

LAURENCE BOOTH • W. SEAN CLEARY



INTRODUCTION TO  
**CORPORATE  
FINANCE**

SECOND EDITION

INTRODUCTION TO  
CORPORATE  
FINANCE

MANAGING CANADIAN FIRMS  
IN A GLOBAL ENVIRONMENT

Second Edition

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input data are the same.<sup>2</sup> Other ratios, such as the debt ratio, have multiple definitions, that can vary quite widely in their calculation, and hence their interpretation. Acting on the assumption that all ratios are prepared on the same basis can lead to misleading conclusions, and it is essential to always compare “apples with apples,” and not “oranges.”

### CONCEPT REVIEW QUESTIONS

1. What difficulties do analysts face when trying to compare the financial statements of firms that are based in different countries?
2. Why should people be aware of the precise definition of a financial ratio employed by the source of the ratio?

## 4.2 A FRAMEWORK FOR FINANCIAL ANALYSIS

### Return on Equity (ROE) and the DuPont System

The **return on equity (ROE)** is one of the most commonly referenced ratios for good reason: it measures the return earned by the equity holders on their investment in the company. It is calculated as the net income (NI) divided by shareholders' equity (SE), as shown in Equation 4-1.<sup>3</sup>

$$ROE = \frac{NI}{SE}$$

[4-1]

We calculate the 2008 ROE for Tim Hortons Inc. by using the figures reported in their financial statements, which were included in Chapter 3, and we will do the same for the other ratios introduced in this chapter. In 2008, NI was \$284.678 million, while SE was \$1,140.404 million, so Tim Hortons' ROE was as follows:

$$ROE = \frac{NI}{SE} = \frac{284.678}{1,140.404} = 24.96\%$$

This is a healthy ROE figure that would be rated above average, and which suggests that Tim Hortons lies at the upper end of corporate profitability in Canada (or anywhere else for that matter).

ROE is not a “pure” financial ratio because it involves dividing an income statement (flow) item by a balance sheet (stock) item.<sup>4</sup> As a result, some people calculate the ROE

#### Learning Objective 4.2

Explain why return on equity is one of the key financial ratios used for assessing a firm's performance, and how it can be used to provide information about three areas of a firm's operations.

return on equity (ROE) the return earned by equity holders on their investment in the company; net income divided by shareholders' equity

<sup>2</sup> This is not because they make mistakes, but rather because they employ different definitions of the same ratio.

<sup>3</sup> ROE can also be defined as NI available to the common shareholders (i.e., NI – preferred dividends) divided by common equity (CE). For Tim Hortons, there is no difference, because the company does not have any preferred equity. For some firms, it can make a difference.

<sup>4</sup> “Pure” ratios involve dividing an income statement item by another income statement item, or dividing a balance sheet item by another balance sheet item.

as NI over the “average” SE—that is, the average of the starting and ending SE. This adjustment acknowledges that NI is earned throughout the year, so it makes sense to divide by an average of SE to recognize that not all of those funds were invested throughout the year. For example, the ending SE is partly the result of the retained earnings for the year, which, in turn, is dependent on the net income for the year; however, with three years of data, the use of the average SE causes the loss of an observation. As a result, most analysts use the ending SE as the denominator simply to get more estimates of the ROE; that way, they can assess a trend over time. However, this tends to understate a firm’s profitability on average, because the ending SE will usually exceed the average for the year if the firm is profitable.

The next step in financial analysis is to understand where Tim Hortons’ ROE came from. The most popular approach to “decomposing” ROE is attributable to the DuPont Corporation, which pioneered a variation of the expansion of the ROE shown in Figure 4-1.

The DuPont system provides a good starting point for any financial analysis and is commonly included in research reports as a way of summarizing a firm’s key financial ratios. Table 4-1 shows the information for Tim Hortons for 2007 and 2008, as provided by Scotia iTRADE (formerly E-Trade Canada Securities Corporation). We do not comment on the items in the table now, but you will see how all the reported figures and ratios are related as you proceed through this section, with particular emphasis on the 2008 numbers.

The DuPont approach defines the firm’s **return on assets (ROA)** as NI divided by total assets (TA), as shown in Equation 4-2.

return on assets (ROA)  
net income divided by total  
assets

[4-2]

$$ROA = \frac{NI}{TA}$$

leverage ratio total assets  
divided by shareholders’  
equity; it measures how  
many dollars of total assets  
are supported by each dol-  
lar of shareholders’ equity,  
or how many times the firm  
has leveraged the capital  
provided by the sharehold-  
ers into total financing

For Tim Hortons in 2008,

$$ROA = \frac{NI}{TA} = \frac{284.678}{1,992.627} = 14.29\%$$

If the ROA is multiplied by TA and divided by SE, the TA’s cancel out and produce the ROE. So what is TA divided by SE? This is called the **leverage ratio**, and it measures how

FIGURE 4-1  
DuPont System

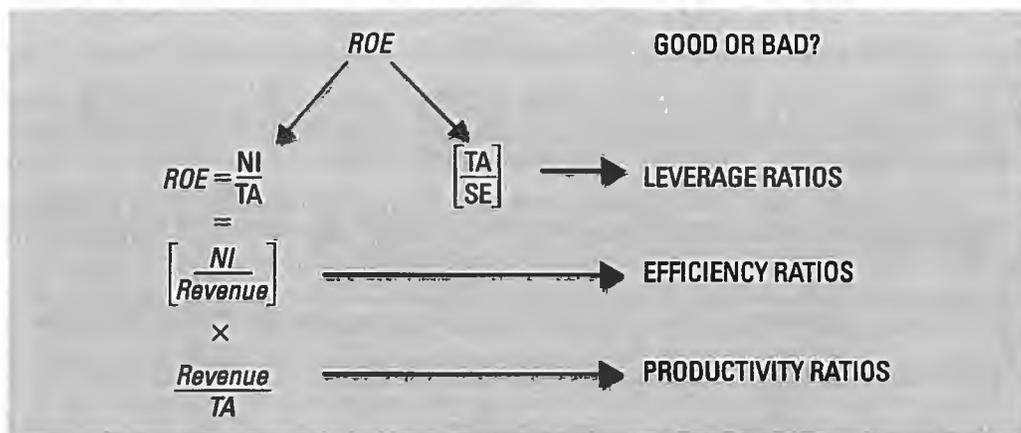


TABLE 4-1 Scotia iTRADE's ROE Analysis for Tim Hortons, Inc.

Return on Equity	12/31/2008	12/31/2007
(1) Net sales	1,348,025	1,248,574
(2) Pretax income	423,924	408,402
(3) Net Income	284,678	269,551
(4) Total assets	1,992,627	1,797,131
(5) Shareholders' equity	1,140,404	1,002,083
Pretax margin % (2/1)	31.45	32.71
x Tax retention % (3/2)	67.15	66.00
= Profit margin % (3/1)	21.12	21.59
x Assets utilization % (1/4)	67.65	69.48
= ROA % (3/4)	14.29	15.00
x Leverage % (4/5)	174.73	179.34
= ROE % (3/5)	24.98	26.90

Source: Data from the Scotia iTRADE website at [www.scotiaintrade.com](http://www.scotiaintrade.com).

many dollars of total assets are supported by each dollar of SE, or how many times the firm has "leveraged" the capital provided by the shareholders into total financing. It is shown in Equation 4-3.

$$\text{Leverage} = \frac{TA}{SE}$$

[4-3]

The 2008 leverage ratio for Tim Hortons is as follows:

$$\text{Leverage} = \frac{TA}{SE} = \frac{1,992.627}{1,140.404} = 1.747, \text{ or } 174.7\%$$

Thus, Tim Hortons has leveraged every dollar of shareholders' equity into \$1.747 of total financing by using debt and other forms of liabilities to help finance its operations.

The way to interpret this ratio is that every dollar of total assets earned an ROA of 14.29 percent, but the shareholders didn't provide all this financing. They provided about 57 percent of the money to buy the firm's total assets (i.e.,  $1/1.747$ )—that is, the firm leveraged up each dollar of shareholders' equity by 1.747. As a result, the ROE is the ROA of 14.29 percent multiplied by the leverage ratio of 1.747, which gives an ROE of 24.96 percent. What this figure means is that part of the reason for Tim Hortons' high ROE is that it is extremely profitable and has a high ROA of 14.29 percent. The rest of the story is that Tim Hortons magnified this ROA using financial leverage. As a result, when we analyze corporate performance, we look at ROE, ROA, and a series of

financial leverage the use of capital provided by shareholders to increase total financing

ratios that measure **financial leverage**, since how the firm finances its operations is very important.

We can now decompose ROA into two of its major components: the firm's **net profit margin** and its (asset) **turnover ratio**, which we show in Equation 4-4 and Equation 4-5.

$$[4-4] \quad \text{Net profit margin} = \frac{NI}{\text{Revenues}}$$

$$[4-5] \quad \text{Turnover ratio} = \frac{\text{Revenues}}{TA}$$

net profit margin part of return on assets; net income divided by revenues

Multiplying the two together cancels the revenues figure on the bottom of net profit margin with the revenues figure on the top of the turnover ratio, leaving NI/TA, or simply the ROA, as shown in Equation 4-6.

$$[4-6] \quad \text{ROA} = \frac{NI}{TA} = \frac{NI}{\text{Revenues}} \times \frac{\text{Revenues}}{TA}$$

turnover ratio part of return on assets; revenues divided by total assets

For Tim Hortons, the 2008 net profit margin or (return on revenues) was as follows:

$$\text{Net profit margin} = \frac{NI}{\text{Revenues}} = \frac{284.678}{1,348.025} = 21.12\%$$

So Tim Hortons made profits of close to 14 percent of revenues earned. We look at the net profit margin to determine how *efficiently* the firm converts revenues into profits. Later in the chapter, we will expand our analysis to include additional efficiency ratios.

So if every dollar of revenue earned Tim Hortons' 14 percent in profits, how many dollars of revenues did it generate from each dollar invested in assets, or, alternatively, what was its turnover ratio?

$$\text{Turnover ratio} = \frac{\text{Revenues}}{TA} = \frac{1,348.025}{1,992.627} = 0.677$$

For 2008, with total assets of \$1,992.627 million, Tim Hortons generated revenues of \$2,043.693 million. In other words, each dollar of assets generated about \$1.0256 in revenues. The turnover ratio is a productivity ratio, as it measures how *productive* the firm is in generating revenues from its assets. As you will see, several productivity ratios can be calculated to determine the main drivers of this overall productivity.

Now we have the major ratios of the DuPont formula. Putting them all together produces Equation 4-7.<sup>5</sup>

$$[4-7] \quad \begin{aligned} \text{ROE} &= \frac{NI}{SE} = \frac{NI}{\text{Revenues}} \times \frac{\text{Revenues}}{TA} \times \frac{TA}{SE} \\ &= \text{Net profit margin} \times \text{Turnover ratio} \times \text{Leverage ratio} \end{aligned}$$

<sup>5</sup> This is the simplest and most commonly used version of the DuPont system. There are other versions, which we do not discuss here, many of which break ROE into five or more components.

For Tim Hortons in 2008,

$$ROE = \frac{NI}{Revenues} \times \frac{Revenues}{TA} \times \frac{TA}{SE} = 0.2112 \times 0.677 \times 1.747 = 24.98\%$$

(as calculated at the start of this section).

Each dollar of equity supported \$1.747 of assets, which, in turn, generated \$1.0256 in revenues, which, in turn, generated a net profit margin of 13.93 percent. In other words, overall the ROE is determined by leverage, turnover, and profit margin. So what does this mean?

## Interpreting Ratios

A single ratio on its own provides little information. To judge whether a given ratio is “good” or “bad” requires some basis for comparison. Two bases are commonly used for comparison:

1. the company's historical ratios, or the *trend* in its ratios
2. *comparable* companies—for this purpose, we can use a similar company or use industry average ratios

Table 4-2 includes Tim Hortons' DuPont analysis ratios for 2007 and 2008.<sup>6</sup>

Often, unique factors drive a particular firm's ratios and that makes them difficult to compare with the ratios of other firms. For example, if a firm has made a recent large acquisition of another firm, key profitability and turnover ratios often drop. For this reason, it is important to look at a firm's ratios over time. What we can observe from Table 4-2 is that Tim Hortons was profitable in both 2007 and 2008, with ROEs of 26.90 percent and 24.96 percent, respectively. The net profit margin was around 14 percent in both years, while both the turnover ratio and the leverage ratio decreased slightly during 2008, resulting in a slight decline in ROE.

So how does Tim Hortons compare with its competition? Ideally, we would compare Tim Hortons with another Canadian fast-service food and coffee franchise company of similar size and market presence, or even an industry average comprising several

	2007	2008
ROE	0.2690	0.2496
ROA	0.1500	0.1429
Net profit margin	0.2159	0.2112
Turnover	0.695	0.677
Leverage	1.7933	1.7473

<sup>6</sup> Ideally, we would prefer to have three to five years of data for trend analysis, but as mentioned in Chapter 3, Tim Hortons was a subsidiary of Wendy's until September of 2006, so we are focusing on its subsequent numbers.

TABLE 4-3 McDonald's and Starbucks DuPont Ratios

	McDonald's (December)		Starbucks (September)	
	2007	2008	2007	2008
ROE	0.1529	0.3224	0.2946	0.1267
ROA	0.0795	0.1516	0.1259	0.0556
Net profit margin	0.1025	0.1834	0.0715	0.0304
Turnover	0.7753	0.8265	1.7612	1.8304
Leverage	1.9236	2.1267	2.3396	2.2773

similar Canadian firms. Certainly, this would be a viable approach if we were comparing the Canadian banks, because they are so similar. However, no other Canadian companies compare to Tim Hortons very well along several dimensions such as size, product offerings, and nationwide market presence.<sup>7</sup> Therefore, we have chosen two well-known U.S. companies, McDonald's Corporation and Starbucks Corporation, which have similar market presence as Tim Hortons in the markets in which Tim Hortons operates.<sup>8</sup> Both companies represent major competitors for Tim Hortons, even though they offer differentiated versions of Tim Hortons' product lines. McDonald's offers a wider variety of fast-food products, and Starbucks offers a "higher-end" version of Tim Hortons' product line but a narrower number of food offerings. Obviously, there are differences among the companies, but they represent reasonable benchmarks.

Table 4-3 provides the DuPont ROE data for McDonald's and Starbucks for 2007 and 2008. These ratios are comparable to Tim Hortons' ratios, although it should be noted that Starbucks has a September year end, while both Tim Hortons and McDonald's have December year ends.<sup>9</sup>

The 2007 and 2008 ROEs for McDonald's are 15 and 32 percent respectively, while Starbucks' ROEs are 29 and 13 percent, so Tim Hortons' ROEs are right in the middle in the 25 to 26 percent range. Notice that during 2008, which was a poor year for the economy (particularly in the second half of the year when we officially entered a recessionary period), McDonald's (the lower-end competitor) saw its ROE increase substantially, while Starbucks (the higher-end competitor) saw its ROE decline markedly, and Tim Hortons' ROE remained relatively constant. For both McDonald's and Starbucks, the change in ROE was driven by a large swing in the net profit margin, although McDonald's also improved its turnover ratio, and increased its leverage factor during 2008. Tim Hortons had stable profit margins of around 14 percent, which compare well

<sup>7</sup> Also, recall that Tim Hortons' financial statements have been prepared in accordance with U.S. GAAP, and we want to compare "apples with apples" to the greatest extent possible.

<sup>8</sup> The ratios for these two companies have been calculated based on the financial statement information we found for them at [www.globeinvestor.com](http://www.globeinvestor.com).

<sup>9</sup> The choice of fiscal year end can have a significant impact on reported financial ratios, based on annual financial statements, especially for firms that face a seasonal sales cycle. As a result, several balance sheet items, such as loans outstanding, accounts receivable, inventory, and accounts payable, will vary considerably during the year. The analyst must be aware of these factors when evaluating the ratios, and also when comparing to other "similar" firms that choose different fiscal year ends.

with its competitors. Tim Hortons' turnover ratio is slightly lower than McDonalds, but much lower than that for Starbucks, while its leverage ratios are lower than those for the two other companies, which indicates less financial risk.

On the surface, we could conclude that Tim Hortons has slightly better and more stable results than its competitors, because it generates similar (and more stable) ROEs based on similar profit margins and asset turnover, but uses less financial leverage. However, we should consider any possible contributing factors before reaching any conclusions. To get a better understanding of these results, we can extend the analysis of the leverage, efficiency, and productivity ratios.

#### CONCEPT REVIEW QUESTIONS

1. What three areas of a firm's operations does the DuPont system provide information about?
2. All else being equal, list three factors that will lead to higher ROE ratios.
3. What can we use as a basis for comparison when looking at financial ratios? What kind of information can we gain from this comparison?

## 4.3 LEVERAGE RATIOS

Leverage is synonymous with magnification. It is good when a firm is low risk and earns a healthy ROA, since it magnifies these high ROAs into even higher ROEs; but when the firm loses money, the use of leverage magnifies ROEs on the downside as well. This can get the firm into serious trouble, as discussed in the following Lessons to Be Learned.

#### Learning Objective 4.3

Describe, calculate, and evaluate the key ratios relating to financial leverage.

Figure 4-2 provides a graphical depiction of the five largest U.S. investment banks over the 2003–7 period. While the leverage ratios of financial institutions (FIs) are much higher than for traditional companies due to the very nature of FIs, Figure 4-2 shows a steady increase in these ratios, all of which exceeded 25 by 2007, with three exceeding 30. More conservative figures for banks would be in the range of 12 to 20.

The leverage ratio is a measure of the risk taken by a firm; a higher ratio indicates more risk. It is calculated as total debt divided by shareholders' equity. Each firm's ratio increased between 2003 and 2007.

As mentioned above, the use of leverage works well during good times, as good results are magnified and transformed to even better results. Unfortunately, during tough times, leverage also magnifies poor results. Either way, dramatic increases in leverage, and high use of leverage in an absolute sense, represent a high risk situation for any company, and in this case, it suggested a high level of systemic risk in the U.S. investment banking industry. Thus, this heavy build up of debt should have represented a warning signal to those following this industry.

So what happened to these banks? By the third quarter of 2008, these five investment banks (which do not have the stability afforded by depositors like a commercial bank) could no longer finance their operations and had either gone bankrupt (Lehman Brothers), merged with other institutions, or became depository banks to improve their ability to secure funds.

LESSONS  
TO BE  
LEARNED

because it disregards the bond's purchase price relative to all the future cash flows and uses just the next year's interest payment. The current yield is also sometimes referred to as the flat or cash yield. It can be calculated using Equation 6-3.

[6-3]

$$CY = \frac{\text{Annual interest}}{B}$$

**EXAMPLE 6-10****Current Yield**

Determine the current yield for the bond used in Example 6-8, which was trading for \$1,030.

**Solution**

$B = 1,030$ ; annual interest =  $\$30 \times 2 = \$60$  (or simply  $\$1,000 \times 0.06$ )

$$CY = \frac{60}{1,030} = 0.0583 \text{ or } 5.83\%$$

Notice that the current yield does not equal the coupon rate of 6 percent or the YTM of 5.74 percent. This will hold unless the bond is trading at its face value, in which case all three rates will be equal. It is clear that whenever bonds trade at a premium, the CY will be less than the coupon rate but greater than the YTM (as in Example 6-10), and whenever they trade at a discount, the CY will be greater than the coupon rate but less than the YTM, as shown in the following table.

**Price-Yield Relationships**

Bond Price	Relationship
Par	Coupon rate = CY = YTM
Discount	Coupon rate < CY < YTM
Premium	Coupon rate > CY > YTM

**CONCEPT REVIEW QUESTIONS**

1. Why is there no simple analytical formula for the yield to maturity?
2. When bonds sell above their par value, is the yield to maturity greater or less than the coupon rate?
3. Is the yield to call always greater than the yield to maturity?

**6.4 INTEREST RATE DETERMINANTS****Base Interest Rates**

Interest rates are usually quoted on an annual percentage basis. However, it is common to refer to changes in interest rates in terms of "basis points," each of which represents 1/100th of 1 percent. For example, a decrease of 10 basis points implies that interest rates declined 0.1 percent.

**Learning Objective 6.4**

List and describe the factors, both domestic and global, that affect interest rates.

As we discussed in Chapter 5, the interest rate is the price of money and, just like the price of any other commodity, is determined by the laws of supply and demand. In the case of interest rates, it is the supply of and demand for “loanable funds.” All else being constant, as the demand for loanable funds increases so does their price, and as a result, interest rates increase; conversely, interest rates decrease as the supply of loanable funds increases. The interest rates that we have been discussing so far are called **nominal interest rates**, because they are the rates charged for lending today’s dollars in return for getting dollars back in the future, without taking into account the purchasing power of those future dollars. One of the most important factors in determining these nominal interest rates is the expected rate of inflation because this determines the purchasing power of those future dollars.

In structuring our discussion of actual interest rates, we refer to the base rate as the **risk-free rate (RF)**. We will discuss risk at length shortly, but the term “risk-free,” although conventional, is a bit of a misnomer; what it actually refers to is **default free**, in that the investors know exactly how many dollars they will get back on their investment. It is common to use the yield on short-term government treasury bills (T-bills), which are discussed in greater detail later in this chapter, as a proxy for this risk-free rate. Federal government T-bill yields are considered risk-free because they possess no risk of default; the government essentially controls the Bank of Canada and can always have it buy any bonds that are issued, using Bank of Canada banknotes. Further, government T-bills possess little interest rate risk because their term to maturity is short.

As a result, we have the following approximate relationship:

$$RF \approx \text{Real rate} + \text{Expected inflation}$$

[6-4]

This relationship is an approximation of the direct relationship between inflation and interest rates that is often referred to as the “Fisher effect,” after Irving Fisher, who described how investors attempt to protect themselves from the loss in purchasing power caused by inflation by increasing their required nominal yield.<sup>12</sup> As a result, interest rates will be low when expected inflation is low and high when expected inflation is high.

The average return on Government of Canada T-bills over the 1938 to 2005 period was 5.2 percent. Over the same period, inflation averaged 3.99 percent, which indicates that the average real return over this period was 1.21 percent, or 121 basis points.<sup>13</sup>

### Estimating the Real Rate of Return

If T-bill rates are presently 4.5 percent and the expected level of inflation is 2 percent, estimate the real rate of return.

#### Solution

$$\text{Real rate} = 4.5 - 2 = 2.5\%$$

nominal interest rates the rates charged for lending today’s dollars in return for getting dollars back in the future, without taking into account the purchasing power of those future dollars

risk-free rate (RF) the rate of return on risk-free investments, which is often used as the base interest rate

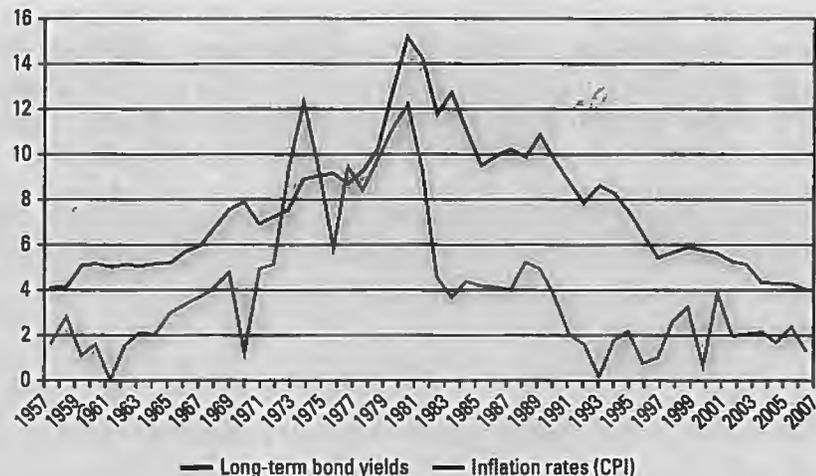
default free having no risk of non-payment

### EXAMPLE 6-11

<sup>12</sup> Technically, the correct procedure is to multiply  $(1 + \text{Real rate})$  by  $(1 + \text{Expected inflation})$  and subtract 1. The approximation in Equation 6-4 works very well when levels of inflation are relatively low, as they are today. See Fisher, Irving. “Appreciation and Interest.” *Publications of the American Economic Association* (August 1896), pp. 1–1001.

<sup>13</sup> Notice that we are looking at returns “after the fact” in this example. In practice, the return is based on expected inflation, which will usually not be the same as actual inflation.

FIGURE 6-3

*Interest Rates and Inflation*

The graph in Figure 6-3 provides the history of the annual inflation rate as measured by the consumer price index (CPI) and the yield to maturity on 30-year Government of Canada bonds over the 1957 to 2008 period.

The level of nominal interest rates generally tracked the increase in inflation throughout the 1960s, until inflation peaked at more than 12 percent in 1981. Since then, interest rates have generally declined with the rate of inflation. As we just discussed, one measure of the real rate is the difference between the ongoing expected inflation rate and the level of nominal interest rates. This difference was much larger from 1981 until recently than it was in the 1960s, because the capital market persistently failed to take into account the inflationary pressures in the economy at that time.

### Global Influences on Interest Rates

Although interest rate levels vary from one country to the next, global interest rates interact with one another. This occurs because most countries have now removed foreign exchange restrictions, allowing capital to flow from one country to another in search of higher rates of return. As a result, interest rates in Canada are heavily influenced by prevailing rates in other countries, especially those in the United States. This influence is inevitable in today's capital markets because money is the most generic of all commodities; if there are no restrictions, one price will prevail in the capital market.

Exactly how do foreign interest rates affect domestic interest rates? For example, why do investors not invest in the bonds of countries that are offering higher interest rates, and why do companies not issue bonds in countries with lower rates? The answer to these questions lies in the functioning of foreign exchange markets. For example, although it may be tempting to buy bonds in countries offering higher interest rates, the additional gains could easily be cancelled out (and even large losses incurred) as a result of adverse movements in the foreign exchange rates prevailing when funds are converted back into the domestic currency. In other words, investing or issuing debt abroad creates foreign exchange risk, which offsets the potential advantages that may arise from inter-country interest rate differentials.

The **interest rate parity (IRP) theory** demonstrates how differences in interest rates between countries are offset by expected changes in exchange rates. If this were not the case, capital would flow from countries with low interest rates to those with high interest rates, increasing the supply of capital in the country with higher rates, which would ultimately drive down borrowing costs. Similarly, the capital outflows from countries with low rates would cause their rates to rise in order to have the supply of funds equal the demand for these funds.

The IRP theory, which is discussed in greater detail in Appendix 6A, uses forward currency exchange rates to describe the precise relationship between interest rates and currency levels, because forward currency contracts can be used to eliminate foreign exchange risk. Essentially, the IRP theory states that forward exchange rates, which can be locked in today in order to eliminate foreign exchange risk, will be established at levels that ensure investors will end up with the same amount whether they invest at home or in another country (with no foreign exchange risk). Important factors that affect both interest rates and currency exchange rates are inflation and inflation differentials between countries. For example, if Canadian inflation exceeded that in the United States, we would expect that interest rates would be higher in Canada than in the United States. However, the inflation would cause the value of our currency to depreciate in relation to the U.S. dollar (USD) so that we could remain competitive in international trade. Thus, a U.S. investor who bought Canadian bonds in an attempt to benefit from our higher rates would lose these gains when he or she converted the Canadian dollar (CDN) payments back into USD.

In short, although interest rates are heavily influenced by inflation and other domestic macroeconomic variables, global factors, such as foreign exchange rates and inflation differentials, also play an important role in the level of interest rates at any given time.

## The Term Structure of Interest Rates

So far, we have discussed the major factors affecting the base level of interest rates or RF, which we proxy as the yield on short-term government T-bills. The yields on other debt instruments will differ from RF for several reasons. One important factor affecting debt yields is related to the term to maturity. This is obvious if we look at the Canadian bond quotes from Finance in the News 6-2, where we can see various yield levels for bonds with different maturity dates, even though they were issued by the same entity. For example, at the top of the chart, the Government of Canada benchmarks are yields ranging from 0.28 percent, for bonds maturing in six months, to 4.06 percent for 24-year bonds.

The relationship between interest rates and the term to maturity on underlying debt instruments is referred to as the **term structure of interest rates**. Finance in the News 6-3 provides a graphic representation of this relationship, which is often referred to as the **yield curve**. The curve must be based on debt instruments that are from the same issuer; otherwise, default risk (discussed below) and other risk factors, in addition to maturity differentials, will affect the difference in yields. Therefore, the yield curve is almost always constructed using federal government issues because they possess the same default risk, as well as similar issue characteristics. In addition, the government tends to have a large number of issues outstanding at any given time, so we can construct a yield curve with rate estimates for a wide variety of maturities.

**interest rate parity (IRP) theory** a theory that demonstrates how differences in interest rates between countries are offset by expected changes in exchange rates

**term structure of interest rates** the relationship between interest rates and the term to maturity on underlying debt instruments

**yield curve** the graphic representation of the term structure of interest rates, based on debt instruments from the same issuer

## CONCEPT REVIEW QUESTIONS

1. In what ways are preferred shares different from bonds?
2. How is a traditional preferred share valued?
3. How can we estimate the investor's required rate of return for a traditional preferred share?

## 7.3 COMMON SHARE VALUATION: THE DIVIDEND DISCOUNT MODEL (DDM)

### The Basic Dividend Discount Model

Valuing common shares involves several complications that arise with respect to the appropriate future cash flows that should be discounted. Which cash flows should be discounted? The most popular model for valuing discounted cash flow, which is discussed below, uses dividends. However, unlike bonds or even preferred shares, there is no requirement that common shares pay dividends at all. In addition, the level of dividend payments is also discretionary, which implies we must make estimates regarding the amount and timing of any dividend payments.

The **Dividend Discount Model (DDM)** assumes that common shares are valued according to the present value of their expected future cash flows. Based on this premise, today's price can be estimated using Equation 7-4, if we have an  $n$ -year holding period.

$$P_0 = \frac{D_1}{(1 + k_c)^1} + \frac{D_2}{(1 + k_c)^2} + \dots + \frac{D_n + P_n}{(1 + k_c)^n} \quad [7-4]$$

where  $P_0$  = the estimated share price today

$D_1$  = the expected dividend at the end of year 1

$P_n$  = the expected share price after  $n$  years

$k_c$  = the required return on the common shares

Consider Example 7-3, in which the investor plans to hold the stock for one year.

### Estimating Price of a Common Share for a One-Year Holding Period

An investor buys a common share and estimates she will receive an annual dividend of \$0.50 per share in one year. She estimates she will be able to sell the share for \$10.50. Estimate its value, assuming the investor requires a 10-percent return on this investment.

#### Solution

$$P_0 = \frac{0.50 + 10.50}{(1 + 0.10)^1} = \$10.00$$

### Learning Objective 7.3

Explain how to value common shares using the dividend discount model.

**Dividend Discount Model (DDM)** a model for valuing common shares that assumes they are valued according to the present value of their expected future dividends

### EXAMPLE 7-3

According to the DDM, the selling price at any point (say, time  $n$ ) will equal the present value of all the expected future dividends from period  $n + 1$  to infinity. So the price next year, for example, is the present value of the expected dividend and share price for year 2. By repeatedly substituting for the future share price, we replace it with the present value of the dividend and share price expected the following year. As a result, we remove  $P_n$  in Equation 7-4 and eventually get the following:

$$[7-5] \quad P_0 = \frac{D_1}{(1 + k_c)^1} + \frac{D_2}{(1 + k_c)^2} + \dots + \frac{D_\infty}{(1 + k_c)^\infty} = \sum_{t=1}^{\infty} \frac{D_t}{(1 + k_c)^t}$$

In other words, the price today is the present value of all future dividends to be received (i.e., from now to infinity).

Why use dividends? Well, if investors buy a particular stock, the only cash flows they will receive until they sell the stock will be the dividends. Although a firm's residual earnings technically belong to the common shareholders, corporations generally do not pay out all their earnings as dividends. Of course, earnings are important too—without them the corporation could not sustain dividend payments for long. In fact, earnings receive more attention from investors than any other single variable. However, corporations typically reinvest a portion of their earnings to enhance future earnings and, ultimately, future dividends. Finance in the News 7-1 discusses the importance of dividends to investors.

Equation 7-5 is the workhorse of share valuation because it says that the value of a share is the present value of expected future dividends. However, by repeatedly substituting for the share price, we are implicitly making a very important assumption: that

## finance

INTHENEWS7-1

### THE IMPORTANCE OF DIVIDENDS

**B**etween the credit crisis, global recession and now a swine flu outbreak, these are risky times for investors. What better way to ride out the turmoil than with blue-chip stocks that pay rising dividends?

Dividend growth stocks are attractive for a few reasons. They put a growing stream of cash in your pocket. The income is taxed at a favourable rate, thanks to the dividend tax credit. And studies have shown that, over long periods, stocks with rising dividends beat those with flat or no dividends.

That makes dividend stocks an excellent choice for investors, including retirees, BMO Nesbitt Burns' chief economist Sherry Cooper says in her latest book, *The New Retirement: How It Will Change Our Future*.

"The most favourable are those stocks with an attractive yield, a history of steady dividend growth above the rate of inflation, a low payout ratio and an improving position in the marketplace," she writes.

#### TODAY'S SCREEN

We'll update a stock screen that Ms. Cooper presents in her book. To make the cut, the company had to have a dividend yield of more than 2.5 percent and a five-year dividend growth rate of more than 10 percent. To emphasize dividend safety, the payout ratio—dividends divided by earnings—had to be less than 60 percent. And because we want stocks that are less risky, the beta—a measure of a stock's volatility in relation to the market—had to be less than 1.

#### WHAT DID WE FIND?

Reflecting the sinking economy, the list has shrunk from 12 companies when we last ran the screen in February to just seven today. Most are making a return appearance, but there are a couple of new names on the list—Fairfax Financial Holdings Ltd., which made a bundle betting against U.S. subprime mortgages, and specialty TV and radio operator Corus Entertainment Inc.

Source: Excerpted from Heinzl, John. "Dividend Growth Provides Comfort Amid Turmoil." *The Globe and Mail Report on Business*, April 29, 2009, B18.

investors are rational. We assume that at each point, investors react rationally and value the share based on what they rationally expect to receive the next year. This assumption specifically rules out “speculative bubbles” or what is colloquially known as the “bigger fool theorem.”

Suppose, for example, a broker tells a client to buy XYZ at \$30. The investor refuses because the stock is only worth \$25. The broker replies, “I know, but there is momentum behind it and I am seeing a lot of interest. I think it will go to \$40 by next year.” The investor is a fool to pay \$30 for something he or she thinks is worth \$25, but it is not the fool theorem but the bigger fool theorem. If the investor does buy it, he or she is a fool, but he or she is also assuming that an even bigger fool will buy it in a year’s time for \$40.

This type of speculative bubble, in which prices keep increasing and become detached from reality, is specifically ruled out by the assumption of rational investors coolly calculating the present value of the expected cash flows each year, so that prices never get detached from these fundamentals. Of course, there have been speculative bubbles when it has been very difficult to estimate these fundamental values. In Appendix 7A, we review the famous bubble involving the South Sea Company in 1720, when Sir Isaac Newton almost bankrupted himself and then proclaimed, “I can calculate the motions of the heavenly bodies, but not the madness of people.” The madness of people was what caused the share price of the South Sea Company to become completely detached from its fundamentals. The Internet bubble of the late 1990s, in which the price of shares in Nortel Networks Corporation rose from \$20 to \$122 and then fell back to less than \$2, indicates that the madness of people may not have changed much in almost 300 years. However, it is difficult to build pricing models based on irrationality, so we will continue with the development of models based on fundamental cash flows.

## The Constant Growth DDM

Obviously, it is impractical to estimate and discount *all* future dividends one by one, as required by Equation 7-5. Fortunately, this equation can be simplified into a usable formula by assuming that dividends grow at a constant rate ( $g$ ) indefinitely. We can then estimate all future dividends, assuming we know the last dividend paid ( $D_0$ ).

$$\begin{aligned} D_1 &= D_0(1 + g) \\ D_2 &= D_1(1 + g) = D_0(1 + g)^2 \\ D_3 &= D_2(1 + g) = D_0(1 + g)^3 \end{aligned}$$

and so on.

Therefore, assuming constant growth in dividends to infinity, Equation 7-5 reduces to the following expression:

$$P_0 = \frac{D_0(1 + g)^1}{(1 + k_c)^1} + \frac{D_0(1 + g)^2}{(1 + k_c)^2} + \dots + \frac{D_0(1 + g)^\infty}{(1 + k_c)^\infty} \quad [7-6]$$

In Equation 7-6 we are multiplying  $D_0$  by a factor of  $(1 + g)/(1 + k_c)$  every period. This represents a “growing perpetuity,” which is easily solved because it represents the sum of a geometric series. In fact, Equation 7-6 reduces to the following expression, which is the constant growth version of the DDM, or simply the **Constant Growth DDM**:

Constant Growth DDM  
a version of the dividend discount model for valuing common shares, which assumes that dividends grow at a constant rate indefinitely

[7-7]

$$P_0 = \frac{D_0(1 + g)}{k_c - g} = \frac{D_1}{k_c - g}$$

There are several important points to note about Equation 7-7.

1. This relationship holds only when  $k_c$  is greater than  $g$ . Otherwise, the answer is negative, which is uninformative.<sup>2</sup>
2. Only *future* estimated cash flows and estimated growth in these cash flows are relevant.
3. The relationship holds only when growth in dividends is expected to occur at the same rate indefinitely.

**EXAMPLE 7-4****Using the Constant Growth DDM**

Assume a company is currently paying \$1.10 per share in dividends. Investors expect dividends to grow at an annual rate of 4 percent indefinitely, and they require a 10-percent return on the shares. Determine the price of these shares.

**Solution**

$$D_1 = (\$1.10)(1 + 0.04) = \$1.144$$

$$P_0 = \frac{D_1}{k_c - g} = \frac{\$1.144}{0.10 - 0.04} = \$19.07$$

**Estimating the Required Rate of Return**

The Constant Growth DDM can be rearranged as Equation 7-8 to obtain an estimate of the rate of return required by investors on a particular share.

[7-8]

$$k_c = \frac{D_1}{P_0} + g$$

The first term ( $D_1/P_0$ ) in Equation 7-8 represents the expected dividend yield on the share, which we discussed in Chapter 4. Therefore, we may view the second term,  $g$ , as the expected capital gains yield, because the total return must equal the dividend yield plus the capital gains yield. It is important to recognize that this equation provides an appropriate estimate for required return *only* if the conditions of the Constant Growth DDM are met (i.e., in particular, the assumption regarding constant growth in dividends to infinity must be satisfied).

**EXAMPLE 7-5****Estimating the Required Rate of Return Using the DDM**

The market price of a company's shares is \$12 each, the estimated dividend at the end of this year ( $D_1$ ) is \$0.60, and the estimated long-term growth rate in dividends ( $g$ ) is 4 percent. Estimate the implied required rate of return on these shares.

(continued)

<sup>2</sup> The negative answer occurs because if  $g$  is greater than  $k_c$  in Equation 7-6, each future dividend is worth more in today's terms than the previous one. The value never converges but increases to infinity.

**Solution**

$$k_c = \frac{D_1}{P_0} + g = \frac{0.60}{12} + 0.04 = 0.05 + 0.04 = 0.09 = 9\%$$

This result suggests that the expected return on these shares comprises an expected dividend yield of 5 percent and an expected capital gains yield of 4 percent.

**Estimating the Value of Growth Opportunities**

The Constant Growth DDM can also provide a useful assessment of the market's perception of growth opportunities available to a company, as reflected in its market price. Let's begin by assuming that a firm with no profitable growth opportunities should not reinvest residual profits in the company, but rather should pay out all its earnings as dividends. Under these conditions, we have  $g = 0$  and  $D_1 = \text{EPS}_1$ , where  $\text{EPS}_1$  represents the expected earnings per common share in the upcoming year. Under these assumptions, the Constant Growth DDM reduces to the following expression:

$$P_0 = \frac{\text{EPS}_1}{k_c} \quad [7-9]$$

It is unlikely to find a company that has exactly "zero" growth opportunities, but the point is that we can view the share price of any common stock (that satisfies the assumptions of the Constant Growth DDM) as comprising two components: its no-growth component, and the remainder, which is attributable to the market's perception of the growth opportunities available to that company. We denote this as the present value of growth opportunities (PVGO). These growth opportunities will generally represent a company's ability to generate substantial growth in future profits and cash flows. This growth may be attributable to several factors including the prospects for its industry, its competitive position within that industry, the value of its "brand" name, and its long-term investment and research and development programs, etc. We will discuss these issues in greater detail throughout the text, and in chapters 13, 14, and 20 in particular.

Taking into account PVGO, we get Equation 7-10.

$$P_0 = \frac{\text{EPS}_1}{k_c} + \text{PVGO} \quad [7-10]$$

**Estimating PVGO**

A company's shares are selling for \$20 each in the market. The company's EPS is expected to be \$1.50 next year, and the required return on the shares is estimated to be 10 percent. Estimate the PVGO per share.

**Solution**

This can be solved by rearranging Equation 7-10 to solve for PVGO:

$$\text{PVGO} = P_0 - \frac{\text{EPS}_1}{k_c} = \$20 - \frac{\$1.50}{0.10} = \$20 - \$15 = \$5.00$$

### Examining the Inputs of the Constant Growth DDM

From Equation 7-7, we can see that the Constant Growth DDM predicts that, all else remaining equal, the price of common shares ( $P_0$ ) will *increase* as a result of

1. an increase in  $D_1$
2. an increase in  $g$
3. a decrease in  $k_c$

This list illustrates the intuitive appeal of the DDM. It links common share prices to three important fundamentals: corporate profitability, the general level of interest rates, and risk. In particular, expected dividends are closely related to profitability, as is the growth rate of these dividends, while the required rate of return is affected by the base level of interest rates (RF) and by risk (as reflected in the risk premium required by investors). In particular, *all else being equal*, the DDM predicts that common share prices will be higher when profits are high (and expected to grow), when interest rates are lower, and when risk premiums are lower.

We can usually assume that current dividends ( $D_0$ ) are given, so it is the movements in  $k_c$  and  $g$  that determine the price of a share (i.e., because  $k_c - g$  is the denominator, and because  $D_0(1 + g)$  is the numerator). In fact, given the long period involved in the discount process (i.e., to infinity), price estimates are very sensitive to these inputs, as illustrated in Example 7-7 and Example 7-8.

#### EXAMPLE 7-7

#### More Pessimistic Inputs of the Constant Growth DDM

Revisit the company in Example 7-4 that is currently paying \$1.10 per share in dividends. This time, revise the expectations for annual growth in dividends to 3 percent (from 4 percent) and revise the estimated required rate of return to 11 percent (from 10 percent). Re-estimate the price of these shares.

#### Solution

$$D_1 = (\$1.10)(1 + 0.03) = \$1.133$$

$$P_0 = \frac{D_1}{k_c - g} = \frac{\$1.133}{0.11 - 0.03} = \$14.16$$

Notice the substantial drop in price (i.e., 25.7 percent, from \$19.07 to \$14.16) that results when we increase the discount rate from 10 percent to 11 percent and lower the growth rate from 4 percent to 3 percent (which are both bad things for stock prices). Similarly, Example 7-8 illustrates the large price increase that results from the use of improved estimates for these inputs.

#### EXAMPLE 7-8

#### More Optimistic Inputs of the Constant Growth DDM

Redo Example 7-7 by assuming annual growth in dividends is 5 percent and the required rate of return is 9 percent.

(continued)

## EXAMPLE 7-8 continued

**Solution**

$$D_1 = (\$1.10)(1 + 0.05) = \$1.155$$

$$P_0 = \frac{D_1}{k_c - g} = \frac{\$1.155}{0.09 - 0.05} = \$28.88$$

In this case, the price estimate is 51.4 percent higher than the original estimate of \$19.07, yet we only changed each of our inputs by 1 percentage point! Obviously, we need to be careful when determining these inputs, which are in fact merely estimates.

**Estimating DDM Inputs**

Estimating the inputs into the Constant Growth DDM generally requires a great deal of analysis and judgement. Assuming we know the most recent year's dividend payment ( $D_0$ ), we need to estimate  $g$  because  $D_1 = D_0(1 + g)$ . As discussed earlier, the discount rate for equities will equal the risk-free rate of return plus a risk premium, as depicted in Equation 7-1. We defer further discussion of estimating the discount rate for equities to chapters 8 and 9.

Several methods can be used to estimate the expected annual growth rate in dividends ( $g$ ). One of the most common approaches is to determine the company's **sustainable growth rate**, which can be estimated by multiplying the earnings retention ratio by the return on equity, as shown in Equation 7-11.

sustainable growth rate  
the earnings retention ratio  
multiplied by return on  
equity

$$g = b \times \text{ROE}$$

[7-11]

where  $b$  = the firm's earnings retention ratio =  $1 -$  firm's dividend payout ratio

ROE = firm's return on common equity = net profit/common equity (as defined in Chapter 4)

Growth in earnings (and dividends) will be positively related to the proportion of each dollar of earnings reinvested in the company ( $b$ ) multiplied by the return earned on those reinvested funds, which we measure using ROE. For example, a firm that retains all its earnings and earns 10 percent on its equity would see its equity base grow by 10 percent per year. If the same firm paid out all of its earnings, it would not grow. Similarly, a firm that retained a portion ( $b$ ) would earn 10 percent on that proportion, resulting in  $g = b \times \text{ROE}$ .<sup>3</sup>

**Estimating a Firm's Sustainable Growth Rate**

## EXAMPLE 7-9

A firm has an ROE of 12 percent, and its dividend payout ratio is 30 percent. Use this information to determine the firm's sustainable growth rate.

**Solution**

$$g = b \times \text{ROE} = (1 - 0.3) \times (0.12) = (0.7) \times (0.12) = 0.084 = 8.4\%$$

<sup>3</sup> A major weakness of this approach is its reliance on accounting figures to determine ROE, because it is based on book values and the accrual method of accounting. As a result, it may not represent the "true" return earned on reinvested funds.

Recall from Chapter 4 that we can use the DuPont system to decompose ROE into three factors, as shown in Equation 7-12:

[7-12]

$$\begin{aligned} \text{ROE} &= (\text{Net income/Sales}) \times (\text{Sales/Total assets}) \times (\text{Total assets/equity}) \\ &= \text{Net profit margin} \times \text{Turnover ratio} \times \text{Leverage ratio} \end{aligned}$$

The ROE, and hence  $g$ , increases with higher profit margins, higher asset turnover, and higher debt (although higher debt implies higher risk and, therefore, higher  $k_c$ ).

**EXAMPLE 7-10****Estimating a Firm's Sustainable Growth Rate Using the DuPont System**

A company just paid an annual dividend of \$1.00 per share and had an EPS of \$4.00 per share. Its projected values for net profit margin, turnover ratio, and leverage ratio are 4 percent, 1.25, and 1.40, respectively. Determine the firm's sustainable growth rate.

**Solution**

$$\text{ROE} = (0.04)(1.25)(1.4) = 0.07 = 7\%$$

$$\text{Payout ratio} = \text{DPS/EPS} = \$1/\$4 = 0.25, \text{ so } b = 1 - 0.25 = 0.75$$

$$g = b \times \text{ROE} = (0.75)(7\%) = 5.25\%$$

Another method of estimating  $g$  is to examine historical rates of growth in dividends and earnings levels, including long-term trends in these growth rates for the company, the industry, and the economy as a whole. Predictions regarding future growth rates can be determined based on these past trends by using arithmetic or geometric averages, or by using more involved statistical techniques, such as regression analysis. Finally, an important source of information regarding company growth, particularly for the near term, can be found in analyst estimates. Investors are often especially interested in "consensus" estimates, because market values are often based to a large extent on these estimates.

It is important to remember in the application of any of these approaches that "future" growth is being estimated, and the inputs require judgement on the part of the analyst. If researchers believe past growth will be repeated in the future, or if they want to eliminate period-to-period fluctuations in  $b$  and ROE, they may choose to use three- to five-year averages for these variables. Conversely, if the company has changed substantially, or if analysts have good reason to believe the ratios for the most recent year are the best indicators of future sustainable growth, they will use these figures. In addition, an analysis of macroeconomic, industry-specific, and company-specific factors may lead researchers to develop predicted values for these variables independent of their historical levels.

**The Multiple-Stage Growth Version of the DDM**

The Constant Growth DDM relationship holds only when we are able to assume constant growth in dividends from now to infinity. In many situations, it may be more appropriate to estimate dividends for the most immediate periods up to some point ( $t$ ),

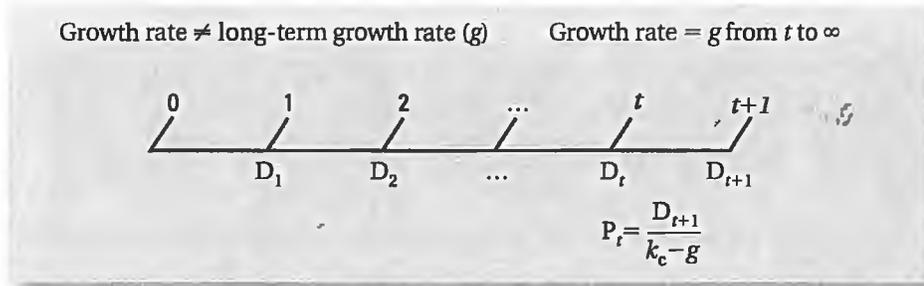


FIGURE 7-2

*The Cash Flow Pattern for Multiple-Stage Growth in Dividends*

after which it is assumed there will be constant growth in dividends to infinity. Several situations lend themselves to this structure. For example, it is reasonable to assume that competitive pressures and business-cycle influences will prevent firms from maintaining extremely high growth in earnings for long periods. In addition, short-term earnings and dividend estimates should be much more reliable than those covering a longer period, which are often estimated using very general estimates of future economic, industry, and company conditions. To use the best information available at any point, it may make the most sense to estimate growth as precisely as possible in the short term before assuming some long-term rate of growth.

Equation 7-13 can be applied when steady growth in dividends to infinity does not begin until period  $t$ :

$$P_0 = \frac{D_1}{(1 + k_c)^1} + \frac{D_2}{(1 + k_c)^2} + \dots + \frac{D_t + P_t}{(1 + k_c)^t} \quad [7-13]$$

where  $P_t = \frac{D_{t+1}}{k_c - g}$

Notice that this is Equation 7-4, with  $n$  replaced by  $t$  and with an estimate for  $P_t$ . Figure 7-2 depicts the cash flows associated with this type of valuation framework.

Essentially, whenever we use multiple-period growth rates, we estimate dividends up to the beginning of the period in which it is reasonable to assume constant growth to infinity. Then we can use the Constant Growth DDM to estimate the market price of the share at that time ( $P_t$ ). Finally, we discount all the estimated dividends up to the beginning of the constant growth period, as well as the estimated market price at that time.<sup>4</sup> This provides us with today's estimate of the share's market price.

### Using the Multi-Stage DDM

A company is expected to pay a dividend of \$1.00 at the end of this year, a \$1.50 dividend at the end of year 2, and a \$2.00 dividend at the end of year 3. It is estimated dividends will grow at a constant rate of 4 percent per year thereafter. Determine the market price of this company's common shares if the required rate of return is 11 percent.

*(continued)*

### EXAMPLE 7-11

<sup>4</sup> Recall that  $P_t$  represents the present value of all the expected dividends from time  $t + 1$  to infinity, so we are essentially discounting *all* the expected future dividends associated with the stock.

EXAMPLE 7-11 *continued***Solution**

First, estimate dividends up to the start of constant growth to infinity. In this example, they are all given, so no calculations are required:

$$D_1 = \$1.00$$

$$D_2 = \$1.50$$

$$D_3 = \$2.00$$

Second, estimate the price at the beginning of the constant growth to infinity period:

$$D_4 = (\$2.00)(1 + 0.04) = \$2.08$$

$$P_3 = \frac{D_4}{k_c - g} = \frac{\$2.08}{0.11 - 0.04} = \$29.71$$

Third, discount back the relevant cash flows to time 0:

$$P_0 = \frac{1.00}{(1 + 0.11)} + \frac{1.50}{(1 + 0.11)^2} + \frac{2.00 + 29.71}{(1 + 0.11)^3} = 0.90 + 1.22 + 23.19 = \$25.31$$

## solution using a financial calculator

(TI BA II Plus)



**PV** ( $D_1$ ): **N** → 1; **I/Y** (or  $i$ ) → 11%; **PMT** → 0; **FV** → -1.00; **CPT** then

**PV** gives 0.90

**PV** ( $D_2$ ): **N** → 2; **I/Y** (or  $i$ ) → 11%; **PMT** → 0; **FV** → -1.50; **CPT** then

**PV** gives 1.22

**PV** ( $D_3 + P_3$ ): **N** → 3; **I/Y** (or  $i$ ) → 11%; **PMT** → 0; **FV** → -31.71; (i.e., 2 + 29.71);

**CPT** then **PV** gives 23.19

Then we add these figures to get \$25.31, as above.

A well-known version of the multiple-growth DDM is the two-stage growth rate model, which assumes growth at one rate for a certain period, followed by a steady growth rate to infinity. This is illustrated in Example 7-12.

## EXAMPLE 7-12

**Two-Stage Dividend Growth**

A company just paid a dividend of \$2.00 per share. An investor estimates that dividends will grow at 10 percent per year for the next two years and then grow at an annual rate of 5 percent to infinity. Determine the market price of this company's common shares if the required rate of return is 12 percent.

**Solution**

First, estimate dividends up to the start of constant growth to infinity. In this example, we use the first-period growth rate of 10 percent:

$$D_1 = (\$2.00)(1.1) = \$2.20$$

$$D_2 = (\$2.20)(1.1) = \$2.42$$

(continued)

Second, estimate the price at the beginning of the constant growth to infinity period:

$$D_3 = (\$2.42)(1 + 0.05) = \$2.541$$

$$P_2 = \frac{D_3}{k_c - g} = \frac{\$2.541}{0.12 - 0.05} = \$36.30$$

Third, discount the relevant cash flows back to time 0:

$$P_0 = \frac{2.20}{(1.12)^1} + \frac{2.42 + 36.30}{(1.12)^2} = 1.96 + 30.87 = \$32.83$$

(D<sub>1</sub>):  → 1;  (or *I*) → 12%;  → 0;  → -2.20;  then  
 gives 1.96  
 (D<sub>2</sub> + P<sub>2</sub>):  → 2;  (or *I*) → 12%;  → 0;  → -38.72; (i.e., 2.42 + 36.30);  
 then  gives 30.87

Then we add these figures to get \$32.83, as above.

## Limitations of the DDM

Although the DDM provides significant insight into the factors that affect the valuation of common shares, it is based on several assumptions that are not met by a large number of firms, especially in Canada. In particular, it is best suited for companies that (1) pay dividends based on a stable dividend payout history that they want to maintain in the future, and (2) are growing at a steady and sustainable rate. As such, the DDM works reasonably well for large corporations in mature industries with stable profits and an established dividend policy. In Canada, the banks and utility companies fit this profile, while in the United States, there are numerous NYSE-listed companies of this nature. Not surprisingly, the DDM does not work well and/or is difficult to apply for many resource-based companies, which are cyclical in nature and often display erratic growth in earnings and dividends. Many of these companies (especially the smaller ones) do not distribute much in the way of profits to shareholders as dividends. The model will also not work well for firms in distress, firms that are in the process of restructuring, firms involved in acquisitions, and private firms. Finally, if a company enters into substantial share-repurchase arrangements, the model will require adjustments, because share repurchases also represent a method of distributing wealth to shareholders.

Due to the limitations of the DDM discussed above, and because common share valuation is a challenging process, involving, as it does, predictions for the future, analysts often use several approaches to value common shares. This is evident from the survey results of a recent study, reported in Table 7-1. The study surveyed the percentage of analysts who use a particular share valuation method, and the fact that the percentages far exceed 100 percent suggests that most analysts use several methods.

In addition to the DDM and the relative valuation approaches discussed in the next section, another discounted cash flow approach—the free cash flow approach—is used

### EXAMPLE 7-12 *continued*

solution using a financial calculator



(TI BA II Plus)

TABLE 7-1 Common Share Valuation Approaches

Method Used	Percentage
Price-earnings (P/E) approach	88.1
Discounted free cash flow approach	86.8
Enterprise value multiple	76.7
Price-to-book-value approach	59.0
Price-to-cash-flow approach	57.2
Price-to-sales approach	40.3
Dividend-to-price or price-to-dividend approaches	35.5
Dividend discount model	35.1

Source: Model Selection from "Valuation Methods" Presentation, October 2007, produced by Tom Robinson, Ph.D., CFA, CPA, CFP®, Head, Educational Content, CFA Institute. Copyright 2007, CFA Institute. Reproduced and republished from Valuation Methods with permission from CFA Institute. All rights reserved.<sup>5</sup>

frequently, which is obvious from Table 7-1. The free cash flow approach is implemented almost identically to the DDM, except that instead of discounting estimated future dividends, you discount expected future free cash flows. The underlying rationale is that dividends are discretionary, and many firms may choose not to pay out the amount of dividends they could. Therefore, instead of using dividends, you use free cash flow, which is in some sense a measure of what a firm could pay out if it chose, after taking account of expenses, changes in net working capital, and capital expenditures. We will not discuss this model in detail but would note that there are two variations of this approach: (1) using free cash flows to equity holders and discounting them using the required return to equity holders (as in the DDM); and (2) using free cash flows to the firm, and discounting them using the firm's weighted average cost of capital (which will be discussed in Chapter 20).<sup>6</sup> This approach is often more appropriate when firms do not pay out a significant portion of their earnings as dividends, or pay out well below their capacity.

#### CONCEPT REVIEW QUESTIONS

1. Why is share value based on the present value of expected future dividends?
2. What is the "bigger fool theorem" of valuation?
3. Why does an increase in the expected dividend growth rate increase share prices?

<sup>5</sup> The results are based on a survey of about 13,500 CFA Institute members, 2,369 of whom accepted the invitation. 2,063 of those surveyed evaluate individual securities in order to make an investment recommendation or portfolio decision. They are primarily buy-side investment analysts and portfolio managers. For those managing portfolios, the sample was split fairly equally between members managing institutional and individual (private wealth) portfolios.

<sup>6</sup> Free cash flow available to equity holders can be estimated as Net income + Depreciation & Amortization + Deferred taxes - Capital spending +/- Change in net working capital - Principal repayments + New external debt financing. Free cash flow to the firm can be estimated as Net income + Depreciation & Amortization + Deferred taxes - Capital spending +/- Change in net working capital + Interest expense × (1 - Tax rate).

## CONCEPT REVIEW QUESTIONS

1. Explain how we can use the constant growth DDM to estimate the cost of firms' internal common equity, as well as the cost of new common share issues.
2. Explain the relationship between ROE, retention rates, and firm growth.
3. How can we relate the existence of multiple growth stages to four commonly used firm classifications?
4. Describe the Fed model and how it may be used to estimate the required rate of return of the market as a whole.

## 20.6 RISK-BASED MODELS AND THE COST OF COMMON EQUITY

### Using the CAPM to Estimate the Cost of Common Equity

In the previous section we saw that the DCF model could be rearranged to estimate the investors' required return on a firm's common shares. We also discussed how the model performs poorly when applied to growth stocks, which pay low dividends and/or display high growth rates. In these situations, it makes sense to rely more heavily on **risk-based models**. The most important risk-based model is the **capital asset pricing model (CAPM)**, which was discussed in detail in Chapter 9.

Equation 20-26 represents the central equation of the CAPM, the security market line (SML).

$$K_e = R_F + MRP \times \beta_e \quad [20-26]$$

In this equation, the required return by common shareholders ( $K_e$ ) is composed of three terms:

1. The **risk-free rate of return** ( $R_F$ ), which represents compensation for the time value of money
2. The **market risk premium** (MRP), which is compensation for assuming the risk of the market portfolio and is defined as  $E(R_M) - R_F$ , where  $E(R_M)$  is the expected return on the market
3. The **beta coefficient** ( $\beta_e$ ) for the firm's common shares, which measures the firm's systematic or market risk and which represents the contribution that this security makes to the risk of a well-diversified portfolio

The CAPM is derived as a single-period model, but just what is meant by a single period is an unresolved issue, since investment horizons differ from investor to investor. In testing the CAPM, it is common to use a 30-day time horizon, yet such a short time horizon is rarely useful in making corporate finance decisions. In fact, when we talked about the characteristics of common equity in Chapter 19, one of the most important was the absence of a maturity date. While individual investors may invest for 30 days, at that time they will sell the shares to other investors, so the security is still outstanding. In addition, as we will see when we discuss corporate investment decisions, the cost of capital or

#### Learning Objective 20.6

Estimate the cost of equity using risk-based models and describe the advantages and limitations of these models.

risk-based models models that estimate costs based on the associated risks

capital asset pricing model (CAPM) a pricing model that uses one factor, beta, to relate expected returns to risk

risk-free rate of return compensation for the time value of money

market risk premium compensation for assuming the risk of the market portfolio

beta coefficient a measure of a firm's systematic or market risk

WACC is used to evaluate long-term investment decisions made by the firm. For this reason, the risk-free rate used in *corporate* applications of the CAPM is usually the yield on the longest-maturity Government of Canada bond, which is currently the 30-year bond.

In order to estimate the MRP, we generally use long-run averages supplemented by knowledge of the prevailing economic scenario. The basic idea is that over long periods of time, what people expect to happen should on average occur—that is, they are biased in forming their expectations if they consistently over or under predict returns. In contrast, over short periods of time, expectations are unlikely to be realized. It's like tossing a die: you may get three consecutive 1s, but if you throw it enough times, eventually you will get 1s one-sixth of the time, 2s one-sixth of the time, and so on. Let's keep this in mind as we consider the performance of the S&P/TSX Composite Index over the 2003 to 2008 period, as reported in Table 20-11.

Clearly, it is difficult to argue that in any one particular year the performance of the S&P/TSX Composite Index was what was expected at the time. For example, nobody would have held shares in 2008 if they expected the stock market to crash the way it did! Similarly, the performance in 2003 and 2005 was exceptional; indeed, if you consistently earned returns of more than 20 percent, you would become very rich very quickly! In both cases it is like observing three consecutive 1's when throwing dice; it can happen but is not what was expected.

Table 20-12 (formerly Table 8-2 in Chapter 8) shows estimates of average investment returns over the period 1938 to 2008.

**TABLE 20-11** Returns on the S&P/TSX Composite Index

	Returns (%)
2003	26.72
2004	14.48
2005	24.12
2006	17.26
2007	9.83
2008	-33.26

**TABLE 20-12** Average Investment Returns and Standard Deviations (1938 to 2008)

	Annual Arithmetic Average (%)	Annual Geometric Mean (%)	Standard Deviation of Annual Returns (%)
Government of Canada Treasury Bills	5.14	5.05	4.24
Government of Canada Bonds	6.52	6.16	9.13
Canadian Stocks	11.21	9.90	16.75
U.S. Stocks	12.31	10.91	17.87

Source: Data from Canadian Institute of Actuaries.

no great trend. The price at July 16, 2009, was down relative to year end but was still up over the year. Most investors would have loved to have had all their money invested in Timmies, rather than the TSX, for 2008–9!

However, remember that when we make estimates we are looking forward, not backward; just because Tim Hortons has been low risk does not mean it will continue to be low risk. Starbucks Corporation is a good example of a competitor that was similarly regarded as low risk until the recession hit. Then its premium coffee strategy turned into a millstone as low-end competitors like McDonald's Corporation started offering premium coffee at much lower prices. This is one of the reasons firms generally push up their cost of capital estimates by at least 1 percent: they are attempting to take into account uncertainties that have not played out in the capital market and, as a result, have not yet affected their beta estimate.

We conclude this section by revisiting firm ABC from Examples 20-1 through 20-5 and determining its cost of internal and external common equity, as well as its WACC.

**EXAMPLE 20-6****Determining the Cost of Internal Common Equity Using CAPM**

Assume the beta for firm ABC from Examples 20-1 through 20-5 is 1.15 and that the risk-free rate is 4.5 percent, while the MRP is 4.5 percent. Estimate the firm's cost of equity for internal funds using CAPM.

**Solution**

$$K_e = 4.5 + (4.5) \times (1.15) = 9.68\%$$

Notice that with the CAPM approach, the equity share price is not explicitly considered, which adds a complication if we want to estimate the cost of new common equity to the firm. There are two common ways to deal with this issue. The first is to take the premium over the cost of internal funds that was estimated using the constant growth DDM approach, which does include the price. For this company, the premium was 0.22 percent, since the cost of internal equity was estimated at 9.2 percent, while the cost of new common equity was estimated to be 9.42 percent. However, this will not work when we are unable to use the DDM, which is exactly when we will want to use a risk-based approach such as the CAPM, as discussed previously. In this case, we can merely "scale" our estimate of  $K_e$  by the following factor, which relates the share price to the net proceeds after flotation costs:  $P_0/NP$ . This adjustment leads to the following estimate of the cost of new common equity ( $K_{ne}$ ):

[20-27]

$$K_{ne} = K_e \times P_0/NP$$

Example 20-7 applies both approaches.

**EXAMPLE 20-7****Determining the Cost of External Common Equity Using CAPM**

Use the estimate of internal common equity for firm ABC, obtained in Example 20-6, to estimate the firm's cost of external equity.

(continued)