CHAPTER 10

Valuation and Rates of Return

LEARNING OBJECTIVES

- **LO1** Describe the valuation of a financial asset as based on the present value of future cash flows.
- **LO2** Propose that the required rate of return in valuing an asset is based on the risk involved.
- **LO3** Assess the current value (price) of bonds, preferred shares (perpetuals), and common shares based on the future benefits (cash flows).
- **LO4** Evaluate the yields on financial claims based on the relationship between current price and future expected cash flows.
- **LO5** Describe the use of a price-earnings ratio to determine value.

Chapter 9 considered the basic principles of the time value of money. In this chapter we extend this concept to determine how financial assets (bonds, preferred stock, and common stock) are valued and how investors establish the rates of return they require for investing in these assets. The following chapter uses the material from this chapter to determine the overall cost of financing to the firm. For the corporation to attract funds it must pay the rates of return (yields) demanded by the providers of capital (bondholders and shareholders). These costs of corporate financing (capital) are collectively the firm's cost of capital, which is employed in Chapters 12 and 13 to analyze whether or not a project is an acceptable investment (the capital budgeting decision). This development is depicted in Figure 10–1.

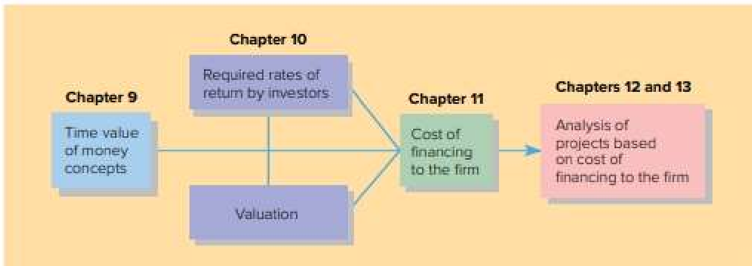


Figure 10–1 The relationship between time value of money, required return, cost of financing, and investment decisions

Financial calculators are used to work the problems in this chapter. Your answer will be slightly different if it is determined using the tables. Whether you use tables, calculators, or computers to do these calculations, you must firmly comprehend the concept behind present value analysis to be successful.

VALUATION CONCEPTS

LO1 In our market-based or mixed capitalistic system, the value of an asset is ultimately determined by what someone else is prepared to pay for it at the moment. When financial assets trade on a regular basis in well-developed financial markets, current values are easily determined. In less well-developed markets (thin markets) or where markets do not exist at all, we require other objective measures for determining value.

What someone is prepared to pay for a financial asset (or security) is referred to as its market value. The financial assets that we study in this chapter often trade in financial markets, where their prices change minute by minute. Thus, market values change regularly.

A financial asset (capital), as contrasted to a real asset, is basically a claim against a firm, government, or individual for future expected cash flows. Its current or market value can therefore be seen as deriving from future expected benefits and the return that investors expect from those benefits. With new information, investors change their expectations about future cash payouts and their required rates of return from securities. Prices will be bid up or down according to interpretations of this new information as the financial assets are exchanged between investors.

Valuation of a financial asset based on these concepts can also be seen as the present value of those future anticipated cash flows derived using an appropriate discount rate. This is our "time value of money" concept. In well-developed financial markets, the present value of a financial asset's future expected cash flows should be equal to its market value. In "thin" or nonexistent markets we will often rely on present value techniques for valuating a financial security.

Throughout the balance of this chapter, concepts of valuation are applied to corporate bonds, preferred stock, and common stock. Although we describe the basic characteristics of each form of security as part of the valuation discussion, extended discussion of each security is deferred until Chapters 16 and 17.

LO2 Yield

The market-determined required rate of return is the discount rate used for the "time value" calculations, and depends on the market's perceived level of risk associated with an individual security. Required or expected rates of returns on investments are referred to as yields. Sometimes the yield is called an interest rate, but "interest rate" more appropriately refers to fixed payments and may be only part of the total return, or yield, on an investment. Capital is allocated to companies by the market and investors based on estimates of risk, efficiency, and expected returns—which are based to some degree on past performance. The reward to the manager for the efficient use of capital is a lower required return demanded by investors compared to competing companies that do not manage their financial resources as well.

Required rates of return are competitively determined among the many companies seeking financial capital. For example, the Royal Bank, due to its low financial risk, reasonable return, and strong market position in banking, is likely to raise debt or equity capital at a significantly lower cost than Bombardier, which has a much more volatile business environment. Investors are willing to accept a lower return for a lower risk, and vice versa.

The required rate of return is usually envisioned over the length of time the investor expects to own or hold the financial security. Thus, the yield to maturity, or discount rate, is the rate of return required by investors over that period. The investor allows three basic factors to influence his or her required rate of return.

www.

Bombardier, Inc.
bombardier.com

RBC Royal Bank
rbcroyalbank.com

Bank of Canada
bankofcanada.ca

1. The Required Real Rate of Return This is the rate of return that the investor demands for giving up current use of the funds on a non-inflation-adjusted basis. It is the financial rent the investor charges for using his or her funds for one year, five years, or any given time period. Historically, the real rate of return demanded by investors has been about 2 to 3 percent. Throughout the 1980s and early 1990s, the real rate of return was much higher—5 to 7 percent. Today, we are back to the more long-term historical norm.

2. Inflation Premium In addition to the real rate of return, the investor requires a premium to compensate for the eroding effect of inflation on the value of the dollar. It would hardly satisfy an investor to have a 3 percent total rate of return in a 5 percent inflationary economy. Under such circumstances, the lender (investor) would be paying the borrower 2 percent (in purchasing power) for use of the funds. This would be irrational. No one wishes to ***pay*** another party to use his or her funds. The inflation premium added to the real rate of return ensures that this does not happen. The size of the inflation premium is based on the investor's expectations about future inflation. Through the 1980s the inflation premium was 4 to 5 percent. In the late 1970s it was in excess of 10 percent. Since 2000 the annual inflation rate has been slightly less than 2 percent.

If one combines the real rate of return and the inflation premium, the risk-free rate of return is determined. This is the rate that compensates the investor for the current use of his or her funds and for the loss in purchasing power due to inflation, but not for taking risks. The risk-free rate of return is often considered to be the yield on Government of Canada Treasury bills. As an example, if the real rate of return was 3 percent and the inflation premium was 4 percent, we would say the risk-free rate of return was 7 percent.[1]

In Chapter 6 we examined the term structure of interest rates by looking at the yields for various maturities of Government of Canada securities. We discovered first that because of a liquidity preference to deal with uncertainty, longer-term rates are higher than short-term rates. Second, a yield curve is a reflection of the expectations of investors as to what they believe interest rates, or yields, will be in the future. Those expectations are formulated by many factors, including inflationary expectations, government monetary policy, government fiscal policies (in particular, the upward pressure on interest rates created by the demands of debt financing), and the influences on Canadian interest rates from the global financial community.

3. Risk Premium We must now add the risk premium to the risk-free rate of return. This is a premium associated with the special risks of a given investment. Of primary interest to us are two types of risks: business risk and financial risk. Business risk relates to the possible inability of the firm to hold its competitive position and maintain stability and growth in its earnings. We can relate this to the firm's capital assets and operating leverage. Financial risk relates to the possible inability of the firm to meet its debt obligations as they come due. This relates to the firm's capital structure and the maturity of its financial obligations. This is the financial leverage we examined in Chapter 5. From an investor's viewpoint, we often speak of different risks such as

> ***Default risk:*** that the firm will not be able to meet its payment obligations as promised
>
> ***Liquidity risk:*** that there is a weak market for a firm's securities, making it difficult to sell them on short notice
>
> ***Maturity risk:*** that the value of the security will fluctuate due to the time until final payment

Whatever the label, risk concerns add to the required rate of return.

In addition to these two forms of risk, the risk premium is greater or less for different investments. For example, because bonds possess a contractual obligation for the firm to pay interest and repay principal to bondholders, they are considered less risky than common stock, where no such obligation exists. On the other hand, common stock carries the potential for unlimited return when the corporation is very profitable.

The risk premium of an investment may range from as low as zero on a very short-term Canadian government-backed security to 10 to 15 percent on a gold mining expedition. Typical risk premiums range from 2 to 6 percent. On the corporate bonds of a somewhat risky firm we might suggest a risk premium of 3 percent. If we add this risk premium to the two components of the risk-free rate of return, we arrive at an overall required rate of return of 10 percent.

+ Real rate of return	3%
+ Inflation premium	4
= Risk-free rate	7%
+ Risk premium	3
= Required rate of return	10%

[1]Actually, a slightly more accurate representation would be

$$\text{Risk-free rate} = (1 + \text{Real rate of return})(1 + \text{Inflation premium}) - 1$$

We would show

$$(1.03)(1.04) - 1 = 0.0712 = 7.12 \text{ percent}$$

In this instance, we assume that we are evaluating the required return on a bond issued by a firm. If the security had been the common stock of the same firm, the risk premium might have been 5 to 6 percent, thus making the required rate of return 12 to 13 percent.

As we conclude this section, please recall that the required rate of return is effectively identical to the yield expected by investors. The required rates of return and their components are common to the valuation of all financial securities.

VALUATION OF BONDS

LO3 A bond represents a long-term debt owed by a firm (or government) to an investor (bondholder) that obligates it to make regular interest (or coupon) payments and then a final lump-sum payment at a future date (maturity). This is one of the ways a firm hopes to raise long-term capital to invest in revenue-generating assets. A bond is usually outstanding for several years from the date it is originally sold (issued) to the final payment at maturity. During this time the bond may be traded many times in the financial markets among investors, and its price will fluctuate based on the prevailing supply and demand factors.

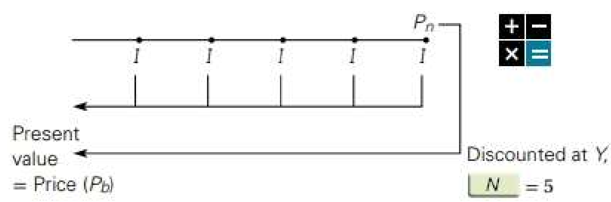
A bond contractually promises a stream of annuity payments (known as ***interest*** or ***coupon***) and a final payment (known as ***maturity***, or ***face*** or ***par value***). Generally, the maturity value is $1,000. In its most common form, the maturity value and coupon payments of a bond are fixed (cannot change) by contract over the term of the bond.

Investors will value these future expected cash flows to determine the current price of the bond. The discount factor used to determine the price or present value is called the yield to maturity (Y). Yield, therefore, is the relationship between the price investors are prepared to pay and future expected cash flows—in this case, the coupon payments and the maturity value. The value of ***Y*** is determined in the bond markets and represents the required rate of return demanded by investors on a bond of a given risk and maturity. ***Yield to maturity and the interest (or coupon) rate are not the same thing.***

Over time, the market will evaluate different economic factors and a new yield, or required rate of return, will be demanded on the bond. Because the coupon payments and maturity values are fixed, the price of the bond will move up or down as these benefits become more or less desirable. Bond prices change constantly in the financial markets. Therefore, the price of a bond, discounted by the current yield to maturity (***Y***), is equal to the sum of

- The present value of regular interest payments and
- The present value of the maturity value

This relationship can be expressed graphically as follows:



Where

P_b = Price of the bond
I_t = Interest payments
P_n = Principal payment at maturity
t = Number corresponding to a period; running from 1 to n
N = Total number of periods
Y = Yield to maturity (or required rate of return)

FINANCE IN ACTION

Market Yields and Market Values

The financial markets offer a wide range of yields, for the most part based on the risk of the investment. The risk of the investment generally centres on whether the investor is likely to receive the promised future payments, be they interest, dividend payments, or capital gains.

Although we speak of required rates of return, we must remember that no future returns are certain and can only be "expected." In March 2017, a range of yields included

Treasury bills (one-month)	0.43%
10-year government bond	1.76
10-year corporate bond.........................	2.73
Dividend yield (S&P/TSX Composite)	2.67
Price-earnings ratio (S&P/TSX Composite Index)....	18.80×

A roller coaster of expected and realized returns has been exhibited by the company formerly known as Research In Motion (RIM), rising from a market share value of $4.5 billion in mid-2006 to almost $80 billion in mid-2008, and then back to $5 billion by early 2017, by which time the company had been renamed BlackBerry. During that same period, the Royal Bank value rose fairly steadily from $59 to $142 billion.

Share prices usually reflect the market's belief in a firm's ability to generate revenues and profits.

Q1 What are current yields in the marketplace?

Q2 What are the current equity value and revenue of BlackBerry and the Royal Bank?

blackberry.com
Symbol: BB

rbc.com
Symbol: RY

tmx.com
canadianfixedincome.ca

With a calculator:

$$P_b = \boxed{PV} \qquad I_t = \boxed{PMT}$$
$$N = \boxed{N} \qquad Y = \boxed{I/Y}$$
$$P_n = \boxed{FV}$$

Let us consider the following example in which a $1,000 bond pays $100 interest payments for 20 periods and the required yield to maturity is 10 percent. The bond price would be as follows:

From our graphical representation,

$$P_n = \boxed{FV} = \$1{,}000$$
$$I = \boxed{PMT} = \$100$$
$$\boxed{N} = 20$$
$$Y = \boxed{I/Y} = 10$$
$$\boxed{CPT}\ \boxed{PV} = P_b = -\$1{,}000.$$

This relationship can also be expressed mathematically, using the same notation, by the following formula:

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

Using the same example as above,

$$P_b = \sum_{t=1}^{20} \frac{\$100}{(1+0.10)^t} + \frac{\$1{,}000}{(1+0.10)^{20}} = \$1{,}000$$

Tables (optional) We could use present value tables. Take the present value of the interest payments (Appendix D) and then add this value to the present value of the principal payment at maturity (Appendix B).

(PV_A) Present value of interest payments	\$ 851.40
(PV) Present value of principal payment at maturity .	149.00
Total present value, or price, of the bond	\$1,000.40

The price of the bond in this case is essentially the same as its par, or stated, value to be received at maturity of \$1,000. This is because the annual interest rate is 10 percent (the annual interest payment of \$100 divided by \$1,000), and the yield to maturity, or discount rate, is also 10 percent. When the interest rate on the bond and the yield to maturity are equal, the bond trades at par value.

TIME AND YIELD TO MATURITY—IMPACT ON BOND VALUATION

Let us now examine the conditions in the market that cause the yield to maturity to change, and the subsequent effect on the price of a bond.

LO4 **Increase in Inflation Premium** Although other factors will cause the required rate of return to change almost continually, inflation tends to be a major factor. For example, assume that the inflation premium, from our previous example, goes up from 4 to 6 percent while all else remains constant. The required rate of return would now become 12 percent.

+ Real rate of return	3%
+ Inflation premium	6
= Risk-free rate	9%
+ Risk premium	3
= Required rate of return	12%

This increase in the required rate of return, or yield to maturity, on the bond causes its price to change. Of course, the required rate of return on all other financial assets also goes up proportionately. A bond that pays only 10 percent interest when the required rate of return (yield to maturity) is 12 percent has its price fall below its former value of approximately \$1,000. The new price of the bond, \$850.61, is computed as follows:

FV = $1,000

0	1	...	20
	$100	$100	$100

PV = ?

N = 20
I/Y = 12%
(current yield)
PMT = 100

CPT PV = **−$850.61.**

A purchaser of this bond, selling at this ***discount*** price, still receives a 12 percent return, but it consists of interest and capital appreciation with the maturity payment.

Spreadsheet: Bond value

	A	B	C	D	E	F	G
1	rate	%I/Y	12%		"= + PV(C1,C2,C3,C4,)		
2	nper	N	20		"= PV(rate, nper,(pmt),(fv),[type])		
3	pmt	PMT	-$100		$850.61		
4	fv	FV	-$1,000				
5					"= +RATE(12,20,-100,-1000)		
6					"= rate(rate, nper,(pmt),(fv),[type])		
7					$850.61		

Tables (optional) Total Present Value

(PV_A) Present value of interest payments (Appendix D)	$746.90
(PV) Present value of principal payment at maturity (Appendix B) . .	104.00
Total present value, or price, of the bond	$850.90

In this example, we assumed that increasing inflation caused the required rate of return (yield to maturity) to go up and the bond price to fall by approximately $150. The same effect would occur if the business risk increased or if the demanded level for the ***real*** rate of return became higher.

Decrease in Inflation Premium Of course, the opposite effect would happen if the required rate of return went down because of lower inflation, less risk, or other factors. Let's assume that the inflation premium declines and the required rate of return (yield to maturity) goes down to 8 percent. The 20-year bond with the 10 percent interest rate would now sell for $1,196.36.

FV = $1,000

0	1	...	20
	$100	$100	$100

PV = ?

N = 20
I/Y = 8%
(current yield)
PMT = 100

CPT PV = **−$1,196.36.**

A purchaser of this bond, selling at this premium price, will receives an 8 percent return, but it consists of higher interest and a capital loss with the maturity payment.

Tables (optional) Total Present Value

(PV_A) Present value of interest payments (Appendix D)	$ 981.80
(PV) Present value of principal payment at maturity (Appendix B) ...	215.00
Total present value, or price, of the bond	$1,196.80

The price of the bond has now risen $196.36 above par value. This is certainly in line with the expected result, because the bond is paying 10 percent interest when the required yield in the market is only 8 percent. The 2 percent differential on a $1,000 par value bond represents $20 per year. The investor receives this differential for the next 20 years. The present value of $20 for the next 20 years at the current market rate of interest of 8 percent is $196.36. This explains why the bond is trading at $196.36 over its stated, or par, value.

The further the yield to maturity on a bond falls away from the stated interest rate on the bond, the greater the price change effect is. This is illustrated in Table 10–1 for the 10 percent interest rate, 20-year bonds discussed in this chapter. Also, note the inverse relationship between price and yield. As required yield increases, price decreases, and as yield decreases, price increases.

(10 percent interest payment, 20 years to maturity)

Yield to Maturity	Bond Price
2%	$2,308.11
4	1,815.42
6	1,458.80
7	1,317.82
8	1,196.36
9	1,091.29
10	1,000.00
11	920.37
12	850.61
13	789.26
14	735.07
16	644.27
20	513.04
25	406.92

Table 10–1 Bond price sensitivity to yield to maturity

Clearly, different yields to maturity have a significant impact on the price of a bond.[2]

[2]Observe that the impact of a decrease or increase in interest rates is not equal. For example, a 2 percent decrease in interest rates produces a $196.36 gain in the bond price, and an increase of 2 percent causes a $149.39 loss. Although price movements are not symmetrical around the price of the bond when the time dimension is the maturity date of the bond, they are symmetrical around the duration of the bond. The duration represents the weighted average time period to recapture the interest and principal on the bond.

Time to Maturity

The impact of a change in yield to maturity on valuation is also affected by the remaining time to maturity. The effect of a bond paying 2 percent more or less than the going rate of interest is much greater for a 20-year bond than it is for a 1-year bond. In the latter case, the investor gains or gives up only $20 for one year. That is not the same as having this differential for an extended time. Let's once again return to the 10 percent interest rate bond and show the effect of a 2 percent decrease or increase in yield to maturity for varying ***times*** to maturity. The values are shown in Table 10–2 and graphed in Figure 10–2. The upper part of the figure shows how the amount (premium) above par value is reduced as the number of years to maturity becomes smaller and smaller. The figure should be read from left to right. The lower part shows how the amount (discount) below par value is reduced with progressively fewer years to maturity. Clearly, the longer the maturity the greater the impact of changes in yield.

Time period in years (of 10 percent coupon bond)	Bond price with 8 percent yield to maturity	Bond price with 12 percent yield to maturity
0	$1,000.00	$1,000.00
1	1,018.52	982.14
5	1,079.85	927.90
10	1,134.20	887.00
15	1,171.19	863.78
20	1,196.36	850.61
25	1,213.50	843.14
30	1,225.16	838.90

Table 10–2 Bond price sensitivity to time to maturity changes

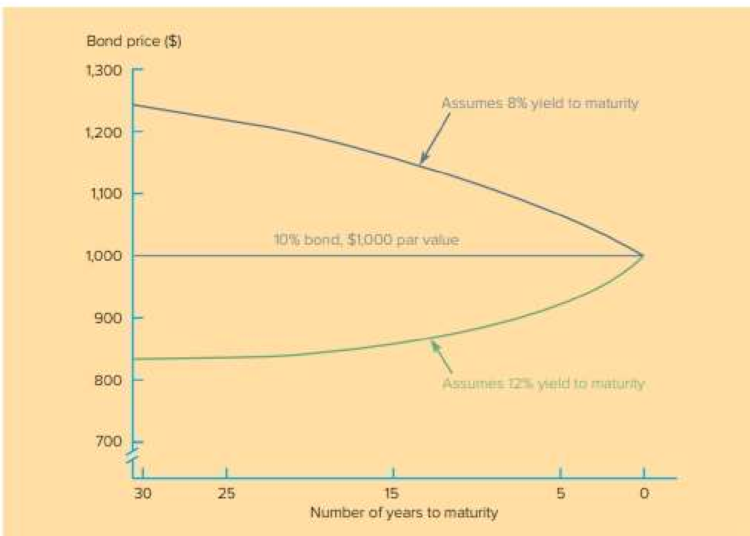


Figure 10–2 Relationship between time to maturity and bond price*

*The relationship in the graph is not symmetrical in nature.