

## TOPIC 2

### DISCOUNTED DIVIDEND VALUATION

#### LEARNING OUTCOMES AND ASSESSMENT CRITERIA

On completion of this topic you should be able to:

- 1) Justify the economic rationale for discounted cash flow (DCF) valuation
- 2) Distinguish between three expected cash flow definitions that can be used in discounted cash flow valuation, taking account of the advantages and disadvantages of each, and identifying the investment situations in which each is suitable
- 3) Determine whether a dividend discount model (DDM) is appropriate for valuing a share
- 4) Identify the components of the required rate of return on equity used to discount expected future cash flows
- 5) Differentiate between CAPM and APT and bond yield plus risk premium approaches to determining the required rate of return for an equity investment
- 6) Calculate the required rate of return for an equity investment using each major approach
- 7) Calculate the Gordon growth model (GGM) equity risk premium estimate
- 8) Identify the three limitations to the CAPM and APT approaches to determining the required return on equity
- 9) Calculate the expected holding period return on a share given its current price, expected next period price and expected next period dividend
- 10) Contrast the expected holding period return with the required rate of return
- 11) Argue the effect on expected return of the convergence of price to value, given that the price does not equal value
- 12) Calculate the value of an ordinary share using the DDM for one, two and multiple holding periods
- 13) Identify the equation and account for the general form of the DDM
- 14) Identify the two major approaches to the dividend forecasting problem
- 15) Evaluate the assumptions of the Gordon model
- 16) Calculate the value of an ordinary share using the Gordon growth model
- 17) Assess the choice of growth rate in the Gordon model in relation to the growth rate of the economy

- 18) Calculate the expected rate of return or implied dividend growth rate in the Gordon growth model given the market price
- 19) Calculate and apply the justified leading and trailing price to earnings ratio (P/E's) based on fundamentals, using the Gordon growth model
- 20) Calculate the value of a fixed rate perpetual preference share given the shares annual dividend and the discount rate
- 21) Calculate and apply the present value of growth opportunities (PVGO) given current earnings per share, the required rate of return, and the market price of the share (or value of the share)
- 22) Analyse the strengths and limitations of the Gordon growth model
- 23) Justify the selection of the Gordon growth model to value a company, given the characteristics of the company being valued.
- 24) Evaluate the assumptions and justify the selection of the two stage DDM, the H model and three stage DDM and spreadsheet modelling
- 25) Contrast the concepts of the growth phase, transitional phase, and maturity phase of a business
- 26) Argue the concept of terminal value and identify alternative approaches to determining the terminal value in a discounted dividend model
- 27) Calculate the value of ordinary shares using the two stage DDM, the H model and the three stage DDM
- 28) Justify the selection of a particular multistage dividend DDM given characteristics of the company being valued
- 29) Estimate the implied expected rate of return for any DDM, including the two stage DDM, the H model and the three stage DDM and the spreadsheet model
- 30) Calculate the implied expected rate of return for the H model and a general two stage model
- 31) Identify the strengths and limitations of the two stage DDM, the H model, the three stage DDM, and spreadsheet model
- 32) Argue the concept of sustainable growth rate and assess the underlying assumptions
- 33) Calculate the sustainable growth rate of a company
- 34) Use the Du Pont model to forecast the return on equity in estimating the sustainable growth rate
- 35) Demonstrate how dividend discount models are used as a discipline for portfolio selection, and identify two risk control methodologies

## SUMMARY CHAPTER 2 DIVIDEND DISCOUNTED VALUATION

- In DCF models, the value of any asset is the present value of its (expected) future cash flows

$$V_0 = \sum_{t=1}^{\infty} \frac{CF_t}{(1+r)^t}$$

where  $V_0$  is the value of the asset as of  $t = 0$  (today),  
 $CF_t$  is the (expected) cash flow at time  $t$ ,  
and  $r$  is the discount rate or required rate of return.

- Several alternative streams of expected cash flows can be used to value equities, including dividends, free cash flow, and residual income. A discounted dividend approach is most suitable for dividend-paying stocks, where the company has a discernible dividend policy that has an understandable relationship to the company's profitability, and the investor has a non-control (minority ownership) perspective.
- The free cash flow approach (FCFF or FCFE) might be appropriate when the company does not pay dividends, dividends differ substantially from FCFE, free cash flows align with profitability, or the investor takes a control (majority ownership) perspective.
- The residual income approach can be useful when the company does not pay dividends (as an alternative to a FCF approach), or free cash flow is negative.
- The required rate of return is the minimum rate of return that an investor would anticipate receiving in order to invest in an asset. The two major approaches to determining the cost of equity are an equilibrium method (CAPM or APT) and the bond yield plus risk premium method.
- The equity risk premium for use in the CAPM approach can be based on historical return data or based explicitly on expectational data.
- The DDM with a single holding period gives stock value as

$$V_0 = \frac{D_1}{(1+r)^1} + \frac{P_1}{(1+r)^1} = \frac{D_1 + P_1}{(1+r)^1}$$

where  $D_t$  is the expected dividend at time  $t$  (here  $t = 1$ ) and  $V_t$  is the stock's (expected) value at time  $t$ . Assuming that  $V_0$  is equal to today's market price,  $P_0$ , the expected holding-period return is

$$r = \frac{D_1 + P_1}{P_0} - 1 = \frac{D_1}{P_0} + \frac{P_1 - P_0}{P_0}$$

- Expected holding-period returns differ from required rates of return when price does not exactly reflect value. When price does not equal value, there will generally be an additional component to the expected holding-period return reflecting the convergence of price to value.
- The expression for the DDM for any given finite holding period  $n$  and the general expression for the DDM are, respectively,
$$V_0 = \sum_{t=1}^n \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n} \text{ and } V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$$
- There are two main approaches to the problem of forecasting dividends: First, we can assign the entire stream of expected future dividends to one of several stylized growth patterns. Second, we can forecast a finite number of dividends individually up to a terminal point, valuing the remaining dividends by assigning them to a stylized growth pattern, or forecasting share price as of the terminal point of our dividend forecasts. The first forecasting approach leads to the Gordon growth model and multistage dividend discount models, the second forecasting approach lends itself to spreadsheet modelling.
- The Gordon growth model assumes that dividends grow at a constant rate  $g$  forever, so that  $D_t = D_{t-1}(1+g)$ . The dividend stream in the Gordon growth model has a value of
$$V_0 = \frac{D_0(1+g)}{r-g} \text{ or } V_0 = \frac{D_1}{r-g}$$
where  $r > g$ .
- The value of fixed rate perpetual preferred stock is  $v_0 = \frac{D}{r}$ , where  $D$  is the stock's (constant) annual dividend.
- Assuming that price equals value, the Gordon growth model estimate of a stock's expected rate of return is
$$r = \frac{D_0(1+g)}{P_0} + g = \frac{D_1}{P_0} + g$$
- Given an estimate of the next-period dividend and the stock's required rate of return, we can use the Gordon growth model to estimate the dividend growth rate implied by the current market price (making a constant growth rate assumption).
- The present value of growth opportunities (PVGO) is the part of a stock's total value,  $v_0$ , that comes from profitable future growth opportunities in contrast to the value associated with assets already in place. The relationship is
$$V_0 = \frac{E}{r} + \text{PVGO} \text{ where } \frac{E}{r} \text{ is defined as the no growth value per share}$$

- We can express the leading price-earnings ratio  $\frac{P_0}{E_1}$  and the trailing price earnings ratio  $\frac{P_0}{E_0}$  in terms of the Gordon growth model as, respectively,

$$\frac{P_0}{E_1} = \frac{D_1}{r-g} = \frac{1-b}{r-g} \text{ and } \frac{P_0}{E_0} = \frac{D_0(1+g)}{r-g} = \frac{(1-b)(1+g)}{r-g}$$

where

b = Retention Ratio = [1 - Pay Out Ratio]

- The above expressions give a stock's justified price earnings ratio based on forecasts of fundamentals (given that the Gordon growth model is appropriate).
- The Gordon growth model may be useful for valuing broad-based equity indexes and the stock of businesses with earnings that we expect to grow at a stable rate comparable to or lower than the nominal growth rate of the economy.
- Gordon growth model values are very sensitive to the assumed growth rate and required rate of return.
- For many companies, growth falls into phases. In the growth phase, a company enjoys an abnormally high growth rate in earnings per share, called supernormal growth. In the transition phase, earnings growth slows. In the mature phase, the company reaches an equilibrium in which factors such as earnings growth and the return on equity stabilize at levels that can be sustained long term. Analysts often apply multistage DCF models to value the stock of a firm with multistage growth prospects.
- The two-stage dividend discount model assumes different growth rates in Stage 1 and Stage 2

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

where  $g_S$  is the expected dividend growth rate in the first period and  $g_L$  is the expected growth rate in the second period.

- The terminal stock value,  $v_n$  is sometimes found with the Gordon growth model or with some other method, such as applying a P/E multiplier to forecasted EPS as of the terminal date.
- The H-model assumes that the dividend growth rate declines linearly from a high supernormal rate to the normal growth rate during Stage 1, and then grows at a constant normal growth rate thereafter:

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

- There are two basic three-stage models. In one version, the growth rate is constant in each of the three stages. In the second version, the growth rate is constant in Stage 1, declines linearly in Stage 2, and becomes constant and normal in Stage 3.
- Spreadsheet models are very flexible, providing the analyst with the ability to value any pattern of expected dividends.
- In addition to valuing equities, DDM's are used to find expected rates of return. For simpler models (like the one-period model, the Gordon growth model, and the H-model), well-known formulas may be used to calculate these rates of return. For many dividend streams, however, the rate of return must be found by trial and error, producing a discount rate that equates the present value of the forecasted dividend stream to the current market price. Adjustments to the expected return estimates may be needed to reflect the convergence of price to value.
- Multistage DDM models can accommodate a wide variety of patterns of expected dividends. Even though such models may use stylized assumptions about growth, they can provide useful approximations.
- Values from multistage DDMs are generally sensitive to assumptions. The usefulness of such values reflects the quality of the inputs.
- Dividend growth rates can be obtained from analyst forecasts, from statistical forecasting models, or from company fundamentals. The sustainable growth rate depends on the ROE and the earnings retention rate,  $b$ :  $g = b \times \text{ROE}$ . This expression can be expanded further, using the DuPont formula, as

$$g = \frac{\text{Net Income} - \text{Dividends}}{\text{Net Income}} \times \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Shareholders Equity}}$$

- Dividend discount models can be used as a discipline for portfolio construction. Potential investments can be screened or selected based on their estimated rates of return, along with other portfolio requirements. Often, the discipline involves three steps: sorting stocks into groups according to a risk-control methodology, ranking stocks by expected return within each group, and selecting a portfolio from the highest expected return stocks consistent with the risk-control methodology.

\* Du-pont NB

## QUESTIONS – DIVIDEND DISCOUNT VALUATION

1. The estimated betas for AOL Time Warner (NYSE: AOL), J.P. Morgan Chase & Company (NYSE: JPM), and The Boeing Company (NYSE: BA) are 2.50, 1.50, and 0.80 respectively. The risk-free rate of return is 4.35 percent, and the market risk premium is 8.04 percent. Calculate the required rates of return for these three stocks using the CAPM.

2. The estimated factor sensitivities of Terra Energy to the five macroeconomic factors in the Burmeister, Roll, and Ross (1994) article are given in the table below. The table also gives the market risk premiums to each of these same factors.

	Factor Sensitivity	Risk Premium (%)
Confidence risk	0.25	2.59
Time horizon risk	0.30	-0.66
Inflation risk	-0.45	-0.43
Business cycle risk	1.60	1.49
Market timing risk	0.80	3.61

Use the 5-factor BIRR APT model to calculate the required rate of return for Terra Energy using these estimates. The Treasury bill rate is 4.1 percent.

3. Newmont Mining (NYSE: NEM) has an estimated beta of -0.2. The risk-free rate of return is 4.5 percent, and the equity risk premium is estimated to be 7.5 percent. Using the CAPM, calculate the required rate of return for investors in NEM.

4. The expression for the value of a stock given a single-period investment horizon has four variables:  $V_0$ ,  $D_1$ ,  $P_1$  and  $r$ . Solve for the value of the missing variable for each of the four stocks in the table below.

Stock	Expected Value $V_0$	Expected Dividend $D_1$	Expected Price $P_1$	Require Rate Of Return $r$
1	?	0.30	21.00	10.0%
2	30.00	?	32	10.0%
3	92.00	2.70	?	12.0%
4	16.00	0.30	17.90	?

5. General Motors (NYSE: GM) sells for \$66.00 per share. The expected dividend for next year is \$2.40. Use the single-period DDM to predict GM's stock price one year from today. The risk-free rate of return is 5.3 percent, the market risk premium is 6.0 percent, and GM's beta is 0.90.

6. BP PLC (NYSE: BP) has a current stock price of \$50 and current dividend of \$1.50. The dividend is expected to grow at 5 percent annually. BP's beta is 0.85. The risk-free interest rate is 4.5 percent, and the market risk premium is 6.0 percent.

A. What is next year's projected dividend?  
 B. What is BP's required rate of return based on the CAPM?  
 C. Using the Gordon growth model, what is the value of BP?  
 D. Assuming the Gordon growth model is valid, what dividend growth rate would result in a model value of BP equal to its market price?

7. The current market prices of three stocks are given below. The current dividends, dividend growth rates, and required rates of return are also given. The dividend growth rates are perpetual.

Stock	Current Price	Current Dividend	Dividend Growth Rate	Required Rate of Return
Que Corp	25.00	0.50	7.0%	10.0%
SHS Co.	40.00	1.20	6.5%	10.5%
True Corp	20.00	0.88	5.0%	10.0%

A. Find the value of each stock with the Gordon growth model.  
 B. Which stock's current market price has the smallest premium or largest discount relative to its DDM valuation?

8. For five utility stocks, the table below provides the expected dividend for next year, the current market price, the expected dividend growth rate, and the beta. The risk free rate is currently 5.3 percent, and the market risk premium is 6.0 percent.

Stock	Dividend	Price	Dividend Growth Rate	Beta
AEP	2.40	46.17	5.0%	0.60
ED	2.20	39.80	5.0%	0.60
EXC	1.69	64.12	7.0%	0.80
SO	1.34	23.25	5.5%	0.65
D	2.58	60.13	5.5%	0.65

A. Calculate the expected rate of return for each stock using the Gordon growth model.  
 B. Calculate the required rate of return for each stock using the CAPM.

9. Vicente Garcia is a buy-side analyst for a large pension fund. He frequently uses dividend discount models such as the Gordon growth model for the consumer non-cyclical stocks that he covers. The current dividend for Procter & Gamble Co. (NYSE: PG) is \$1.46, and the dividend eight years ago was \$0.585. The current stock price is \$80.00.

- A. What is the historical dividend growth rate for Procter & Gamble?  
B. Garcia assumes that the future dividend growth rate will be exactly half of the historical rate. What is Procter & Gamble's expected rate of return using the GGM?  
C. Garcia uses a beta of 0.53 (computed versus the S&P 500 index) for Procter & Gamble. The risk-free rate of return is 5.56 percent and the equity risk premium is 3.71 percent. If Garcia continues to assume that the future dividend growth rate will be exactly half of the historical rate, what is the value of the stock with the Gordon growth model?

10. NiSource Preferred B (NYSE: NI-B) is a fixed-rate perpetual preferred stock paying a \$3.88 annual dividend. If the required rate of return is 7.88 percent, what is the value of one share? If the price of this preferred stock were \$46.00, what would be the yield?

11. R.A. Nixon put out a "strong buy" on DuPont (DPT). This company has a current stock price of \$88.00 per share. The company has sales of \$210 million, net income of \$3 million, and 300 million outstanding shares. DPT is not paying a dividend. Dorothy Josephson has argued with Nixon that DPT's valuation is excessive relative to its sales, profits, and any reasonable assumptions about future possible dividends. Josephson also asserts that DPT has a market value equal to that of many large blue-chip companies, which it does not deserve. Nixon feels that Josephson's concerns reflect an archaic attitude about equity valuation and a lack of understanding about DPT's industry.

- A. What is the total market value of DPT's outstanding shares? What are the price-to-earnings and price-to-sales ratios?  
B. Nixon and Josephson have agreed on a scenario for future earnings and dividends for DPT. Their assumptions are that sales grow at 60 percent annually for four years, and then at 7 percent annually thereafter. In Year 5 and thereafter, earnings will be 10 percent of sales. No dividends will be paid for four years, but in Year 5 and after, dividends will be 40 percent of earnings. Dividends should be discounted at a 12 percent rate. What is the value of a share of DPT using the discounted dividend approach to valuation?  
C. Nixon and Josephson explore another scenario for future earnings and dividends for DPT. They assume that sales will grow at 7 percent in Year 5 and thereafter. Earnings will be 10 percent of sales, and dividends will be 40 percent of earnings. Dividends will be initiated in Year 5, and dividends should be discounted at 12 percent. What level of sales is required in Year 4 to achieve a discounted dividend valuation equal to the current stock price?

12. Dole Food (NYSE: DOL) has a current dividend of \$0.40, which is expected to grow at 7 percent forever. Felipe Rodriguez has estimated the required rate of return for Dole using three methods. The methods and the estimates are as follows:

Bond yield plus risk premium method	$r = 9.6\%$
CAPM method	$r = 11.2\%$
APT method	$r = 10.4\%$

Using the assumed dividend pattern, what is the value of Dole Food using each of the three estimated required rates of return?

13. The CFO of B-to-C Inc., a retailer of miscellaneous consumer products, recently announced the objective of paying its first (annual) cash dividend of \$0.50 in four years. Thereafter, the dividend is expected to increase by 7 percent per year for the foreseeable future. The company's required rate of return is 15 percent.

- A. Assuming that you have confidence in the CFO's dividend target, what is the value of the stock of B-to-C today?  
B. Suppose that you think that the CFO's outlook is too optimistic. Instead, you believe that the first dividend of \$0.50 will not be received until six years from now. What is the value of the stock?

14. FPR is expected to pay a \$0.60 dividend next year. The dividend is expected to grow at a 50 percent annual rate for Years 2 and 3, at 20 percent annually for Years 4 and 5, and at 5 percent annually for Year 6 and thereafter. If the required rate of return is 12 percent, what is the value per share?

15. EB Systems is selling for \$11.40 and is expected to pay a \$0.40 dividend next year. The dividend is expected to grow at 15 percent for the following four years, and then at 7 percent annually after Year 5. If purchased at its current price, what is the expected rate of return on EB Systems? Assume price equals value.

16. Hanson PLC (LSE: HNS) is selling for GBP 472. Hansen has a beta of 0.83 against the FTSE 100 index, and the current dividend is GBP 13.80. The risk-free rate of return is 4.66 percent, and the equity risk premium is 4.9 percent. An analyst covering this stock expects the Hanson dividend to grow initially at 14 percent but to decline linearly to 5 percent over a 10-year period. After that, the analyst expects the dividend to grow at 5 percent.

- A. Compute the value of the Hanson dividend stream using the H-model. According to the H-model valuation, is Hanson overpriced or underpriced?  
B. Assume that Hanson's dividends follow the H-model pattern the analyst predicts. If an investor pays the current GBP 472 price for the stock, what will be the rate of return?

17. (Adapted from 1995 CFA Level I1 exam) Your supervisor has asked you to evaluate the relative attractiveness of the stocks of two very similar chemical companies: Litchfield Chemical Corp. (LCC) and Aminochem Company (AOC). AOC and LCC have June 30 fiscal year ends. You have compiled the data in Exhibit 17-1 for this purpose. Use a one-year time horizon and assume the following:

- Real gross domestic product is expected to rise 5 percent;
- S&P 500 expected total return of 20 percent;
- U.S. Treasury bills yield 5 percent; and
- 30-year U.S. Treasury bonds yield 8 percent.

*Risk Free rate (short term) (long-term) should use long-term all the time!*

Selected Data for Litchfield and Aminochem

	Litchfield Chemical (LCC)	Aminochem (AOC)
Current stock price	\$50.00	\$30.00
Shares outstanding (millions)	10	20
Projected earnings per share (FY 1996)	4.00	3.20
Projected dividends per share (FY 1996)	0.90	1.60
Projected dividend growth	8%	7%
Stock Beta	1.2	1.4
Investors required rate of return	10%	11%
<b>Balance sheet data (millions)</b>		
Long term debt	\$100	\$130
Stockholders equity	\$300	\$320

- Calculate the value of the common stock of LCC and AOC using the constant growth DDM. Show your work.
- Calculate the expected return over the next year of the common stock of LCC and AOC using the CAPM. Show your work.
- Calculate the internal (implied, normalized, or sustainable) growth rate of LCC and AOC. Show your work.
- Recommend LCC or AOC for investment. Justify your choice using your answers to A, B, and C and the information given in the table above

18. (Adapted from 1999 CFA Level I1 exam) Scott Kelly is reviewing MasterToy's financial statements in order to estimate its sustainable growth rate. Using the information presented in the table below

- Identify the three components of the DuPont formula.
- Calculate the ROE for 1999 using the three components of the DuPont formula.
- Calculate the sustainable growth rate for 1999.

Kelly has calculated actual and sustainable growth for each of the past four years and finds in each year that its calculated sustainable growth rate substantially exceeds its actual growth rate.

B. Cite one course of action (other than ignoring the problem) Kelly should encourage MasterToy to take, assuming the calculated sustainable growth rate continues to exceed the actual growth rate.

Income Statement	1998	1999	Change %
Revenue	4,750	5,140	8.2
Cost of goods sold	2,400	2,540	
Selling, general and administrative expenses	1,400	1,550	
Depreciation	180	210	
Goodwill Amortisation	10	10	
Operating Income	760	830	9.2
Interest Expense	20	25	
Income before tax	740	805	
Income Taxes	265	295	
Net income	475	510	
Earnings per share	1.79	1.96	9.5
Average shares outstanding (millions)	265	260	
<b>Balance Sheet</b>			
Cash	400	400	
Accounts receivable	680	700	
Inventories	570	600	
Net property, plant and equipment	800	870	
Intangibles	500	530	
Total Assets	2,950	3,100	
Current liabilities	550	600	
Long term debt	300	300	
Total liabilities	850	900	
Stockholders equity	2,100	2,200	
Total liabilities and equity	2,950	3,100	
Book value per share	7.92	8.46	
Annual dividend per share	0.55	0.60	

19. (Adapted from 2000 CFA Level 2 exam) 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. In order to realize Sundanci's full value, Telluride has announced that it will divest Sundanci in a tax-free spin-off.

Sue Carroll, CFA, is Director of Research at Kesson and Associates. In developing an investment recommendation for Sundanci, Carroll has directed four of her analysts to determine a valuation of Sundanci using various valuation disciplines. To assist her analysts, Carroll has gathered the information shown in Tables 2-17 and Table 2-18 below.

**TABLE 2-17 Sundanci Actual 1999 and 2000 Financial Statements for Fiscal Years Ending 31 May (in millions except per share data)**

	1999	2000
<b>INCOME STATEMENT</b>		
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>		
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 2-18 Selected Financial Information**

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

Prior to determining Sundanci's valuation, Carroll analyzes Sundanci's return on equity (ROE) and sustainable growth.

A. I. Calculate the **three** components of ROE in the DuPont formula for the year 2000.

ii. Calculate ROE for the year 2000.

iii. Calculate the sustainable rate of growth. Show your work.

Carroll learns that Sundanci's Board of Directors is considering the following policy changes that will affect Sundanci's sustainable growth rate:

- Director A proposes an increase in the quarterly dividend by \$0.15 per share.
- Director B proposes a bond issue of \$25 million, the proceeds of which will be used to increase production capacity.
- Director C proposes a 2-for-1 stock split.

B. Indicate the effect of each of these proposals on Sundanci's sustainable rate of growth, given that the other factors remain unchanged. Identify which components of the sustainable growth model, if any, are directly affected by each proposal.

Helen Morgan, CFA, has been asked by Carroll to determine the potential valuation for Sundanci using the DDM. Morgan anticipates that Sundanci's earnings and dividends will grow at 32 percent for two years and 13 percent thereafter.

C. Calculate the current value of a share of Sundanci stock using a two-stage dividend discount model and the data from Exhibits 19-1 and 19-2. Show your work.

20. (Adapted from 2001 CFA Level 11 exam) Peninsular Research is initiating coverage of a mature manufacturing industry. John Jones, CFA, head of the research department, gathers the information given in Exhibit 20-1 to help in his analysis.

**TABLE 2-19 Fundamental Industry and Market Data**

Forecasted industry earnings retention rate	40%
Forecasted industry return on equity	25%
Industry beta	1.2
Government bond yield	6%
Equity risk premium	5%

A. Compute the price to earnings (P/E) ratio for the industry based on the fundamental data in Exhibit 20-1. Show your work.

John Jones wants to analyze how fundamental P/E ratios might differ among countries. He gathers the data given in Exhibit 20-2:

**TABLE 2-20 Economic and Market Data**

Fundamental Factors	Country A	Country B
Forecasted growth in real gross domestic product	5%	2%
Government bond yield	10%	6%
Equity risk premium	5%	4%

B. Determine whether each of the fundamental factors in Exhibit 20-2 would cause PIES to be generally higher for Country A or higher for Country B. Justify each of your conclusions with one reason. **Note:** Consider each fundamental factor in isolation, with all else remaining equal.

21. (Adapted from 1998 CFA Level I exam) Janet Ludlow's company requires all its analysts to use a two-stage DDM and the CAPM to value stocks. Using these models, Ludlow has valued QuickBrush Company at \$63 per share. She now must value SmileWhite Corporation.

	QuickBrush	SmileWhite
Beta	1.35	1.15
Market price	\$45.00	\$30.00
Intrinsic value	\$65.00	?
Notes:		
Risk-free rate	4.50%	
Expected market return	14.50%	

A. Calculate the required rate of return for SmileWhite using the information in Exhibit 21-1 and the CAPM. Show your work.

Ludlow estimates the following EPS and dividend growth rates for SmileWhite:  
 First three years: 12% per year  
 Years thereafter: 9% per year

The 1997 dividend per share is \$1.72.

B. Estimate the intrinsic value of SmileWhite using the data above and the two-stage DDM. Show your work.

C. Recommend QuickBrush or SmileWhite stock for purchase by comparing each company's intrinsic value with its current market price. Show your work.

D. Describe one strength of the two-stage DDM in comparison with the constant growth DDM. Describe one weakness inherent in all DDMs.

### SUMMARY CHAPTER 3 FREE CASH FLOW VALUATION

#### Defining Free Cash Flow

- **Free cash flow to the firm:** is the cash flow available to the company's suppliers of capital after all operating expenses (including tax) have been paid and necessary investments in working capital and fixed capital have been made. The calculation of FCFF differs depending on available accounting information. The suppliers of capital include common stockholders, bondholders and sometimes preferred stockholders.
- **Free cash flow to equity:** is the cash available to the company's common equity holders after all operating expenses, interest and principal payments have been paid and necessary investments in working and fixed capital have been paid. FCFE is the cash flow from operations minus capital expenditures minus payments to (and receipts from) debt holders.

#### Computing FCFE

##### Computing FCFE from Net Income

$$\begin{aligned} \text{FCFE} &= \text{Net income available to common stockholders after pref div} \\ &\quad \text{Plus: Net noncash items} \\ &\quad \text{Plus: Interest expense (1-Tax Rate)} \\ &\quad \text{Minus: Investment in fixed capital} \\ &\quad \text{Minus: Investment in working capital} \end{aligned}$$

This equation can be written compactly as:

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

NB: Although working capital is often defined as current assets minus current liabilities, working capital for cash flow and valuation purposes is defined to exclude cash and short-term debt (which includes the short term portion of long term debt repayments)

Thus for valuation purposes:

$$\begin{aligned} \text{Adjusted current assets} &= \text{current assets minus cash and cash equivalents / short-term investment} \\ \text{Adjusted current liabilities} &= \text{current liabilities minus notes payable and short term portion of long term debt} \end{aligned}$$

##### Computing FCFE from the Statement of Cash Flows

$$\begin{aligned} \text{FCFE} &= \text{Cash flow from operations} \\ &\quad \text{Plus: Interest expense} \times (1-\text{Tax Rate}) \\ &\quad \text{Less: Investment in fixed capital} \end{aligned}$$

This equation can be written compactly as:

*KB*  
~~Work Cap~~  
 = Current Assets - Cash

## Chapter 2 – Discounted Dividend Valuation

### Solutions

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1. For AOL Time Warner, the required return is
$$r = R_f + \beta[E(R_M) - R_f] = 4.35\% + 2.50(8.04\%) = 4.35\% + 20.10\% = 24.45\%$$
For J.P. Morgan Chase, the required return is
$$r = R_f + \beta[E(R_M) - R_f] = 4.35\% + 1.50(8.04\%) = 4.35\% + 12.06\% = 16.41\%$$
For Boeing, the required return is
$$r = R_f + \beta[E(R_M) - R_f] = 4.35\% + 0.80(8.04\%) = 4.35\% + 6.43\% = 10.78\%$$
2. The five-factor APT model is of the form
$$E(R_i) = T\text{-bill rate} + (\text{Sensitivity to confidence risk} \times 2.59\%) - (\text{Sensitivity to time horizon risk} \times 0.66\%) - (\text{Sensitivity to inflation risk} \times 4.32\%) + (\text{Sensitivity to business-cycle risk} \times 1.49\%) + (\text{Sensitivity to market-timing risk} \times 3.61\%)$$
For Terra Energy, the required return is
$$\begin{aligned} r &= 4.10\% + (0.25 \times 2.59\%) - (0.30 \times 0.66\%) - (-0.45 \times 4.32\%) + (1.60 \times 1.49\%) + (0.80 \times 3.61\%) \\ &= 4.10\% + 0.65\% - 0.20\% + 1.94\% + 2.38\% + 2.89\% \\ &= 11.76\% \end{aligned}$$
3. The required return is given by
$$r = R_f + \beta[E(R_M) - R_f] = 0.045 + (-0.2)(0.075) = 4.5\% - 1.5\% = 3.0\%$$
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.
4. The equation for the single-period DDM is  $V_0 = \frac{D_1 + P_1}{1+r}$ 

For Stock 1,  $V_0 = \frac{0.30 + 21.00}{1.10} = \$19.36$

For Stock 2,  $30.00 = \frac{D_1 + 32.00}{1.10}$ ,  $D_1 = 1.10(30.00) - 32.00 = \$1.00$

For Stock 3,  $92.00 = \frac{2.70 + P_1}{1.12}$ ,  $P_1 = 92.00(1.12) - 2.70 = \$100.34$

For Stock 4,  $16.00 = \frac{0.30 + 17.90}{1+r}$ ,  $r = \frac{0.30 + 17.90}{16.00} - 1 = 0.1375 = 13.75\%$

5. Using the CAPM, GM's required rate of return is

$r = R_f + \beta[E(R_M) - R_f] = 5.3\% + 0.90(6.00\%) = 5.3\% + 5.4\% = 10.7\%$   
 Substituting the values into the single-period DDM, we obtain

$$V_0 = \frac{D_1 + P_1}{(1+r)^1}, \text{ or } 66.00 = \frac{2.40 + P_1}{(1.107)^1}$$

The expected price is  $P_1 = 66.00(1.107) - 2.40 = 73.06 - 2.40 = \$70.66$ .

6. A.  
 B.  
 C.  
 D.

The projected dividend is  $D_1 = D_0(1+g) = 1.50(1.05) = \$1.575$ .

$r = R_f + \beta[E(R_M) - R_f] = 4.5\% + 0.85(6.0\%) = 4.5\% + 5.1\% = 9.6\%$

$V_0 = D_1/(r-g) = 1.575/(0.096 - 0.05) = 1.575/0.046 = \$34.24$

The stock price predicted by the Gordon growth model (\$34.24) is below the market price of \$50. A  $g > 5$  percent is required for the value estimated with the model to be \$50. To find the  $g$  that would yield a \$50 price, we solve

$$50 = \frac{1.50(1+g)}{0.096-g}, \text{ which simplifies to}$$

$$4.8 - 50g = 1.5 + 1.5g$$

$$51.5g = 3.3$$

$$g = 0.06408, \text{ or } g = 6.408\%$$

To verify that this growth rate results in a value of \$50, substitute  $g = 6.408$  percent into the Gordon growth model equation:

$$V_0 = \frac{D_0(1+g)}{r-g} = \frac{1.50(1.06408)}{0.096 - 0.06408} = \frac{1.59612}{0.03192} = \$50.00$$

7.

A.

The value of each stock using the Gordon growth model is

$$V_{Qw} = \frac{0.50(1.07)}{0.10 - 0.07} = \frac{0.535}{0.03} = \$17.83$$

$$V_{SHS} = \frac{1.20(1.065)}{0.105 - 0.065} = \frac{1.278}{0.04} = \$31.95$$

$$V_{True} = \frac{0.88(1.05)}{0.10 - 0.05} = \frac{0.924}{0.05} = \$18.48$$

- B. All three stocks are selling at a premium above their DDM estimated values. The percentage premiums are

Premium (Que) =  $(25 - 17.83)/17.83 = 7.17/17.83 = 40.2\%$

Premium (SHS) =  $(40 - 31.95)/31.95 = 8.05/31.95 = 25.2\%$

Premium (True) =  $(20 - 18.48)/18.48 = 1.52/18.48 = 8.2\%$

True Corporation is selling for the smallest relative premium over its estimated value found with the Gordon growth model.

8.

A.

In the Gordon growth model, the expected rate of return is  $r = D_1/P_0 + g$ .

ABP

$$r = 2.40/46.17 + 5.0\% = 5.20\% + 5.0\% = 10.2\%$$

Consolidated Edison  $r = 2.20/39.80 + 5.0\% = 5.53\% + 5.0\% = 10.53\%$

Exelon

$$r = 1.69/64.12 + 7.0\% = 2.64\% + 7.0\% = 9.64\%$$

Southern Co.

$$r = 1.34/23.25 + 5.5\% = 5.76\% + 5.5\% = 11.26\%$$

Domination Resources  $r = 2.58/60.13 + 5.5\% = 4.29\% + 5.5\% = 9.79\%$

B. With the capital asset pricing model, the required return is

$$r = R_F + \beta[E(R_M) - R_F]$$

AEP

$$r = 5.3\% + 0.6(6.0\%) = 5.3\% + 3.6\% = 8.9\%$$

Consolidated Edison  $r = 5.3\% + 0.6(6.0\%) = 5.3\% + 3.6\% = 8.9\%$

Exelon  $r = 5.3\% + 0.8(6.0\%) = 5.3\% + 4.8\% = 10.1\%$

Southern Co.  $r = 5.3\% + 0.65(6.0\%) = 5.3\% + 3.9\% = 9.2\%$

Dominion Resources  $r = 5.3\% + 0.65(6.0\%) = 5.3\% + 3.9\% = 9.2\%$

9. A. Compounded for eight years,  $0.585(1 + g)^8 = 1.46$ . Solving for  $g$ , we get  $g = 12.11\%$ .

B. For the future dividend growth rate, use  $g = 12.11\%/2 = 6.06\%$ . The expected rate of return is

$$r = \frac{D_1}{P_0} + g = \frac{1.46(1.0606)}{80.00} + 0.0606 = 0.0800 = 8.00\%$$

C. The required rate of return for PG using the CAPM is

$$r = R_F + \beta[E(R_M) - R_F] = 5.56\% + 0.53(3.71\%) = 7.53\%$$

$$V_0 = \frac{D_1}{r - g} = \frac{1.46(1.0606)}{0.0753 - 0.0606} = \$105.34$$

10. The value of one share of NiSource Preferred B is  $V_0 = D/r = 3.88/0.0788 = \$49.24$ . If the price is \$46.00, the yield is  $r = D/P_0 = 3.88/46.00 = 0.0843 = 8.43\%$ .

11. A. Total market value = (Price/share)  $\times$  (Number of shares) =

$$88.00(300,000,000) = \$26.4 \text{ billion.}$$

Earnings per share = EPS = \$3,000,000/300,000,000 shares = \$0.01 per share

$$P/E = 88.00/0.01 = 8,800$$

Sales per share = \$210,000,000/300,000,000 shares = \$0.70

$$\text{Price/Sales} = 88.00/0.70 = 125.7$$

Sales in Year 0 (the current year) are \$210 million

Sales in Year 4 = Sales<sub>4</sub> = 210 million  $\times$  (1.60)<sup>4</sup> = \$1,376.26 million

Sales in Year 5 = Sales<sub>5</sub> = Sales<sub>4</sub>  $\times$  (1.07) = 1,376.26 million (1.07) = \$1,472.59 million

Earnings in Year 5 = 10%  $\times$  Sales<sub>5</sub> = 0.10 (1,472.59) = \$147.26 million

Finally, dividends in Year 5 = 0.40  $\times$  147.26 million = \$58.90 million

The dividend per share is 58.90 million/300 million = \$0.1963 per share

Using the Gordon growth model, the value of one share at the end of Year

4 would be  $V_4 = D_5/(r - g) = 0.1963/(0.12 - 0.07) = \$3.93$  per share.

$V_0$ , the present value of  $V_4$ , is  $V_0 = 3.93/(1.12)^4 = \$2.50$ , which is far less than the current market value of \$88.00 per share.

C. We solve this problem by finding the sales and dividend per share in Year 4 that would be required to produce the current \$88.00 price. Then we multiply this sales per share figure by the number of outstanding shares to get the total sales figure.

$$88.00 = \frac{1}{(1.12)^4} V_4 = \frac{1}{(1.12)^4} \left( \frac{D_5}{0.12 - 0.07} \right)$$

Solving this expression, we find that  $D_5 = \$6.92$ . Because dividends are growing at 7 percent,  $D_4 = 6.92/1.07 = \$6.47$ . Because dividends are 40 percent of earnings,  $EPS_4 = 6.47/0.40 = \$16.175$ . Because earnings are 10 percent of sales, Sales per share =  $16.175/0.10 = \$161.75$ .

Finally, the total sales of the company is  $\$161.75 \times 300$  million =  $\$48.53$  billion. In this scenario, the current valuation of the stock is justified if sales can increase from  $\$210$  million to  $\$48.53$  billion in four years!

12. In the Gordon (constant dividend growth) model,  $V_0 = D_0(1 + g)/(r - g)$ . With the bond yield plus risk premium method, with  $r = 9.6\%$ , the value of Dole is

$$V_0 = 0.40(1 + 0.07)/(0.096 - 0.07) = 0.428/0.026 = \$16.46.$$

With the CAPM method,  $r = 11.2\%$  and the value of Dole is

$$V_0 = 0.40(1 + 0.07)/(0.112 - 0.07) = 0.428/0.042 = \$10.19.$$

With the APT,  $r = 10.4\%$  and the value of Dole is

$$V_0 = 0.40(1 + 0.07)/(0.104 - 0.07) = 0.428/0.034 = \$12.59.$$

13. A. An analyst accepting the CFO's dividend target would compute the value as follows:

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

$$V_3 = 0.50/(0.15 - 0.07) = \$6.25$$

$$V_0 = V_3/(1 + r)^3$$

$$V_0 = \$6.25/(1.15)^3 = \$4.11$$

- B. An analyst extending the dividend target would compute the value as follows:

$$V_5 = D_6/(r - g)$$

$$V_5 = 0.50/(0.15 - 0.07) = \$6.25$$

$$V_0 = V_5/(1 + r)^5$$

$$V_0 = \$6.25/(1.15)^5 = \$3.11$$

14. The table below calculates the first five dividends and also finds their present values discounted at 12 percent. The value of the dividends for Year 6 and after is found using the Gordon growth model, where the value at time  $t = 5$  depends on the dividend at  $t = 6$ .  $D_6$  is found by growing the  $D_1$  dividend at 50 percent for two years, at 20 percent for two more years, and at 5 percent for one year.

$$D_6 = 0.60(1.50)^2(1.20)^2(1.05) = \$2.0412$$

$V_5$  is

$$V_5 = \frac{D_6}{r - g} = \frac{2.0412}{0.12 - 0.05} = \frac{2.0412}{0.07} = \$29.16$$

The present values of  $V_5$  and the dividends for  $t = 1$  through  $t = 5$  are in the far right column of the table.

Time	Value	Calculation	$D_t$ or $V_t$	Present values $D_t/(1.12)^t$ or $V_t/(1.12)^t$
1	$D_1$	0.60	0.60	0.536
2	$D_2$	$0.60(1.50)$	0.90	0.717
3	$D_3$	$0.60(1.50)^2$	1.35	0.961
4	$D_4$	$0.60(1.50)^2(1.20)$	1.62	1.030
5	$D_5$	$0.60(1.50)^2(1.20)^2$	1.944	1.103
5	$V_5$	$0.60(1.50)^2(1.20)^2(1.05)/(0.12 - 0.05)$	29.16	16.546
Total				20.893

The dividend for FPR grows at different rates for three time periods. The total present value of the stock's dividends is \$20.89.

15. EB Systems dividends are expected to grow in two stages, and the two-stage DDM is used to value the stock. The expected rate of return is the discount rate that causes the present value of the future dividend stream to equal the current price of \$11.40. If EB Systems' dividend stream were growing at 7 percent (like the Gordon growth model), the rate of return would be  $r = D_1/P_0 + g = 0.40/11.40 + 7\% = 3.51\% + 7\% = 10.51\%$ . Because the dividend is growing more rapidly during Years 1 through 5, the rate of return will exceed 10.51 percent.

In the table below, we illustrate using trial and error to find the discount rate. The second column shows the dividends for Years 1 through 5. The following columns calculate the present value of these five dividends discounted at 11 percent, 11.5 percent, and 12 percent, respectively. The value of the dividends after Year 5 is  $V_5 = D_6/(r - g)$ , which is  $V_5 = 0.7486/(r - 0.07)$ . Notice that  $r$  changes, so the terminal values for  $r = 11\%$ ,  $11.5\%$ , and  $12\%$  also change, as shown in the table. The present value of  $V_5$  is calculated and added to the present value of the first five dividends in the bottom row of the table.

Year	Dividend	PV at 11%	PV at 11.5%	PV at 12%	PV at 11.563%
1	0.400	0.360	0.359	0.357	0.359
2	0.460	0.373	0.370	0.367	0.370
3	0.529	0.387	0.382	0.377	0.381
4	0.608	0.401	0.394	0.387	0.393
5	0.700	0.415	0.406	0.397	0.405
Total PV of Dividends		1.936	1.910	1.884	1.907
Terminal price ( $V_5$ )		18.714	16.635	14.971	16.405
PV of terminal price		11.106	9.653	8.495	9.493
Total PV of Div and $V_5$		13.042	11.563	10.379	11.399

The current stock price of \$11.40 occurs with a discount rate between 11.5 percent and 12 percent. Further trial and error reveals the discount rate to be 11.563 percent, which gives a total present value of the dividend stream close to \$11.40, as shown in the last column of the table.

16. A.

The required rate of return for Hanson is  $r = R_f + \beta[E(R_M) - R_f] = 4.66\% + 0.83(4.92\%) = 8.74\%$ . Using the H-model, the value of Hanson PLC is

$$V_0 = \frac{D_0(1+g_L)}{r-g_L} + \frac{D_0 H(g_S - g_L)}{r-g_L} = \frac{13.80(1+0.05)}{0.0874-0.05} + \frac{13.80(5)(0.14-0.05)}{0.0874-0.05}$$

$$V_0 = \frac{14.49}{0.0374} + \frac{6.21}{0.0374} = 387.43 + 166.04 = \text{GBP } 553.47$$

The market price of GBP 472 is below the H-model price of GBP 553.47, so Hanson seems to be underpriced at this time.

B. For the H-model the expected rate of return can be derived as

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

$$r = \left( \frac{13.80}{472} \right) [(1+0.05) + 5(0.14-0.05)] + 0.05 = 0.0439 + 0.05 = 0.0939 = 9.39\%$$

Hanson will return 9.39 percent to the investor if all of these assumptions hold.

17. A.

Using the constant-growth dividend discount model,  $V_0 = D_1/(r-g)$

For LCC:  $V_0 = \$0.90/(0.10 - 0.08) = \$45.00$

For AOC:  $V_0 = \$1.60/(0.11 - 0.07) = \$40.00$

B.

Using the CAPM, the expected return  $r = R_f + \beta[E(R_M) - R_f]$

For LCC:  $r = 8\% + 1.2(20\% - 8\%) = 22.4\%$

For AOC:  $r = 8\% + 1.4(20\% - 8\%) = 24.8\%$

Alternatively, using CAPM and using the Treasury bill rate as the risk-free rate

For LCC:  $r = 5\% + 1.2(20\% - 5\%) = 23\%$

For AOC:  $r = 5\% + 1.4(20\% - 5\%) = 26\%$

C.

The internal growth rate is  $g = b \times \text{ROE} = [(E - D)/E] \times (E/BV)$

For LCC:  $BV = \$300/10 = \$30$  book val

$$g = [(\$4.00 - \$0.90)/\$4.00] \times (\$4.00/\$30)$$

$$= 0.775 \times 13.33\% = 10.33\%$$

For AOC:  $BV = \$320/20 = \$16$

$$g = [(\$3.20 - \$1.60)/\$3.20] \times (\$3.20/\$16) = 0.50 \times 20\% = 10.00\%$$

$$\text{Book value per share} = \frac{\text{Equity}}{\text{No. of outstanding shares}}$$

- D. *Recommendation:* Aminochem (AOC) is a more attractive investment than Litchfield (LCC) based on the answers to parts A, B, and C and the information provided in Table 2-15.

*Justification:* Using the constant-growth dividend discount model (DDM), the stock price of AOC is more attractive, at a price of \$30 (well below its DDM value of \$40), than that of LCC. LCC's internal growth rate (computed in part C) is higher than that of AOC, but LCC's higher P/E of 12.5 (\$50/\$4) versus 9.4 (\$30/\$3.20) for AOC is not justified by the small difference in growth rates.

18. A. i. Return on equity (ROE) = Profit margin  $\times$  Asset turnover  $\times$  Financial leverage  
 ROE = (Net income/Revenue)  $\times$  (Revenue/Assets)  $\times$  (Assets/Equity)  
 ii.  $ROE = (510/5,140) \times (5,140/3,100) \times (3,100/2,200) = 23.18\%$   
 This calculation used end-of-year (1999e) values. Slightly different and acceptable values would be obtained if balance sheet averages were used for assets and equity or if the beginning value for equity were used.  
 iii. Sustainable growth rate = ROE  $\times$  Retention rate  
 The retention rate = 1 - Dividend payout ratio  
 Dividend payout ratio =  $0.60/1.96 = 0.306$   
 Retention rate =  $1 - 0.306 = 0.694$   
 Sustainable growth rate =  $23.18\% \times 0.694 = 16.09\%$
- B. The sustainable growth rate (of 16.09 percent) exceeds MasterToy's actual growth rate. If the problem were temporary, management could simply accumulate resources in anticipation of future growth. Assuming this trend continues longer term (as the question states), however, management has at least two alternative courses of action when actual growth is below sustainable growth:
- Return money to shareholders by increasing the dividend or the dividend payout ratio.
  - Return money to shareholders by buying back stock.
19. A. i. Return on equity is the product of three components: profitability (net profit margin), asset turnover ratio (sales/assets), and financial leverage or equity multiplier (asset-to-equity ratio).  
 Net profit margin = Net income/Sales =  $80/598 = 13.378\%$   
 Total asset turnover = Sales/Assets =  $598/815 = 0.7337$   
 Financial leverage = Assets/Equity =  $815/674 = 1.2092$   
 Return on equity = Net income/Equity =  $80/674 = 11.87\%$   
 Or,  $ROE = 13.378\% \times 0.7337 \times 1.2092 = 11.87\%$
- ii. If the company maintains the current capital structure and a stable dividend payout rate, the sustainable rate of growth is defined by the product of ROE, which was calculated above, and the retention rate (1 minus the dividend payout rate), which can be determined

from Table 2-17. Sustainable growth rate = ROE × Retention rate  
 = 11.87% × (1 - 24/80) = 8.31%

B.

Proposal	Effect on Sustainable Growth rate	Component directly affected (if any)
Increase in quarterly dividend	Decrease	Retention rate. An increase in the dividend payout rate lowers the retention rate and thus decreases the sustainable growth rate.
Bond issue	Increase	Financial leverage or equity multiplier. An increase in the debt ratio raises financial leverage or the equity multiplier and thus increases sustainable growth.
Stock split	No effect	None. A stock split affects none of the components and thus does not affect the sustainable growth rate.

C.

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

Year 1 dividend per share ( $D_1$ ) = \$0.286 (1.32) = \$0.37752

Year 2 dividend per share ( $D_2$ ) = \$0.286 (1.32)<sup>2</sup> = \$0.49833

Year 3 dividend per share ( $D_3$ ) = \$0.286 (1.32)<sup>2</sup> (1.13) = \$0.56311

Terminal value ( $V_3$ ) =  $D_3 / (r - g) = 0.56311 / (0.14 - 0.13) = \$56.311$

The value of one share is the present value of the first two dividends plus the present value of the terminal share value:

$$V_0 = \frac{0.37752}{1.14} + \frac{0.49833}{(1.14)^2} + \frac{56.311}{(1.14)^2} = 0.331 + 0.383 + 43.329 = \$44.04$$

20.

A.

The industry's estimated P/E can be computed using the following model:

$$P_0/E_1 = \text{Payout ratio} / (r - g)$$

Because  $r$  and  $g$  are not explicitly given, however, they must be computed. The growth rate is

$$g = \text{ROE} \times \text{Retention rate} = 0.25 \times 0.40 = 0.10$$

The required rate of return is

$$r = R_f + \beta[E(R_M) - R_f] = 0.06 + 1.2(0.05) = 0.06 + 0.06 = 0.12$$

$$P_0/E_1 = 0.60 / (0.12 - 0.10) = 30.0$$

B.

Fundamental Factor	P/E's higher for Country A or Country B?	Justification
Forecasted growth in real gross domestic product (GDP)	P/E should be higher for Country A.	Higher expected growth in GDP implies higher earnings growth and a higher P/E.
Government bond yield	P/E should be higher for Country B.	A lower government bond yield implies a lower risk-free rate and a higher P/E.
Equity risk premium	P/E should be higher for Country B.	A lower equity risk premium implies a lower required return and a higher P/E.

21. A. The required rate of return is the risk-free rate + beta × (expected market rate of return – risk-free rate):

$$r = R_f + \beta[E(R_M) - R_f] = 0.045 + 1.15(0.145 - 0.045) = 16.0\%$$

- B. The formula for the two-stage DDM is

$$V_0 = \sum_{t=1}^3 \frac{D_t}{(1+r)^t} + \frac{V_3}{(1+r)^3}$$

The estimated future dividends are

$$D_1 = 1.72 \times 1.12 = 1.93$$

$$D_2 = 1.93 \times 1.12 = 2.16$$

$$D_3 = 2.16 \times 1.12 = 2.42$$

$$D_4 = 2.42 \times 1.09 = 2.64$$

The terminal stock price at  $t = 3$  is

$$V_3 = D_4/(r - g) = 2.64/(0.16 - 0.09) = 37.71$$

The present values of the first three dividends and the terminal value are

$$1.93 \times 1/(1.16)^1 = 1.66$$

$$2.16 \times 1/(1.16)^2 = 1.61$$

$$2.42 \times 1/(1.16)^3 = 1.55$$

$$37.71 \times 1/(1.16)^3 = 24.16$$

$$\text{Total present value} = 28.98$$

- C. Recommendation: Janet Ludlow should recommend QuickBrush for purchase because it is selling below Ludlow's intrinsic value estimate, whereas SmileWhite is selling above Ludlow's intrinsic value estimate. QuickBrush should have an expected return above its required rate of return, whereas SmileWhite should have an expected return below its required return.

- D. QuickBrush has an intrinsic value of \$63.00 versus a current market price of \$45.00, or an intrinsic value of 40% above the market price. SmileWhite has an intrinsic value of \$28.98 versus a current market price of \$30.00, an intrinsic value of 3.40% below the market price. *Strengths of the two-stage DDM in comparison with the constant-growth DDM.* The DDM is extremely sensitive to the estimated growth rate,  $g$ . The two-stage model allows for a separate valuation of two distinct

periods in a company's future. As a result, a company such as QuickBrush can be evaluated in light of an anticipated change in sustainable growth. Industries have distinct life cycles in which they typically move from a period of rapid growth to a period of normal growth and then to declining growth. The two-stage model has many of the same problems as the constant-growth model, but it is probably a more realistic approach than assuming a constant growth rate for all time. The use of a two-stage model is a key valuation tool, in that analysts with superior insight into a potential shift in a company's growth rate at a future date can use that expectation to assess the proper valuation at each stage.

*Weaknesses inherent in all DDMs.* All dividend discount models are extremely sensitive to input values. For example, small changes in the growth rate estimates,  $g$ , and/or the required rate of return,  $r$ , lead to large changes in a stock's estimated value. These inputs are difficult to estimate and may be based on unrealistic assumptions.