .

10. A. The required rate of return for McDonald's found with the CAPM is  
 $r = E(R_i) = R_f + \beta_i[E(R_M) - R_f] = 5.08\% + 0.70(5.50\%) = 8.93\%$   
 The value per share is  
 $V_0 = \frac{\text{FCFE}_0(1 + g)}{r - g} = \frac{0.88(1.064)}{0.0893 - 0.064} = \$37.01$

- B. The table below shows the calculated price for McDonald's using the base case values for all values except for the variable being changed from the base case value.

Variable	Estimated price with low value	Estimated price with high value	Range (Rank)
Normalized FCFE <sub>0</sub>	\$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 perpetual growth rate	\$18.56	\$48.79	\$30.23 (1)

As the table shows, the value of McDonald's is most sensitive to the changes in the FCFE growth rate, with the price moving over a very wide range. McDonald'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 impacts of these variables are smaller than that of the growth rate.

## 11. A.

Using the CAPM, the required rate of return for Alcan is

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

To estimate FCFE, use Equation 3-14:

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

where DR is the debt ratio—that is, new debt financing as a percentage of the net new investments in fixed capital and the increase in working capital. The table below shows net income, which grows at 20 percent annually for Years 1, 2, and 3, and then at 8 percent for Year 4.

Investment (Capital expenditures - Depreciation + Investment in WC) are 1,150 in Year 1 and grow at 15 percent annually for Years 2 and 3. Debt financing is 40 percent of this investment. FCFE is NI - investments + financing. Finally, the present value of FCFE for Years 1, 2, and 3 is found by discounting at 12.2 percent.

Year	1	2	3	4
Net income	\$720.00	\$864.00	\$1,036.80	\$1,119.74
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
Free cash flow to equity	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 using the constant-growth model:

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

The present value of  $V_3$  discounted at 12.2 percent is \$15,477.64 million. The total value of equity, the present value of the first three years' FCFE

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

B. The planner's estimate of the share value of \$70.98 is much higher than the FCFE model estimate of \$49.21 for several reasons. First, taxes and interest expenses have a prior claim to the company's cash flow and should be taken out because these cash flows are not available to equity holders. The planner did not do this.

Second, EBITDA does not account for the company's reinvestments in operating assets. So, EBITDA overstates the funds available to stockholders if reinvestment needs exceed depreciation charges, which is the case for growing companies such as Alcan.

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

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

12. The table below develops the information to calculate FCFE.

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

Earnings for 2002 are \$3.00, and the EPS estimates for 2003 through 2008 in the table are found by increasing the previous year's earnings per share by that year's growth rate. The net capital expenditures each year were specified by the analyst. The increase in working capital per share is equal to 25 percent of net capital expenditures. Finally, debt financing is 40 percent of that year's total net capital expenditures and investment in working capital. For example, in 2003, net capital

expenditures plus investment in working capital is \$5,000 plus \$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 initially negative in 2003 because of large capital investments and investments in working capital. As these investments decline relative to net income, FCFE becomes very substantial and positive.

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. Because the FCFE from 2008 onward will grow at a constant 6 percent, the constant-growth model can be used to value these cash flows.

$$V_{2007} = \frac{\text{FCFE}_{2008}}{r - g} = \frac{5,249}{0.12 - 0.06} = \$87,483$$

The present value of this stream is  $\$87,483/(1.12)^5 = \$49,640$ . The value per share is the value of the first five FCFE (2003 through 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. FCFE measures how much a company can afford to pay out as dividends, but in a given year, FCFE may be more or less than the amount actually paid out.

Sundanci's FCFE for the year 2000 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
Number of shares	=	84 million
FCFE per share	=	\$0.286

At the given dividend payout ratio, Sundanci's FCFE equals the dividends paid.

B.

The FCFE model requires forecasts of FCFE for the high-growth years (2001 and 2002) plus a forecast for the first year of stable growth (2003) to allow for an estimate of the terminal value in 2002 based on 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 template shows the process for estimating Sundanci's current value on a per share basis.

### Free Cash Flow to Equity

Base Assumptions					
Shares outstanding (millions)	84	Actual		Projected	
Required return on equity ( $r$ )	14%	2000	2001	2002	2003
Growth rate ( $g$ )		27%	27%	27%	13%
Earnings after tax	Total	Per share			
Plus: Depreciation expense	\$80	\$0.952	\$1.2090	\$1.5355	\$1.7351
Less: Capital expenditures	\$23	\$0.274	\$0.3480	\$0.4419	\$0.4994
Less: Increase in net working capital	\$38	\$0.452	\$0.5740	\$0.7290	\$0.8238
Equals: FCFE	\$41	\$0.488	\$0.6198	\$0.7871	\$0.8894
Terminal value*	\$24	\$0.286	\$0.3632	\$0.4613	\$0.5213
Total cash flows to equity**		\$0.3632	\$52.5913		
Discounted value***		\$0.3186	\$40.4673		
Current value per share****	\$40.7859				

\*Projected 2002 terminal value = Projected 2003 FCFE/( $r - g$ )

\*\*Projected 2002 total cash flows to equity = Projected 2002 FCFE plus Projected 2002 Terminal value

\*\*\*Discounted values obtained using  $r = 14$  percent

\*\*\*\*Current value per share = Discounted value 2001 plus Discounted value 2002.

C. The following limitations of the DDM *are* addressed by the FCFE model: The DDM uses a strict definition of cash flows to equity; that is, the expected dividends on the common stock. The FCFE model expands the definition of cash flows 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 where 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, there is the difficulty of defining the duration of the extraordinary growth period. For example, a longer period of high growth will lead to a higher valuation, and analysts may be tempted to assume an unrealistically long period of extraordinary growth.

Second, an assumption of a sudden shift from high growth to lower, stable growth is unrealistic. The transformation more likely will occur gradually over a period of 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 share other limitations as well, notably difficulties in accurately estimating required rates of return.

14. A.

Using a two-stage dividend discount model, the value of a share of Mackinac is calculated as follows:

$$DPS_0 = \text{Cash dividends/Shares outstanding} = \$22,470/13,000 = \$1.7285$$

$$DPS_1 = DPS_0 \times 1.17 = \$2.0223$$

$$DPS_2 = DPS_0 \times 1.17^2 = \$2.3661$$

$$DPS_3 = DPS_0 \times 1.17^3 = \$2.7683$$

$$DPS_4 = DPS_0 \times 1.17^3 \times 1.09 = \$3.0175$$

Using the CAPM, the required return on equity is

$$\text{Cost of Equity } (r) = \text{Government bond rate} + (\text{Beta} \times \text{Equity risk premium})$$

$$= 0.06 + (1.25 \times 0.05) = 0.1225 \text{ or } 12.25 \text{ percent}$$

$$\text{Value per share} = \frac{DPS_1}{(1+r)} + \frac{DPS_2}{(1+r)^2} + \frac{DPS_3}{(1+r)^3}$$

$$+ \frac{[DPS_4/(r - g_{\text{stable}})]}{(1+r)^3}$$

$$\text{Value per share} = \$2.0223/1.1225 + \$2.3661/1.1225^2 + \$2.7683/1.1225^3$$

$$+ [\$3.0175/(0.1225 - 0.09)]/1.1225^3$$

$$= \$1.8016 + \$1.8778 + \$1.9573 + \$65.6450 = \$71.28$$

B.

Using the two-stage FCFE model, the value of a share of Mackinac is calculated as follows:

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

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

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

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

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

$$\$4,000$$

$$FCFE_0 = \text{Net income} + \text{Depreciation} - \text{Capital expenditures} - \text{Change in working Capital} =$$

$$FCFE_0 = \$37,450 + \$10,500 - \$15,000 - \$5,500 = \$31,450$$

$$FCFE_0 \text{ per share} = \$31,450/13,000 = \$2.4192$$

$$FCFE_1 = FCFE_0 \times 1.17 = \$2.8305$$

$$FCFE_2 = FCFE_0 \times 1.17^2 = \$3.3117$$

$$FCFE_3 = FCFE_0 \times 1.17^3 = \$3.8747$$

$$FCFE_4 = FCFE_0 \times 1.17^3 \times 1.09 = \$4.2234$$

$$\text{Cost of equity } (r) = \text{Government bond rate} + (\text{Beta} \times \text{Equity risk premium})$$

$$= 0.06 + (1.25 \times 0.05) = 0.1225 \text{ or } 12.25 \text{ percent}$$

$$\text{Value per share} = \frac{FCFE_1}{(1+r)} + \frac{FCFE_2}{(1+r)^2} + \frac{FCFE_3}{(1+r)^3}$$

$$+ \frac{[FCFE_4/(r - g_{\text{stable}})]}{(1+r)^3}$$

$$\text{Value per share} = \$2.8305/1.1225 + \$3.3117/1.1225^2 + \$3.8747/1.1225^3$$

$$+ [\$4.2234/(0.1225 - 0.09)]/1.1225^3$$

$$= \$2.5216 + \$2.6283 + \$2.7395 + \$91.8798 = \$99.77$$

C.

The FCFE model is best for valuing firms for takeovers or in situations that have a reasonable chance for 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 dividend discount model 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 Co. is
- |                            |               |
|----------------------------|---------------|
| Country return (real)      | 6.50%         |
| Industry adjustment        | +0.60%        |
| Size adjustment            | -0.10%        |
| <u>Leverage adjustment</u> | <u>+0.25%</u> |
| 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

$$V_0 = \frac{FCFE_0(1 + g_{real})}{r_{real} - g_{real}} = \frac{1,300(1.035)}{0.0725 - 0.035} = 35,880 \text{ Korean Won}$$

16. The required return for TNE, found with the CAPM, is  $r = E(R) = R_f + \beta_1 E(R_M) - R_f] = 4.5\% + 2.0(5.0\%) = 14.5\%$ . The estimated future values of FCFE are given in the table below.

Year <i>t</i>	Variable	Calculation	Value in Year <i>t</i>	Present Value at 14.5%
1	FCFE <sub>1</sub>	0.75(1.10)	0.825	0.721
2	FCFE <sub>2</sub>	0.75(1.10)(1.26)	1.040	0.793
3	FCFE <sub>3</sub>	0.75(1.10)(1.26) <sup>2</sup>	1.310	0.873
4	FCFE <sub>4</sub>	0.75(1.10)(1.26) <sup>3</sup>	1.650	0.960
4	TV <sub>4</sub>	FCFE <sub>5</sub> ( <i>r</i> - <i>g</i> ) = 0.75(1.10)(1.26) <sup>3</sup> (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 table. 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 plus the present value of the terminal value.

17. The total value of non-operating assets is  
\$60 million short-term securities

\$45 million market value of noncurrent assets  
\$40 million pension fund surplus  
\$145 million non-operating assets

The total value of the firm is the value of the operating assets plus the value of the non-operating 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.