CHAPTER 7

Share valuation

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

7.1 describe the four types of secondary markets

7.2 explain why many financial analysts treat preference shares as a special type of bond rather than as an equity security

7.3 describe how the general dividend valuation model values a share

7.4 discuss the assumptions that are necessary to make the general dividend valuation model easier to use, and be able to use the model to calculate the value of a company's ordinary shares

7.5 explain how valuing preference shares with a stated maturity differs from valuing preference shares with no maturity date, and be able to calculate the price of a preference share under both conditions.

Finding the actual price of a publicly traded share is easy. You can just look it up in *The Australian Financial Review*. But don't expect the price to stay the same; share prices change all the time — sometimes dramatically.

Between 2005 and 2007 the Australian stock market experienced a bull market with the ASX All Ordinaries Index (All Ords) reaching a peak of 6873 points in November 2007.[1] This was followed by a crash during 2008 and 2009, reaching a low of 3090 in March 2009.[2] Since then, the All Ords have steadily increased in value except for a few brief periods with a downward trend. For example, the All Ords declined to 3829 in August 2011 but have since risen to 5963 in April 2015. The index has yet to recover back to its November 2007 high. In recent years global demand for commodities waned, but many major listed mining companies faced significant headwinds. During recent weeks, Australian shares have been hampered by low commodity prices and falling business confidence amid subdued economic growth.[3] These trends are shown in figure 7.1.

When share prices rise or fall, how do investors or financial managers know when it is time to buy or sell? In other words how can they tell if the market price of a share reflects its value? One approach is to develop a share valuation model and compare the estimate from the model with the market price. If the market price is below the estimate, the share may be undervalued, in which case the investor may buy the share. (Of course, other factors may weigh into the final decision to buy.) In this chapter, we develop and apply share valuation models that enable us to estimate a share's value. The models are very similar to those used in practice by financial analysts.[4]

Chapter preview

This chapter focuses on equity securities and how they are valued. We first examine the fundamental factors that determine a share's value; then we discuss several valuation models. These models tell us what a share's price *should* be. We can compare our estimates from such models with *actual* market prices.

FIGURE 7.1 **All Ords 10-year trend chart**[5]

Source: Yahoo!7 Finance, 2015.

Why are share-valuation formulas important for you to study in a corporate finance course? First, management may want to know if the company's shares are undervalued or overvalued. For example, if the shares are undervalued, management may want to buy back shares to reissue in the future or postpone an equity offering until the share prices increase. Second, as we mentioned in chapter 1, the overarching goal of financial management is to maximise the current value of the company's shares. To make investment or financing decisions that increase shareholder value, you must understand the fundamental factors that determine the market value of the company's shares.

We begin this chapter with a discussion of the secondary markets for equity securities and their efficiency, explain how to read share market price listings in the newspaper, and introduce the types of equity securities that companies typically issue. Then we develop a general valuation model and demonstrate that the value of a share is the present value of *all* expected future cash dividends. We use some simplifying assumptions about dividend payments to implement this valuation model. These assumptions correspond to actual practice and allow us to develop several specific valuation models that are theoretically sound.

7.1 The market for shares

LEARNING OBJECTIVE 7.1 Describe the four types of secondary markets.

Equity securities are certificates of ownership of a company. Equities are the most visible securities on the financial landscape. At the end of June 2015, more than $1.6 trillion of public equity securities were outstanding in Australia alone.[6] Every day Australians eagerly track the ups and downs of the share market. Most people instinctively believe that the performance of the share market is an important barometer of the country's economic health. Also fuelling interest is the large number of people (36 per cent of the adult population) who own equity securities either directly or indirectly.[7]

Secondary markets

Recall from chapter 2 that the share market consists of primary and secondary markets. In the primary market, companies sell new shares to investors to raise money. In secondary markets, outstanding shares are bought and sold among investors. We will discuss the primary markets for bonds and equity securities in a later chapter. Our focus here is on secondary markets.

Any trade of a security after its primary offering is said to be a secondary market transaction. Most secondary market transactions do not directly affect the company that issues the securities. For example, when an investor buys 100 shares in Woolworths on the ASX, the exchange of money is only between the investors buying and selling the securities; Woolworths' cash position is not affected.

The presence of a secondary market does, however, affect the issuer indirectly. Simply put, investors will pay a higher price for primary securities that have an active secondary market because of the marketability the secondary market provides. As a result, companies whose securities trade on a secondary market can sell their new debt or equity issues at a lower funding cost than companies selling similar securities that have no secondary market.

Secondary markets and their efficiency

In Australia, virtually all secondary equity market transactions take place on the Australian Securities Exchange (ASX). In terms of total volume of activity and total equity value of the companies listed, the ASX is the world's fourteenth largest share market as at January 2015.[8] Of course the world's largest equity market by market value is the New York Stock Exchange (NYSE).

The role of these and other secondary markets is to bring buyers and sellers together. Ideally we would like security markets to be as efficient as possible. Markets are efficient when current market prices of securities traded reflect all available information relevant to the security. If this is the case, security prices will be near or at their true value. The more efficient the market, the more likely this is to happen.

There are four types of secondary markets, and each type differs according to the amount of price information available to investors, which in turn affects the efficiency of the market. We discuss the four types of secondary markets — direct search, brokered, dealer and auction — in the order of their increasing market efficiency.

Direct search

The secondary markets furthest from the ideal of complete availability of price information are those in which buyers and sellers must seek each other out directly. In these markets, individuals bear the full cost of locating and negotiating, and it is typically too costly for them to conduct a thorough search to locate the best price. Securities that sell in direct search markets are usually bought and sold so infrequently that few third parties, such as brokers or dealers, find it profitable enough to serve the market. In these markets, sellers often rely on word-of-mouth communication to find interested buyers. The ordinary shares of small private companies are a good example of a security that trades in this manner.

Brokered

When trading in a security issue becomes sufficiently heavy, brokers find it profitable to offer specialised search services to market participants. Brokers bring buyers and sellers together to earn a fee, called a commission. To provide investors with an incentive to hire them, brokers may charge a commission that is less than the cost of a direct search. Brokers are not passive agents but aggressively seek out buyers or sellers and try to negotiate an acceptable transaction price for their clients. The presence of active brokers increases market efficiency because brokers are in frequent contact with market participants and are likely to know what constitutes a 'fair' price for a security. The ASX is best described as a quote-driven broker market.

Dealer

If the trading in a given security has sufficient volume, market efficiency is improved if there is someone in the marketplace to provide continuous bidding (selling or buying) for the security. Dealers provide this service by holding inventories of securities which they own, and then buying new securities and selling from the inventory to earn a profit. Unlike brokers, dealers have capital at risk. Dealers earn their profits from the *spread* on the securities they trade — the difference between their **bid price** (the price at which they buy) and their **offer (ask) price** (the price at which they sell). NASDAQ is the best known example of a dealer market.

The advantage of a dealer over a brokered market is that brokers cannot guarantee that an order to buy or sell will be executed promptly. This uncertainty about the speed of execution creates price risk. During the time a broker is trying to sell a security, its price may change and the client could suffer a loss. A dealer market eliminates the need for time-consuming searches for a fair deal because buying and selling take place immediately from the dealer's inventory of securities.

Dealers make markets in securities using computer networks to quote prices at which they are willing to buy or sell a particular security. These networks enable dealers to electronically survey the prices quoted by different dealers to help establish their sense of a fair price and to trade.

Auction

In an auction market, buyers and sellers confront each other directly and bargain over price. The participants can communicate orally if they are located in the same place, or the information can be transmitted electronically. The ASX did originally operate as an 'open out-cry' market but the trading floors were phased out in 1990 following the introduction of the Stock Exchange Automatic Trading System (SEATS) in 1987.[9] The New York Stock Exchange is the best known example of an auction market. In the NYSE, the auction for a security takes place at a specific location on the floor of the exchange, called a **post**. The auctioneer in this case is the specialist, who is designated by the exchange to represent orders placed by public customers. Specialists, as the name implies, handle a small set of securities and are also allowed to act as dealers. Thus, in reality, the NYSE is an auction market that also has some features of a dealer market. In recent years, the NYSE has been moving toward electronic trading with the SuperDOT system (DOT stands for 'designated order turnaround'), which allows orders to be transmitted electronically to specialists.

Reading the share market listings

The Australian Financial Review and other newspapers provide share listings for the ASX as well as other security market information. Figure 7.2 shows a small section of a listing from *The Australian Financial Review* market wrap for the ASX.

In the figure, go to the entry for Domino's Pizza, which is highlighted. Domino's is the largest worldwide franchise pizza delivery company. Columns 1 and 2 show the highest price ($41.64) and the lowest price ($20.08) over the past 52 weeks. Column 4 shows that Domino's last sale price before the day's closing was $38.64. Column 6 indicates the highest price bid for a share of Domino's at the closing, while column 7 shows the lowest sell price at which a Domino's share is offered for sale at closing.

Column 8 shows Domino's annual cash dividend per share paid to shareholders, which is $0.436. Although the annual dividend is shown, most Australian listed companies, including Domino's, pay dividends twice yearly. In the table you will note some companies have an 'f' or 'p' noted next to the dividend. These symbols indicate whether the company has already paid tax on the dividend: 'f' indicates that the dividend is 100% franked, which means the company has fully paid tax on the dividend; 'p' denotes that the dividend is partly franked; and a blank space in this column indicates that the dividend paid is unfranked or no tax was paid on the dividend. Dividend imputation is covered further in coming chapters. Column 10 indicates the dividend times covered ratio; that is, the number of times the company's profit covers the company's latest dividend. In this case, Domino's profit per share covers its dividend 1.44 times.

(1) 52 Wk High	(2) 52 Wk Low	(3) Company Name	(4) Last Sale	(5) + or − (¢)	(6) Quote Buy	(7) Quote Sell	(8) Div ¢ per Share	(9) Franking	(10) Div Tms Cov	(11) NTA	(12) Div Yld %	(13) P/E ratio
11.00	8.19	Coca-Cola Amatil	9.04	−6.0	9.02	9.05	42	p	0.85	1.76	4.65	25.4
93.97	62.41	Cochlear	90.24	−169.0	90.08	90.24	217	p	1.17	1.58	2.40	35.7
96.69	73.57	C'wlth Bank of Aust	86.35	26.0	86.30	86.38	416	f	1.33	24.46	4.82	15.6
13.56	10.875	Computershare	11.91	−19.0	11.89	11.91	30	p	0.78	−2.69	2.52	51.0
1.20	0.935	Cromwell Property stp	1.095		1.09	1.095	7.86		1.34	0.74	7.18	10.4
16.47	11.66	Crown Resorts	13.30	−18.0	13.26	13.30	37	p	1.76	4.14	2.78	20.4
96.60	63.77	CSL	96.17	152.0	96.17	96.32	139.23		2.27	5.52	1.45	30.4
4.43	3.15	CSR	3.62	10.0	3.61	3.63	20		1.24	2.17	5.52	14.5
8.25	1.10	DEXUS Prop Grp stp	7.64	−9.0	7.61	7.64	41.04		1.03	6.47	5.37	18.1
41.64	**20.08**	**Domino's Pizza**	**38.64**	**−57.0**	**38.63**	**38.67**	**43.6**	**f**	**1.44**	**−0.01**	**1.13**	**61.6**
5.22	3.93	Downer EDI	4.49	−11.0	4.47	4.49	24	f	1.97	2.54	5.35	9.5
2.589	2.14	DUET Grp forus	2.15	−1.0	2.14	2.15	17.5		0.18	1.37	8.14	66.6
6.88	5.11	DuluxGroup	5.82	−10.0	5.81	5.82	21.5	f	1.15	0.25	3.69	23.6
5.07	3.08	Echo Entertainment	4.81	−9.0	4.80	4.83	9	f	2.12		1.87	25.2
1.11	0.725	Fairfax Media	0.83	−1.5	0.825	0.835	4	f	0.60	0.29	4.82	34.6
3.19	2.48	Federation Cntres stp	2.96		2.94	2.96	16.9		1.81	2.44	5.71	9.7
48.20	31.41	Flight Centre Travel	35.40	−75.0	35.40	35.44	152	f	1.28	7.66	4.29	18.1
4.131	2.905	Genworth Mortg Ins	3.57	7.0	3.55	3.57	15.9	f	3.14		4.45	7.2
6.70	5.045	Goodman Grp stp	6.46	−4.0	6.44	6.46	22.2		2.63	3.15	3.44	11.1
4.89	3.77	GPT Grp stp	4.46	−2.0	4.45	4.46	21.7		1.76	3.94	4.87	11.7
10.36	7.83	GrainCorp	8.64	1.0	8.61	8.65	12.5	f	1.07	5.63	1.45	64.5

FIGURE 7.2 **ASX 100 leading industrial shares**[10]
The figure shows a small section of a listing from *The Australian Financial Review* market wrap for the ASX share listings.

Column 11 shows Domino's net tangible assets (NTA) per share ratio. This is the total assets of a company less total liabilities, not including intangible items such as goodwill. In Domino's case, the NTA ratio is –0.01. Column 12 shows Domino's **dividend yield**, which is 1.13 per cent. The dividend yield is calculated by dividing the annual dividend payout by the current share price. For Domino's this calculation is 0.436/38.64 = 0.0113 or 1.13 per cent. If you scan the dividend yields you will notice that most of the 100 leading Australian industrial companies pay dividends, and that they are generally fully franked. As you will learn, most companies under dividend imputation will pay a fully franked dividend. For those companies that do not pay a dividend, investors are still willing to purchase shares in those companies as long as the investors believe that they will receive dividends and/or a higher share price in the future.

Finally, column 13 indicates Domino's price–earnings (P/E) ratio, which is the current price per share divided by its earnings per share. For Domino's, the P/E ratio is 61.6 times. This tells us that investors are willing to pay a price per share 61.6 times the earning per share for Domino's shares. Domino's P/E ratio is very high. To justify a higher P/E ratio, investors must believe that the company has good prospects for future earnings growth. We will have more to say about the P/E ratio in later chapters.

BEFORE YOU GO ON

1. How do dealers differ from brokers?
2. What does the price–earnings ratio tell us?

7.2 Ordinary and preference shares

LEARNING OBJECTIVE 7.2 Explain why many financial analysts treat preference shares as a special type of bond rather than as an equity security.

Equity securities take several forms. The most common type of equity security is **ordinary shares**. Ordinary shares represent the basic ownership claim in a company. One of the basic rights of the owners is to vote on all important matters that affect the life of the company, such as the election of the board of directors or a proposed merger or acquisition. Owners of ordinary shares are not guaranteed any dividend payments and have the lowest priority claim on the company's assets in the event of insolvency. Legally, ordinary shareholders enjoy limited liability; that is, their losses are limited to the original amount of their investment in the company and their personal assets cannot be taken to satisfy the obligations of the company. Finally, ordinary shares are perpetuities in the sense that they have no maturity. Ordinary shares can be retired only if management buys them in the open market from investors or if the company is liquidated, in which case its assets are sold, as described in the next section.

Like ordinary shares, **preference shares** represent an ownership interest in the company, but as the name implies, preference shares receive preferential treatment over ordinary shares. Specifically, preference shareholders take precedence over ordinary shareholders in the payment of dividends and in the distribution of corporate assets in the event of liquidation. Unlike the interest payments on bonds, which are contractual obligations, preference share dividends are declared by the board of directors, and if a dividend is not paid the lack of payment is not legally viewed as a default.

Preference shares are legally a form of equity. Thus, preference share dividends are paid by the issuer with after-tax dollars. Even though preference shares are an equity security, the owners have no voting privileges unless the preference share is convertible into an ordinary share. Preference shares are generally viewed as perpetuities because they have no maturity. However, most preference shares are not true perpetuities because their share contracts often contain call provisions and can even include *sinking fund* provisions, which require management to retire a certain percentage of the share issue annually until the entire issue is retired.

Preference shares: debt or equity?

One of the ongoing debates in finance is whether preference shares are debt or equity. A strong case can be made that preference shares are a special type of bond. The argument behind this case is as follows. First, regular (non-convertible) preference shares confer no voting rights. Second, preference shareholders receive a fixed dividend, regardless of the company's earnings, and if the company is liquidated, they receive a stated value (usually par) and not a residual value. Third, preference shares often have 'credit' ratings that are similar in nature to those issued to bonds. Fourth, preference shares are sometimes convertible into ordinary shares. Finally, most preference share issues are not true perpetuities. For these reasons, many investors consider preference shares to be a special type of debt rather than equity.

Ordinary share valuation

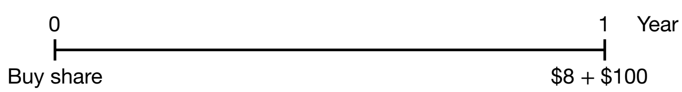
In earlier chapters we emphasised that the value of any asset is the present value of its future cash flows. The steps in valuing an asset are as follows.

1. Estimate the future cash flows.
2. Determine the required rate of return, or discount rate, which depends on the riskiness of the future cash flows.
3. Calculate the present value of the future cash flows to determine what the asset is worth.

It is relatively straightforward to apply these steps in valuing a bond because the cash flows are stated as part of the bond contract and the required rate of return or discount rate is just the yield to maturity on bonds with comparable risk characteristics. However, ordinary share valuation is more difficult for several reasons. First, while the expected cash flows for bonds are well documented and easy to determine, ordinary share dividends are much less certain. Dividends are declared by the board of directors, and a board may or may not decide to pay a cash dividend at a particular time. Thus, the size and the timing of dividend cash flows are less certain. Second, ordinary shares are true perpetuities in that they have no final maturity date. Thus, companies never have to redeem them. In contrast, bonds have a finite maturity. Finally, unlike the rate of return, or yield, on bonds, the rate of return on ordinary shares is not directly observable. Thus, grouping ordinary shares into risk classes is more difficult than grouping bonds. Keeping these complexities in mind, we now turn to a discussion of ordinary share valuation.

A one-period model

Let's assume that you have a genie that can tell the future with perfect certainty. Suppose you are thinking about buying a share and selling it after a year. The genie volunteers that in 1 year you will be able to sell the share for \$100 (P_1) and it will pay an \$8 dividend (D_1) at the end of the year. The time line for the transaction is:



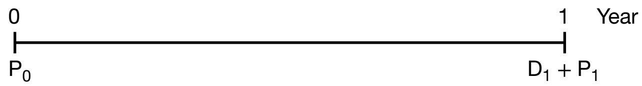
If you and the other investors require a 20 per cent return on investments in securities in this risk class, what price would you be willing to pay for the share today?

The value of the share is the present value of the future cash flows you can expect to receive from it. The cash flows you will receive are as follows: (1) the \$8 dividend and (2) the \$100 sale price. Using a 20 per cent rate of return, we see that the value of the share equals the present value (PV) of the dividend plus the present value of the cash received from the sale of the share:

$$\begin{aligned} \text{PV(share)} &= \text{PV(dividend)} + \text{PV(sale price)} \\ &= \frac{\$8}{1 + 0.2} + \frac{\$100}{1 + 0.2} \end{aligned}$$

$$= \frac{\$8 + \$100}{1.2} = \frac{\$108}{1.2}$$
$$= \$90$$

Thus, the value of the share today is \$90. If you pay \$90 for the share, you will have a 1-year holding period return of exactly 20 per cent. More formally, the time line and the current value of the share for our one-period model can be as shown:



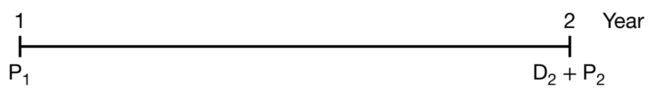
$$P_0 = \frac{D_1 + P_1}{1 + R}$$

where:

P_0 = the current value, or price, of the share
D_1 = dividend paid at the end of the period
P_1 = price of the share at the end of the period
R = required return on ordinary shares, or discount rate, in a particular risk class

Note that P_0 denotes time zero, which is today; P_1 is the price one period later; P_2 is two periods in the future and so on. Note also that when we speak of the price (P) in this context, we mean the value — what we have determined is what the price *should* be, given our model — not the actual market price. Our one-period model provides an estimate of what the market price should be.

Now what if at the beginning of year 2, we are again asked to determine the price of an ordinary share with the same dividend pattern and a 1-year holding period. As in our first calculation, the current price (P_1) of the share is the present value of the dividend and the share's sale price, both received at the end of the year (P_2). Specifically, our time line and the share pricing formula are as follows:



$$P_1 = \frac{D_2 + P_2}{1 + R}$$

If we repeat the process again at the beginning of year 3, the result is similar:

$$P_2 = \frac{D_3 + P_3}{1 + R}$$

and at the beginning of year 4:

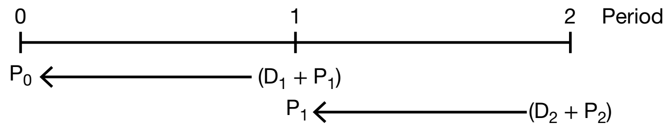
$$P_3 = \frac{D_4 + P_4}{1 + R}$$

Each single-period model discounts the dividend and sale price at the end of the period by the required return.

A perpetuity model

Unfortunately, although our one-period model is correct, it is not very realistic. We need a share-valuation formula for perpetuity, not for one or two periods. However, we can string together a series of one-period share pricing models to arrive at a share perpetuity model. Here is how we are going to do it.

First, we will construct a two-period share-valuation model. The time line for the two-period model follows:



To construct our two-period model, we start with our initial single-period valuation formula:

$$P_0 = \frac{D_1 + P_1}{1 + R}$$

Now we substitute into this equation the expression derived earlier for $P_1 = (D_2 + P_2)/(1 + R)$, which is as follows:

$$P_0 = \frac{D_1 + [(D_2 + P_2)/(1 + R)]}{1 + R}$$

Solving this equation results in a share-valuation model for two periods:

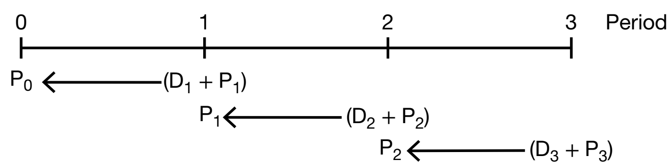
$$P_0 = \frac{D_1}{1 + R} + \frac{D_2}{(1 + R)^2} + \frac{P_2}{(1 + R)^2}$$

Finally, we combine the second-period terms, resulting in this two-period share valuation equation:

$$P_0 = \frac{D_1}{1 + R} + \frac{D_2 + P_2}{(1 + R)^2}$$

This equation shows that the price of a share for two periods is the present value of the dividend in period 1 (D_1) plus the present value of the dividend and sale price in period 2 (D_2 and P_2).

Now let's construct a three-period model. The time line for the three-period model is:



If we substitute the equation for P_2 into the two-period valuation model shown above, we have a three-period model which is shown in the following equations. Recall that $P_2 = (D_3 + P_3)/(1 + R)$. This model was developed in precisely the same way as our two-period model:

$$\begin{aligned}
P_0 &= \frac{D_1}{1 + R} + \frac{D_2}{(1 + R)^2} + \frac{P_2}{(1 + R)^2} \\
&= \frac{D_1}{1 + R} + \frac{D_2}{(1 + R)^2} + \frac{(D_3 + P_3)/(1 + R)}{(1 + R)^2} \\
&= \frac{D_1}{1 + R} + \frac{D_2}{(1 + R)^2} + \frac{D_3}{(1 + R)^3} + \frac{P_3}{(1 + R)^3} \\
&= \frac{D_1}{1 + R} + \frac{D_2}{(1 + R)^2} + \frac{D_3 + P_3}{(1 + R)^3}
\end{aligned}$$

By now, it should be clear that we could go on to develop a four-period model, a five-period model, a six-period model and so on. The ultimate result is the following equation:

$$P_0 = \frac{D_1}{1 + R} + \frac{D_2}{(1 + R)^2} + \frac{D_3}{(1 + R)^3} + \cdots + \frac{D_t}{(1 + R)^t} + \frac{P_t}{(1 + R)^t}$$

Here, t is the number of time periods, which can be any number from one to infinity (∞).

In summary, we have developed a model showing that the value, or price, of a share today (P_0) is the present value of all future dividends and the share's sale price in the future. Although theoretically sound, this model is not practical to apply because the number of dividends could be infinite. It is unlikely that we can successfully forecast an infinite number of dividend payments or a share's sale price far into the future. What we need are some realistic simplifying assumptions.

BEFORE YOU GO ON

1. Why are preference shares often viewed as a special type of a bond rather than a share?

7.3 The general dividend valuation model

LEARNING OBJECTIVE 7.3 Describe how the general dividend valuation model values a share.

In the preceding equation, notice that the final term, as in the earlier valuation models, is always the sale price of the share in period t (P_t) and that t can be any number, including infinity. The model assumes that we can forecast the sale price of the share far into the future, which does not seem very likely in real life. However, as a practical matter, as P_t moves further out in time towards infinity, the value of the P_t approaches zero. Why? No matter how large the sale price of the share, the present value of P_t will approach zero because the discount factor approaches zero. Therefore, if we go out to infinity, we can ignore the $P_t/(1 + R)^t$ term and write our final equation as:

$$\begin{aligned} P_0 &= \frac{D_1}{1 + R} + \frac{D_2}{(1 + R)^2} + \frac{D_3}{(1 + R)^3} + \frac{D_4}{(1 + R)^4} + \frac{D_5}{(1 + R)^5} + \cdots + \frac{D_\infty}{(1 + R)^\infty} \\ &= \sum_{t=1}^{\infty} \frac{D_t}{(1 + R)^t} \end{aligned} \tag{7.1}$$

where:

P_0 = the current value, or price, of the share
D_t = the dividend received in period t, where $t = 1, 2, 3, \ldots \infty$
R = the required return on ordinary shares or discount rate

Equation 7.1 is a general expression for the value of a share. It says that the price of a share is the present value of *all* expected future dividends:

Share price = PV (All future dividends)

The formula does not assume any specific pattern for future dividends, such as a constant growth rate. Nor does it make any assumption about when the share is going to be sold in the future. Furthermore, the model says that to calculate a share's current value, we need to forecast an infinite number of dividends, which is a daunting task at best.

Equation 7.1 provides some insights into why share prices are changing all the time and why, at certain times, price changes can be dramatic. Equation 7.1 implies that the underlying value of a share is determined by the market's expectations of the future cash flows (from dividends) that the company can generate. In efficient markets, share prices change constantly as new information becomes available and is incorporated into the company's market price. For publicly traded companies, the market is inundated with facts and rumours, such as when a company fails to meet sales projections, the CEO resigns or is fired, or a class-action suit is filed against one of its products. Some events may have little or no impact on the company's cash flows and hence its share price. Others can have very large effects on cash flows. Examples include the impact on businesses in Brisbane following destructive storms in November 2014 or the effects of flooding caused by storms in the lower North Island of New Zealand in June 2015, which led to a slowdown in each country's economy.

The growth share pricing paradox

An interesting issue concerning growth shares arises out of the fact that the share valuation equation is based on dividend payments. *Growth shares* are typically defined as the shares of companies whose earnings are growing at above-average rates and are expected to continue to do so for some time. A company of this type typically pays little or no dividends on its shares because management believes that the company has a number of high-return investment opportunities and that both the company and its investors will be better off if earnings are reinvested rather than paid out as dividends.

To illustrate the problem with valuing growth shares, let's suppose that the earnings of Acme Ltd are growing at an exceptionally high rate. The company's shares pay no dividends, and management states that there are no plans to pay any dividends. Based on our share valuation equation, what is the value of Acme's shares?

Obviously, since all the dividend values are zero, the value of our growth share is zero!

$$P_0 = \frac{0}{1 + R} + \frac{0}{(1 + R)^2} + \frac{0}{(1 + R)^3} + \cdots = 0$$

How can the value of a growth share be zero? What is going on here?

The problem is that our definition of growth shares was less than precise. Our application of equation 7.1 assumes that Acme will never pay a dividend. If Acme had an article of association that stated it would *never* pay dividends and would *never* liquidate itself (unless it became insolvent), the value of its shares would indeed be zero. Equation 7.1 predicts and common sense says that if you own shares in a company that will *never* pay you any cash, the market value of those shares is absolutely nothing. As you may recall, this is a point we emphasised in chapter 1.

What we should have said is that a growth share is a share in a company that *currently* has exceptional investment opportunities and thus is not *currently* paying dividends because it is reinvesting earnings. At some time in the future, growth share companies will pay dividends or will liquidate themselves (for example, by selling out to other companies) and pay a single large 'cash dividend'. People who buy growth shares expect rapid price appreciation because management reinvests the cash flows from earnings internally in investment projects believed to have high rates of return. If the internal investments succeed, the share's price should go up significantly and investors can sell their shares at a price that is higher than the price they paid.

BEFORE YOU GO ON

1. What is the general formula used to calculate the price of a share? What does it mean?
2. What are growth shares and why do they typically pay little or no dividends?

7.4 Share valuation: some simplifying assumptions

LEARNING OBJECTIVE 7.4 Discuss the assumptions that are necessary to make the general dividend valuation model easier to use, and be able to use the model to calculate the value of a company's ordinary shares.

Conceptually, our dividend model (equation 7.1) is consistent with the notion that the value of an asset is the discounted value of future cash flows. Unfortunately, at a practical level, the model is not easy to use because of the difficulty of estimating future dividends over a long period of time. We can, however, make some simplifying assumptions about the pattern of dividends that will make the model more manageable. Fortunately, these assumptions closely resemble the way many companies manage their dividend payments. We have a choice among three different assumptions: (1) Dividend payments remain constant over time; that is, they have a growth rate of zero. (2) Dividends have a constant growth rate; for example, they grow at 3 per cent per year. (3) Dividends have a mixed growth rate pattern; that is, dividends have one payment pattern and then switch to another. Next, we discuss each assumption in turn.

Zero growth dividend model

The simplest assumption is that dividends will have a growth rate of zero. Thus, the dividend payment pattern remains constant over time:

$$D_1 = D_2 = D_3 = \ldots = D\infty$$

In this case the dividend discount model (equation 7.1) becomes:

$$P_0 = \frac{D}{1+R} + \frac{D}{(1+R)^2} + \frac{D}{(1+R)^3} + \frac{D}{(1+R)^4} + \frac{D}{(1+R)^5} + \cdots + \frac{D}{(1+R)^\infty}$$

This cash flow pattern essentially describes a perpetuity with a constant cash flow. You may recall that we developed an equation for such a perpetuity in chapter 4. Equation 4.3 said that the present value of a perpetuity with a constant cash flow is CF/*i*, where CF is the constant cash flow and *i* is the interest rate. In terms of our share valuation model, we can present the same relationship as follows:

$$P_0 = \frac{D}{R} \tag{7.2}$$

where:

P_0 = the current value, or price, of the share
D = the constant cash dividend received in each time period
R = the required return on ordinary shares or discount rate

This model fits the dividend pattern for ordinary shares of a company that is not growing and has little growth potential or for preference shares, which we discuss in the next section.

For example, Great Southern Print & Copy is a small printing company that serves Albany, Western Australia. The town's economic base has remained constant over the years, and Great Southern's sales and earnings reflect this trend. The company pays a $5 dividend per year, and the board of directors has no plans to change the dividend. The company's investors are mostly local businesspeople who expect a 20 per cent return on their investment. What should be the price of the company's shares?

Since the cash dividend payments are constant, we can use equation 7.2 to find the price of the shares:

$$P_0 = \frac{D}{R} = \frac{\$5}{0.20} = \$25 \text{ per share}$$

DEMONSTRATION PROBLEM 7.1

The value of a small business

Problem

For the past 15 years, a family has operated the gift shop in a luxury hotel in Cairns, Queensland. The hotel management wants to sell the gift shop to the family members rather than paying them to operate it. The family's accountant will incorporate the new business and estimates that it will generate an annual cash dividend of $150 000 for the shareholders. The hotel will provide the family with an infinite guarantee for the space and a generous buyout plan in the event that the hotel closes its doors. The accountant estimates that a 20 per cent discount rate is appropriate. What is the value of the shares?

Approach

Assuming that the business will operate indefinitely and that its growth is constrained by its circumstances, the zero growth discount model can be used to value the shares. Thus, we can use equation 7.2. Since the number of shares outstanding is not known, we can simply interpret P_0 as being the total value of the outstanding ordinary shares.

Solution

$$P_0 = \frac{D}{R} = \frac{\$150\,000}{0.20} = \$750\,000$$

Constant growth dividend model

Under the next dividend assumption, cash dividends do not remain constant but instead grow at some average rate g from one period to the next forever. The rate of growth can be positive or negative. And, as it turns out, a constant growth rate is not a bad approximation of the actual dividend pattern for some companies. Constant dividend growth is an appropriate assumption for mature companies with a history of stable growth.

You may have concerns about the assumption of an infinite time horizon. In practice, though, it does not present a problem. It is true that most companies do not live on forever. We know, however, that the further in the future a cash flow will occur, the smaller its present value. Thus, far-distant dividends have a small present value and contribute very little to the share price. For example, as shown in figure 7.3, with constant dividends and a 15 per cent discount rate, dividends paid during the first 10 years account for more than 75 per cent of the value of a share, while dividends paid after the twentieth year contribute less than 6 per cent of the value.

Identifying and applying the constant-growth dividend model is fairly straightforward. First, we need a model to calculate the value of dividend payments for any time period. We will assume that the cash dividends grow at a constant rate g from one period to the next forever. This situation is an application of the compound growth rate formula, equation 3.5 developed in chapter 3:

$$FV_n = PV \times (1 + g)^n$$

where g is the compound growth rate and n is the number of compounding periods. We can apply this formula to our dividend payments. We note that D_0 is the current dividend, paid at time $t = 0$, and it grows at a constant growth rate g. The next dividend, paid at time $t = 1$, is D_1, which is just the current dividend (D_0) multiplied by the growth factor, $(1 + g)$. Thus, $D_1 = D_0 \times (1 + g)$. The general formula for dividend values over time is stated as follows:

$$D_t = D_0 \times (1 + g)^t \qquad \textbf{7.3}$$

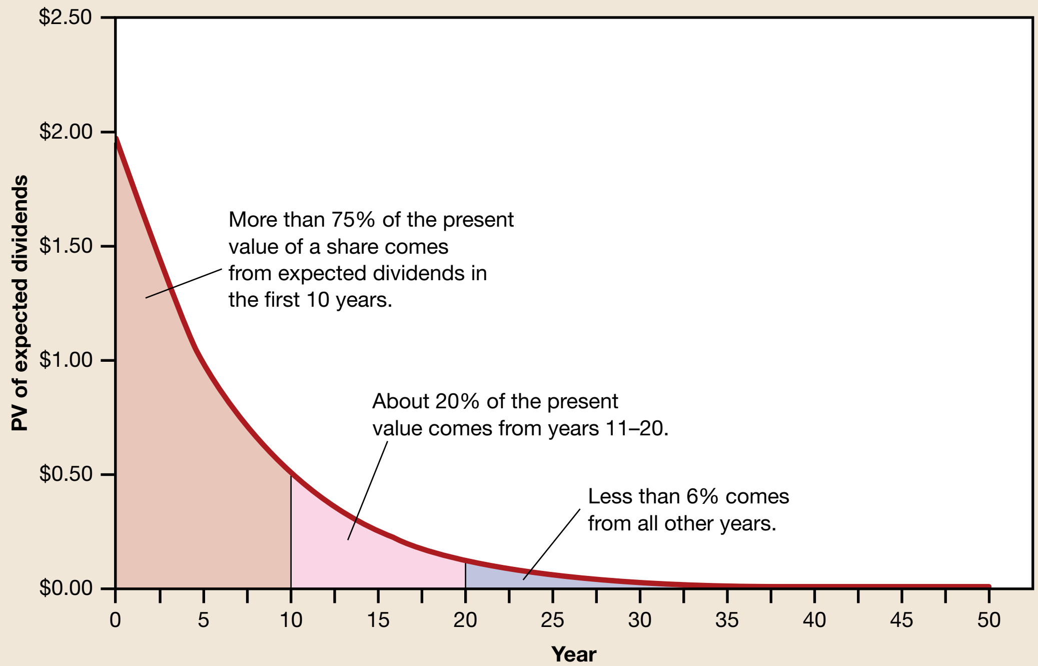
where:

D_t = dividend payment in period t, where $t = 1, 2, 3, \ldots \infty$

D_0 = dividend paid in the current period, $t = 0$

g = the constant growth rate for dividends

Equation 7.3 allows us to calculate the dividend payment for any time period.



Note: Calculations based on discount rate of 15% and constant dividends.

FIGURE 7.3 **Impact on share prices of near and distant future dividends**
Dividends expected far in the future have a smaller present value than dividends expected in the next few years, and so they have less effect on the share price. As you can see in the figure, with constant dividends more than 75 per cent of the current price of a share comes from expected dividends in the first 10 years.

Notice that to calculate the dividend for any period, we multiply D_0 by the growth rate factor to some power, but we *always* start with D_0.

We can now develop the constant growth dividend model, which is easy to do because it is just an extension of equation 4.3 from chapter 4. Equation 4.3 says that the present value of a perpetuity (PVP) is the cash flow value (CF_1) from period 1, divided by the discount rate (i):

$$\text{PVP} = \frac{CF_1}{i}$$

We can now extend this relationship to include growing cash flows. The present value of a growing perpetuity (PVP) is the growing cash flow value (CF_1) from period 1, divided by the difference between the discount rate (i) and the rate of growth (g) of the cash flow (CF_1) as follows:

$$PVP = \frac{CF_1}{i - g}$$

We can represent this same relationship as follows:

$$P_0 = \frac{D_1}{R - g} \tag{7.4}$$

where:

P_0 = the current value, or price, of the shares
D_1 = the dividend paid in the next period ($t = 1$)
g = the constant growth rate for dividends
R = the required return on ordinary shares or discount rate

In other words, the constant growth dividend model tells us that the current price of a share is the next period dividend divided by the difference between the discount rate and the dividend growth rate. Note that PVP is the current value or price of the share (P_0), which is the present value of the dividend cash flows.

The growing perpetuity model is valid only as long as the growth rate is less than the discount rate, or required rate of return. In terms of equation 7.4, then, the value of g must be less than the value of R ($g < R$). If the equation is used in situations where R is equal to or less than g ($R \leq g$), the calculated results will be meaningless.

Finally, notice that if $g = 0$ there is no dividend growth, the dividend payment pattern becomes a constant no-growth dividend stream, and equation 7.4 becomes $P_0 = D/R$. This equation is precisely the same as equation 7.2, which is our zero growth dividend model. Thus, equation 7.2 is just a special case of equation 7.4 where $g = 0$.

Let's work through an example using the constant growth dividend model. Blue Oval Motor Wreckers is an automotive parts supplier based in Geelong. At the company's year-end shareholders meeting, the CFO announces that this year's dividend will be $4.81. The announcement conforms to Blue Oval's dividend policy, which sets dividend growth at a 4 per cent annual rate. Investors who own shares in similar types of companies expect to earn a return of 18 per cent. What is the value of the company's shares?

First, we need to calculate the cash dividend payment for next year (D_1). Applying equation 7.3 for $t = 1$ yields the following:

$$D_1 = D_0 \times (1 + g) = \$4.81 \times (1 + 0.04) = \$4.81 \times 1.04 = \$5.00$$

Next, we apply equation 7.4 to find the value of the company's shares, which is $35.71 per share:

$$\begin{aligned} P_0 &= \frac{D_1}{R - g} \\ &= \frac{\$5.00}{0.18 - 0.04} \\ &= \frac{\$5.00}{0.14} \\ &= \$35.71 \end{aligned}$$

DEMONSTRATION PROBLEM 7.2

Blue Oval grows faster

Problem

Using the information given in the text, calculate the value of Blue Oval's shares if dividends grow at 12 per cent rather than 4 per cent. Explain why the answer makes sense.

Approach

First calculate the cash dividend payment for next year (D_1) using the 12 per cent growth rate. Then apply equation 7.4 to solve for the company's share price.

Solution

$$D_1 = \$4.81 \times 1.12 = \$5.39$$

$$P_0 = \frac{\$5.39}{0.18 - 0.12} = \frac{\$5.39}{0.06} = \$89.83$$

The higher share value of \$89.93 is no surprise because dividends are now growing at a rate of 12 per cent rather than 4 per cent. Hence, value from cash payments to investors (dividends) is expected to be larger.

Calculating future share prices

The constant growth dividend model (equation 7.4) can be modified to determine the value, or price, of a share at any point in time. In general, the price of a share, P_t, can be expressed in terms of the dividend in the next period (D_{t+1}), g and R, when the dividends from D_{t+1} forward are expected to grow at a constant rate. Thus, the price of a share at time t is as follows:

$$P_t = \frac{D_{t+1}}{R - g} \qquad \textbf{7.5}$$

Notice that equation 7.4 is just a special case of equation 7.5 in which $t = 0$. To be sure that you understand this, set up equation 7.5 to calculate a share's current price at $t = 0$. When you are done, the resulting equation should look exactly like equation 7.4.

An example will illustrate how equation 7.5 is used. Suppose that a company has a current dividend (D_0) of \$2.50, R is 15 per cent and g is 5 per cent. What is the share price today (P_0), and what will it be in 5 years (P_5)? To help visualise the problem, we will lay out a time line and identify some of the important variables necessary to solve the problem:

	0	1	2	3	4	5	6	Year
	Dividend: \$2.50	D_1	D_2	D_3	D_4	D_5	D_6	
	Share price: P_0					P_5		

To find the current share price, we can apply equation 7.4, but we must first calculate the dividend for the next period (D_1), which is at $t = 1$. Using equation 7.3, we calculate the company's dividend for next year:

$$D_1 = D_0 \times (1 + g) = \$2.50 \times 1.05 = \$2.625$$

Then we can use equation 7.4 to find the price of the share today:

$$P_0 = \frac{D_1}{R - g} = \frac{\$2.625}{0.15 - 0.05} = \frac{\$2.625}{0.10} = \$26.25$$

Now we will find the value of the share in 5 years. In this situation equation 7.5 is expressed as:

$$P_5 = \frac{D_6}{R - g}$$

We need to calculate D_6, and we do so by using equation 7.3:

$$D_6 = D_0 \times (1 + g)^6 = 2.50 \times (1.05)^6 = 2.50 \times 1.34 = \$3.35$$

The price of the share in 5 years is therefore:

$$P_5 = \frac{\$3.35}{0.15 - 0.05} = \frac{\$3.35}{0.10} = \$33.50$$

Finally, note that $\$33.50/(1.05)^5 = \$26.25$, which is the value today.

DEMONSTRATION PROBLEM 7.3

David Jones' current share price

Problem

Suppose that the current cash dividend on David Jones' ordinary shares is \$0.27. Financial analysts expect the dividends to grow at a constant rate of 6 per cent per year, and investors require a 12 per cent return on this class of shares. What should be the current share price of David Jones?

Approach

In this scenario, $D_0 = \$0.27$, $R = 0.12$ and $g = 0.06$. We first find D_1 using equation 7.3, and we then calculate the value of a share using equation 7.4.

Solution:

$$\text{Dividend: } D_1 = D_0 \times (1 + g) = \$0.27 \times 1.06 = \$0.2862$$

$$\text{Value of a share: } P_0 = \frac{D_1}{R - g} = \frac{\$0.2862}{0.12 - 0.06} = \frac{\$0.2862}{0.06} = \$4.77$$

DEMONSTRATION PROBLEM 7.4

David Jones' future share price

Problem

Continuing the example in demonstration problem 7.3, what should David Jones' share price be 7 years from now (P_7)?

Approach

This is an application of equation 7.5. We first need to calculate David Jones' dividend in period 8, using equation 7.3. Then we can apply equation 7.5 to calculate the estimated price of the share 7 years in the future.

Solution

Dividend in period 8: $D_8 = D_0 \times (1 + g)^8 = \$0.27 \times (1.06)^8 = \$0.27 \times 1.594 = 0.43$

Price of a share in 7 years: $P_7 = \frac{D_8}{R - g} = \frac{\$0.43}{0.12 - 0.06} = \frac{\$0.43}{0.06} = \$7.17$

Alternatively, you could calculate the price of a share in 7 years by using equation 3.6.

Value of a share in year 0: $P_0 = \$4.77$
Price of a share in 7 years: $P_7 = PV_0 \times (1 + g)^n = \$4.77 \times 1.06^7 = \$4.77 \times 1.5036 = \$7.17$

The relationship between R and *g*

We previously mentioned that the dividend growth model provides valid solutions only when $g < R$. Students frequently ask what happens to equations 7.4 or 7.5 if this condition does not hold (if $g \geq R$). Mathematically, as g approaches R, the share price becomes larger and larger, and when $g = R$, the value of the share is infinite, which is nonsense. When the growth rate (g) is larger than the discount rate (R), the constant growth dividend model tells us that the value of the share is negative. However, this is not possible; the value of a share can never be negative.

From a practical perspective, the growth rate in the constant growth dividend model cannot be greater than the sum of the long-term rate of inflation and the long-term real growth rate of the economy. Since this model assumes that the company will grow at a constant rate forever, any growth rate that is greater than this sum would imply that the company will eventually take over the entire economy. Of course, we know this is not possible. Since the sum of the long-term rate of inflation and the long-term real growth rate has historically been less than 7 to 8 per cent, the growth rate (g) is virtually always less than the discount rate (R) for the shares that we would want to use the constant growth dividend model to value.

It is possible for companies to grow faster than the long-term rate of inflation plus the real growth rate of the economy — just not forever. A company that is growing at such a high rate is said to be growing at a supernormal growth rate. We must use a different model to value the shares of a company like this. We discuss one such model next.

Mixed (supernormal) growth dividend model

For many companies, it is not appropriate to assume that dividends will grow at a constant rate. Companies typically go through *life cycles* and, as a result, exhibit different dividend patterns over time.

During the early part of their lives, successful companies experience a supernormal rate of growth in earnings. These companies tend to pay lower dividends or no dividends at all because many good investment projects are available to them and management wants to reinvest earnings in the company to take advantage of these opportunities. If a growth company does not pay regular dividends, investors receive their returns from capital appreciation of the company's shares (which reflects increases in expected future dividends), from a cash or share payout if the company is acquired, or possibly from a large special cash dividend. As a company matures, it will settle into a growth rate at or below the long-term rate of inflation plus the long-term real growth rate of the economy. When a company reaches this stage, it will typically be paying a fairly predictable regular dividend.

Figure 7.4 shows several dividend growth curves. In the top curve, dividends figure a supernormal growth rate of 25 per cent for 4 years, then a more sustainable nominal growth rate of 5 per cent (this might, for example, be made up of 2.5 per cent growth from inflation plus a 2.5 per cent real growth rate). By comparison, the remaining curves show dividends with a constant nominal growth rate of 5 per cent, a zero growth rate and a negative 10 per cent growth rate.

As mentioned earlier, successful companies often experience supernormal growth early in their life cycles. During 2014, for example, companies such as Kloud Solutions, Metro Property Development and Prime Build experienced supernormal growth.[11] Older companies that reinvent themselves with new products or strategies may also experience periods of supernormal growth. Between the return of Steve Jobs to the helm of Apple in 1997 and his death in 2011, both earnings growth and shareholder returns exceeded 30 per cent per annum.[12] Not long after Tim Cook took over as chief executive officer, Apple announced that net profit had increased by 85 per cent in the financial year ending 27 September 2011. Apple's annual net profit growth has varied considerably since 2011, fluctuating between –11.25 per cent (in 2013) and 60.99 per cent (in 2012). In the March 2015 quarter, Apple posted a net profit growth of 33 per cent. The increase in growth has been attributed to Apple's move into China's markets and an increase in iPhone sales.[13] Apple's stock price has risen 236 per cent during the last five years ending 27 July 2015.[14] Apple has since returned some of its profits to shareholders in the form of dividends and share buybacks, whereas in the past Jobs preferred to retain Apple's earnings for further investments in profitable projects.

To value a share for a company with supernormal dividend growth patterns, we do not need to develop any new equations. Instead, we can apply equation 7.1, our general dividend model, and equation 7.5, which gives us the price of a share with constant dividend growth at any point in time.

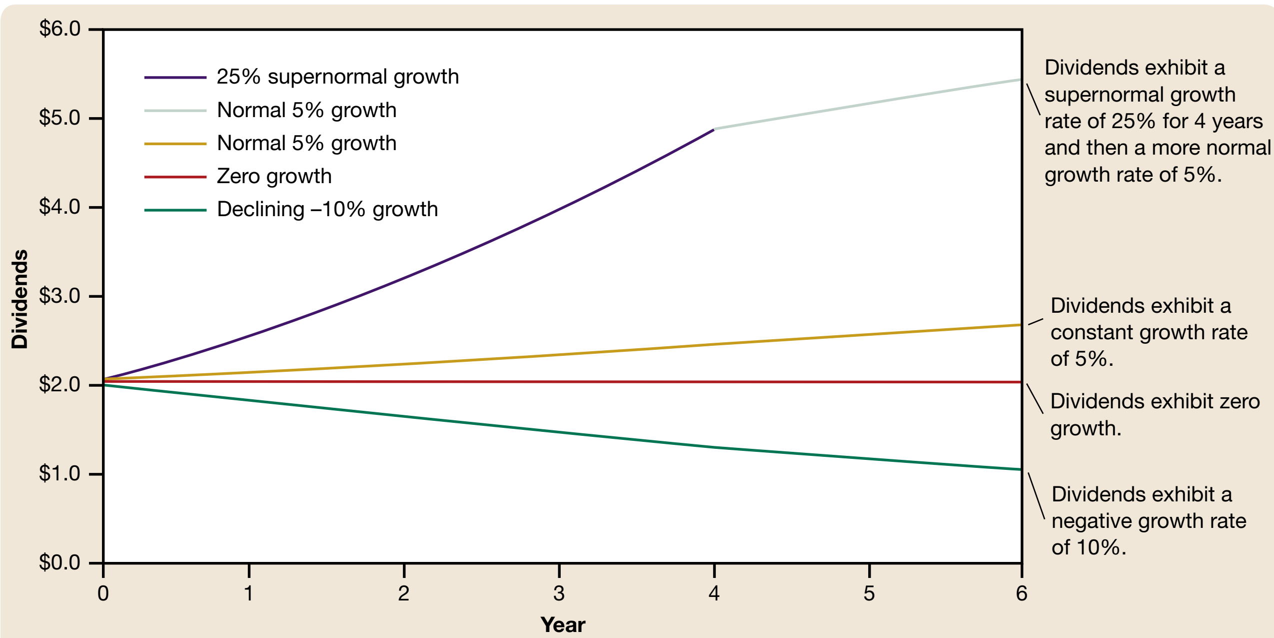


FIGURE 7.4 **Dividend growth rate patterns**
The graph shows several dividend growth curves from supernormal growth of 25 per cent for 4 years to a negative 10 per cent growth rate.

We will illustrate with an example. Suppose a company's expected dividend pattern for 3 years is as follows: $D_1 = \$1$, $D_2 = \$2$, $D_3 = \$3$. After 3 years, the dividends are expected to grow at a constant rate of 6 per cent a year. What should the current share price (P_0) be if the required rate of return demanded by investors is 15 per cent?

We begin by drawing a time line, as shown in figure 7.5. We recommend that you prepare a time line whenever you solve a problem with a complex dividend pattern so that you can be sure the cash flows are placed in the proper time periods. The critical element in working these problems is to correctly identify when the constant growth starts and to value it properly.

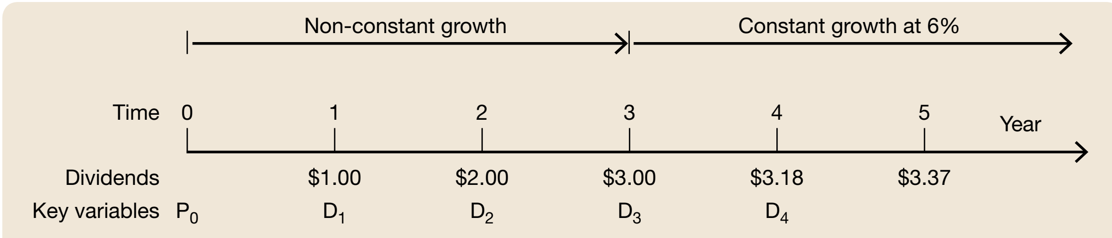


FIGURE 7.5 **Time line for non-constant dividend pattern**
The figure shows a time line for a non-constant growth dividend pattern. The time line makes it easy to see that we have two different dividend patterns. For 3 years, the dividends are expected to grow at a non-constant rate; after that, they are expected to grow at a constant rate of 6 per cent.

Looking at figure 7.5, it is easy to see that we have two different dividend patterns. (1) D_1 through D_3 represent a mixed dividend pattern, which can be valued using equation 7.1, the general dividend valuation model. (2) After the third year, dividends show a constant growth rate of 6 per cent, and this pattern can be valued using equation 7.5, the constant growth dividend valuation model. Thus, our valuation model is:

$$P_0 = \text{PV (Mixed dividend growth)} + \text{PV (Constant dividend growth)}$$

Combining these present values yields the following result:

$$P_0 = \underbrace{\frac{D_1}{(1+R)} + \frac{D_2}{(1+R)^2} + \frac{D_3}{(1+R)^3}}_{\text{PV of mixed growth dividend payments}} + \underbrace{\frac{P_3}{(1+R)^3}}_{\text{Value of constant growth dividend payments}}$$

The value of the constant growth dividend stream is P_3, which is the value, or price, at time $t = 3$. More specifically, P_3 is the value of the future cash dividends discounted to time period $t = 3$. With a required rate of return of 15 per cent, the value of these dividends is calculated as follows:

$$D_4 = D_3 \times (1 + g) = \$3.00 \times 1.06 = \$3.18$$

$$P_3 = \frac{D_4}{R - g} = \frac{\$3.18}{0.15 - 0.06}$$

$$= \frac{\$3.18}{0.09}$$

$$= \$35.33$$

We find the value of P_3 using equation 7.5, which allows us to calculate share prices in the future for shares with constant dividend growth. Note that the equation gives us the value, as of year 3, of a constant growth perpetuity that begins in year 4. This formula always gives us the value as of one period before the first cash flow.

Now, since P_3 is at time period $t = 3$, we must discount it back to the present ($t = 0$). This is accomplished by dividing P_3 by the appropriate discount factor — $(1 + R)^3$.

Plugging the values for the dividends, P_3 and R into the above mixed growth equation results in the following:

$$P_0 = \frac{\$1.00}{1.15} + \frac{\$2.00}{(1.15)^2} + \frac{\$3.00}{(1.15)^3} + \frac{\$35.33}{(1.15)^3}$$

$$= \$0.87 + \$1.51 + \$1.97 + \$23.23$$

$$= \$27.58$$

Thus, the value of the share is $27.58.

We can write a general equation for the supernormal growth situation, where dividends grow first at a non-constant rate until period t and then at a constant rate, as follows:

$$P_0 = \frac{D_1}{1+R} + \frac{D_2}{(1+R)^2} + \cdots + \frac{D_t}{(1+R)^t} + \frac{P_t}{(1+R)^t} \tag{7.6}$$

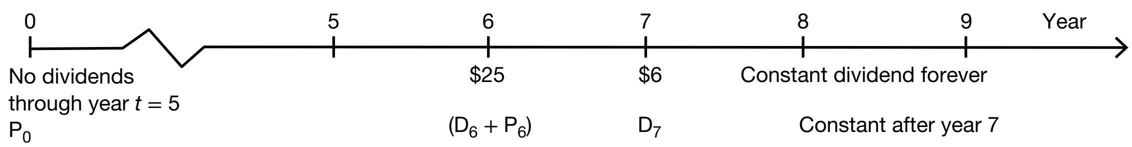
If the supernormal growth period ends and dividends grow at a constant rate, g, then P_t is calculated from equation 7.5 as follows:

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

The two preceding equations can also be applied when dividends are constant over time, since we know that $g = 0$ is just a special case of the constant growth dividend model ($g > 0$).

Let's look at another example, this time using equation 7.6. Suppose that AusBiotech Ltd is a high-tech medical device company located in Melbourne. The company is 3 years old and has experienced spectacular growth since its inception. You are a financial analyst for a share brokerage company and have just returned from a 2-day visit to the company. You learned that AusBiotech plans to pay no dividends for the next 5 years. In year 6, management plans to pay a large special cash dividend, which you estimate to be \$25 per share. Then, beginning in year 7, management plans to pay a constant annual dividend of \$6 per share for the foreseeable future. The appropriate discount rate for the shares is 12 per cent and the current market price is \$25 per share. Your boss doesn't think the shares are worth the price. You think that they are a bargain and that you should recommend them to the company's clients. Who is right?

Our first step in answering this question is to lay out on a time line the expected dividend payments:



This situation is a direct application of equation 7.6, which is the mixed dividend model. That is, there are two different dividend cash streams: (1) the mixed dividends, which in this case comprise a single dividend paid in year 6 (equation 7.1) and (2) the constant dividend stream ($g = 0$) of \$6 per year forever (equation 7.5). The value of the ordinary shares can be calculated as follows:

$$P_0 = \text{PV (Mixed dividend growth)} + \text{PV (Constant dividends with no growth)}$$

Applying equation 7.6 to the cash flows presented in the problem yields:

$$\begin{aligned} P_0 &= \frac{D_1}{1+R} + \frac{D_2}{(1+R)^2} + \cdots + \frac{D_t}{(1+R)^t} + \frac{P_t}{(1+R)^t} \\ &= \frac{D_6}{(1+R)^6} + \frac{P_6}{(1+R)^6} \\ &= \frac{D_6 + P_6}{(1+R)^6} \end{aligned}$$

Note that the first term in the second line calculates the present value of the large \$25 dividend paid in year 6. In the second term, P_6 is the discounted value of the constant \$6 dividend payments made in perpetuity, valued to period $t = 6$. To calculate the present value of P_6, we divide it by the appropriate discount factor, which is $(1 + R)^6$.

Next, we plug the data given earlier into the above equation:

$$P_0 = \frac{\$25 + P_6}{(1.12)^6}$$

We can see that we still need to calculate the value of P_6 using equation 7.5:

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

Equation 7.5 is easy to apply since the dividend payments remain constant over time. Thus, $D_{t+1} = \$6$ and $g = 0$. P_6 is calculated as follows:

$$P_6 = \frac{D_7}{R - g} = \frac{\$6}{0.12 - 0} = \frac{\$6}{0.12}$$
$$= \$50$$

The calculation for P_0 is, therefore:

$$P_0 = \frac{\$25 + \$50}{(1.12)^6}$$
$$= \frac{\$75}{1.9738}$$
$$= \$38.00$$

The share's current market price is \$25, and if your estimates of dividend payments are correct, the share's value is \$38 per share. This suggests that the share is a bargain and that your boss is incorrect.

BEFORE YOU GO ON

1. What three different models are used to value shares based on different dividend patterns?
2. Explain why the growth rate *g* must always be less than the rate of return R.

7.5 Valuing preference shares

LEARNING OBJECTIVE 7.5 Explain how valuing preference shares with a stated maturity differs from valuing preference shares with no maturity date, and be able to calculate the price of a preference share under both conditions.

As mentioned earlier in the chapter, preference shares are hybrid securities, falling someplace between bonds and ordinary shares. For example, preference shares are a higher priority claim on the company's assets than ordinary shares but a lower priority claim than the company's creditors in the event of default. In calculating the value of preference shares, however, the critical issue is whether the preference share has an effective 'maturity'. If the preference share contract has a sinking fund that calls for the mandatory retirement of the shares over a scheduled period of time, financial analysts will tend to treat the shares as if they were a bond with a fixed maturity.

The most significant difference between a preference share with a fixed maturity and a bond is the risk of default. Bond coupon payments are a legal obligation of the company, and failure to pay them results in default, whereas preference share dividends are declared by the board of directors, and failure to pay dividends does not result in default. Even though it is not a legal default, the failure to pay a preference share dividend as promised is not a trivial event. It is a serious financial breach that can signal to the market that the company is in serious financial difficulty. As a result, managers make every effort to pay preference share dividends as promised.

Preference shares with a fixed maturity

Because preference shares with an effective maturity is considered similar to a bond, we can use the bond valuation model developed in chapter 6 to determine its price, or value. Applying equation 6.3 requires only that we recognise that the coupon payments (C) are now dividend payments (D) and the preference share dividends are paid semiannually. Thus, equation 6.3 can be restated as the price of a preference share (PS_0):

$$\text{Preference share price} = \text{PV(Dividend payments)} + \text{PV(Par value)}$$

$$PS_0 = \frac{D/m}{i/m}\left[1 - \frac{1}{(1 + i/m)^{mn}}\right] + \frac{P_{mn}}{(1 + i/m)^{mn}} \tag{7.7}$$

where:

D = the annual preference share dividend payment
P = the stated (par) value of the preference share
i = the yield to maturity of the preference share
m = the number of times dividend payments are made each year
n = the number of years to maturity

For preference shares with semiannual dividend payments, m equals 2.

Consider an example of how this equation is used. Suppose that an energy company's preference shares have an annual dividend payment of $10 (paid semiannually), a stated (par) value of $100, and an effective maturity of 20 years owing to a sinking fund requirement. If similar preference share issues have market yields of 8 per cent, what is the value of the preference shares?

First, we convert the data to semiannual compounding as follows: (1) the market yield is 4 per cent semiannually (8 per cent per year/2), (2) the dividend payment is $5 semiannually ($10 per year/2) and (3) the total number of dividend payments is 40 (2 per year × 20 years). Plugging the data into equation 6.3, we find that the value of the preference shares is:

$$\begin{aligned} PS_0 &= \frac{\$5}{0.04}\left[1 - \frac{1}{(1.04)^{40}}\right] + \frac{\$100}{(1.04)^{40}} \\ &= (125 \times 0.7917) + \frac{\$100}{4.801} \\ &= 98.96 + 20.83 \\ &= \$119.79 \end{aligned}$$

We can, of course, also solve this problem on a financial calculator, as follows.

Procedure	Key operation	Display
Enter cash flow data	4 [I/Y]	4 => I/Y 4.00
	40 [N]	40 => N 40.00
	100 [FV]	100 => FV 100.00
	5 [PMT]	5 => PMT 5.00
Calculate PV	[COMP] [PV]	PV = –119.79

DEMONSTRATION PROBLEM 7.5

Calculating the yield on preference shares

Problem

AGL Energy Ltd (AGL) has a preference share issue outstanding that has a stated value of $100 that will be retired by the company in 15 years and that pays a $4 dividend each 6 months. If the preference shares are currently selling for $95, what is the share's yield to maturity?

Approach

We calculate the yield to maturity on this preference share in exactly the same way we calculate the yield to maturity on a bond. We already know that the semiannual dividend rate is $4, but we must convert the number of periods to allow for semiannual compounding. The total number of compounding periods is 30 (2 per year × 15 years). Using equation 7.7, we can enter the data and find *i*, the share's yield to maturity through trial and error. Alternatively, we can solve the problem easily on a financial calculator.

Solution

Applying equation 7.7:

$$PS_0 = \frac{D/m}{i/m}\left[1 - \frac{1}{(1 + i/m)^{mn}}\right] + \frac{P_{mn}}{(1 + i/m)^{mn}}$$

$$\$95 = \frac{\$4}{i}\left[1 - \frac{1}{(1 + i)^{30}}\right] + \frac{\$100}{(1 + i)^{30}}$$

Financial calculator steps are as follows.

Procedure	Key operation	Display
Enter cash flow data	[+/–] 95 [PV]	(–95) => PV –95.00
	30 [N]	30 => N 30.00
	100 [FV]	100 => FV 100.00
	4 [PMT]	4 => PMT 4.00
Calculate I/Y	[COMP] [I/Y]	I/Y = 4.30

The preference share's yield is 4.30 per cent per half-year, and the annual yield is 8.60 per cent (4.30 per cent × 2).

Perpetuity preference shares

Some preference share issues have no maturity. These securities have dividends that are constant over time ($g = 0$), and the fixed dividend payments go on forever. Thus, these preference shares can be valued as perpetuities, using equation 7.2:

$$P_0 = \frac{D}{R}$$

where D is a constant cash dividend and R is the interest rate, or required rate of return.

Let's work an example. Suppose that Qantas has a perpetual preference share issue that pays a dividend of $5 per year. Investors require an 18 per cent return on such an investment. What should be the value of the preference share? Applying equation 7.2, we find that the value is:

$$P_0 = \frac{D}{R} = \frac{\$5.00}{0.18} = \$27.78$$

BEFORE YOU GO ON

1. Why can skipping payment of a preference share dividend be a bad signal?
2. How is a preference share with a fixed maturity valued?

SUMMARY OF LEARNING OBJECTIVES

7.1 Describe the four types of secondary markets.

The four types of secondary markets are: (1) direct search, (2) broker, (3) dealer and (4) auction. In direct search markets, buyers and sellers seek each other out directly. In broker markets, brokers bring buyers and sellers together for a fee. Trades in dealer markets go through dealers who buy securities at one price and sell at a higher price. The dealers face the risk that prices could decline while they own the securities. Auction markets have a fixed location where buyers and sellers confront each other directly and bargain over the transaction price.

7.2 Explain why many financial analysts treat preference shares as a special type of bond rather than as an equity security.

Preference shares represent ownership in a company and entitle the owner to a dividend, which must be paid before dividends are paid to ordinary shareholders. Similar to bonds, preference share issues have credit ratings, are sometimes convertible to ordinary shares and are often callable. Unlike owners of ordinary shares, owners of non-convertible preference shares do not have voting rights and do not participate in the company's profits beyond the fixed dividends they receive. Because of their strong similarity to bonds, many financial analysts treat preference shares that are not true perpetuities as a form of debt rather than equity.

7.3 Describe how the general dividend valuation model values a share.

The general dividend valuation model values a share as the present value of all future cash dividend payments, where the dividend payments are discounted using the rate of return required by investors for a particular risk class.

7.4 Discuss the assumptions that are necessary to make the general dividend valuation model easier to use, and be able to use the model to calculate the value of a company's ordinary shares.

The problems with the general dividend valuation model are that the exact discount rate that should be used is unknown, dividends are often uncertain, and some companies do not pay dividends at all. To make the model easier to apply, we make assumptions about the dividend payment patterns of businesses. These simplifying assumptions allow the development of more manageable models, and they also conform with the actual dividend policies of many companies. Dividend patterns include the following: (1) dividends are constant (zero growth), as calculated in demonstration problem 7.1; (2) dividends have a constant growth pattern (they grow forever at a constant rate g), as calculated in demonstration problem 7.2; and (3) dividends grow first at a non-constant rate then at a constant rate, as calculated in the AusBiotech example at the end of section 7.4.

7.5 Explain how valuing preference shares with a stated maturity differs from valuing preference shares with no maturity date, and be able to calculate the price of a preference share under both conditions.

When a preference share has a maturity date, financial analysts value it as they value any other fixed obligation — that is, like a bond. To value such a preference share, we can use the bond valuation model from chapter 6. Before using the model, we need to recognise that we will be using dividends in the place of coupon payments and that the par value of the share will replace the par value of the bond. Additionally, in Australia, both bond coupons and preference share dividends are paid semi-annually. When a preference share has no stated maturity, it becomes a perpetuity, with the dividend becoming the constant payment that goes on forever. We use the perpetuity valuation model represented by equation 7.2 to price such shares. The calculations appear in demonstration problem 7.5 and the Qantas example at the end of section 7.5.

KEY TERMS

bid price the price a securities dealer will pay for a given share
dividend yield a share's dividend payout divided by its current price
offer (ask) price the price at which a securities dealer seeks to sell a given share
ordinary share an equity share that represents the basic ownership claim in a company; the most ordinary type of equity security
post a specific location on the floor of a securities exchange at which auctions for a particular security take place
preference share an equity share in a company that entitles the owner to preferred treatment over owners of ordinary shares with respect to dividend payments and claims against the company's assets in the event of insolvency or liquidation but that typically has no voting rights

SUMMARY OF KEY EQUATIONS

Equation	Description	Formula
7.1	The general dividend valuation model	$P_0 = \frac{D_1}{1+R} + \frac{D_2}{(1+R)^2} + \frac{D_3}{(1+R)^3} + \frac{D_4}{(1+R)^4} + \frac{D_5}{(1+R)^5} + \cdots + \frac{D_\infty}{(1+R)^\infty} = \sum_{t=1}^{\infty} \frac{D_t}{(1+R)^t}$
7.2	Zero growth dividend model	$P_0 = \frac{D}{R}$
7.3	Value of a dividend at time *t* in a constant-growth scenario	$D_t = D_0 \times (1+g)^t$
7.4	Constant growth dividend model	$P_0 = \frac{D_1}{R-g}$
7.5	Value of a share at time *t* when dividends grow at a constant rate	$P_t = \frac{D_{t+1}}{R-g}$
7.6	Supernormal growth share valuation model	$P_0 = \frac{D_1}{1+R} + \frac{D_2}{(1+R)^2} + \cdots + \frac{D_t}{(1+R)^t} + \frac{P_t}{(1+R)^t}$
7.7	Value of a preference share with a fixed maturity	$PS_0 = \frac{D/m}{i/m}\left[1 - \frac{1}{(1+i/m)^{mn}}\right] + \frac{P_{mn}}{(1+i/m)^{mn}}$

SELF-STUDY PROBLEMS

7.1 Ted McKay has just bought ordinary shares in Ryland Pty Ltd. The company expects to grow at the following rates for the next 3 years: 30 per cent, 25 per cent and 15 per cent. Last year the company paid a dividend of $2.50. Assume a required rate of return of 10 per cent. Calculate the expected dividends for the next 3 years and also the present value of these dividends.

7.2 Centrogen Manufacturing Pty Ltd has been growing at a rate of 6 per cent for the past 2 years, and the company's CEO expects the company to continue to grow at this rate for the next several years. The company paid a dividend of $1.20 last year. If your required rate of return was 14 per cent, what is the maximum price that you would be willing to pay for this company's shares?

7.3 Clarion Australia Pty Ltd has been selling electrical supplies for the past 20 years. The company's product line has seen very little change in the past 5 years, and the company does not expect to add any new items for the foreseeable future. Last year, the company paid a dividend of $4.45 to its ordinary shareholders. The company is not expected to grow its revenues for the next several years. If your required rate of return for such companies is 13 per cent, what is the current value of this company's shares?

7.4 Cooper Communications Pty Ltd is a fast-growing communications company. The company did not pay a dividend last year and is not expected to do so for the next 2 years. Last year the company's growth accelerated, and they expect to grow at a rate of 35 per cent for the next 5 years before slowing down to a more stable growth rate of 7 per cent for the next several years. In the third year, the company has forecast a dividend payment of $1.10. Calculate the share price of the company at the end of its rapid growth period (that is, at the end of 5 years). Your required rate of return for such shares is 17 per cent. What is the current price of these shares?

7.5 You are interested in buying the preference shares of a bank that pays a dividend of $1.80 semiannually. If you discount such cash flows at 8 per cent, what is the price of this share?

CRITICAL THINKING QUESTIONS

7.1 Why can the market price of a security differ from its true value?

7.2 Why are investors and managers concerned about market efficiency?

7.3 Why are ordinary shareholders considered to be more at risk than the holders of other types of securities?

7.4 How can individual shareholders avoid double taxation?

7.5 What does it mean when a company has a very high P/E ratio? Give examples of industries in which you believe high P/E ratios are justified.

7.6 Preference shares are considered to be non-participating because:

a investors do not participate in the election of the company's directors.
b investors do not participate in the determination of the dividend payout policy.
c investors do not participate in the company's earnings growth.
d none of the above.

7.7 Explain why preference shares are considered to be a hybrid of equity and debt securities.

7.8 Why is share valuation more difficult than bond valuation?

7.9 You are currently thinking about investing in a share valued at $25.00. The share recently paid a dividend of $2.25 and is expected to grow at a rate of 5 per cent for the foreseeable future. You normally require a return of 14 per cent on shares of similar risk. Is the share overpriced, underpriced or correctly priced?

7.10 Share A and Share B are both priced at $50. Share A has a P/E ratio of 17, while Share B has a P/E ratio of 24. Which is the more attractive investment, considering everything else to be the same, and why?

QUESTIONS AND PROBLEMS

★ BASIC | ★★ MODERATE | ★★★ CHALLENGING

★ BASIC

7.1 **Present value of dividends:** Outback Yards Pty Ltd is a fast-growing company. The company expects to grow at a rate of 22 per cent over the next 2 years and then slow down to a growth rate of 18 per cent for the following 3 years. If the last dividend paid by the company was $2.15, estimate the dividends for the next 5 years. Calculate the present value of these dividends if the required rate of return was 14 per cent.

7.2 **Zero growth:** Nicnet Australia Ltd paid a dividend of $3.54 last year. The company does not expect to increase its dividend for the next several years. If the required rate of return is 13 per cent, what is the current share price?

7.3 **Zero growth:** Armour Supply Pty Ltd has seen no growth for the past several years and expects the trend to continue. The company last paid a dividend of $3.67. If you require a rate of return of 18.5 per cent, what is the current share price?

7.4 **Zero growth:** Sam Gripple is interested in buying the shares of Bank of Queensland Ltd. While the bank expects no growth in the near future, Sam is attracted by the dividend income. Last year the bank paid a dividend of $5.88. If Sam requires a return of 16.5 per cent on such shares, what is the maximum price he should be willing to pay?

7.5 **Zero growth:** The current share price of Coral Pty Ltd is $41.45. If the required rate of return is 18 per cent, what is the dividend paid by this company, which is not expected to grow in the near future?

7.6 **Constant growth:** Happy Optical Pty Ltd declared a dividend of $2.15 yesterday. The company is expected to grow at a steady rate of 5 per cent for the next several years. If shares such as these require a rate of return of 21 per cent, what should be the market value of this share?

7.7 **Constant growth:** Maurica Ltd is a consumer products company growing at a constant rate of 6.5 per cent. The company's last dividend was $3.36. If the required rate of return was 14 per cent, what is the market value of this share?

7.8 **Constant growth:** Tarco Pty Ltd is expected to pay a dividend of $2.32 next year. The forecast for the share price a year from now is $41.50. If the required rate of return is 17.5 per cent, what is the current share price? Assume constant growth.

7.9 **Constant growth:** Lavfield Pty Ltd is expected to grow at a constant rate of 8.25 per cent. If the company's next dividend is $1.83 and its current price is $22.35, what is the required rate of return on this share?

7.10 **Preference share valuation:** Keystone Energy Pty Ltd has issued perpetual preference shares with a par of $100 and an annual dividend of 5.5 per cent. If the required rate of return is 11.75 per cent, what is the share's current market price?

7.11 **Preference share valuation:** Icelock (Australia) Pty Ltd has issued perpetual preference shares with a $100 par value. The bank pays a quarterly dividend of $1.65 on a share. What is the current price of this preference share given a required rate of return of 10 per cent, compounding quarterly?

7.12 **Preference shares:** The preference shares of Queensland Tours Pty Ltd are selling currently at $54.56. If the required rate of return is 11.5 per cent, what is the dividend paid by this share?

7.13 **Preference shares:** Each quarter, Top Brewers Pty Ltd pays a dividend on its perpetual preference shares. Today the share is selling at $62.33. If the required rate of return for such shares is 14.5 per cent, compounding quarterly, what is the quarterly dividend paid by this company?

★★ MODERATE

7.14 **Constant growth:** Kathleen Ferrero is interested in purchasing the ordinary shares of Vespertine Pty Ltd which are currently priced at $39.96. The company expects to pay a dividend of $2.58 next year and expects to grow at a constant rate of 8 per cent.

a What should the market value of the share be if the required rate of return is 14 per cent?

b Is this a good buy? Why or why not?

7.15 **Constant growth:** The required rate of return is 23 per cent. Gnangara Pty Ltd has just paid a dividend of $3.12 and expects to grow at a constant rate of 5 per cent. What is the expected price of the share 3 years from now?

7.16 **Constant growth:** Pedro Sanchez is interested in buying shares in TreeTop Pty Ltd which is growing at a constant rate of 8 per cent. Last year the company paid a dividend of $2.65. The required rate of return is 18.5 per cent. What is the current price for this share? What would be the price of the share in year 5?

7.17 **Non-constant growth:** Anittel Pty Ltd is a fast-growing technology company. The company projects a rapid growth of 30 per cent for the next 2 years, then a growth rate of 17 per cent for the following 2 years. After that, the company expects a constant growth rate of 8 per cent. The company expects to pay its first dividend of $2.45 a year from now. If the required rate of return on such shares is 22 per cent, what is the current price of the share?

7.18 **Non-constant growth:** Agenix Ltd, a biotech company, forecast the following growth rates for the next 3 years: 35 per cent, 28 per cent and 22 per cent. The company then expects to grow at a constant rate of 9 per cent for the next several years. The company paid a dividend of $1.75 last week. If the required rate of return is 20 per cent, what is the market value of this share?

7.19 **Non-constant growth:** Nillahcootie Outdoor Centre Pty Ltd is a fast-growth share and expects to grow at a rate of 23 per cent for the next 4 years. It then will settle to a constant growth rate of 6 per cent. The first dividend will be paid in year 3 and be equal to $4.25. If the required rate of return is 17 per cent, what is the current price of the share?

7.20 **Non-constant growth:** Quoin Hill Vineyard expects to pay no dividends for the next 6 years. It has projected a growth rate of 25 per cent for the next 7 years. After 7 years, the company will grow at a constant rate of 5 per cent. Its first dividend to be paid in year 7 will be worth $3.25. If your required rate of return is 24 per cent, what is the share worth today?

7.21 **Non-constant growth:** Serventy Organic Wines Pty Ltd will pay dividends of $5.00, $6.25, $4.75 and $3.00 for the next 4 years. Thereafter, the company expects its growth rate to be a constant rate of 6 per cent. If the required rate of return is 18.5 per cent, what is the current market price of the share?

7.22 **Non-constant growth:** Devil's Lair Pty Ltd is growing rapidly at a rate of 35 per cent for the next 7 years. The first dividend, to be paid 3 years from now, will be worth $5. After 7 years, the company will settle to a constant growth rate of 8.5 per cent. What is the market value for this share given a required rate of return of 14 per cent?

7.23 **Non-constant growth:** Tim Adams Wines Pty Ltd is growing rapidly. Dividends are expected to grow at rates of 30 per cent, 35 per cent, 25 per cent and 18 per cent over the next 4 years. Thereafter the company expects to grow at a constant rate of 7 per cent. The shares are currently selling at $47.85, and the required rate of return is 16 per cent. Calculate the dividend for the current year (D_0).

★★★ CHALLENGING

7.24 Wineries stores has forecast a high growth rate of 40 per cent for the next 2 years, followed by growth rates of 25 per cent and 20 per cent for the following 2 years. It then expects to stabilise its growth to a constant rate of 7.5 per cent for the next several years. The company paid a dividend of $3.80 recently. If the required rate of return is 15 per cent, what is the current market price of the share?

7.25 Chambers Rosewood Pty Ltd issued perpetual preference shares a few years ago. The company pays an annual dividend of $4.27, and your required rate of return is 12.2 per cent.

- **a** What is the value of the share given your required rate of return?
- **b** Should you buy this share if its current market price is $34.41? Explain.

7.26 Gerald Neut owns shares in Patina Pty Ltd. Currently, the market price of the share is $36.34. The company expects to grow at a constant rate of 6 per cent for the foreseeable future. Its last dividend was worth $3.25. Gerald's required rate of return for such shares is 16 per cent. He wants to find out whether he should sell his shares or add to his holdings.

- **a** What is the value of this share?
- **b** Based on your answer to part a, should Gerald buy additional shares in Patina Pty Ltd? Why or why not?

7.27 Parri Holdings Pty Ltd declared a dividend of $2.50 yesterday. You are interested in investing in this company, which has forecast a constant growth rate of 7 per cent for the next several years. The required rate of return is 18 per cent.

a Calculate the expected dividends D_1, D_2, D_3 and D_4.

b Find the present value of these four dividends.

c What is the price of the share 4 years from now (P_4)?

d Calculate the present value of P_4. Add the answer you got in part b. What is the price of the share today?

e Use the equation for constant growth (equation 7.4) to calculate the price of the share today.

7.28 Aspen Australia Pty Ltd is a fast-growing drug company. The company forecasts that in the next 3 years its growth rates will be 30 per cent, 28 per cent and 24 per cent, respectively. Last week it declared a dividend of $1.67. After 3 years, the company expects a more stable growth rate of 8 per cent for the next several years. The required rate of return is 14 per cent.

a Calculate the dividends for the next 3 years, and find its present value.

b Calculate the price of the share at the end of year 3, when the company settles to a constant growth rate.

c What is the current price of the share?

7.29 Trentham Estate Pty Ltd expects to grow at a rate of 22 per cent for the next 5 years and then settle to a constant growth rate of 6 per cent. The company's most recent dividend was $2.35. The required rate of return is 15 per cent.

a Find the present value of the dividends during the rapid growth period.

b What is the price of the share at the end of year 5?

c What is the price of the share today?

7.30 Comwin Pty Ltd is expanding very fast and expects to grow at a rate of 25 per cent for the next 4 years. The company recently declared a dividend of $3.60 but does not expect to pay any dividends for the next 3 years. In year 4, it intends to pay a $5 dividend and thereafter grow it at a constant growth rate of 6 per cent. The required rate of return on such shares is 20 per cent.

a Calculate the present value of the dividends during the fast growth period.

b What is the price of the share at the end of the fast growth period (P_4)?

c What is the share price today?

d Would today's share price be driven by the length of time you intend to hold the share?

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