LO5 The Price-Earnings Ratio Concept and Valuation

In Chapter 2 we introduced the concept of the price-earnings ratio (P/E). The price-earnings ratio represents a multiplier applied to current earnings to determine the value of a share of stock in the market. It is considered a pragmatic, everyday approach to valuation. If a stock has earnings per share of $3 and a P/E ratio of 12 times, it carries a market value of $36. Another company with the same earnings but a P/E ratio of 15 times enjoys a market price of $45.

The price-earnings ratio is influenced by the earnings and sales growth of the firm, the risk (or volatility in performance), the debt-equity structure of the firm, the dividend policy, the quality of management, and a number of other factors. Firms that have bright expectations for the future tend to trade at high P/E ratios, but the opposite is true of low P/E firms. It is because of those future expectations of earnings that one should be careful in applying historical P/E ratios to current earnings.

FINANCE IN ACTION

Valuation of Small Businesses

The value of a small business takes on importance when the business is sold as part of a divorce settlement, for estate purposes, or when the owner wishes to retire. Unlike a firm trading in the public securities market, there is no ready market for a local bookstore, a bowling alley, or an accountant's practice. Lower liquidity decreases the value assigned the business.

Another factor affecting value is the importance of a key person in the operation of the business. If the founder of the business is critical to its functioning, the goodwill established by the owner will often diminish after he or she departs, resulting in declining cash flows and a loss of value.

Earnings of a small business are often lower than those of a publicly traded company. The owners of small businesses often intermingle personal and business expenses. Family use of cars, health insurance, travel, and so on, may be charged as business expenses even when Canada Revenue Agency tries to restrict the practice. Furthermore, small, private businesses try to report earnings that are as low as possible to minimize taxes. Publicly traded companies report quarterly, often attempting to show ever-increasing profits to boost share prices. Analysts will carefully examine the earnings reports of the small business, making necessary adjustments that may increase the stated earnings.

The average small business may sell at some multiple of average adjusted earnings for the previous three years. Sale prices on comparable businesses are also considered in the valuation. Accountants and financial analysts with experience in similar business valuations can be of immense help.

In March 2017, the average P/E for the top 300 companies of the Toronto Stock Exchange (the S&P/TSX Composite Index) was 19 to 1. There is often a large variation among firms, based on their future earnings expectations and earnings at that moment. P/E ratios are reported only for common shares, which have a claim on the earnings, and only when earnings are positive.

Price-earnings ratios can be looked up in many financial newspapers and at several websites, such as investcom.com or tmx.com. The typical information is displayed in Table 10–3.

Toronto Stock Exchange
tmx.com
The Globe and Mail
investcom

	Open	High	Low	Close	Year high	Year low	Volume	EPS	P/E	Div	Yield
Royal Bank (RY)	96.64	97.40	93.13	96.55	99.90	73.18	2.2 m	7.19	13.40	3.48	3.60
Descartes (DSG)	30.76	30.90	30.37	30.67	31.79	22.94	0.2 m	0.40	75.70	0	0

The P/E ratio is determined by dividing the closing price by the latest reported earnings.
The yield is determined by dividing the current dividend (quarterly × 4) by the closing price.
Other columns show the open, high, and low prices for the day; the volume of shares traded; and the high and low prices for the year.
The company stock ticker symbols used by the Toronto Stock Exchange for identification are also shown.

Table 10–3 An example of stock quotations, March 2017

The P/E ratio represents an easily understood, pragmatic approach to valuation that is widely used by stockbrokers and individual investors. The dividend valuation approach (based on the present value of dividends) we have been using throughout the chapter is more theoretically sound and is likely to be used by sophisticated financial analysts. To some extent, the two concepts can be brought together. A stock that has a high required rate of return (K_e) because of its risky nature generally has a low P/E ratio. Similarly, a stock with a high expected growth rate (g) normally has a high P/E ratio. In the first example, both methods provide a low valuation, while in the latter case both methods provide a high valuation.

Variable Growth in Dividends

In the discussion of common stock valuation, we have considered procedures for firms that had no growth in dividends and for firms that had a constant growth. Most of the discussion and literature in finance assumes a constant growth dividend model. However, there is also a third case, and that is one of variable growth in dividends. The most common variable growth model is one in which the firm experiences very rapid or supernormal growth for a number of years and then levels off to more normal, constant growth. This is modelled in Appendix 10B. The supernormal growth pattern is often experienced by firms in emerging industries, such as in the early days of electronics or microcomputers.

In evaluating a firm with an initial pattern of supernormal growth, we first take the present value of dividends during the exceptional growth period. We then determine the price of the stock at the end of the supernormal growth period by taking the present value of the normal, constant dividends that follow the supernormal growth period. We discount this price to the present and add it to the present value of the supernormal dividends. This gives us the current price of the stock. A numerical example of a supernormal growth rate evaluation model is presented in Appendix 10B.

Finally, in the discussion of common stock valuation models, readers may ask about the valuation of companies that currently pay no dividends. Since virtually all of our discussion has been based on values associated with dividends, how can this no-dividend circumstance be handled? One approach is to assume that even for the firm that pays no current dividends, at some point in the future shareholders will be rewarded with cash dividends. We then take the present value of their deferred dividends.

A second approach to valuing a firm that pays no cash dividend is to take the present value of earnings per share for a number of periods and add that to the present value of the last earnings per share, valued as a perpetuity. The discount rate applied to future earnings is generally higher than the discount rate applied to future dividends.

FINANCE IN ACTION

Diamonds, Nickel, Gold, or BlackBerry—for Value?

Share prices for several Canadian companies represent fascinating examples of valuation based on future expected cash flows that were highly speculative.

In 1991, Dia Met Minerals Ltd. shares traded at $0.26, and the firm's equity value was less than $2 million. In 1992, the shares traded as high as $60, and the equity in Dia Met was worth $600 million. Dia Met Minerals had little in the way of hard assets and had never paid a dividend. Investors had bid up the price of the shares on the basis of the promise of future cash flows. Quality diamonds had been discovered in the Northwest Territories. By 1999, mining production began to generate cash flows from those diamonds, and today Canada is a world leader in diamond production. Dia Met was acquired by BHP Ltd., a company that trades on the Australian Stock Exchange.

As a result of the rush to find diamonds in Canada, another company, Diamond Fields Resources Inc., was formed to locate diamonds, and for $450,000 it sponsored two prospectors. Near Voisey's Bay, Labrador, they found one of the world's richest deposits of nickel, copper, and cobalt. In the fall of 1994, Diamond Fields stock traded for $3.55, and by 1996 it was trading at over $160 per share (adjusted for stock splits). Inco purchased Diamond Fields for $4.3 billion, even though no full-scale mining had begun. The value, established by Inco bidding in the securities market, was based on the promised returns from this rich mineral deposit in the future. In 1996, nickel sold at about $3.80 per pound, and the future looked bright; but by 1998 nickel sold for less than $2 per pound, and Voisey's Bay was mothballed. By 2006, Inco was acquired by CVRD, becoming Vale Inco, and in 2007 nickel was priced above $22 a pound.

Shares in the company Bre-X soared in value from a few dollars in early 1995 to over $240 by mid-1996 on the basis of reports that it had discovered one of the largest gold finds in the world. Bre-X was touted as having perhaps 200 million ounces of gold in the wilds of Borneo, and value was established on the possibility of future earnings from this discovery. However, by 1997 it was apparent that Bre-X was a hoax, and the shares plunged in value to almost nothing.

Investors become excited about future potential revenues that may, they hope, result in profits. Internet companies created a "bubble" in share prices for high-tech companies through 1999 and 2000 on the belief that revenues and profits would continue to climb. Nortel soared to a value of $350 billion but within two years of that was worth only $3 billion. In 2009, Nortel sought bankruptcy protection. Some suggested that the Internet, with its effect on the economy, had changed valuation standards. Similarly, BlackBerry increased in value from $4.5 to $80 billion between 2006 and 2008, only to fall back to $5 billion by 2017.

Q1 To what extent is Vale Inco developing Voisey's Bay?

Q2 How have the share prices of RIO (Inco), BHP, and BB performed over the last year?

vale.com	**asx.com.au**	**blackberry.com**
Symbol: VALE (NYSE)	Symbol: BHP	Symbol: BB

SUMMARY AND REVIEW OF FORMULAS

1. The primary emphasis in this chapter is on valuation of financial assets: bonds, preferred stock, and common stock. Regardless of the security being analyzed, valuation is normally based on the concept of determining the present value of future cash flows. Thus, we draw on many of the time-value-of-money techniques developed in Chapter 9.
2. Inherent in the valuation process is a determination of the rate of return demanded by investors. The rate of return is also referred to as the discount rate, or yield to maturity. We note that the required rate of return is composed of a real rate of return, an inflation premium, and a risk premium based on the uncertainty of the future expected cash flows. When we have identified the rate of return required by investors, we have also identified what it will cost the corporation to raise new capital.

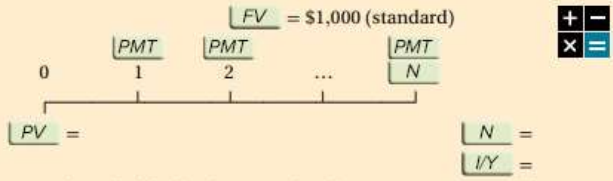
3., 4. In the section below, we specifically review the valuation techniques associated with bonds, preferred stock, and common stock.

Bonds

The price, or current value, of a bond is equal to the present value of interest payments (I_t) over the life of the bond plus the present value of the principal payment (P_n) at maturity. The discount rate used in the analytical process is the yield to maturity (Y). The yield to maturity (required rate of return) is determined in the marketplace by factors such as the real rate of return, an inflation premium, and a risk premium.

The formula for bond valuation was presented as formula 10–1.

$$P_b = \sum_{t=1}^{n} \frac{I_t}{(1+Y)^t} + \frac{P_n}{(1+Y)^n} \quad (10\text{–}1)$$



Bonds fit the pattern described by the above graphical representation. Usually, we are concerned with determining the current price of the bond or its yield. The other variables are likely known.

Tables (optional) We say the present value of interest payments is

$$PV_A = A \times PVI_{IFA} \quad (n = \_\_\_\_\_, i = \_\_\_\_\_) \quad \text{(Appendix D)}$$

Whereas the present value of the principal payment at maturity is

$$PV = FV \times PV_{IF} \quad (n = \_\_\_\_\_, i = \_\_\_\_\_) \quad \text{(Appendix B)}$$

Adding these two values together gives us the price of the bond. We may use annual or semiannual analysis.

The value of the bond is strongly influenced by the relationship of the yield to maturity in the market to the interest rate on the bond and also the length of time to maturity.

If we know the price of the bond, the size of the interest payments, and the maturity of the bond, we can solve for the yield to maturity, as discussed in Appendix 10A.

Preferred Stock

In determining the value of preferred stock, we are taking the present value of an infinite stream of level dividend payments. This would be a tedious process if it were not for the fact that the mathematical calculations can be compressed into a simple formula. The appropriate formula is formula 10–3.

$$P_p = \frac{D_p}{K_p} \quad (10\text{–}3)$$

According to this formula, to find the preferred stock price (P_p) we take the constant annual dividend payment (D_p) and divide this value by the rate of return that preferred shareholders are demanding (K_p).

If, on the other hand, we know the price of the preferred stock and the constant annual dividend payment, we can solve for the required rate of return on preferred stock as

$$K_p = \frac{D_p}{P_p} \quad (10\text{–}4)$$

Common Stock

The value of common stock is also based on the concept of the present value of an expected stream of future dividends. Unlike preferred stock, the dividends are not necessarily level. The firm and shareholders may experience

1. No growth in dividends
2. Constant growth in dividends
3. Variable or supernormal growth in dividends

It is the second circumstance that receives most of the attention in the financial literature. If a firm has constant growth (g) in dividends (D) and the required rate of return (K_e) exceeds the growth rate, formula 10–8 can be utilized.

$$P_0 = \frac{D_1}{K_e - g} \quad (10\text{–}8)$$

In using this formula, all we need to know is the value of the dividend at the end of the first year, the required rate of return, and the discount rate. Most of our valuation calculations with common stock utilize formula 10–7.

If we need to know the required rate of return (K_e) for common stock, formula 10–9 can be employed.

$$K_e = \frac{D_1}{P_0} + g \quad (10\text{–}9)$$

The first term represents the dividend yield on the stock, and the second term represents the growth rate. Together they provide the total return demanded by the investor.

5. The price-earnings ratio represents a multiplier applied to earnings to determine share price. It is an easy rule of thumb used to determine value, but it does not incorporate the dynamics of the other models, including future expected cash flows and today's required rate of return.

DISCUSSION QUESTIONS

1. How is valuation of financial assets by investors related to the cost of financing (cost of capital) for the firm? (LO1)
2. How is valuation of any financial asset related to future cash flows? (LO2)

3. Why might investors demand a lower rate of return for an investment in BCE as compared to Air Canada? (LO2)
4. What are the three factors that influence the required rate of return by investors? (LO2)
5. What is meant by real rate of return? (LO2)
6. If inflationary expectations increase, what is likely to happen to the yield to maturity on bonds in the marketplace? What is also likely to happen to the price of bonds? (LO2, LO4)
7. Why is the remaining time to maturity an important factor in evaluating the impact of a change in yield to maturity on bond prices? (LO4)
8. These valuation models are based on investors' required rates of return and their reflection in the prices of the assets. Does the change in price always occur according to the model? (LO2)
9. What three adjustments have to be made in going from annual to semiannual bond analysis? (LO3)
10. Why is a change in required yield for preferred stock likely to have a greater impact on price than a change in required yield for bonds? (LO3)
11. What type of dividend pattern for common stock is similar to the dividend payment for preferred stock? (LO1)
12. What two conditions must be met to go from formula 10–7 to formula 10–8 in using the dividend valuation model? (LO5)

$$P_0 = \frac{D_1}{K_e - g} \quad (10\text{–}8)$$

13. What two components make up the required rate of return on common stock? (LO5)
14. What factors might influence a firm's price-earnings ratio? (LO5)
15. How does a firm's price-earnings ratio relate to K_e? To g? (LO5)
16. How is the supernormal growth pattern likely to vary from the more normal, constant growth pattern? (LO3)
17. What approaches can be taken in valuing a firm's stock when there is no cash dividend payment? (LO3)

INTERNET RESOURCES AND QUESTIONS

The Globe and Mail has daily bond prices and yields (Report on Business, Market Action):
financialpost.com

Perimeter Financial provides good information on Canadian fixed income securities:
pfin.ca/canadianfixedincome

Reuters provides considerable information on common shares (stocks: search):
reuters.com/finance/markets

The Toronto Stock Exchange (TSX) site includes information on listed stocks that include daily and yearly high and low prices, opening prices, volume, EPS, P/E ratios, and dividend yields:
tmx.com

The Government of Canada Finance Department provides a technical guide on determining bond prices and yields, as well as definitions of various government bonds: fin.gc.ca

The Bank of Canada provides current money market and long-term bond yields: bankofcanada.ca

1. What is the price and yield of Government of Canada bonds of 1, 2, 5, 10, and 30 years?
2. Find the price-earnings ratio and dividend yield for today for the following corporations: Encana (ECA), Imperial Oil (IMO), Molson Coors (TPX.A), OpenText (OTEX), and Royal Bank Preferred (RY.PR.J). Discuss the reasons for differences in the ratios among these securities.

PROBLEMS

1. The Wild Rose Company has $1,000 par value (maturity value) bonds outstanding at 9 percent interest. The bonds will mature in 20 years with annual payments. Compute the current price of the bonds if the present yield to maturity is
   a. 6 percent
   b. 8 percent
   c. 12 percent
2. Midland Oil has $1,000 par value (maturity value) bonds outstanding at 8 percent interest. The bonds will mature in 25 years with annual payments. Compute the current price of the bonds if the present yield to maturity is
   a. 7 percent
   b. 10 percent
   c. 13 percent
3. Exodus Limousine Company has $1,000 par value bonds outstanding at 10 percent interest. The bonds will mature in 50 years with annual payments. Compute the current price of the bonds if the current yield to maturity is
   a. 5 percent
   b. 15 percent
4. Referring back to the previous problem, part ***b***, what percent of the total bond value does the repayment of principal represent?
5. Applied Software has a $1,000 par value bond outstanding that pays 12 percent interest with annual payments. The current yield to maturity on such bonds in the market is 7 percent. Compute the price of the bonds for these maturity dates
   a. 30 years
   b. 15 years
   c. 1 year
6. The Victoria Telephone Company has a $1,000 par value bond outstanding that pays 5 percent interest with annual payments. The current yield to maturity on such bonds in the market is 8 percent. Compute the price of the bonds for these maturity dates:
   a. 30 years
   b. 15 years
   c. 1 year

7. For the previous problem, graph the relationship in a manner similar to the top half of Figure 10–2. Also explain why the pattern of price change occurs.

8. A Sunfish bond is paying 10 percent interest for 20 years on a semiannual basis. Assume interest rates in the market (yield to maturity) decline from 12 percent to 8 percent:
   a. What is the bond price at 12 percent?
   b. What is the bond price at 8 percent?
   c. What would be the percentage return on an investment bought when rates were 12 percent and sold when rates are 8 percent?

9. For the same Sunfish bond (as in the problem above) assume interest rates in the market (yield to maturity) increase from 6 to 12 percent.
   a. What is the bond price at 6 percent?
   b. What is the bond price at 14 percent?
   c. What would be the percentage return on an investment bought when rates were 6 percent and sold when rates are 14 percent?

10. Ron Rhodes calls his broker to inquire about purchasing a bond of Golden Years Recreation Corporation. His broker quotes a price of $1,170. Ron is concerned that the bond might be overpriced based on the facts involved. The $1,000 par value bond pays 13 percent annual interest payable semiannually, and has 18 years remaining until maturity. The current yield to maturity on similar bonds is 11 percent. Compute the new price of the bond and comment on whether you think it is overpriced in the marketplace.

11. The Vinny Cartier Company issued bonds at $1,000 per bond. The bonds had a 25-year life when issued, with semiannual payments at the then annual rate of 12 percent. This return was in line with required returns by bondholders at that point, as described below:

Real rate of return	3%
Inflation premium	6
Risk premium	3
Total return	12%

Assume that ten years later the inflation premium is 3 percent, the risk premium has declined to 2 percent and both are appropriately reflected in the required return (or yield to maturity) of the bonds. The bonds have 15 years remaining until maturity. Compute the new price of the bond.

12. Martin Shipping Lines issued bonds ten years ago at $1,000 per bond. The bonds had a 30-year life when issued, with semiannual payments at the then annual rate of 10 percent. This return was in line with required returns by bondholders at that point, as described below:

Real rate of return	2%
Inflation premium	4
Risk premium	4
Total return	10%

Assume that today the inflation premium is only 2 percent and is appropriately reflected in the required return (or yield to maturity) of the bonds. Compute the new price of the bond.

13. Lance Whittingham IV specializes in buying deep discount bonds. These represent bonds that are trading at well below par value. He has his eye on a bond issued by the Leisure Time Corporation. The $1,000 par value bond with semiannual payments has 4 percent annual interest and has 16 years remaining to maturity. The current yield to maturity on similar bonds is 10 percent.
    a. What is the current price of the bonds?
    b. By what percent will the price of the bonds increase between now and maturity?
    c. What is the annual compound rate of growth in the value of the bonds? (An approximate answer is acceptable.)
14. Bonds issued by the Coleman Manufacturing Company have a par value of $1,000, which is also the amount of principal to be paid at maturity. The bonds are currently selling for $850. They have 10 years to maturity. Annual interest is 9 percent ($90), paid semiannually. Compute the yield to maturity.
15. Bonds issued by the Tyler Food Chain have a par value of $1,000, are selling for $1,080, and have 20 years remaining to maturity. Annual interest payment is 12.5 percent ($125), paid semiannually. Compute the yield to maturity.
16. Pia Cloe is considering a bond investment in the Miette Music Company. The $1,000 bonds have a quoted annual interest rate of 12 percent, and the interest is paid semiannually. The yield to maturity on the bonds is 10 percent annually. There are 15 years to maturity. Compute the price of the bonds.
17. You are called in as a financial analyst to appraise the bonds of the Holtz Corporation. The $1,000 par value bonds have a quoted annual interest rate of 14 percent, paid semiannually. The yield to maturity on the bonds is 12 percent annually. There are 15 years to maturity.
    a. Compute the price of the bonds.
    b. With 10 years remaining to maturity, if yield to maturity goes down substantially to 8 percent, what will be the new price of the bonds?
    c. With a price of $858 what is the yield to maturity if the bond has 10 years to maturity?
18. Douglas bonds mature in 10 years and have an annual coupon rate of 10.5 percent with semiannual payments. The $1,000 par value bond currently trades at $1,105 in the market. Compute the annual yield to maturity on the Douglas bond.
19. A $1,000 par value bond has a 6 percent coupon, which is paid on a semiannual basis. It matures in either 1 year or 20 years. Current yields on similar bonds are either 4 percent or 8 percent.
    a. Calculate the price of the bond for the four possibilities.
    b. What is the relationship between price and yield?
    c. What is the relationship between bond price changes and time to maturity?
20. A preferred share of Hilton Chocolate Company pays an annual dividend of $6. It has a required rate of return of 8 percent. Compute the price of a preferred share.
21. Airdrie Lanes preferred shares pay an annual dividend of $1.20, payable on a quarterly basis. Current yields of similar risk preferred shares are 3 percent. What is the price of each preferred share?
22. X-Tech issued preferred shares many years ago. They carry a fixed dividend of $5 per share. With the passage of time, yields have soared from the original 5 percent to 12 percent (yield is the same as required rate of return).
    a. What was the original issue price?

b. What is the current value of a X-Tech preferred share?

c. If the yield on the Preferred Stock Index declines, how will the price of these preferred shares be affected?

23. The Quaid Brothers Corporation has preferred shares outstanding that pay an annual dividend of $12. Each has a price of $108. What is the required rate of return (yield) on the preferred stock?

24. B2Y Solutions has preferred shares outstanding that pay an annual dividend of $3, payable quarterly. Each has a price of $75.00. What is the required rate of return (yield) on the preferred stock?

25. Stagnant Iron and Steel Co. currently pays a $4.20 annual cash dividend (D_0). It plans to maintain the dividend at this level for the foreseeable future, as no future growth is anticipated. If the required rate of return by common shareholders (K_e) is 12 percent, what is the price of each common share?

26. Allied Coal will pay a common share dividend of $3.40 at the end of the year (D_1). The required return on common shares (K_e) is 14 percent. The firm has a constant growth rate (g) of 8 percent. Compute the current price of the shares (P_0).

27. Husky Kennels will pay a quarterly common share dividend of $0.20 at the end of the next quarter. The required return on common shares is 8 percent and the firm has a constant growth rate of 3 percent. Compute the price of a common share of Husky.

28. Friedman Steel Company will pay a dividend of $1.50 per share in the next 12 months (D_1). The required rate of return (K_e) is 10 percent and the constant growth rate is 5 percent.

a. Compute P_0.

(For the remaining questions in this problem, all variables remain the same except the one specifically changed. Each question is independent of the others.)

b. Assume K_e, the required rate of return, goes up to 12 percent, what will be the new value of P_0?

c. Assume the growth rate (g) goes up to 7 percent, what will be the new value of P_0?

d. Assume D_1 is $2, what will be the new value of P_0?

29. The Fleming Corporation paid a dividend of $4 last year. Over the next 12 months, the dividend is expected to grow at 8 percent, which is the constant growth rate for the firm. The new dividend after 12 months will represent D_1. The required rate of return is 13 percent. Compute the price of a common share.

30. Rick's Department Stores has had the following pattern of earnings per share over the last five years:

Year	Earnings per Share
20XU	$4.00
20XV	4.20
20XW	4.41
20XX	4.63
20XY	4.86

The earnings per share have grown at a constant rate (on a rounded basis) and will continue to do so in the future. Dividends represent 40 percent of earnings.

a. Project earnings and dividends for the next year (20XZ). Round all values in this problem to two places to the right of the decimal point.