

1. **Dividend Discount Model.** Amazon.com has never paid a dividend, but in November 2007 the market value of its stock was \$35 billion. Does this invalidate the dividend discount model? (LO2)
2. **Dividend Yield.** Favored stock will pay a dividend this year of \$2.40 per share. Its dividend yield is 8%. At what price is the stock selling? (LO1)
3. **Preferred Stock.** Preferred Products has issued preferred stock with an \$8 annual dividend that will be paid in perpetuity. (LO2)
  - a. If the discount rate is 12%, at what price should the preferred sell?
  - b. At what price should the stock sell 1 year from now?
  - c. What is the dividend yield, the capital gains yield, and the expected rate of return of the stock?
4. **Constant-Growth Model.** Waterworks has a dividend yield of 8%. If its dividend is expected to grow at a constant rate of 5%, what must be the expected rate of return on the company's stock? (LO3)
5. **Dividend Discount Model.** How can we say that price equals the present value of all future dividends when many actual investors may be seeking capital gains and planning to hold their shares for only a year or two? Explain. (LO2)
6. **Rate of Return.** Steady As She Goes, Inc., will pay a year-end dividend of \$3 per share. Investors expect the dividend to grow at a rate of 4% indefinitely.
  - a. If the stock currently sells for \$30 per share, what is the expected rate of return on the stock? (LO3)
  - b. If the expected rate of return on the stock is 16.5%, what is the stock price? (LO2)
7. **Dividend Yield.** BMM Industries pays a dividend of \$2 per quarter. The dividend yield on its stock is reported at 4.8%. What price is the stock selling at? (LO1)
8. **Forms of Efficient Markets.** Supply the missing words from the following list: *fundamental, semistrong, strong, technical, weak.* (LO5)
 

There are three forms of the efficient market theory. Tests that have found there are no patterns in share price changes provide evidence for the \_\_\_\_\_ form of the theory. Evidence for the \_\_\_\_\_ form of the theory is provided by tests that look at how rapidly markets respond to new public information, and evidence for the \_\_\_\_\_ form of the theory is provided by tests that look at the performance of professionally managed portfolios. Market efficiency results from competition between investors. Many investors search for information about the company's business that would help them to value the stock more accurately. This is known as \_\_\_\_\_ analysis. Such research helps to ensure that prices reflect all available information. Other investors study past stock prices for recurrent patterns that would allow them to make superior profits. This is known as \_\_\_\_\_ analysis. Such research helps to eliminate any patterns.
9. **Information and Efficient Markets.** "It's competition for information that makes securities markets efficient." Is this statement correct? Explain. (LO5)
10. **Behavioral Finance.** Some finance scholars cite well-documented behavioral biases to explain apparent cases of market inefficiency. Describe two of these biases. (LO5)

11. **Stock Values.** Integrated Potato Chips paid a \$1 per share dividend *yesterday*. You expect the dividend to grow steadily at a rate of 4% per year. (LO2)
  - a. What is the expected dividend in each of the next 3 years?
  - b. If the discount rate for the stock is 12%, at what price will the stock sell?
  - c. What is the expected stock price 3 years from now?
  - d. If you buy the stock and plan to hold it for 3 years, what payments will you receive? What is the present value of those payments? Compare your answer to (b).
12. **Constant-Growth Model.** A stock sells for \$40. The next dividend will be \$4 per share. If the rate of return earned on reinvested funds is 15% and the company reinvests 40% of earnings in the firm, what must be the discount rate? (LO3)
13. **Constant-Growth Model.** Gentleman Gym just paid its annual dividend of \$3 per share, and it is widely expected that the dividend will increase by 5% per year indefinitely. (LO2)
  - a. What price should the stock sell at? The discount rate is 15%.
  - b. How would your answer change if the discount rate were only 12%? Why does the answer change?
14. **Constant-Growth Model.** Arts and Crafts, Inc., will pay a dividend of \$5 per share in 1 year. It sells at \$50 a share, and firms in the same industry provide an expected rate of return of 14%. What must be the expected growth rate of the company's dividends? (LO2)
15. **Constant-Growth Model.** Eastern Electric currently pays a dividend of about \$1.64 per share and sells for \$27 a share. (LO3)
  - a. If investors believe the growth rate of dividends is 3% per year, what rate of return do they expect to earn on the stock?
  - b. If investors' required rate of return is 10%, what must be the growth rate they expect of the firm?
  - c. If the sustainable growth rate is 5% and the plowback ratio is .4, what must be the rate of return earned by the firm on its new investments?
16. **Constant-Growth Model.** You believe that the Non-stick Gum Factory will pay a dividend of \$2 on its common stock next year. Thereafter, you expect dividends to grow at a rate of 6% a year in perpetuity. If you require a return of 12% on your investment, how much should you be prepared to pay for the stock? (LO2)
17. **Negative Growth.** Horse and Buggy Inc. is in a declining industry. Sales, earnings, and dividends are all shrinking at a rate of 10% per year. (LO2)
  - a. If  $r = 15%$  and  $DIV_1 = \$3$ , what is the value of a share?
  - b. What price do you forecast for the stock next year?
  - c. What is the expected rate of return on the stock?
  - d. Can you distinguish between "bad stocks" and "bad companies"? Does the fact that the industry is declining mean that the stock is a bad buy?
18. **Constant-Growth Model.** Metatrend's stock will generate earnings of \$6 per share this year. The discount rate for the stock is 15%, and the rate of return on reinvested earnings also is 15%. (LO2)
  - a. Find both the growth rate of dividends and the price of the stock if the company reinvests the following fraction of its earnings in the firm: (i) 0%; (ii) 40%; (iii) 60%.
  - b. Redo part (a) now assuming that the rate of return on reinvested earnings is 20%. What is the present value of growth opportunities for each reinvestment rate?
  - c. Considering your answers to parts (a) and (b), can you briefly state the difference between companies experiencing growth versus companies with growth opportunities?
19. **Nonconstant Growth.** You expect a share of stock to pay dividends of \$1.00, \$1.25, and \$1.50 in each of the next 3 years. You believe the stock will sell for \$20 at the end of the third year. (LO2)



- a. What is the stock price if the discount rate for the stock is 10%?
- b. What is the dividend yield?

20. **Constant-Growth Model.** Here are data on two stocks, both of which have discount rates of 15%. (LO2)

	Stock A	Stock B
Return on equity	15%	10%
Earnings per share	\$2.00	\$1.50
Dividends per share	\$1.00	\$1.00

- a. What are the dividend payout ratios for each firm?
  - b. What are the expected dividend growth rates for each firm?
  - c. What is the proper stock price for each firm?
21. **P/E Ratios.** Web Cites Research projects a rate of return of 20% on new projects. Management plans to plow back 30% of all earnings into the firm. Earnings this year will be \$3 per share, and investors expect a 12% rate of return on stocks facing the same risks as Web Cites. (LO4)
- a. What is the sustainable growth rate?
  - b. What is the stock price?
  - c. What is the present value of growth opportunities?
  - d. What is the P/E ratio?
  - e. What would the price and P/E ratio be if the firm paid out all earnings as dividends?
  - f. What do you conclude about the relationship between growth opportunities and P/E ratios?
22. **Constant-Growth Model.** Fincorp will pay a year-end dividend of \$2.40 per share, which is expected to grow at a 4% rate for the indefinite future. The discount rate is 12%. (LO2)
- a. What is the stock selling for?
  - b. If earnings are \$3.10 a share, what is the implied value of the firm's growth opportunities?
23. **P/E Ratios.** No-Growth Industries pays out all of its earnings as dividends. It will pay its next \$4 per share dividend in a year. The discount rate is 12%. (LO4)
- a. What is the price-earnings ratio of the company?
  - b. What would the P/E ratio be if the discount rate were 10%?
24. **Growth Opportunities.** Stormy Weather has no attractive investment opportunities. Its return on equity equals the discount rate, which is 10%. Its expected earnings this year are \$4 per share. Find the stock price, P/E ratio, and growth rate of dividends for plowback ratios of
- a. zero. (LO2)
  - b. .40. (LO2)
  - c. .80. (LO2)
25. **Growth Opportunities.** Trend-Line Inc. has been growing at a rate of 6% per year and is expected to continue to do so indefinitely. The next dividend is expected to be \$5 per share. (LO2)
- a. If the market expects a 10% rate of return on Trend-Line, at what price must it be selling?
  - b. If Trend-Line's earnings per share will be \$8, what part of Trend-Line's value is due to assets in place, and what part to growth opportunities?
26. **P/E Ratios.** Castles in the Sand generates a rate of return of 20% on its investments and maintains a plowback ratio of .30. Its earnings this year will be \$4 per share. Investors expect a 12% rate of return on the stock.
- a. Find the price and P/E ratio of the firm. (LO2)
  - b. What happens to the P/E ratio if the plowback ratio is reduced to .20? Why? (LO4)
  - c. Show that if plowback equals zero, the earnings-price ratio, E/P, falls to the expected rate of return on the stock. (LO4)
27. **Dividend Growth.** Grandiose Growth has a dividend growth rate of 20%. The discount rate is 10%. The end-of-year dividend will be \$2 per share. (LO2)
- a. What is the present value of the dividend to be paid in year 1? Year 2? Year 3?
  - b. Could anyone rationally expect this growth rate to continue indefinitely?
28. **Stock Valuation.** Start-Up Industries is a new firm that has raised \$200 million by selling shares of stock. Management plans to earn a 24% rate of return on equity, which is more than

the 15% rate of return available on comparable-risk investments. Half of all earnings will be reinvested in the firm. (LO2)

- a. What will be Start-Up's ratio of market value to book value?
  - b. How would that ratio change if the firm can earn only a 10% rate of return on its investments?
29. **Nonconstant Growth.** Planned Obsolescence has a product that will be in vogue for 3 years, at which point the firm will close up shop and liquidate the assets. As a result, forecast dividends are  $DIV_1 = \$2$ ,  $DIV_2 = \$2.50$ , and  $DIV_3 = \$18$ . What is the stock price if the discount rate is 12%? (LO2)
30. **Nonconstant Growth.** Tattletale News Corp. has been growing at a rate of 20% per year, and you expect this growth rate in earnings and dividends to continue for another 3 years. (LO2)
- a. If the last dividend paid was \$2, what will the next dividend be?
  - b. If the discount rate is 15% and the steady growth rate after 3 years is 4%, what should the stock price be today?
31. **Nonconstant Growth.** Reconsider Tattletale News from the previous problem.
- a. What is your prediction for the stock price in 1 year? (LO2)
  - b. Show that the expected rate of return equals the discount rate. (LO3)
32. **Interpreting the Efficient-Market Theory.** How would you respond to the following comments? (LO5)
- a. "Efficient market, my eye! I know lots of investors who do crazy things."
  - b. "Efficient market? Balderdash! I know at least a dozen people who have made a bundle in the stock market."
  - c. "The trouble with the efficient-market theory is that it ignores investors' psychology."
33. **Real versus Financial Investments.** Why do investments in financial markets almost always have zero NPVs, whereas firms can find many investments in their product markets with positive NPVs? (LO5)
34. **Investment Performance.** It seems that every month we read an article in *The Wall Street Journal* about a stockpicker with a marvelous track record. Do these examples mean that financial markets are not efficient? (LO5)
35. **Implications of Efficient Markets.** The president of Good Fortunes, Inc., states at a press conference that the company has a 30-year history of ever-increasing dividend payments. Good Fortunes is widely regarded as one of the best-run firms in its industry. Does this make the firm's stock a good buy? Explain. (LO5)
36. **Implications of Efficient Markets.** "Long-term interest rates are at record highs. Most companies, therefore, find it cheaper to finance with common stock or relatively inexpensive short-term bank loans." Discuss. (LO5)
37. **Expectations and Efficient Markets.** Geothermal Corp. just announced good news: Its earnings have increased by 20%. Most investors had anticipated an increase of 25%. Will Geothermal's stock price increase or decrease when the announcement is made? (LO5)
38. **Behavioral Finance.** In Section 7.7 we gave two examples of market anomalies (the earnings-announcement puzzle and the new-issue puzzle). Do you think that behavioral finance can help to explain these anomalies? (LO5)

39. **Sustainable Growth.** Computer Corp. reinvests 60% of its earnings in the firm. The stock sells for \$50, and the next dividend will be \$2.50 per share. The discount rate is 15%. What is the rate of return on the company's reinvested funds? (LO2)
40. **Nonconstant Growth.** A company will pay a \$2 per share dividend in 1 year. The dividend in 2 years will be \$4 per share, and it is expected that dividends will grow at 5% per year thereafter. The expected rate of return on the stock is 12%. (LO2)
- a. What is the current price of the stock?

- b. What is the expected price of the stock in a year?  
 c. Show that the expected return, 12%, equals dividend yield plus capital appreciation.
41. **Nonconstant Growth.** Phoenix Industries has pulled off a miraculous recovery. Four years ago it was near bankruptcy. Today, it announced a \$1 per share dividend to be paid a year from now, the first dividend since the crisis. Analysts expect dividends to increase by \$1 a year for another 2 years. After the third year (in which dividends are \$3 per share) dividend growth is expected to settle down to a more moderate long-term growth rate of 6%. If the firm's investors expect to earn a return of 14% on this stock, what must be its price? (LO2)
42. **Nonconstant Growth.** Compost Science, Inc. (CSI), is in the business of converting Boston's sewage sludge into fertilizer. The business is not in itself very profitable. However, to induce CSI to remain in business, the Metropolitan District Commission (MDC) has agreed to pay whatever amount is necessary to yield CSI a 10% return on investment. At the end of the year, CSI is expected to pay a \$4 dividend. It has been reinvesting 40% of earnings and growing at 4% a year. (LO2)
- a. Suppose CSI continues on this growth trend. What is the expected rate of return for an investor who purchases the stock at the market price of \$100?  
 b. What part of the \$100 price is attributable to the present value of growth opportunities?  
 c. Now the MDC announces a plan for CSI to also treat Cambridge sewage. CSI's plant will therefore be expanded gradually over 5 years. This means that CSI will have to reinvest 80% of its earnings for 5 years. Starting in year 6, however, it will again be able to pay out 60% of earnings. What will be CSI's stock price once this announcement is made and its consequences for CSI are known?
43. **Nonconstant Growth.** Better Mousetraps has come out with an improved product, and the world is beating a path to its door. As a result, the firm projects growth of 20% per year for 4 years. By then, other firms will have copycat technology, competition will drive down profit margins, and the sustainable growth rate will fall to 5%. The most recent annual dividend was  $DIV_0 = \$1$  per share. (LO2)
- a. What are the expected values of  $DIV_1$ ,  $DIV_2$ ,  $DIV_3$ , and  $DIV_4$ ?  
 b. What is the expected stock price 4 years from now? The discount rate is 10%.  
 c. What is the stock price today?  
 d. Find the dividend yield,  $DIV_1/P_0$ .  
 e. What will next year's stock price,  $P_1$ , be?  
 f. What is the expected rate of return to an investor who buys the stock now and sells it in 1 year?
44. **Nonconstant Growth.** (LO2)
- a. Return to the previous problem, and compute the value of Better Mousetraps for assumed sustainable growth rates of 6% through 9%, in increments of .5%.  
 b. Compute the percentage change in the value of the firm for each 1-percentage-point increase in the assumed final growth rate,  $g$ .  
 c. What happens to the sensitivity of intrinsic value to changes in  $g$ ? What do you conclude about the reliability of the dividend growth model when the assumed sustainable growth rate begins to approach the discount rate?
45. **Yield Curve and Efficient Markets.** If the yield curve is downward-sloping, meaning that long-term interest rates are lower than short-term interest rates, what might investors believe about future short-term interest rates? (LO5)

## Solutions to Chapter 7

### Valuing Stocks

1. No, this does not invalidate the dividend discount model. The dividend discount model allows for the fact that firms may not *currently* pay dividends. As the market matures, and Amazon's growth opportunities moderate, investors may justifiably believe that Amazon will enjoy high future earnings and will then pay dividends. The stock price today can still reflect the present value of the expected per share stream of dividends.
2. Dividend yield = Dividend/Price =  $DIV_1/P_0$   
 $0.08 = 2.40/P_0 \Rightarrow P_0 = \$30$
3. The preferred stock pays a level perpetuity of dividends. The expected dividend next year is the same as this year's dividend (\$8).
  - a.  $\$8.00/0.12 = \$66.67$
  - b.  $\$8.00/0.12 = \$66.67$
  - c. Dividend yield =  $\$8/\$66.67 = 0.12 = 12\%$   
Capital gains yield = 0  
Expected rate of return = 12%
4.  $r = DIV_1/P_0 + g = 8\% + 5\% = 13\%$
5. The value of a share of common stock equals the present value of dividends received out to the investment horizon, plus the present value of the forecast stock price at the horizon. But the stock price at the horizon date depends on expectations of dividends from that date forward. So, even if an investor plans to hold a stock for only a year or two, the price ultimately received from another investor depends on dividends to be paid after the date of purchase. Therefore, the stock's present value is the same for investors with different time horizons.
6.
  - a.  $P_0 = DIV_1/(r - g)$   
 $\$30 = \$3/(r - 0.04) \Rightarrow r = 0.14 = 14\%$
  - b.  $P_0 = \$3/(0.165 - 0.04) = \$24$



7. The annual dividend is:  $\$2 \times 4 = \$8$   
 $\text{DIV}_1/P_0 = 0.048 \Rightarrow \$8/P_0 = 0.048 \Rightarrow P_0 = \$8/0.048 = \$166.67$
8. weak, semistrong, strong, fundamental, technical
9. The statement is correct. The search for information and insightful analysis makes investor assessments of stock values as reliable as possible. Since the rewards accrue to the investors who uncover relevant information *before* it is reflected in stock prices, competition among these investors means that there is always an active search for mispriced stocks.
10. The two broad areas of investors' behavioral biases are in their attitudes towards risk and their assessments of probabilities. Investors appear to be less averse to losses following substantial gains than they are to losses that follow other losses. Consequently, the early gains of the "dot-com bubble" may have led investors to increase their investments in dot-com stocks, leading to the tremendous gains leading up to March 2000.

In addition, psychologists believe that investors make two mistakes in their assessment of stock market probabilities. First, when assessing the future of stock market performance, investors attach too much importance to the recent past, largely ignoring events of the more distant past. Second, investors suffer from overconfidence, believing that they are better stock pickers than they are in reality. These two biases reinforced the bubble prior to March 2000: overconfident investors attached too much importance to their experiences during the preceding five years.

11. a.  $\text{DIV}_1 = \$1 \times 1.04 = \$1.04$   
 $\text{DIV}_2 = \$1 \times 1.04^2 = \$1.0816$   
 $\text{DIV}_3 = \$1 \times 1.04^3 = \$1.1249$
- b.  $P_0 = \frac{\text{DIV}_1}{r - g} = \frac{\$1.04}{0.12 - 0.04} = \$13.00$
- c.  $P_3 = \frac{\text{DIV}_4}{r - g} = \frac{\$1.1249 \times 1.04}{0.12 - 0.04} = \$14.6237$
- d. Your payments will be:

	Year 1	Year 2	Year 3
DIV	\$1.04	\$1.0816	\$1.1249
Selling Price			14.6237
Total Cash Flow	\$1.04	\$1.0816	\$15.7486
PV of Cash Flow	\$0.9286	\$0.8622	\$11.2095

Sum of PV = \$13.00, the same as the answer to part (b).

12.  $g = \text{return on equity} \times \text{plowback ratio} = 0.15 \times 0.40 = 0.06 = 6.0\%$

$$40 = \frac{4}{r - 0.06} \Rightarrow r = \frac{4}{40} + 0.06 = 0.16 = 16.0\%$$

13. a.  $P_0 = \frac{\text{DIV}_1}{r - g} = \frac{\$3 \times 1.05}{0.15 - 0.05} = \$31.50$

b.  $P_0 = \frac{\$3 \times 1.05}{0.12 - 0.05} = \$45$

The lower discount rate makes the present value of future dividends higher.

14.  $\$50 = \frac{\$5}{0.14 - g} \Rightarrow g = 0.14 - \frac{\$5}{\$50} = 0.04 = 4.0\%$

15. a.  $r = \text{DIV}_1/P_0 + g = [(\$1.64 \times 1.03)/27] + 0.03 = 0.0926 = 9.26\%$

b. If  $r = 0.10$ , then:  $0.10 = [(\$1.64 \times 1.03)/27] + g \Rightarrow g = 0.0374 = 3.74\%$

c.  $g = \text{return on equity} \times \text{plowback ratio}$

$$5\% = \text{return on equity} \times 0.4 \Rightarrow \text{return on equity} = 0.125 = 12.5\%$$

16.  $P_0 = \text{DIV}_1/(r - g) = \$2/(0.12 - 0.06) = \$33.33$

17. a.  $P_0 = \text{DIV}_1/(r - g) = \$3/[0.15 - (-0.10)] = \$3/0.25 = \$12$

b.  $P_1 = \text{DIV}_2/(r - g) = \$3(1 - 0.10)/0.25 = \$10.80$

c. expected rate of return =

$$\frac{\text{DIV}_1 + \text{Capital gain}}{P_0} = \frac{\$3 + (\$10.80 - \$12)}{\$12} = 0.150 = 15.0\%$$

d. 'Bad companies' may be declining, but if the stock price already reflects this fact, the investor can still earn a fair rate of return, as shown in part (c).

18. a. (i) reinvest 0% of earnings:  $g = 0$  and  $DIV_1 = \$6$

$$P_0 = \frac{DIV_1}{r - g} = \frac{\$6}{0.15 - 0} = \$40.00$$

- (ii) reinvest 40%:  $g = 15\% \times 0.40 = 6\%$  and  $DIV_1 = \$6 \times (1 - 0.40) = \$3.60$

$$P_0 = \frac{DIV_1}{r - g} = \frac{\$3.60}{0.15 - 0.06} = \$40.00$$

- (iii) reinvest 60%:  $g = 15\% \times 0.60 = 9\%$  and  $DIV_1 = \$6 \times (1 - 0.60) = \$2.40$

$$P_0 = \frac{DIV_1}{r - g} = \frac{\$2.40}{0.15 - 0.09} = \$40.00$$

- b. (i) reinvest 0%:  $P_0 = \frac{\$6}{0.15 - 0} = \$40.00 \Rightarrow PVGO = \$0$

(ii) reinvest 40%:  $P_0 = \frac{\$3.60}{0.15 - (0.2 \times 0.40)} = \$51.43 \Rightarrow$

$$PVGO = \$51.43 - \$40.00 = \$11.43$$

(iii) reinvest 60%:  $P_0 = \frac{\$2.40}{0.15 - (0.2 \times 0.60)} = \$80.00 \Rightarrow$

$$PVGO = \$80.00 - \$40.00 = \$40.00$$

- c. In part (a), the return on reinvested earnings is equal to the discount rate. Therefore, the NPV of the firm's new projects is zero, and PVGO is zero in all cases, regardless of the reinvestment rate. While higher reinvestment results in higher growth rates, it does not result in a higher value of growth opportunities. This example illustrates that there is a difference between growth and growth opportunities.

In part (b), the return on reinvested earnings is greater than the discount rate. Therefore, the NPV of the firm's new projects is positive, and PVGO is positive. In this case, PVGO is higher when the reinvestment rate is higher because the firm is taking greater advantage of its opportunities to invest in positive NPV projects.

19. a.  $P_0 = \frac{\$1.00}{1.10} + \frac{\$1.25}{(1.10)^2} + \frac{\$1.50 + \$20}{(1.10)^3} = \$18.10$

b.  $DIV_1/P_0 = \$1/\$18.10 = 0.0552 = 5.52\%$

20.

	Stock A	Stock B
a. Payout ratio	$\$1/\$2 = 0.50$	$\$1/\$1.50 = 0.67$
b. $g = \text{ROE} \times \text{plowback ratio}$	$15\% \times 0.5 = 7.5\%$	$10\% \times 0.333 = 3.33\%$
c. $\text{Price} = \frac{\text{DIV}_1}{r - g}$	$\frac{\$1}{0.15 - 0.075} = \$13.33$	$\frac{\$1}{0.15 - 0.0333} = \$8.57$

21. a.  $g = \text{ROE} \times \text{plowback ratio} = 20\% \times 0.30 = 6\%$

b.  $E = \$3, r = 0.12 \Rightarrow P_0 = \frac{\$3 \times (1 - 0.30)}{0.12 - 0.06} = \$35.00$

c. No-growth value =  $E/r = \$3/0.12 = \$25.00$

PVGO =  $P_0 - \text{No-growth value} = \$35 - \$25 = \$10$

d.  $P/E = \$35/\$3 = 11.667$

e. If all earnings were paid as dividends, price would equal the no-growth value (\$25) and P/E would be:  $\$25/\$3 = 8.333$

f. High P/E ratios reflect expectations of high PVGO.

22. a.  $\frac{\$2.40}{0.12 - 0.04} = \$30.00$

b. No-growth value =  $E/r = \$3.10/0.12 = \$25.83$

PVGO =  $P_0 - \text{No-growth value} = \$30 - \$25.83 = \$4.17$

23. a. Earnings =  $\text{DIV}_1 = \$4$

Growth rate =  $g = 0$

$P_0 = \frac{\$4}{0.12 - 0} = \$33.33$

$P/E = \$33.33/\$4 = 8.33$

b. If  $r = 0.10 \Rightarrow P_0 = \frac{\$4}{0.10} = \$40.00 \Rightarrow P/E \text{ increases to: } \$40/\$4 = 10$

24. a. Plowback ratio = 0  $\Rightarrow$   $DIV_1 = \$4$  and  $g = 0$

$$\text{Therefore: } P_0 = \frac{\$4}{0.10 - 0} = \$40.00 \Rightarrow \text{P/E ratio} = \$40/\$4 = 10$$

- b. Plowback ratio = 0.40  $\Rightarrow$   $DIV_1 = \$4(1 - 0.40) = \$2.40$  and  $g = 10\% \times 0.40 = 4\%$

$$\text{Therefore: } P_0 = \frac{\$2.40}{0.10 - 0.04} = \$40.00 \Rightarrow \text{P/E ratio} = \$40/\$4 = 10$$

- c. Plowback ratio = 0.80  $\Rightarrow$   $DIV_1 = \$4(1 - 0.80) = \$0.80$  and  $g = 10\% \times 0.80 = 8\%$

$$\text{Therefore: } P_0 = \frac{\$0.80}{0.10 - 0.08} = \$40.00 \Rightarrow \text{P/E ratio} = \$40/\$4 = 10$$

Regardless of the plowback ratio, the stock price = \$40 because all projects offer return on equity equal to the opportunity cost of capital.

25. a.  $P_0 = DIV_1/(r - g) = \$5/(0.10 - 0.06) = \$125$

- b. If Trendline followed a zero-plowback strategy, it could pay a perpetual dividend of \$8. Its value would be:  $\$8/0.10 = \$80$ . Therefore, the value of assets in place is \$80. The remainder of its value must be due to growth opportunities, so that:

$$PVGO = \$125 - \$80 = \$45$$

26. a.  $g = 20\% \times 0.30 = 6\%$

$$P_0 = \$4(1 - 0.30)/(0.12 - 0.06) = \$46.67$$

$$P/E = \$46.67/\$4 = 11.667$$

- b. If the plowback ratio is reduced to 0.20  $\Rightarrow$   $g = 20\% \times 0.20 = 4\%$

$$P_0 = \$4(1 - 0.20)/(0.12 - 0.04) = \$40$$

$$P/E = \$40/\$4 = 10$$

P/E falls because the firm's value of growth opportunities is now lower: It takes less advantage of its attractive investment opportunities.

- c. If the plowback ratio = 0  $\Rightarrow$   $g = 0$  and  $DIV_1 = \$4$

$$P_0 = \$4/0.12 = \$33.33 \text{ and } E/P = \$4/\$33.33 = 0.12 = 12.0\%$$

27. a.  $DIV_1 = \$2.00$                        $PV = \$2/1.10 = \$1.818$   
 $DIV_2 = \$2(1.20) = \$2.40$        $PV = \$2.40/1.10^2 = \$1.983$   
 $DIV_3 = \$2(1.20)^2 = \$2.88$        $PV = \$2.88/1.10^3 = \$2.164$
- b. This could not continue indefinitely. If it did, the stock would be worth an infinite amount.
28. a. Book value = \$200 million  
Earnings = \$200 million  $\times$  0.24 = \$48 million  
Dividends = Earnings  $\times$  (1 – plowback ratio) = \$48 million  $\times$  (1 – 0.5) = \$24 million  
 $g = \text{return on equity} \times \text{plowback ratio} = 0.24 \times 0.50 = 0.12 = 12.0\%$   
Market value =  $\frac{\$24 \text{ million}}{0.15 - 0.12} = \$800 \text{ million}$   
Market-to-book ratio = \$800/\$200 = 4
- b. Now  $g$  falls to  $(0.10 \times 0.50) = 0.05$ , earnings decline to \$20 million, and dividends decline to \$10 million.  
Market value =  $\frac{\$10 \text{ million}}{0.15 - 0.05} = \$100 \text{ million}$   
Market-to-book ratio =  $\frac{1}{2}$   
This result makes sense because the firm now earns less than the required rate of return on its investments. The project is worth less than it costs.
29.  $P_0 = \frac{\$2}{1.12} + \frac{\$2.50}{(1.12)^2} + \frac{\$18}{(1.12)^3} = \$16.59$
30. a.  $DIV_1 = \$2 \times 1.20 = \$2.40$
- b.  $DIV_1 = \$2.40$      $DIV_2 = \$2.88$      $DIV_3 = \$3.456$   
 $P_3 = \frac{\$3.456 \times 1.04}{0.15 - 0.04} = \$32.675$   
 $P_0 = \frac{\$2.40}{1.15} + \frac{\$2.88}{(1.15)^2} + \frac{\$3.456 + \$32.675}{(1.15)^3} = \$28.021$

$$31. \quad a. \quad P_0 = \frac{\$2.88}{1.15} + \frac{\$3.456 + \$32.675}{(1.15)^2} = \$29.825$$

$$\text{Capital gain} = P_1 - P_0 = \$29.825 - \$28.021 = \$1.804$$

$$b. \quad r = \frac{\$2.40 + \$1.804}{\$28.021} = 0.1500 = 15.00\%$$

32. a. An individual *can* do crazy things and not affect the efficiency of financial markets. An irrational person can give assets away for free or offer to pay twice the market value. However, when the person's supply of assets or money runs out, the price will adjust back to its prior level (assuming that there is no new, relevant information released by these actions). If you are lucky enough to trade with such a person you *will* receive a positive gain at that investor's expense. You had better not count on this happening very often though. Fortunately, an efficient market protects irrational investors in cases less extreme than the above. Even if they trade in the market in an 'irrational' manner, they can be assured of getting a fair price since the price reflects all information.

b. Yes, and how many people have dropped a bundle? Or more to the point, how many people have made a bundle only to lose it later? People can be lucky and some people can be very lucky; efficient markets do not preclude this possibility.

c. Investor psychology is a slippery concept, more often than not used to explain price movements that the individual invoking it cannot personally explain. Even if it exists, is there any way to make money from it? If investor psychology drives up the price one day, will it do so the next day also? Or will the price drop to a 'true' level? Almost no one can tell you beforehand what 'investor psychology' will do. Theories based on it have no content.

33. Investments in financial markets, such as stocks or bonds, are available to all participants in the marketplace. As a result, the prices of these investments are bid up to 'fair' levels, that is, prices which reflect the present value of expected cash flows. If the investment weren't zero-NPV, investors would buy or sell the asset and thereby put pressure on its price until the investment becomes a zero-NPV prospect.

In contrast, investments in product markets are made by firms with various forms of protection from full competition. Such protection comes from specialized knowledge, name recognition and customer loyalty, and patent protection. In these cases, a project may be positive NPV for one firm with the know-how to make it work, but not positive NPV for other firms. Or a project may be positive NPV, but only available to one firm because it owns a name brand or patent. In these cases, competitors are kept out of the market, and the costs of the firm's investment opportunities are not bid to levels at which NPV is reduced to zero.

34. There are several thousand mutual funds in the United States. With so many professional managers, it is no surprise that some managers will demonstrate brilliant performance over various periods of time. As an analogy, consider a contest in which 10,000 people flip a coin 20 times. It would not surprise you if *someone* managed to flip heads 18 out of 20 times. But it would be surprising if he could repeat that performance. Similarly, while many investors have shown excellent performance over relatively short time horizons, and have received favorable publicity for their work, far fewer have demonstrated consistency over long periods.
35. If the firm is stable and well run, its price will reflect this information, and the stock may not be a bargain. There is a difference between a ‘good company’ and a ‘good stock.’ The best buys in the stock market are not necessarily the best firms; instead, you want to identify firms that are *better* than anyone else realizes. When the market catches up to your assessment and prices adjust, you will profit.
36. Remember the first lesson of market efficiency: The market has no memory. Just because long-term interest rates are high relative to past levels does not mean they won’t go higher still. Unless you have special information indicating that long-term rates are *too* high, issuing long-term bonds should be a zero-NPV transaction. Issuing short-term debt or common stock should also be a zero-NPV transaction.
37. The stock price will decrease. The original price reflects an anticipation of a 25% increase in earnings. The actual increase is a *disappointment* compared to original expectations.
38. It seems that behavioral finance might explain anomalies such as the earnings announcement puzzle and the new-issue puzzle. For example, we expect that the announcement of unexpectedly good earnings would initially generate a positive reaction. However, the fact that the announced higher earnings figure is ‘unexpected’ indicates that perhaps investors had been accustomed to lower earnings in the recent past, so that investors under-react initially, out of excessive concern about the risk of loss and also giving too much weight to the lower earnings of the recent past. However, the initial increase in price, coupled with investors’ attitudes towards risk and their tendency to be overconfident, would produce additional stock price increases in the future.
39. 
$$\$50 = \frac{\$2.50}{0.15 - g} \Rightarrow g = 0.15 - \frac{\$2.50}{\$50} = 0.10 = 10.0\%$$

$$g = 0.10 = \text{return on equity} \times \text{plowback ratio} = \text{return on equity} \times 0.60 \Rightarrow$$

$$\text{return on equity} = 0.10/0.60 = 0.1667 = 16.67\%$$



$$40. \quad a. \quad P_0 = \frac{DIV_1}{1+r} + \frac{DIV_2 + P_2}{(1+r)^2}$$

$$DIV_1 = \$2$$

$$DIV_2 = \$4$$

$$P_2 = \frac{DIV_2 \times (1+g)}{r-g} = \frac{\$4 \times 1.05}{0.12 - 0.05} = \$60.00$$

$$P_0 = \frac{\$2}{1.12} + \frac{\$4 + \$60}{(1.12)^2} = \$52.806$$

$$b. \quad \text{Next year: } P_1 = \frac{DIV_2}{0.12 - 0.05} = \frac{\$4}{0.07} = \$57.143$$

$$c. \quad r = \frac{DIV_1 + (P_1 - P_0)}{P_0} = \frac{\$2 + (\$57.143 - \$52.806)}{\$52.806} = 0.1200 = 12.00\%$$

$$r = \frac{\$2}{\$52.806} + \frac{\$57.143 - \$52.806}{\$52.806} = 0.1200$$

$$41. \quad DIV_1 = \$1$$

$$DIV_2 = \$2$$

$$DIV_3 = \$3$$

$$g = 0.06 \Rightarrow P_3 = (\$3 \times 1.06)/(0.14 - 0.06) = \$39.75$$

$$P_0 = \frac{\$1}{1.14} + \frac{\$2}{(1.14)^2} + \frac{\$3 + \$39.75}{(1.14)^3} = \$31.27$$

$$42. \quad a. \quad DIV_1 = \$4 \text{ and } g = 4\%$$

$$\text{Expected return} = (DIV_1/P_0) + g = (\$4/\$100) + 4\% = 8\%$$

$$b. \quad DIV_1 = \text{Earnings} \times (1 - \text{plowback ratio})$$

$$\text{Therefore: Earnings} = DIV_1/(1 - \text{plowback ratio}) = \$4/(1 - 0.4) = \$6.6667$$

If the discount rate is 8% (the expected return on the stock), then the no-growth value of the stock is:  $\$6.6667/0.08 = \$83.33$

$$\text{Therefore: PVGO} = \$100 - \$83.33 = \$16.67$$

c. For the first 5 years:  $g = 10\% \times 0.8 = 8\%$

Thereafter:  $g = 10\% \times 0.4 = 4\%$

Year	1	2	3	4	5	6
Earnings	\$6.67	\$7.20	\$7.78	\$8.40	\$9.07	\$9.80
plowback	0.80	0.80	0.80	0.80	0.80	0.40
DIV	\$1.33	\$1.44	\$1.56	\$1.68	\$1.81	\$5.88
g	0.08	0.08	0.08	0.08	0.08	0.04

After year 6, the plowback ratio falls to 0.40 and the growth rate falls to 4 percent. [We assume  $g = 8\%$  in year 5 (i.e., from  $t = 5$  to  $t = 6$ ) because the plowback ratio in year 5 is still high at  $b = 0.80$ . Notice the large jump in the dividends when the plowback ratio falls.] By year 6, the firm enters a steady-growth phase, and the constant-growth dividend discount model can be used to value the stock.

The stock price in year 6 will be:

$$P_6 = \frac{D_6 \times (1 + g)}{k - g} = \frac{\$5.88 \times 1.04}{0.08 - 0.04} = \$152.88$$

$$P_0 = \frac{\$1.33}{1.08} + \frac{\$1.44}{(1.08)^2} + \frac{\$1.56}{(1.08)^3} + \frac{\$1.68}{(1.08)^4} + \frac{\$1.81}{(1.08)^5} + \frac{\$5.88 + \$152.88}{(1.08)^6} = \$106.22$$

43. a.  $DIV_1 = 1.00 \times 1.20 = \$1.20$

$$DIV_2 = 1.00 \times (1.20)^2 = \$1.44$$

$$DIV_3 = 1.00 \times (1.20)^3 = \$1.728$$

$$DIV_4 = 1.00 \times (1.20)^4 = \$2.0736$$

b.  $P_4 = DIV_5 / (r - g) = [DIV_4 \times (1 + g)] / (r - g)$

$$= (\$2.0736 \times 1.05) / (0.10 - 0.05) = \$43.5456$$

c.  $P_0 = \frac{\$1.20}{1.10} + \frac{\$1.44}{(1.10)^2} + \frac{\$1.728}{(1.10)^3} + \frac{\$2.0736 + \$43.5456}{(1.10)^4} = \$34.738$

d.  $DIV_1 / P_0 = \$1.20 / \$34.738 = 0.0345 = 3.45\%$

e. Next year the price will be:

$$P_1 = \frac{\$1.44}{1.10} + \frac{\$1.728}{(1.10)^2} + \frac{\$2.0736 + \$43.5456}{(1.10)^3} = \$37.012$$

f.  $r = \frac{DIV_1 + \text{Capital Gain}}{P_0} = \frac{\$1.20 + (\$37.012 - \$34.738)}{\$34.738} = 0.1000 = 10.00\%$

The expected return equals the discount rate (as it should if the stock is fairly priced).

44.

a,b.  $P_4 = DIV_5 / (r - g) = [DIV_4 \times (1 + g)] / (r - g)$   
 $= (\$2.0736 \times 1.06) / (0.10 - 0.06) = \$54.95$

$$P_0 = \frac{\$1.20}{1.10} + \frac{\$1.44}{(1.10)^2} + \frac{\$1.728}{(1.10)^3} + \frac{\$2.0736 + \$54.95}{(1.10)^4} = \$42.53$$

Sustainable Growth Rate	Intrinsic Value (PV)	% change in PV
5.00%	34.74	
6.00%	42.53	22.42%
6.50%	48.09	13.08%
7.00%	55.51	15.43%
7.50%	65.90	18.71%
8.00%	81.48	23.64%
8.50%	107.44	31.87%
9.00%	159.37	48.33%

c. The percentage change in the value of the firm increases at a faster rate with each 1 percent increase in the assumed final growth rate,  $g$ . The intrinsic value is more sensitivity to changes in  $g$  as the sustainable growth rate approaches the discount rate. The dividend growth model is less reliable as the sustainable growth rate approaches the discount rate.

45. Two important points in the discussion of the yield curve (in Section 6.5) are: first, the yield curve is usually upward sloping (i.e., yields tend to be higher for longer maturity bonds) and, second, an upward sloping yield curve often indicates that future interest rates are expected to increase. The relatively unusual case of a downward sloping yield curve often indicates that future interest rates are expected to decrease.

## Solution to Minicase for Chapter 7

The goal is to value the company under both investment plans and to choose the better investment plan.

The discount rate is the 11% that investors believe they can earn on similar-risk investments, not the 15% return on book equity. Return on equity is useful, however, for computing the growth rate of dividends under the rapid growth scenario. Starting in 2013, in the rapid growth scenario, two-thirds of earnings will be paid out as dividends, and one-third will be reinvested. Therefore, the sustainable growth rate as of 2013 is:

$$\text{return on equity} \times \text{plowback ratio} = 15\% \times 1/3 = 5\%$$

### Valuation based on past growth scenario:

The firm has been growing at 5% per year. Dividends are proportional to book value and have grown at 5% annually. Dividends paid in the most recent year (2012) were \$7.7 million and are projected to be \$8 million next year, in 2013. The value of the firm is therefore:

$$\text{Value}_{2010} = \frac{\text{DIV}_{2011}}{r - g} = \frac{\$8 \text{ million}}{0.11 - 0.05} = \$133.33 \text{ million}$$

The value per share is:  $\$133.33 \text{ million} / 400,000 = \$333.33$

Therefore, it is clear that Mr. Breezeway was correct in advising his relative not to sell for book value of \$200 per share.

### Valuation based on rapid growth scenario

If the firm reinvests all income for the next five years (until 2017), dividends paid in that year will reach \$14 million, far greater than in the constant growth scenario. However, shareholders will have to give up dividend payments until 2017 in order to achieve this rapid growth. The value of the firm in 2017 will be:

$$\text{Value}_{2015} = \frac{\text{DIV}_{2016}}{r - g} = \frac{\$14.7 \text{ million}}{0.11 - 0.05} = \$245 \text{ million}$$

The value of the firm as of the year 2012 is the present value of this amount plus the present value of the dividend to be paid in 2017, which is projected to be \$14 million. (Remember, there will be no dividend flows in the years leading up to 2017.)

$$\text{Value}_{2010} = \frac{14 + 245}{1.11^5} = \$153.70 \text{ million}$$

Value per share is:  $\$153.70 \text{ million} / 400,000 = \$384.25$

Thus, it appears that the rapid growth plan is in fact preferable. If the firm follows this plan, it will be able to go public — that is, sell its shares to the public — at a higher price.