CHAPTER 11

The cost of capital

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- **11.1** explain what the weighted average cost of capital for a company is and why it is often used as a discount rate to evaluate projects
- **11.2** calculate the cost of debt for a company
- **11.3** calculate the cost of ordinary shares and the cost of preference shares for a company
- **11.4** calculate the weighted average cost of capital for a company, explain the limitations of using a company's weighted average cost of capital as the discount rate when evaluating a project, and discuss the alternatives that are available.

The Gold Coast's Q1 Tower is one of the world's tallest residential buildings, standing at 323 metres, including the spire. The building's observation deck, Skypoint, is one of the highest public vantage points in the Southern Hemisphere and the only beachside observation deck. An engineering feat, the building comprises 78 storeys, 18 926 panes of glass windows, 61 000 m^3 of concrete and 9300 tonnes of steel reinforcing. The Q1 spire is one of the world's longest at 98 metres and weighs 87 tonnes. As you can imagine, the cost of financing a project like this is quite substantial.

Before the Sunland Group announced the construction of the tower, you can be sure that the managers carefully evaluated the financial aspects of the project. They evaluated the required investment, what revenues the new tower was likely to generate, and how much it would cost to operate and maintain. For example, one apartment in the building was sold for $9 million, making it the most expensive apartment sold in Queensland at the time. The managers also estimated what it would cost to finance

the project — how much they would pay for the debt and the returns equity investors would require for an investment with this level of risk. This 'cost of capital' would have been incorporated into their net present value (NPV) analysis through the discounting process.

Doing a good job of estimating the cost of capital is especially important for a capital-intensive project. The cost of financing a project like the Q1 Tower can easily claim 50 per cent of the revenue from sales of the apartments.

From this example, you can see how important it is to get the cost of capital right. If the Sunland Group's managers had estimated the cost of capital to be 7 per cent when it was really 8 per cent, they might have ended up investing in a project with a large negative NPV. How did the company approach this important task? In this chapter, we discuss how businesses estimate the cost of capital they use to evaluate projects.[1]

Chapter preview

Earlier we discussed the general concept of risk and described what financial analysts mean when they talk about the risk associated with a project's cash flows. It also explained how this risk is related to expected returns. With this background, we are ready to discuss the methods that financial managers use to estimate discount rates, the reasons they use these methods, and the shortcomings of each method.

We start this chapter by introducing the weighted average cost of capital and explaining how this concept is related to the discount rates that many financial managers use to evaluate projects. Then we describe various methods that are used to estimate the three broad types of financing that companies use to acquire assets — debt, ordinary shares and preference shares — as well as the overall weighted average cost of capital for the company.

We next discuss the circumstances under which it is appropriate to use the weighted average cost of capital for a company as the discount rate for a project and outline the types of problems that can arise when the weighted average cost of capital is used inappropriately. Finally, we examine alternatives to using the weighted average cost of capital as a discount rate.

11.1 The company's overall cost of capital

LEARNING OBJECTIVE 11.1 Explain what the weighted average cost of capital for a company is and why it is often used as a discount rate to evaluate projects.

Our discussions of investment analysis up to this point have focused on evaluating individual projects. We have assumed that the rate used to discount the cash flows for a project reflects the risks associated with the incremental cash flows from that project. In an earlier chapter, we saw that since *unique risk* can be eliminated by holding a diversified portfolio, *systematic risk* is the only risk that investors require compensation for bearing. With this insight, we concluded that we could use equation 5.12 to estimate the expected rate of return for a particular investment:

$$E(R_i) = R_{rf} + \beta_i [E(R_m) - R_{rf}]$$

where $E(R_i)$ is the expected return on project i, R_{rf} is the risk-free rate of return, β_i is the beta for project i, and $E(R_m)$ is the expected return on the market. Recall that the difference between the expected return on the market and the risk-free rate $[E(R_m) - R_{rf}]$ is known as the *market risk premium*.

Although these ideas help us better understand the discount rate on a conceptual level, they can be difficult to implement in practice. Companies do not issue publicly traded shares for individual projects. This means that analysts do not have the share returns necessary to use a regression analysis like that illustrated in figure 5.10 to estimate the beta (β) for an individual project. As a result, they have no way to directly estimate the discount rate that reflects the systematic risk of the incremental cash flows from a particular project.

In many companies, senior financial managers deal with this problem by estimating the cost of capital for the company as a whole and then requiring analysts within the company to use this cost of capital to discount the cash flows for all projects.[2] A problem with this approach is that it ignores the fact that a company is really a collection of projects with varying levels of risk. A company's overall cost of capital

is actually a weighted average of the costs of capital for these projects, where the weights reflect the relative values of the projects.

To see why a company is a collection of projects, consider The Boeing Company. Boeing manufactures a number of different models of civilian and military aircraft. If you have ever flown on a commercial airline, chances are that you have been on a Boeing 737, 747, 757, 767 or 777 aircraft. Boeing manufactures several versions of each of these aircraft models to meet the needs of its customers. These versions have different ranges, seat configurations, numbers of seats and so on. Some are designed exclusively to haul freight for companies such as Australian Air Express. Every version of every model of aircraft at Boeing was, at some point in time, a new project. The assets owned by Boeing today and its expected cash flows are just the sum of the assets and cash flows from all of these individual projects plus the other projects at the company, such as those involving military aircraft.[3] This means that the overall systematic risk associated with Boeing's cash flows and the company's cost of capital are weighted averages of the systematic risks and the costs of capital for its individual projects.

If the risk of an individual project differs from the average risk of the company, the company's overall cost of capital is not the ideal discount rate to use when evaluating that project. Nevertheless, since this is the discount rate that is commonly used, we begin by discussing how a company's overall cost of capital is estimated. We then discuss alternatives to using the company's cost of capital as the discount rate in evaluating a project.

The finance balance sheet

To understand how financial analysts estimate their companies' costs of capital, you must be familiar with a concept that we call the **finance balance sheet**. The finance balance sheet is based on market values rather than book values. Recall that the total book value of the assets reported on an accounting balance sheet does not necessarily reflect the total market value of those assets. This is because the book value is largely based on historical costs, while the total market value of the assets equals the present value of the total cash flows that those assets are expected to generate in the future. The market value can be greater than or less than the book value; it is rarely the same.

The left-hand side of the accounting balance sheet reports the book values of a company's assets, the right-hand side reports how those assets were financed. Companies finance the purchase of their assets using debt and equity.[4] Since the cost of the assets must equal the total value of the debt and equity that was used to purchase them, the book value of the assets must equal the book value of the liabilities plus the book value of the equity on the accounting balance sheet. Just as the total book value of the assets at a company does not generally equal the total market value of those assets, the book value of total liabilities plus shareholders' equity does not usually equal the market value of these claims. In fact, the total market value of the debt and equity claims differ from their book values by exactly the same amount that the market values of a company's assets differ from their book values. This is because the total market value of the debt and the equity at a company equals the present value of the cash flows that the debtholders and the shareholders have the right to receive. These cash flows are the cash flows that the assets in the company are expected to generate. In other words, the people who have lent money to a company and the people who have purchased the company's shares have the right to receive all of the cash flows that the company is expected to generate in the future. The value of the claims they hold must equal the value of the cash flows that they have a right to receive.

The fact that the market value of the assets must equal the value of the cash flows that these assets are expected to generate, combined with the fact that the value of the expected cash flows also equals the total market value of the company's total liabilities and equity, means that we can write the market value (MV) of assets as follows:

$$\text{MV of assets} = \text{MV of liabilities} + \text{MV of equity} \qquad 11.1$$

Equation 11.1 is just like the accounting balance sheet identity. The only difference is that equation 11.1 is based on market values. This relationship is illustrated in figure 11.1.

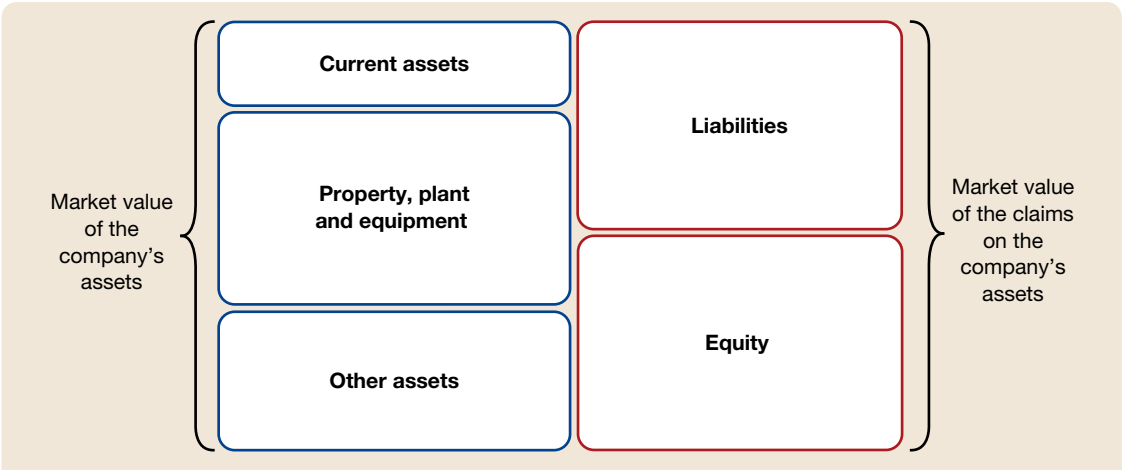

FIGURE 11.1 **The finance balance sheet**
The market value of a company's assets, which equals the present value of the cash flows those assets are expected to generate in the future, must equal the market value of the claims on those cash flows — the company's liabilities and equity.

To see why the market value of the assets must equal the total market value of the liabilities and equity, consider a company whose only business is to own and manage an apartment building that was purchased 20 years ago for $1 000 000. Suppose that there is currently a loan on the building that is worth $300 000, the company has no other debt, and the current market value of the building, based on the expected cash flows from future rents, is $4 000 000. What is the value of all of the equity (shares) in this company? The answer is $4 000 000 − $300 000 = $3 700 000. If the cash flows that the apartment building is expected to produce are worth $4 000 000, then investors would be willing to pay $3 700 000 for the equity in the company. This is the value of the cash flows that they would expect to receive after making the interest and principal payments on the loan. Furthermore, since by definition the loan is worth $300 000, the value of the debt plus the value of the equity is $300 000 + $3 700 000 = $4 000 000 — which is exactly equal to the market value of the company's assets.

The concept of a balance sheet based on market values may not be familiar. A finance balance sheet based on market values is more useful to financial decision makers than the ordinary accounting balance sheet. This is because financial managers are far more concerned about the future than the past when they make decisions. You might revisit the discussion of sunk costs in past chapters to remind yourself of why this is true.

KEY POINT

The market value of a company's assets equals the market value of the claims on those assets

The market value of the debt and equity claims against the cash flows of a company must equal the present value of the cash flows that the company's assets are expected to generate. This is because, between them, the debt holders and the shareholders have the legal right to receive all of those cash flows.

How companies estimate their cost of capital

Now that you understand the basic idea of the finance balance sheet, consider the challenge that financial analysts face when they want to estimate the cost of capital for a company. If analysts at a company could estimate the betas for each of the company's individual projects, they could estimate the beta for the entire company as a weighted average of the betas for the individual projects. They could do this because, as we discussed earlier, the company is simply a collection (portfolio) of projects. This calculation would just be an application of equation 5.13:

$$\beta_{n\ \text{Asset portfolio}} = \sum_{i=1}^{n} x_i \beta_i = x_1\beta_1 + x_2\beta_2 + x_3\beta_3 + \cdots + x_n\beta_n$$

where β_i is the beta for project i and x_i is the fraction of the total company value represented by project i.

The analysts could then use the beta for the company in equation 5.12:

$$E(R_i) = R_{rf} + \beta_i\,[E(R_m) - R_{rf}]$$

to estimate the expected return on the company's assets, which is also the company's cost of capital. Unfortunately, because analysts are not typically able to estimate betas for individual projects, they generally cannot use this approach.

Instead, analysts must use their knowledge of the finance balance sheet, along with the concept of market efficiency, to estimate the cost of capital for the company. Rather than using equations 5.13 and 5.12 to perform the calculations for the *individual projects* represented on the left-hand side of the finance balance sheet, analysts perform a similar set of calculations for the *different types of financing* (debt and equity) on the right-hand side of the finance balance sheet. They can do this because, as we said earlier, the people who finance the company have the right to receive all of the cash flows on the left-hand side. This means that the systematic risk associated with the total assets on the left-hand side is the same as the systematic risk associated with the total financing on the right-hand side. In other words, the weighted average of the betas for the different claims on the assets must equal a weighted average of the betas for the individual assets (projects).

Analysts do not need to estimate betas for each type of financing that the company has. As long as they can estimate the cost of each type of financing — either directly, by observing that cost in the capital markets, or by using equation 5.12 — they can calculate the cost of capital for the company using the following equation:

$$k_{\text{Company}} = \sum_{i=1}^{n} x_i k_i = x_1k_1 + x_2k_2 + x_3k_3 + \cdots + x_nk_n \qquad \textbf{11.2}$$

In equation 11.2, k_{Company} is the cost of capital for the company, k_i is the cost of financing type i, and x_i is the fraction of the total market value of the financing (or of the assets) of the company represented by financing type i. This formula simply says that the overall cost of capital for the company is a weighted average of the cost of each different type of financing used by the company. Note that since we are specifically talking about the cost of capital, we use the symbol k_i to represent this cost, rather than the more general notation $E(R_i)$ that we used earlier in the text.

The similarity between equation 11.2 and equation 5.13 is not an accident. Both are applications of the basic idea that the systematic risk of a portfolio of assets is a weighted average of the systematic risks of the individual assets. Because R_{rf} and $E(R_m)$ in equation 5.12 are the same for all assets, when we substitute equation 5.12 into equation 11.2 — remember that $E(R_i)$ in equation 5.12 is the same as k_i in equation 11.2 — and cancel out R_{rf} and $E(R_m)$, we get equation 5.13. We will not prove this here, but you might do so to convince yourself that what we are saying is true.

To see how equation 11.2 is applied, let's return to the example of the company whose only business is to manage an apartment building. Recall that the total value of this company is $4 000 000 and that it

has $300 000 in debt. If the company has only one loan and one type of shares, then the fractions of the total value represented by those two types of financing are as follows:

$$x_{\text{Debt}} = \$300\,000/\$4\,000\,000 = 0.075, \text{ or } 7.5\%$$
$$x_{\text{Equity}} = \$3\,700\,000/\$4\,000\,000 = 0.925, \text{ or } 92.5\%$$
$$\text{where } x_{\text{Debt}} + x_{\text{Equity}} = 0.075 + 0.925 = 1.000$$

This tells us that the value of the debt claims equals 7.5 per cent of the value of the company and that the value of the equity claims equals the remaining 92.5 per cent of the value of the company. If the cost of the debt for this business is 6 per cent and the cost of the equity is 10 per cent, the cost of capital for the company can be calculated as a weighted average of the costs of the debt and equity:[5]

$$k_{\text{Company}} = x_{\text{Debt}}k_{\text{Debt}} + x_{\text{Equity}}k_{\text{Equity}} = (0.075)(0.06) + (0.925)(0.10) = 0.097, \text{ or } 9.7\%$$

Notice that we have used equation 11.2 to calculate a **weighted average cost of capital (WACC)** for the company in this example. In fact, this is what people typically call the company's cost of capital, k_{Company}. From this point on, we will use the abbreviation WACC to represent the company's overall cost of capital.

DEMONSTRATION PROBLEM 11.1

Calculating the cost of capital for a company

Problem

You are a real estate investor who is considering investing in a new office building that will cost $2 000 000. You plan to finance the building with a $1 500 000 commercial loan at a 6.5 per cent interest rate, a $300 000 term loan at an 8 per cent interest rate, and $200 000 of your own money. You will own all of the equity (shares) in this investment. You estimate that the opportunity cost of your $200 000 investment — that is, what you could earn on an investment of similar risk in the capital market — is 12 per cent with that much debt. What is the cost of capital for this investment?

Approach

You can think of the office building as a separate company and use equation 11.2 to calculate the WACC for this 'company'. Since you are planning to finance the building with capital from three different sources — two loans and your own equity investment — the right-hand side of equation 11.2 will have three terms.

Solution

We begin by calculating the weights for the different types of financing:

$$x_{\text{1st loan}} = \$1\,500\,000/\$2\,000\,000 = 0.75$$
$$x_{\text{2nd loan}} = \$300\,000/\$2\,000\,000 = 0.15$$
$$x_{\text{Equity}} = \$200\,000/\$2\,000\,000 = 0.10$$

where $x_{\text{1st loan}} + x_{\text{2nd loan}} + x_{\text{Equity}} = 0.75 + 0.15 + 0.10 = 1.00$

We can then calculate the WACC using equation 11.2:

$$\begin{aligned}\text{WACC} = k_{\text{Company}} &= x_{\text{1st loan}}k_{\text{1st loan}} + x_{\text{2nd loan}}k_{\text{2nd loan}}\, x_{\text{Equity}}k_{\text{Equity}} \\ &= (0.75)(0.065) + (0.15)(0.08) + (0.10)(0.12) \\ &= 0.073, \text{ or } 7.3\%\end{aligned}$$

On average, you would be paying 7.3 per cent per year on every dollar you invested in the office building. This is the opportunity cost of capital for the office building project. It is the rate that you would use to discount the cash flows associated with the office building in an NPV analysis.

KEY POINT

A company's cost of capital is a weighted average of all of its financing costs

The cost of capital for a company is a weighted average of the costs of the different types of financing used by a company. The weights are the proportions of the total company value represented by the different types of financing. By weighting the costs of the individual financing types in this way, we obtain the overall average opportunity cost of each dollar invested in the company.

BEFORE YOU GO ON

1. Why does the market value of the claims on the assets of a company equal the market value of the assets?
2. How is the WACC for a company calculated?
3. What does the WACC for a company tell us?

11.2 The cost of debt

LEARNING OBJECTIVE 11.2 Calculate the cost of debt for a company.

In our discussion of how the WACC for a company is calculated, we assumed that the costs of the different types of financing were known. This assumption allowed us to simply plug those costs into equation 11.2 once we had calculated the weight for each. Unfortunately, life is not that simple. In the real world, analysts have to estimate each of the individual costs. In other words, the discussion in the preceding section glossed over a number of concepts and issues that you should be familiar with. This section and section 11.3 discuss those concepts and issues and show how the costs of the different types of financing can be estimated.

Before we move on to the specifics of how to estimate the costs of different types of financing, we must stress an important point: all of these calculations depend in some part on financial markets being efficient.[6] We suggested this in the last section when we mentioned that analysts have to rely on the concept of market efficiency to estimate the WACC. The reason is that analysts often cannot directly observe the rate of return that investors require for a particular type of financing. Instead, analysts must rely on the security prices they can observe in the financial markets to estimate the required rate.

It makes sense to rely on security prices only if you believe that the financial markets are reasonably efficient at incorporating new information into these prices. If the markets were not efficient, estimates of expected returns that were based on market security prices would be unreliable. Of course, if the returns that are plugged into equation 11.2 are bad, the resulting estimate for WACC will also be bad. With this caveat, we can now discuss how to estimate the costs of the various types of financing.

Key concepts for estimating the cost of debt

Virtually all companies use some form of debt financing. The financial managers at companies typically arrange for revolving lines of credit to finance working capital items, such as inventories or accounts receivable. These lines of credit (such as an overdraft) are very much like the lines of credit that come with your credit cards. Companies also obtain private fixed-term loans, such as bank loans, or sell bonds to the public to finance ongoing operations or the purchase of non-current assets — just as you would finance your living expenses while you are at university with a student loan or a car with a car loan. For example, an electricity utility company such as AGL Energy in Australia will sell bonds to finance a new power plant, and a rapidly growing retailer such as JB Hi-Fi Ltd will use debt to finance new stores

and distribution centres. As mentioned previously, we will discuss how companies finance themselves in more detail in future chapters, but for now it is sufficient to recognise that companies use these three general types of debt financing: lines of credit, private fixed-term loans and bonds that are sold in the public markets.

There is a cost associated with each type of debt that a company uses. However, when we estimate the cost of capital for a company, we are particularly interested in the cost of the company's long-term debt. Companies generally use long-term debt to finance their non-current assets, and it is the non-current assets that concern us when we think about the value of a company's assets. By long-term debt, we usually mean the debt that, when it was borrowed, was set to mature in more than 1 year. This typically includes fixed-term bank loans used to finance ongoing operations or non-current assets, as well as the bonds that a company sells in the public debt markets.

Although 1 year is not an especially long time, debt with a maturity of more than 1 year is typically viewed as permanent debt. This is because companies often borrow the money to pay off this debt when it matures.

We do not normally worry about lines of credit when calculating the cost of debt because these lines tend to be temporary. Banks typically require that the outstanding balances be periodically paid down to $0 (just as we are sure you pay your entire credit card balance from time to time).

When analysts estimate the cost of a company's long-term debt, they are estimating the cost on a particular date — the date on which they are doing the analysis. This is a very important point to keep in mind because the interest rate that the company is paying on its outstanding debt does not necessarily reflect its current cost of debt. Interest rates change over time, and so does the cost of debt for a company. The rate a company was charged 3 years ago for a 5-year loan is unlikely to be the same rate that it would be charged today for a new 5-year loan. For example, suppose that AGL Energy issued bonds 5 years ago for 7 per cent. Since then, interest rates have recently fallen, so the same bonds could be sold at par value today for 6 per cent. The cost of debt today is 6 per cent, not 7 per cent, and 6 per cent is the cost of debt that management will use in WACC calculations. This is because the WACC is driven by market valuations. If you looked at the company's financial statements, you would see that the company is paying an interest rate of 7 per cent. This is what the financial managers of the company agreed to pay 5 years ago, not what it would cost to sell the same bonds today. The accounting statements reflect the cost of debt that was sold at some time in the past.

KEY POINT

The current cost of long-term debt is what matters when calculating WACC

The current cost of long-term debt is the appropriate cost of debt for WACC calculations. This is the relevant cost because the WACC is the opportunity cost of capital for the company's investors as of today. Historical costs do not belong in WACC calculations.

Estimating the current cost of a bond or an outstanding loan

We have now seen that we should not use historical costs of debt in WACC calculations. Let's discuss how we can estimate the current costs of bonds and other fixed-term loans by using market information.

The current cost of a bond

You may not realise it, but we have already discussed how to estimate the current cost of debt for a publicly traded bond. This cost is estimated using the yield to maturity calculation. Recall that we defined the yield to maturity as the discount rate that makes the present value of the coupon and principal payments equal to the price of the bond.

For example, consider a 10-year $1000 bond that was issued 5 years ago. This bond has 5 years remaining before it matures. If the bond has an annual coupon rate of 7 per cent, pays coupon interest semiannually, and is currently selling for $1042.65, we can calculate its yield to maturity by using equation 6.2 and solving for i or by using a financial calculator. Let's use equation 6.2 for this example.

To do this, as was discussed in the section on semiannual compounding in a previous chapter, we first convert the bond data to reflect semiannual compounding: (1) the total number of coupon payments is 10 (2 per year × 5 years) and (2) the semiannual coupon payment is $35 [($1000 × 7 per cent)/2 = $70/2]. We can now use equation 6.2 and solve for i to find the yield to maturity:

$$P_B = \frac{C}{i}\left[1 - \frac{1}{(1+i)^n}\right] + \frac{F_n}{(1+i)^n}$$

$$\$1042.65 = \frac{35}{i}\left[1 - \frac{1}{(1+i)^{10}}\right] + \frac{1000}{(1+i)^{10}}$$

Now, by trial and error or with a financial calculator, we solve for i and find:

$$i = k_{\text{Bond}} = 0.030, \text{ or } 3.0\%$$

This semiannual rate would be quoted as an annual rate of 6 per cent ($2 \times 0.03 = 0.06$, or 6 per cent). However, as previously explained, this annual rate fails to account for the effects of compounding. We must therefore use equation 4.7 to calculate the effective annual interest rate (EAR) in order to obtain the actual current annual cost of this debt:

$$\text{EAR} = \left(1 + \frac{\text{Quoted interest rate}}{m}\right)^m - 1 = \left(1 + \frac{0.06}{2}\right)^2 - 1$$
$$= (1.03)^2 - 1 = 0.0609, \text{ or } 6.09\%$$

If this bond was sold at par, it paid 7 per cent when it was issued 5 years ago. Someone who buys it today will expect to earn only 6.09 per cent per year. This is the annual rate of return required by the market on this bond, which is known as the effective annual yield.

Notice that the above calculation takes into account the interest payments, the face value of the debt (the amount that will be repaid in 5 years) and the current price at which the bond is selling. It is necessary to account for all of these characteristics of the bond. The return received by someone who buys the bond today will be determined by both the interest income and the capital appreciation (or capital depreciation in this case, since the price is higher than the face value).

We must account for one other factor when we calculate the current cost of bond financing to a company — the cost of issuing the bond. In the above example, we calculated the return that someone who buys the bond can expect to receive. Since a company must pay fees to investment bankers, lawyers and accountants, along with various other costs, to actually issue a bond, the cost to the company is higher than 6.09 per cent.[7] Therefore, in order to obtain an accurate estimate of the cost of a bond, analysis must incorporate *issuance costs* into their calculations. Issuance costs are an example of *direct out-of-pocket costs,* the actual out-of-pocket costs that a company incurs when it raises capital.

The way in which issuance costs are incorporated into the calculation of the cost of a bond is quite simple. Analysts use the *net proceeds* that the company receives from the bond, rather than the price that is paid by the investor, on the left-hand side of equation 6.2. Suppose the company in our example sold 5-year bonds with a 7 per cent coupon today and paid issuance costs equal to 2 per cent of the total value of the bonds. After paying the issuance costs, the company would receive only 98 per cent of the price paid by the investors. Therefore, the company would actually receive only $\$1042.65 \times (1 - 0.02) = \$1021.80$ for each bond it sold and the semiannual cost to the company would be:

$$P_B = \frac{C}{i}\left[1 - \frac{1}{(1+i)^n}\right] + \frac{F_n}{(1+i)^n}$$

$$\$1021.80 = \frac{35}{i}\left[1 - \frac{1}{(1+i)^{10}}\right] + \frac{1000}{(1+i)^{10}}$$

$$i = k_{\text{Bond}} = 0.0324, \text{ or } 3.24\%$$

Converting the adjusted semiannual rate to an EAR, we see that the actual annual cost of this debt financing is:

$$\text{EAR} = (1.0324)^2 - 1 = 0.0658, \text{ or } 6.58\%$$

In this example the issuance costs increase the effective cost of the bonds from 6.1 per cent to 6.6 per cent per year.

The current cost of an outstanding loan

Conceptually, calculating the current cost of long-term bank or other private debt is not as straightforward as estimating the current cost of a public bond because financial analysts cannot observe the market price of private debt. Fortunately, analysts do not typically have to do this. Instead, they can simply call their banker and ask what rate the bank would charge if they decided to refinance the debt today. A rate quote from a banker provides a good estimate of the current cost of a private loan.

Tax and the cost of debt

It is very important that you understand one additional concept concerning the cost of debt. In Australia as well as other countries, *companies can deduct interest payments for tax purposes.* In other words, every dollar a company pays in interest reduces the company's taxable income by one dollar. Thus, if the company's marginal tax rate is 30 per cent, the company's total tax bill will be reduced by 30 cents. A dollar of interest would actually cost this company only 70 cents because the company would save 30 cents on its tax.

More generally, the after-tax cost of interest payments equals the pre-tax cost times 1 minus the tax rate. This means that the after-tax cost of debt is:

$$k_{\text{Debt after-tax}} = k_{\text{Debt pre-tax}} \times (1 - t) \qquad \textbf{11.3}$$

In the previous bond example, the effective pre-tax cost of debt was 6.58 per cent per year. With $k_{\text{Debt after-tax}}$ at 6.58 per cent and t at 30 per cent, equation 11.3 gives us:

$$k_{\text{Debt after-tax}} = k_{\text{Debt pre-tax}} \times (1 - t) = 0.0658 \times (1 - 0.3) = 0.0461, \text{ or } 4.61\%$$

Estimating the cost of debt for a company

Most companies have several different debt issues outstanding at any particular point in time. Just as you might have both a car loan and a home loan, a company might have several bank loans and bond issues outstanding. To estimate the company's overall cost of debt when it has several debt issues outstanding, we must first estimate the costs of the individual debt issues and then calculate a weighted average of these costs.

To see how this is done, let's consider an example. Suppose that your pizza restaurant business has grown dramatically in the past 3 years from a single restaurant to 30 restaurants. To finance this growth, 2 years ago you sold $25 million of 5-year bonds. These bonds pay interest annually and have a coupon rate of 8 per cent. They are currently selling for $1026.24 per $1000 bond. Just today, you also borrowed $5 million from your local bank at an interest rate of 6 per cent. Assume that this is all the long-term debt that you have and that there are no issuance costs. What is the overall average after-tax cost of your debt if your business's tax rate is 30 per cent?

The pre-tax cost of the bonds as of today is the effective annual yield on those bonds. Since the bonds were sold 2 years ago, they will mature 3 years from now. Using equation 6.2, we find that the effective annual yield (which equals the yield to maturity in this example) for these bonds is:

$$P_B = \frac{C}{i}\left[1 - \frac{1}{(1+i)^n}\right] + \frac{F_n}{(1+i)^n}$$

$$\$1026.24 = \frac{80}{i}\left[1 - \frac{1}{(1+i)^3}\right] + \frac{1000}{(1+i)^3}$$

$$i = k_{\text{Bond pre-tax}} = 0.07, \text{ or } 7\%$$

The pre-tax cost of the bank loan that you took out today is simply the 6 per cent rate that the bank is charging you, assuming that the bank is charging you the market rate.

Now that we know the pre-tax costs of the two types of debt that your business has outstanding, we can calculate the overall average cost of your debt by calculating the weighted average of their two costs. The weights for the two types of debt are as follows:

$$x_{\text{Bonds}} = \$25\,000\,000/(\$25\,000\,000 + \$5\,000\,000) = 0.833$$
$$x_{\text{Bank debt}} = \$5\,000\,000/(\$25\,000\,000 + \$5\,000\,000) = 0.167$$
$$\text{where } x_{\text{Bonds}} + x_{\text{Bank debt}} = 0.833 + 0.167 = 1.000$$

The weighted average pre-tax cost of debt is:

$$\begin{aligned} k_{\text{Debt pre-tax}} &= x_{\text{Bonds}}k_{\text{Bonds pre-tax}} + x_{\text{Bonds debt}}k_{\text{Bonds debt pre-tax}} \\ &= (0.833)(0.07) + (0.167)(0.06) \\ &= 0.0683, \text{ or } 6.83\% \end{aligned}$$

The after-tax cost of debt is therefore:

$$k_{\text{Debt after-tax}} = k_{\text{Debt pre-tax}} \times (1 - t) = 6.83\% \times (1 - 0.30) = 4.78\%$$

DEMONSTRATION PROBLEM 11.2

Calculating the cost of debt for a company

Problem

You have just successfully completed a leveraged buyout of the company that you have been working for. To finance this $35 million transaction, you and three partners put up a total of $10 million in equity capital, and you borrowed $25 million from banks and other investors. The bank debt consists of $10 million of secured debt borrowed at a rate of 6 per cent from the National Australia Bank (NAB) and $7 million of senior unsecured debt borrowed at a rate of 7 per cent from the ANZ Bank. The remaining $8 million was borrowed from an investment group managed by a private equity company. The rate on this subordinated (junior) unsecured debt is 9.5 per cent. What is the overall after-tax cost of the debt financing used to buy the company if the company's tax rate is 30 per cent?

Approach

The overall after-tax cost of debt can be calculated using the following three-step process: (1) Calculate the fraction of the total debt (weight) for each individual debt issue. (2) Using these weights, calculate the weighted average pre-tax cost of debt. (3) Use equation 11.3 to calculate the after-tax average cost of debt.

(*continued*)

Solution

(1) The weights for the three types of debt are as follows:

$$x_{\text{Secured debt}} = \$10\,000\,000/\$25\,000\,000 = 0.40$$
$$x_{\text{Senior unsecured debt}} = \$7\,000\,000/\$25\,000\,000 = 0.28$$
$$x_{\text{Subordinated unsecured debt}} = \$8\,000\,000/\$25\,000\,000 = 0.32$$

where $x_{\text{Secured debt}} + x_{\text{Senior unsecured debt}} + x_{\text{Subordinated unsecured debt}}$

$$= 0.40 + 0.28 + 0.32 = 1.00$$

(2) The weighted average pre-tax cost of debt is:

$$\begin{aligned} k_{\text{Debt pre-tax}} &= x_{\text{Secured debt}}k_{\text{Secured debt pre-tax}} + x_{\text{Senior unsecured debt}}k_{\text{Senior unsecured debt pre-tax}} \\ &\quad + x_{\text{Subordinated unsecured debt}}k_{\text{Subordinated unsecured debt pre-tax}} \\ &= (0.40)(0.06) + (0.28)(0.07) + (0.32)(0.095) \\ &= 0.074, \text{ or } 7.4\% \end{aligned}$$

(3) The after-tax cost of debt is therefore:

$$k_{\text{Debt after-tax}} = k_{\text{Debt pre-tax}} \times (1 - t) = 7.4\% \times (1 - 0.3) = 5.18\%$$

DECISION-MAKING EXAMPLE 11.1

Using the cost of debt in decision making

Situation

Your pizza restaurant has developed such a strong reputation that you have decided to take advantage of the restaurant's name recognition by selling frozen pizzas through grocery stores. In order to do this, you will have to build a manufacturing facility. You estimate that this will cost you $10 million. Since your business currently has only $2 million in the bank, you will have to borrow the remaining $8 million. You have spoken with two bankers about possible loan packages. The banker from the Commonwealth Bank offered you a loan for $6 million with a 6 per cent rate and $2 million with a 7.5 per cent rate. You calculate the pre-tax cost of debt for this package to be:

$$\begin{aligned} k_{\text{Loans pre-tax}} &= (\$6\,000\,000/\$8\,000\,000)(0.06) + (\$2\,000\,000/\$8\,000\,000)(0.075) \\ &= 6.375\% \end{aligned}$$

The other banker from Westpac offered you a single $8 million loan for 6.35 per cent. Which financing should you choose if all terms on all of the loans, other than the interest rates, are the same?

Decision

This is an easy decision. You should choose the least expensive alternative — the loan from Westpac. In this example, you can directly compare the pre-tax costs of the two alternatives. You do not need to calculate the after-tax costs because multiplying each pre-tax cost by the same number, $1 - t$, will not change your decision.

BEFORE YOU GO ON

1. Why do analysts care about the *current* cost of long-term debt when estimating a company's cost of capital?
2. How do you estimate the cost of debt for a company with more than one type of debt?
3. How does tax affect the cost of debt?

11.3 The cost of equity

LEARNING OBJECTIVE 11.3 Calculate the cost of ordinary shares and the cost of preference shares for a company.

The cost of equity for a company is a weighted average of the costs of the different types of shares that the company has outstanding at a particular point in time. We saw in an earlier chapter that some companies have both preference shares and ordinary shares outstanding. In order to calculate the cost of equity for these companies, we have to know how to calculate the cost of both ordinary shares and preference shares. In this section, we discuss how financial analysts can estimate the costs associated with these two different share types.

Ordinary shares

Just as information about market rates of return is used to estimate the cost of debt, market information is also used to estimate the cost of equity. There are several ways to do this. The particular approach a financial analyst chooses will depend on what information is available and how reliable the analyst believes it is. Next we discuss three alternative methods for estimating the cost of ordinary shares. It is important to remember throughout this discussion that the 'cost' we are referring to is the rate of return that investors require for investing in these shares at a particular point in time, given their systematic risk.

Method 1: Using the Capital Asset Pricing Model (CAPM)

The first method for estimating the cost of ordinary equity is one that we discussed earlier in the text. This method uses equation 5.12:

$$E(R_i) = R_{rf} + \beta_i \, [E(R_m) - R_{rf}]$$

In this equation, the expected return on an asset is a linear function of the systematic risk associated with that asset.

If we recognise that $E(R_i)$ in equation 5.12 is the cost of the ordinary share capital used by the company (k_{os}) when we are calculating the cost of equity and that $[E(R_m) - R_{rf}]$ is the market risk premium, we can rewrite equation 5.12 as follows:

$$k_{os} = R_{rf} + (\beta_{os} \times \text{Market risk premium}) \qquad \textbf{11.4}$$

Equation 11.4 is just another way of writing equation 5.12. It tells us that the cost of ordinary shares equals the risk-free rate of return plus compensation for the systematic risk associated with the ordinary shares. You already saw some examples of how to use this equation to calculate the cost of equity in the discussion of the Capital Asset Pricing Model (CAPM). In those examples you were given the current risk-free rate, the beta for the shares and the market risk premium, and were asked to calculate k_{os} using the equation. Now we turn our attention to some practical considerations that you must be concerned with when choosing the appropriate risk-free rate, beta and market risk premium for this calculation.

The risk-free rate

First, let's consider the risk-free rate. The current effective annual yield on a risk-free asset should always be used in equation 11.4. This is because the risk-free rate at a particular point in time reflects the rate of inflation that the market expects in the future. Since the expected rate of inflation changes over time, an old risk-free rate might not reflect current inflation expectations.

When analysts select a risk-free rate, they must choose between using a short-term rate, such as that for Treasury notes, or a longer-term rate, such as those for Treasury bonds. Which of these choices is most appropriate? This question has been hotly debated by finance professionals for many years. We

recommend that you use the risk-free rate on a long-term Treasury security when you estimate the cost of equity capital because the equity claim is a long-term claim on the company's cash flows. As you saw previously, the shareholders have a claim on the cash flows of the company in perpetuity. By using a long-term Treasury security, you are matching a long-term risk-free rate with a long-term claim. A long-term risk-free rate better reflects long-term inflation expectations and the cost of getting investors to part with their money for a long period of time than a short-term rate.

The beta

If the ordinary shares of a company are publicly traded, then you can estimate the beta for these shares using a regression analysis similar to that illustrated in figure 5.10. However, identifying the appropriate beta is much more complicated if the ordinary shares are not publicly traded. Since most companies in Australia are privately owned and do not have publicly traded shares, this is a problem that arises quite often when someone wants to estimate the cost of ordinary shares for a company.

Financial analysts often overcome this problem by identifying a 'comparable' company with publicly traded shares that is in the same business and that has a similar amount of debt. For example, suppose you are trying to estimate the beta for your pizza business. The company has now grown to include more than 2000 restaurants throughout the world. The frozen-foods business, however, was never successful and had to be shut down. You know that Domino's Pizza Enterprises Ltd, one of your major competitors, has publicly traded equity and that the proportion of debt to equity for Domino's is similar to the proportion for your company. Since Domino's has a business similar to yours, in that it is only in the pizza business and competes in similar geographic areas, it would be reasonable to consider Domino's a comparable company.

The systematic risk associated with the shares of a comparable company is likely to be similar to the systematic risk for the private company because systematic risk is determined by the nature of the company's business and the amount of debt that it uses. If you are able to identify a good comparable company, such as Domino's, you can use its beta in equation 11.4 to estimate the cost of equity capital for your company. Even when a good comparable company cannot be identified, it is sometimes possible to use an average of the betas for the public companies in the same industry.

The market risk premium

It is not possible to directly observe the market risk premium. We just do not know what rate of return investors expect for the market portfolio — $E(R_m)$ — at a particular point in time. Therefore, we cannot simply calculate the market risk premium as the difference between the expected return on the market and the risk-free rate — $[E(R_m) - R_{rf}]$. For this reason, financial analysts generally use a measure of the average risk premium investors have actually earned in the past as an indication of the risk premium they might require today.

For example, from 1974 to July 2015 actual returns on the Australian equity market exceeded actual returns on long-term Australian government bonds by an average of 4 (4.03) per cent per year. If, on average, investors earned the risk premium that they expected, this figure reflects the average market risk premium over the period from 1974 to 2015. If a financial analyst believes that the market risk premium in the past is a reasonable estimate of the risk premium today, then he or she might use 4 per cent as the market risk premium in equation 11.4.

With this background, let's work an example to illustrate how equation 11.4 is used in practice to estimate the cost of ordinary shares for a company. Suppose that it is 1 July 2015, and we want to estimate the cost of ordinary shares for the oil company Woodside Petroleum Ltd. Using yields reported by the Reserve Bank of Australia (RBA) for that day, we determine that 30-day Treasury notes have an effective yield of 2 (2.06) per cent and that 10-year Treasury bonds have an effective yield of 3 (3.01) per cent. From Reuters web site (www.reuters.com), we find that the beta for Woodside Petroleum is 1.22. We know that the market risk premium averaged 4 (4.03) per cent from 1974 to 2015. What is the expected rate of return on Woodside Petroleum?

Since we are estimating the expected rate of return on ordinary shares, and ordinary shares are a long-term asset from the perspective of the market, we use the long-term Treasury bond yield of

3 per cent in the calculation. Notice that the Treasury note and the Treasury bond rates differed by 0.95 per cent (3.01 − 2.06 = 0.95) on 1 July 2015. These interest rates often differ by this amount and more, dependent on the market expectation of future inflation and the RBA's monetary policy stance, so the choice of which risk-free rate to use can make quite a difference in the estimated cost of equity.

Once we have selected the appropriate risk-free rate, we can plug it, along with the beta and market risk premium values, into equation 11.4 to calculate the cost of ordinary shares for Woodside Petroleum:

$$\begin{aligned} k_{os} &= R_{rf} + (\beta_{os} \times \text{Market risk premium}) \\ &= 0.03 + (1.22 \times 0.04) = 0.0788, \text{ or } 7.88\% \end{aligned}$$

This example illustrates how equation 11.4 is used to estimate the cost of ordinary shares for a company. How would the analysis differ for a private company? The only difference is that we would not be able to estimate the beta directly. We would have to estimate the beta from betas for similar public companies.

DEMONSTRATION PROBLEM 11.3

Calculating the cost of equity using a share's beta

Problem

You have decided to estimate the cost of the ordinary shares of your pizza business on 18 January 2012. As noted previously, the risk-free rate and the market risk premium on that day were 5.5 per cent and 3.5 per cent, respectively. Since you have already decided that Domino's Pizza Enterprises Ltd is a reasonably comparable company, you obtain Domino's Pizza's beta from the Yahoo! Finance web site. This beta is 0.86. What do you estimate the cost of ordinary shares of your pizza business to be?

Approach

Method 1 for calculating the cost of equity is to use the Capital Asset Pricing Model (CAPM). Therefore, in this example, we will use equation 11.4.

Solution

$$\begin{aligned} k_{os} &= R_{rf} + (\beta_{os} \times \text{Market risk premium}) \\ &= 0.055 + (0.86 \times 0.035) = 0.0851, \text{ or } 8.51\% \end{aligned}$$

Method 2: Using the constant-growth dividend model

Earlier in the text we noted that if the dividends received by the owner of an ordinary share are expected to grow at a constant rate in perpetuity, then the value of that share today can be calculated using equation 7.4:

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

where D_1 is the dividend expected to be paid one period from today, R is the required rate of return and g is the annual rate at which the dividends are expected to grow in perpetuity.

We can replace the R in equation 7.4 with k_{os} since we are specifically estimating the expected rate of return for investing in ordinary shares (also the cost of equity). We can then rearrange this equation to solve for k_{os}:

$$k_{os} = \frac{D_1}{P_0} + g \qquad \textbf{11.5}$$

While equation 11.5 is just a variation of equation 7.5, it is important enough to identify as a separate equation because it provides a direct way of estimating the cost of equity under certain circumstances. If we can estimate the dividend that shareholders will receive next period, D_1, and we can estimate the rate at which the market expects dividends to grow over the long run, g, then we can use today's market price, P_0, in equation 11.5 to tell us what rate of return investors in the company's ordinary shares are expecting to earn.

Consider an example. Suppose that the current price for the ordinary shares of AGL Energy Ltd is $20, that the company is expected to pay a dividend of $2 per share to its ordinary shareholders next year, and that the dividend is expected to grow at a rate of 3 per cent in perpetuity after next year. Equation 11.5 tells us that the required rate of return for AGL Energy shares is

$$k_{os} = \frac{D_1}{P_0} + g = \frac{\$2}{\$20} + 0.03 = 0.13, \text{ or } 13\%$$

This approach can be useful for a company that pays dividends when it is reasonable to assume dividends will grow at a constant rate and when the analyst has a good idea what that growth rate will be. An electricity utility company is an example of this type of company. Some electricity utility companies pay relatively high and predictable dividends that increase at a fairly consistent rate. In contrast, this approach would not be appropriate for use by a high-tech company that pays no dividends or that pays a small dividend that is likely to increase at a high rate in the short term. Equation 11.5, like any other equation, should be used only if it is appropriate for the particular share.

You might be asking yourself at this point where you would get P_0, D_1 and g in order to use equation 11.5 for a particular share. You can get the current price of a share as well as the dividend that a company is expected to pay next year quite easily from many different web sites on the internet — for example, Yahoo! Finance, which was mentioned previously. The financial information includes the dollar value of dividends paid in the past year and the dividend that the company is expected to pay in the next year.

Estimating the long-term rate of growth in dividends is more difficult, but there are some guidelines that can help. As we discussed in a previous chapter, the first rule is that dividends cannot grow faster than the long-term growth rate of the economy in a perpetuity model such as equations 7.5 or 11.5. Assuming dividends will grow faster than the economy is the same as assuming that dividends will eventually become larger than the economy itself! We know this is impossible.

What is the long-term growth rate of the economy? Well, historically it has been the rate of inflation plus about 4 per cent. This means that if inflation is expected to be 3 per cent in the long term, then a reasonable estimate for the long-term growth rate in the economy is 7 per cent (3 per cent inflation plus 4 per cent real growth). This tells us that g in equation 11.5 will not be greater than 7 per cent. What exactly it will be depends on the nature of the business and the industry it is in. If it is a declining industry, then g might be negative. If the industry is expected to grow with the economy and the particular company you are evaluating is expected to retain its market share, then a reasonable estimate for g might be 6 or 7 per cent.

Method 3: Using a multistage-growth dividend model

Using a **multistage-growth dividend model** to estimate the cost of equity for a company is very similar to using a constant-growth dividend model. The difference is that a multistage-growth dividend model allows for faster dividend growth rates in the near term, followed by a constant long-term growth rate. If this concept sounds familiar, that is because it is the idea behind the *mixed (supernormal) growth dividend model* discussed in a previous chapter. In equation 7.6 this model was written as:

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

where D_i is the dividend in period i, P_t is the value of constant-growth dividend payments in period t, and R is the required rate of return.

To refresh your memory of how this model works, let's consider a three-stage example. Suppose that a company will pay a dividend 1 year from today (D_1) and that this dividend will increase at a rate of g_1 the following year, g_2 the year after that, and g_3 per year thereafter. The value of a share today thus equals:

$$P_0 = \frac{D_1}{1 + k_{os}} + \frac{D_1(1 + g_1)}{(1 + k_{os})^2} + \frac{D_1(1 + g_1)(1 + g_2)}{(1 + k_{os})^3} + \left[\frac{D_1(1 + g_1)(1 + g_2)(1 + g_3)}{k_{os} - g_3}\right]\left[\frac{1}{(1 + k_{os})^3}\right]$$

In this equation, we have replaced the R in equation 7.6 with k_{os} since we are specifically estimating the expected rate of return for ordinary shares. We have also written all of the dividends in terms of D_1 to illustrate how the different growth rates will affect the dividends in each year. Finally, we have written P_t in terms of the constant-growth model. If we substitute D_1, D_2, D_3 and D_4 where appropriate, you can see that this is really just equation 7.6, where we have replaced R with k_{os} and written P_t in terms of the constant-growth model:

$$P_0 = \frac{D_1}{1 + k_{os}} + \frac{D_2}{(1 + k_{os})^2} + \frac{D_3}{(1 + k_{os})^3} + \left[\frac{D_4}{k_{os} - g_3}\right]\left[\frac{1}{(1 + k_{os})^3}\right]$$

All this equation does is add the present values of the dividends that are expected in each of the next 3 years and the present value of a growing perpetuity that begins in the fourth year. Figure 11.2 illustrates how cash flows relate to the four terms in the equation.

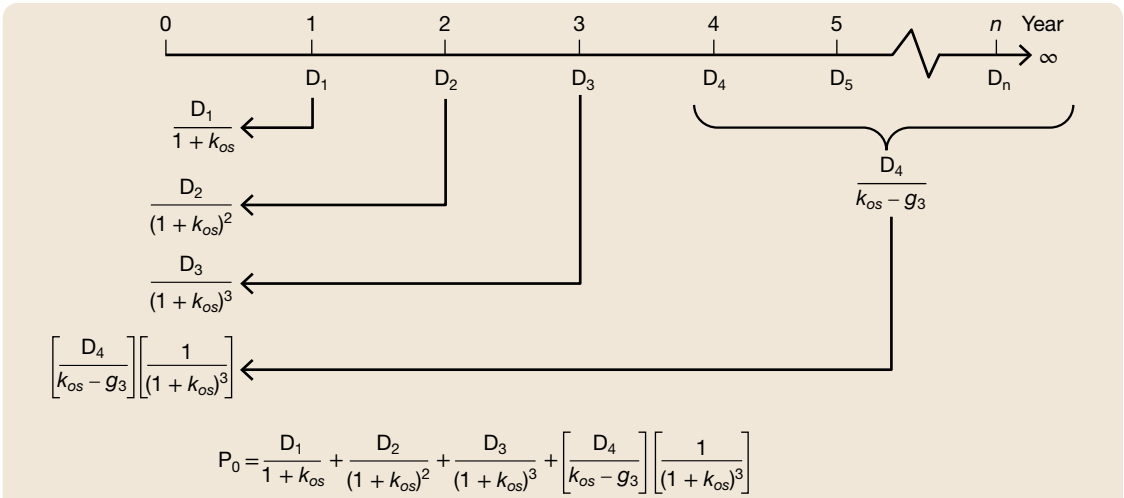

FIGURE 11.2 **The three-stage dividend growth equation**
In the three-stage dividend growth model shown here, the price of a share equals the present values of dividends expected to be received at the end of years 1, 2 and 3, plus the present value of a growing perpetuity that begins in year 4 and whose dividends are assumed to grow at a constant rate g_3 forever.

Note that the fourth term in figure 11.2 is discounted only 3 years because, as we saw in previous chapters, the constant-growth model gives you the present value of a growing perpetuity as of the year before the first cash flow. In this case since the first cash flow is D_4, the model gives you the value of the growing perpetuity as of year 3.

A multistage-growth dividend model is far more flexible than the constant-growth dividend model because we do not have to assume that dividends grow at the same rate forever. We can use a model such as this to estimate the cost of ordinary shares, k_{os}, by plugging P_0, D_1 and the appropriate growth rates into the model and solving for k_{os} using trial and error — just as we solved for the yield to maturity of bonds in a previous chapter and earlier in this chapter. The major issues we have to be concerned about when we use a growth dividend model are (1) that we have chosen the right model, meaning that we have included enough stages or growth rates, and (2) that our estimates of the growth rates are reasonable.

Let's work an example to illustrate how this model is used to calculate the cost of ordinary shares. Suppose that we want to estimate the cost of ordinary shares for a company that is expected to pay a dividend of $1.50 per share next year. This dividend is expected to increase 15 per cent the following year, 10 per cent the year after that, 7 per cent the year after that, and 5 per cent annually thereafter. If the company's ordinary shares are currently selling for $24 per share, what is the rate of return that investors require for investing in these shares?

Because there are four different growth rates in this example, we have to solve a formula with five terms:

$$P_0 = \frac{D_1}{1 + k_{os}} + \frac{D_2}{(1 + k_{os})^2} + \frac{D_3}{(1 + k_{os})^3} + \frac{D_4}{(1 + k_{os})^4} + \left[\frac{D_5}{k_{os} - g_4}\right]\left[\frac{1}{(1 + k_{os})^4}\right]$$

From the information given in the problem statement, we know the following:

$$\begin{aligned}
D_1 &= \$1.50 \\
D_2 &= D_1 \times (1 + g_1) = \$1.500 \times 1.15 = \$1.725 \\
D_3 &= D_2 \times (1 + g_2) = \$1.725 \times 1.10 = \$1.898 \\
D_4 &= D_3 \times (1 + g_3) = \$1.898 \times 1.07 = \$2.031 \\
D_5 &= D_4 \times (1 + g_4) = \$2.031 \times 1.05 = \$2.133
\end{aligned}$$

Substituting these values into the previous equation gives us the following, which we solve for k_{os}:

$$\$24 = \frac{\$1.50}{1 + k_{os}} + \frac{\$1.73}{(1 + k_{os})^2} + \frac{\$1.90}{(1 + k_{os})^3} + \frac{\$2.03}{(1 + k_{os})^4} + \left[\frac{\$2.13}{k_{os} - g_4}\right]\left[\frac{1}{(1 + k_{os})^4}\right]$$

As mentioned previously, we can solve this equation for k_{os} using trial and error. When we do this, we find that k_{os} is 12.2 per cent. This is the rate of return at which the present value of the cash flows equals $24. Therefore, it is the rate that investors currently require for investing in these shares.

USING EXCEL

Solving for k_{os} using a multistage-growth dividend model

Because trial and error calculations can be somewhat tedious when you perform them by hand, you may find it helpful to use a spreadsheet program. If you would like to use a spreadsheet program to solve the preceding problem yourself, the output from the spreadsheet below shows you how to do it using trial and error.

Once you input the indicated numbers and formulas into cells B3 through B14, you can then vary the number in cell B2 until the number in cell B8 equals $24. Once you have built the model, you can also use the 'goal seek' or 'solver' functions in Excel to avoid having to manually solve the problem by trial and error. See the 'Help' feature in Excel for information on how to use these functions.

<>	A	B	C	D
1				Comment
2	k_{OS} =	0.12205		Change this number until the P_0 equals $24.00
3	g_1 =	0.15		Growth rate in year 1
4	g_2 =	0.10		Growth rate in year 2
5	g_3 =	0.07		Growth rate in year 3
6	g_4 =	0.05		Growth rate for perpetuity
7				
8	P_0 =	$24.00		Formula: =NPV(B2,B11:B14) - This formula calculates the present value of the
9				future dividends in cells B11 to B14 using the discount rate in cell B2.
10	Year			
11	1	$1.500		D_1
12	2	$1.725		D_2 = B11*(1+B3)
13	3	$1.898		D_3 = B12*(1+B4)
14	4	$31.619		D_4 = [B13*(1+B5)] + [B13*(1+B5)*(1+B6)]/(B2-B6) - This formula calculates the
15				value of D_4 plus the present value of all the cash flows after year 4 in year 4 dollars.
16				

Which method should we use?

We now have discussed three methods of estimating the cost of ordinary equity for a company. You might be asking yourself how you are supposed to know which method to use. The short answer is that, in practice, most people use the CAPM (method 1) to estimate the cost of ordinary equity if the result is going to be used in the discount rate for evaluating a project. One reason is that, assuming the theory is valid, the CAPM tells managers what rate of return investors should require for equity having the same level of systematic risk that the company's equity has. This is the appropriate opportunity cost of equity capital for an NPV analysis if the project has the same risk as the company and will have similar leverage. Furthermore, the CAPM does not require financial analysts to make assumptions about future growth rates in dividends, as methods 2 and 3 do.

Used properly, methods 2 and 3 provide an estimate of the rate of return that is implied by the current price of a company's shares at a particular point in time. If the share markets are efficient, then this should be the same as the number that we would estimate using CAPM. However, to the extent that the company's shares are mispriced — for example, because investors are not informed or have misinterpreted the future prospects for the company — deriving the cost of equity from the price at one point in time can yield a poor estimate of the true cost of equity.

Indeed, it is important to realise that project valuation can never be an exact science. In principle, the theoretical underpinnings of discounting future cash flows at the opportunity cost of those cash flows are valid. The point is that both the anticipated cash flows and the appropriate discount rate are nebulous. Managers aim to have at least some degree of 'comfort' and 'confidence' in them, however.

Preference shares

As we have discussed, preference shares are a form of equity that has a stated value and specified dividend rate. For example, a preference share might have a stated value of $100 and a 5 per cent dividend rate. The owner of such a share would be entitled to receive a dividend of $5 ($100 × 0.05) each year. Another key feature of preference shares is that they do not have an expiration date. In other words, preference shares continue to pay the specified dividend in perpetuity, unless the company repurchases them or goes out of business.

These characteristics of preference shares allow us to use the perpetuity model, equation 4.3, to estimate the cost of preference shares. For example, suppose that investors would pay $85 for the preference share mentioned above. We can rewrite equation 4.3:

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

as:

$$\text{P}_{\text{ps}} = \frac{\text{D}_{\text{ps}}}{k_{\text{ps}}}$$

where P_{ps} is the present value of the expected dividends (the current preference share price), D_{ps} is the annual preference share dividend, and k_{ps} is the cost of the preference share. Rearranging the formula to solve for k_{ps} yields:

$$k_{\text{ps}} = \frac{\text{D}_{\text{ps}}}{\text{P}_{\text{ps}}} \qquad \textbf{11.6}$$

Plugging the information from our example into equation 11.6, we see that k_{ps} for the preference share in our example is:

$$k_{\text{ps}} = \frac{\text{D}_{\text{ps}}}{\text{P}_{\text{ps}}} = \frac{\$5}{\$85} = 0.059, \text{ or } 5.9\%$$

This is the rate of return at which the present value of the annual $5 cash flows equals the market price of $85. Therefore, 5.9 per cent is the rate that investors currently require for investing in this preference share.

It is easy to incorporate issuance costs into the above calculation to obtain the cost of the preference share to the company that issues it. As in the previous bond calculations, we use the net proceeds from the sale rather than the price that is paid by the investor in the calculation. For example, suppose that in order for a company to sell the above preference share, it must pay an investment banker 5 per cent of the amount of money raised. If there are no other issuance costs, the company would receive $\$85 \times (1 - 0.05) = \$80.75$ for each share sold, and the total cost of this financing to the company would be:

$$k_{\text{ps}} = \frac{\text{D}_{\text{ps}}}{\text{P}_{\text{ps}}} = \frac{\$5}{\$80.75} = 0.062, \text{ or } 6.2\%$$

You may recall that certain characteristics of preference shares look a lot like those of debt. The equation $\text{P}_{\text{ps}} = \text{D}_{\text{ps}}/k_{\text{ps}}$ shows that the value of preference shares also varies with market rates of return in the same way as debt. Because k_{ps} is in the denominator of the fraction on the right-hand side of the equation, whenever k_{ps} increases, P_{ps} decreases, and whenever k_{ps} decreases, P_{ps} increases. That is, the value of preference shares is negatively related to market rates.

It is also important to recognise that the CAPM can be used to estimate the cost of preference shares, just as it can be used to estimate the cost of ordinary equity. A financial analyst can simply substitute k_{ps} for k_{os} and β_{ps} for β_{os} in equation 11.4 and use it to estimate the cost of preference shares. Remember that the CAPM does not apply only to ordinary shares; rather, it applies to any asset. Therefore, we can use it to calculate the rate of return on any asset if we can estimate the beta for that asset.

DEMONSTRATION PROBLEM 11.4

Estimating the cost of preference shares

Problem

You work in the treasury department at Macquarie Bank and your manager has asked you to estimate the cost of each of the different types of share that Macquarie has outstanding. One of these issues is a 6.625 per cent cumulative preference share that has a stated value of $50 and is currently selling for $51.10. Although this preference share is publicly traded, it does not trade very often. This means that you cannot use the CAPM to estimate k_{ps} because you cannot get a good estimate of the beta using regression analysis. How else can you estimate the cost of this preference share, and what is this cost?

Approach

You can also use equation 11.6 to estimate the cost of preference shares.

Solution

First, you must find the annual dividend that someone who owns a preference share will receive. The dividend rate for this share is 6.625 per cent. The annual dividend equals this percentage times the $50 stated value, or 6.625 per cent of $50 = $50 × 0.06625 = $3.3125. Substituting the annual dividend and the market price into equation 11.6 yields:

$$k_{ps} = \frac{D_{ps}}{P_{ps}} = \frac{\$3.3125}{\$51.10} = 0.065, \text{ or } 6.5\%$$

BEFORE YOU GO ON

1. What information is needed to use the CAPM to estimate k_{os} or k_{ps}?
2. Under what circumstances can you use the constant-growth dividend formula to estimate k_{os}?
3. What is the advantage of using a multistage-growth dividend model, rather than the constant-growth dividend model, to estimate k_{os}?

11.4 Using the WACC in practice

LEARNING OBJECTIVE 11.4 Calculate the weighted average cost of capital for a company, explain the limitations of using a company's weighted average cost of capital as the discount rate when evaluating a project, and discuss the alternatives that are available.

We have now covered the basic concepts and calculation tools that are used to estimate the WACC. At this point, we are ready to talk about some of the practical issues that arise when financial analysts calculate the WACC for their companies.

When financial analysts think about calculating the WACC, they usually think of it as a weighted average of the company's after-tax cost of debt, cost of preference shares and cost of ordinary shares. Equation 11.2 is usually written as:

$$\text{WACC} = x_{\text{Debt}} k_{\text{Debt pre-tax}}(1 - t) + x_{ps} k_{ps} + x_{os} k_{os} \qquad 11.7$$

where $x_{Debt} + x_{ps} + x_{os} = 1$. If the company has more than one type of debt outstanding or more than one type of preference or ordinary shares, analysts will calculate a weighted average for each of those types of securities and then plug those averages into equation 11.7. Financial analysts will also use the *market values*, rather than the accounting book values, of the debt, preference shares and ordinary shares to calculate the weights (the x's) in equation 11.7. This is because, as we have already seen, the theory underlying the discounting process requires that the costs of the different types of financing be weighted by their relative market values. Accounting book values have no place in these calculations unless they just happen to equal the market values.

Calculating WACC: an example

An example provides a useful way of illustrating how the theories and tools that we have discussed are used in practice. Assume that you are a financial analyst at a manufacturing company that has used three types of debt, preference shares and ordinary shares to finance its investments.

> **Debt:** The debt includes a $4 million bank loan that is secured by machinery and equipment. This loan has an interest rate of 6 per cent, and your company could expect to pay the same rate if the loan were refinanced today. Your company also has a second bank loan (a $3 million secured loan on your manufacturing plant) with an interest rate of 5.5 per cent. Again, the rate would be the same today. The third type of debt is a bond issue that the company sold 2 years ago for $11 million. The market value of these bonds today is $10 million. Using the approach we discussed previously, you have estimated that the effective annual yield on the bonds is 7 per cent.
> **Preference shares:** The preference shares pay an annual dividend of 4.5 per cent on a stated value of $100. A preference share is currently selling for $60, and there are 100 000 shares outstanding.
> **Ordinary shares:** There are 1 million ordinary shares outstanding, and they are currently selling for $21 each. Using a regression analysis, you have estimated that the beta of these shares is 0.95.

The 10-year Treasury bond rate is currently 5.5 per cent and you have estimated the market risk premium to be 3.5 per cent using the returns on shares and Treasury bonds from the 1974 to 2012 period. The corporate income tax rate is 30 per cent. What is the WACC for your company?

The first step in calculating the WACC is to calculate the pre-tax cost of debt. Since the market value of the company's debt is $17 million ($4 + $3 + $10), we can calculate the pre-tax cost of debt as follows:

$$\begin{aligned} k_{\text{Debt pre-tax}} &= x_{\text{Bank loan 1}}k_{\text{Bank loan 1 pre-tax}} + x_{\text{Bank loan 2}}k_{\text{Bank loan 2 pre-tax}} + x_{\text{Bonds}}k_{\text{Bonds pre-tax}} \\ &= (\$4/\$17)(0.06) + (\$3/\$17)(0.055) + (\$10/\$17)(0.07) \\ &= 0.065, \text{ or } 6.5\% \end{aligned}$$

Note that because the $4 million and $3 million loans have rates that equal what it would cost to refinance them today, their market values equal the amount that is owed. Since the $10 million market value of the bond issue is below the $11 million face value, the rate that the company is actually paying must be lower than the 7 per cent rate you estimated to reflect the current cost of this debt. Recall that as interest rates increase, the market value of a bond decreases. This is the negative relationship that we referred to earlier in this chapter.

We next calculate the cost of the preference shares using equation 11.6, as follows:

$$\begin{aligned} k_{ps} &= \frac{D_{ps}}{P_{ps}} = \frac{0.045 \times \$100}{\$60} \\ &= \frac{\$4.5}{\$60} = 0.075, \text{ or } 7.5\% \end{aligned}$$

From equation 11.4, we calculate the cost of the ordinary shares to be:

$$\begin{aligned} k_{os} &= R_{rf} + (\beta_{cs} \times \text{Market risk premium}) = 0.055 + (0.95 \times 0.035) \\ &= 0.0883, \text{ or } 8.83\% \end{aligned}$$

We are now ready to use equation 11.7 to calculate the company's WACC. Since the company has $17 million of debt, $6 million of preference shares ($60 × 100 000 shares) and $21 million of ordinary shares ($21 × 1 000 000 shares), the total market value of its capital is $44 million ($17 + $6 + $21). The company's WACC is therefore:

$$\begin{aligned}\text{WACC} &= x_{\text{Debt}}k_{\text{Debt pre-tax}}(1-t) + x_{\text{ps}}k_{\text{ps}} + x_{\text{os}}k_{\text{os}}\\ &= (\$17/\$44)(0.065)(1-0.3) + (\$6/\$44)(0.075) + (\$21/\$44)(0.0883)\\ &= 0.070, \text{ or } 7.00\%\end{aligned}$$

DEMONSTRATION PROBLEM 11.5

Calculating the WACC with equation 11.7

Problem

After calculating the cost of the common equity in your pizza business to be 8.51 per cent (see demonstration problem 11.3), you have decided to estimate the WACC. You recently hired a business appraiser to estimate the value of your shares, which includes all of the outstanding ordinary shares. His report indicates that they are worth $500 million.

In order to finance the 2000 restaurants that are now part of your company, you have sold three different bond issues.

Based on the current prices of the bonds from these issues and the issue characteristics (face values and coupon rates), you have estimated the market values and effective annual yields to be:

Bond issue	Value ($ millions)	Effective annual yield
1	$100	6.5%
2	187	6.9
3	154	7.3
Total	$441	

Your company has no other long-term debt or any preference shares outstanding. The corporate tax rate is 30 per cent. What is the WACC for your pizza business?

Approach

You can use equation 11.7 to solve for the WACC for your pizza business. To do so, you must first calculate the weighted average cost of debt. You can then plug the weights and costs for the debt and ordinary shares into equation 11.7. Since your business has no preference shares, the value for this term in equation 11.7 will equal $0.

Solution

The weighted average cost of the debt is:

$$\begin{aligned}k_{\text{Debt pre-tax}} &= x_1k_{1\text{ Debt pre-tax}} + x_2k_{2\text{ Debt pre-tax}} + x_3k_{3\text{ Debt pre-tax}}\\ &= (\$100/\$441)(0.065) + (\$187/\$441)(0.069) + (\$154/\$441)(0.073)\\ &= 0.695, \text{ or } 6.95\%\end{aligned}$$

and the WACC is:

$$\begin{aligned}\text{WACC} &= x_{\text{Debt}}k_{\text{Debt pre-tax}}(1-t) + x_{\text{ps}}k_{\text{ps}} + x_{\text{os}}k_{\text{os}}\\ &= (\$441/[\$441 + \$500])(0.695)(1-0.30) + 0 + (\$500/[\$441 + \$500])(0.0851)\\ &= 0.0680, \text{ or } 6.80\%\end{aligned}$$

DECISION-MAKING EXAMPLE 11.2

Interpreting the WACC

Situation

You are a financial analyst for the company whose WACC of 7.00 per cent we just calculated in the main text. One day, your manager walks into your office and tells you that she is thinking about selling $23 million of ordinary shares and using the proceeds from the sale to pay back both of the company's loans and to repurchase all of the outstanding bonds and preference shares. She tells you that this is a smart move because if she does this, the beta of the company's ordinary shares will decline to 0.70 and the overall k_{os} will decline from 8.83 per cent to 7.95 per cent:

$$k_{os} = R_{rf} + (\beta_{os} \times \text{Market risk premium}) = 0.055 + (0.70 \times 0.035)$$
$$= 0.0795, \text{ or } 7.95\%$$

What do you tell your manager?

Decision

You should politely point out that she is making the wrong comparison. Since the refinancing will result in the company being financed entirely with equity, k_{os} will equal the company's WACC. Therefore, the 7.95 per cent should really be compared with the 7.00 per cent WACC. If your manager goes through with the refinancing, she will be making a poor decision. The average after-tax cost of the capital that your company uses will *increase* from 7.00 per cent to 7.95 per cent.

Limitations of WACC as a discount rate for evaluating projects

At the beginning of this chapter, we told you that financial managers often require analysts within the company to use the company's current cost of capital to discount the cash flows for individual projects. They do so because it is very difficult to directly estimate the discount rate for individual projects. You should recognise by now that the WACC is the discount rate that analysts are often required to use. Using the WACC to discount the cash flows for a project can make sense under certain circumstances. However, in other circumstances, it can be very dangerous. The rest of this section discusses when it makes sense to use the WACC as a discount rate and the problems that can occur when the WACC is used incorrectly.

An earlier chapter discussed how an analyst forecasting the cash flows for a project is forecasting the incremental after-tax free cash flows at the company level. These cash flows represent the difference between the cash flows that the company will generate if the project is adopted and the cash flows that the company will generate if the project is not adopted.

Financial theory tells us that the rate that should be used to discount these incremental cash flows is the rate that reflects their systematic risk. This means that the WACC is going to be the appropriate discount rate for evaluating a project only when the project has cash flows with systematic risks that are exactly the same as those for the company as a whole. Unfortunately, this is not true for most projects. The company itself is a portfolio of projects with varying degrees of risk.

When a single rate, such as the WACC, is used to discount cash flows for projects with varying levels of risk, the discount rate will be too low in some cases and too high in others. When the discount rate is too low, the company runs the risk of accepting a negative NPV project. To see how this might happen, assume that you work at a company that manufactures soft drinks and that the managers at your company are concerned about all the competition in the core soft drink business. They are thinking about expanding into the manufacture and sale of exotic tropical beverages. The managers believe that entering this market would allow the company to better differentiate its products and earn higher profits. Suppose

also that the appropriate beta for soft drink projects is 1.2, while the appropriate beta for tropical beverage projects is 1.5. Since your company is only in the soft drink business right now, the beta for its overall cash flows is 1.2. Figure 11.3 illustrates the problem that could arise if your company's WACC is used to evaluate a tropical beverage project.

In the figure, you can see that since the beta of the tropical beverage project is larger than the beta of the company as a whole, the expected return (or discount rate) for the tropical beverage project should be higher than the company's WACC. The Security Market Line indicates what this expected return should be. Now, if the company's WACC is used to discount the expected cash flows for this project, and the expected return on the project is above the company's WACC, then the estimated NPV will be positive. So far, so good. However, as illustrated in the figure for the tropical beverage example, some projects may have an expected return that is above the WACC but below the SML. For projects such as those, using the WACC as the discount rate may actually cause the company to accept a negative NPV project! The estimated NPV will be positive even though the true NPV is negative. The negative NPV projects that would be accepted in those situations have returns that fall in the red shaded area below the SML, above the WACC line, and to the right of the company's beta.

In figure 11.3 you can also see that using the WACC to discount expected cash flows for low-risk projects can result in managers at the company rejecting projects that have positive NPVs. This problem is, in some sense, the mirror image of the case where the WACC is lower than the correct discount rate. Financial managers run the risk of turning down positive NPV projects whenever the WACC is higher than the correct discount rate. The positive NPV projects that would be rejected are those that fall into the green shaded area that is below the WACC but above the SML and to the left of the company's beta.

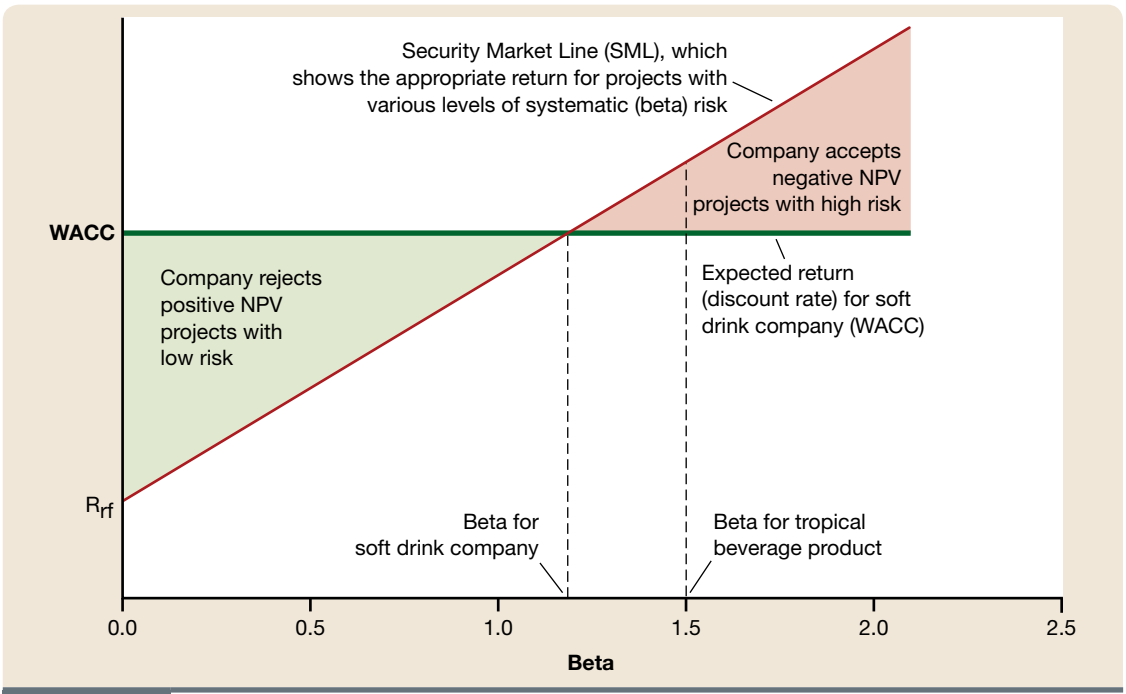

FIGURE 11.3 **Potential errors when using the WACC to evaluate projects**
Two types of problems can arise when the WACC for a company is used to evaluate individual projects: a positive NPV project may be rejected or a negative NPV project may be accepted. For the tropical beverage example, if the expected return on that project was below the level indicated by the SML, but above the company's WACC, the project might be accepted even though it would have a negative NPV.

To see how these types of problems arise, consider a project that requires an initial investment of $100 and that is expected to produce cash inflows of $40 per year for 3 years. If the correct discount rate for this project is 8 per cent, its NPV will be:

$$\begin{aligned} \text{NPV} &= \text{FCF}_0 + \frac{\text{FCF}_1}{1+k} + \frac{\text{FCF}_2}{(1+k)^2} + \frac{\text{FCF}_3}{(1+k)^3} \\ &= -\$100 + \frac{\$40}{1+0.08} + \frac{\$40}{(1+0.08)^2} + \frac{\$40}{(1+0.08)^3} \\ &= \$3.08 \end{aligned}$$

This is an attractive project because it returns more than the investors' opportunity cost of capital.

Suppose, however, that the financial managers of the company considering this project require that all projects be evaluated using the company's WACC of 11 per cent. When the cash flows are discounted using a rate of 11 per cent, the NPV is:

$$\text{NPV} = -\$100 + \frac{\$40}{1+0.11} + \frac{\$40}{(1+0.11)^2} + \frac{\$40}{(1+0.11)^3} = -\$2.25$$

As you can see, when the WACC is used to discount the cash flows, the company will end up rejecting a positive NPV project. The company will be passing up an opportunity to create value for its shareholders. (As an exercise, you might try constructing a numerical example in which a company accepts a negative NPV project.)

It is also important to recognise that when a company uses a single rate to evaluate all of its projects, there will be a bias towards accepting more risky projects. The average risk of the company's assets will tend to increase over time. Furthermore, because some positive NPV projects are likely to be rejected and some negative NPV projects are likely to be accepted, new projects on the whole will probably create less value for shareholders than if the appropriate discount rate had been used to evaluate all projects. This, in turn, can put the company at a disadvantage when compared with its competitors and adversely affect the value of its existing projects.

The key point to take away from this discussion is that it is only really correct to use a company's WACC to discount the cash flows for a project if the expected cash flows from that project have the same systematic risk as the expected cash flows from the company as a whole. You might be wondering how you can tell when this condition exists. The answer is that we never know for sure. Nevertheless, there are some guidelines that you can use when assessing whether the systematic risk for a particular project is similar to that for the company as a whole.

The systematic risk of the cash flows from a project depends on the nature of the business. Revenues and expenses in some businesses are affected more by changes in general economic conditions than revenues and expenses in other businesses. For example, consider the differences between a company that makes bread and a company that makes recreational vehicles. The demand for bread will be relatively constant in good economic conditions and in bad. The demand for recreational vehicles will be more volatile. People buy fewer recreational vehicles during recessions than when the economy is doing well. Furthermore, as we discussed in a previous chapter, operating leverage magnifies volatility in revenue. Therefore, if the recreational vehicle manufacturing process has more fixed costs than the bread manufacturing business, the difference in the volatilities of the pre-tax operating cash flows will be even greater than the difference in the volatilities of the revenues.

While total volatility is not the same as systematic volatility, we find that businesses with more total volatility (uncertainty or risk) typically have more systematic volatility. Since beta is a measure of systematic risk, and systematic risk is a key factor in determining a company's WACC, this suggests that the company's WACC should be used only for projects with business risks similar to those for the company as a whole. Since financial managers usually think of systematic risk when they think of underlying business risks, we can restate this condition as follows:

> **Condition 1:** A company's WACC should be used to evaluate the cash flows for a new project only if the level of systematic risk for the project is the same as that for the portfolio of projects that currently comprise the company.

You have to consider one other factor when you decide whether it is appropriate to use a company's WACC to discount the cash flows for a project. That is the way in which the project will be financed and how this financing compares with the way the company's assets are financed. To better understand why this is important, consider equation 11.7:

$$\text{WACC} = x_{\text{Debt}}k_{\text{Debt pre-tax}}(1 - t) + x_{\text{ps}}k_{\text{ps}} + x_{\text{os}}k_{\text{os}}$$

This equation provides a measure of the company's cost of capital that reflects both how the company has financed its assets — that is, the mix of debt and preference and ordinary shares it has used — and the current cost of each type of financing. In other words, the WACC reflects both the x's and the k's associated with the company's financing. Why is this important? Because the costs of the different types of capital depend on the fraction of the total company financing that each represents. If the company uses more or less debt, the cost of debt will be higher or lower. In turn, the cost of both preference shares and ordinary shares will be affected. This means that even if the underlying business risk of the project is the same as that for the company as a whole, if the project is financed differently than the company, the appropriate discount rate for the project analysis will be different from that for the company as a whole.

> **Condition 2:** A company's WACC should be used to evaluate a project only if that project uses the same financing mix — the same proportions of debt, preference shares and ordinary shares — used to finance the company as a whole.

In summary, WACC is a measure of the current cost of the capital that the company has used to finance its projects. It is an appropriate discount rate for evaluating projects only if (1) the project's systematic risk is the same as that of the company's current portfolio of projects and (2) the project will be financed with the same mix of debt and equity as the company's current portfolio of projects. If either of these two conditions does not hold, then managers should be careful in using the company's current WACC to evaluate a project.

Alternatives to using WACC for evaluating projects

Financial managers understand the limitations of using a company's WACC to evaluate projects, but they also know that there are no perfect alternatives. As we noted previously in this chapter, there are no publicly traded ordinary shares for most individual projects within a company. It is, therefore, not possible to directly estimate the beta for the ordinary shares used to finance an individual project.[8] Although it might be possible to obtain an estimate of the cost of debt from the company's bankers, without an estimate of the ordinary share beta — and, therefore, the cost of ordinary shares — it is not possible to obtain a direct estimate of the appropriate discount rate for a project using equation 11.7.

If the discount rate for a project cannot be estimated directly, a financial analyst might try to find a public company that is in a business that is similar to that of the project. For example, in our exotic tropical beverage example, an analyst at the soft drink company might look for a company that produces only exotic tropical beverages and that also has publicly traded shares. This public company would be what financial analysts call a **pure-play comparable** because it is exactly like the project. The returns on the pure-play company's shares could be used to estimate the expected return on the equity that is used to finance the project. Unfortunately, this approach is generally not feasible due to the difficulty of finding a public company that is only in the business represented by the project. If the public company is in other businesses as well, then we run into the same sorts of problems that we face when we use the company's WACC.

From a practical standpoint, financial managers, such as chief financial officers, do not like letting analysts estimate the discount rates for their projects. Different analysts tend to make different assumptions or use different approaches which can lead to inconsistencies that make it difficult to compare projects. In addition, analysts may be tempted to manipulate discount rates in order to make pet projects look more attractive.

In an effort to use discount rates that reflect project risks better than the company's WACC, while retaining control of the process through which discount rates are set, financial managers sometimes

classify projects into categories based on their systematic risks. They then specify a discount rate that is to be used to discount the cash flows for all projects within each category. The idea is that each category of projects has a different level of systematic risk and therefore a different discount rate should be used for each. Figure 11.4 illustrates such a classification scheme.

The scheme illustrated in figure 11.4 includes four project categories.

1. *Efficiency projects,* such as the implementation of a new production technology that reduces manufacturing costs for an existing product.
2. *Product extension projects,* such as those in which Boeing created variations of its aircraft, like as the Boeing 737, to help meet customer needs.
3. *Market extension projects,* in which existing products are sold in new markets, such as when Intel considers selling a new version of a computer chip that has been used in digital phones to digital camera manufacturers.
4. *New product projects,* in which entirely new products are being considered.

When using the scheme illustrated in figure 11.4, the financial manager would assign a discount rate for each category that reflects the beta in the middle of the indicated range of betas. Such an approach is attractive because it is not generally difficult for analysts to figure out in which of the four categories particular projects belong, and it limits their discretion in choosing discount rates. Most important, it can reduce the possibility of accepting negative NPV projects or rejecting positive NPV projects. We can see the latter benefit by comparing the shaded areas in figures 11.3 and 11.4. The total size of the shaded areas, which represents the possibility of making an error, is much smaller in figure 11.4.

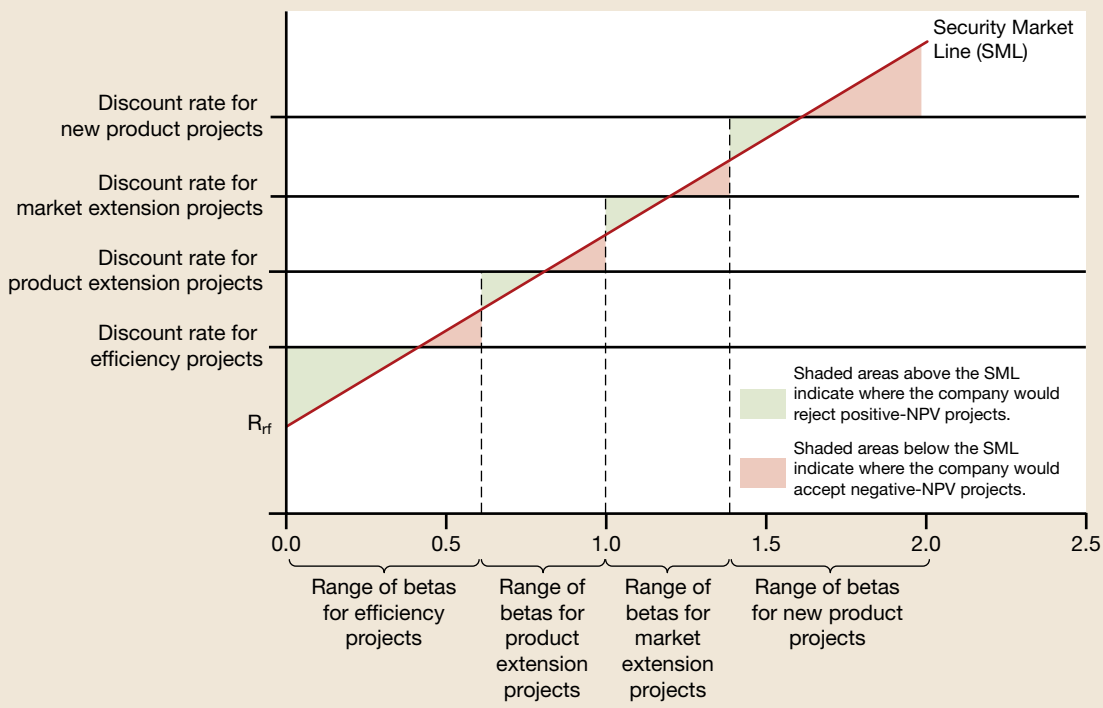

FIGURE 11.4 **Potential errors when using multiple discount rates to evaluate projects**
The potential for errors — either rejecting a positive-NPV project or accepting a negative-NPV project — is smaller when discount rates better reflect the risk of the projects that they are used to evaluate. You can see this by noting that the total size of the shaded areas in this figure is smaller than the size of the shaded areas in figure 11.3. In the ideal situation, where the correct discount rate is used for each project, there would be no shaded area at all in a figure like this.

Consistency of the WACC and Dividend Discount Models

The model of equation 11.6 in its original form as equation 4.3 allows for the discounting of dividends to determine the market equity value of the company. The outcome calculation is, in principle, consistent with discounting the company's cash flow using the WACC to determine the combined market equity and market debt values of the company. To assess your comprehension, consider demonstration problem 11.6.

DEMONSTRATION PROBLEM 11.6

Demonstration of the application of the WACC and the Constant Dividend Model of equation 4.3

Problem

Company ABC has 2 million shares. It has $60 million of debt at an interest rate of 5 per cent. The market believes that ABC can generate earnings of $12 million before interest and tax in perpetuity, and that ABC's cost of equity is 6.3 per cent. ABC will pay out profits after interest and tax as dividends to its shareholders.

Approach

First, use the constant dividend model to calculate the market equity value of ABC. Second, apply the WACC formula to determine the market equity plus debt value of ABC.

Solution

We calculate the annual dividend in perpetuity as $12 million minus the interest payments (5.0 per cent interest on debt of $60 million), and allow for corporate tax (at 30 per cent). Hence, we calculate the dividend payment in perpetuity as ($12 − $60 × 0.05) × (1 − 0.3) = $6.3 million. We may then calculate the equity value of ABC as $6.3/0.063 = $100 million.

Now observe what happens when we apply the WACC method to determine the market value of ABC. We calculate ABC's WACC using equation 11.7 as:

$$\text{WACC} = (\$100/\$160)(0.063) + (\$60/\$160)(0.05)(1 - 0.3)$$
$$= 0.0525, \text{ or } 5.25\%$$

Next, we calculate ABC's 'free cash flow' in perpetuity. Note that this is determined as:

$$\text{Free Cash Flow} = \$(12 \text{ million} \times 0.7) = \$8.4 \text{ million}.$$

And now we discount the $8.4 million perpetuity with the WACC = 5.25%, to give:

$$= \$8.4 \text{ million}/0.0525 = \$160 \text{ million}$$

This is the 'correct answer' as we have the market debt of ABC as $60 million and we calculated the market equity value of ABC as $100 million. Hence, we demonstrate consistency between discounting dividends with the cost of equity to derive market equity value, and discounting free cash flow with the WACC to derive total market equity plus debt value.

BEFORE YOU GO ON

1. Do analysts use book values or market values to calculate the weights when they use equation 11.7? Why?
2. What kinds of errors can be made when the WACC for a company is used as the discount rate for evaluating all projects in the company?
3. Under what conditions is the WACC the appropriate discount rate for a project?

SUMMARY OF LEARNING OBJECTIVES

11.1 Explain what the weighted average cost of capital for a company is and why it is often used as a discount rate to evaluate projects.

The weighted average cost of capital (WACC) for a company is a weighted average of the current costs of the different types of financing that a company has used to finance the purchase of its assets. When the WACC is calculated, the cost of each type of financing is weighted according to the fraction of the total company value represented by that type of financing. The WACC is often used as a discount rate in evaluating projects because it is not possible to directly estimate the appropriate discount rate for many projects. As we also discuss in section 11.4, having a single discount rate reduces inconsistencies that can arise when different analysts in the company use different methods to estimate the discount rate and can also limit the ability of analysts to manipulate discount rates to favour pet projects.

11.2 Calculate the cost of debt for a company.

The cost of debt can be calculated by solving for the yield to maturity of the debt using the bond pricing model (equation 6.2), calculating the effective annual yield and adjusting for tax using equation 11.3.

11.3 Calculate the cost of ordinary shares and the cost of preference shares for a company.

The cost of ordinary shares can be estimated using the CAPM, the constant-growth dividend formula and a multistage-growth dividend formula. The cost of preference shares can be calculated using the perpetuity model for the present value of cash flows.

11.4 Calculate the weighted average cost of capital for a company, explain the limitations of using a company's weighted average cost of capital as the discount rate when evaluating a project, and discuss the alternatives that are available.

The weighted average cost of capital is estimated using either equation 11.2 or equation 11.7, with the cost of each individual type of financing estimated using the appropriate method.

When a company uses a single rate to discount the cash flows for all of its projects, some project cash flows will be discounted using a rate that is too high and other project cash flows will be discounted using a rate that is too low. This can result in the company rejecting some positive NPV projects and accepting some negative NPV projects. It will bias the company towards accepting more risky projects and can cause the company to create less value for shareholders than it would have if the appropriate discount rates had been used.

One approach to using the WACC is to identify a company that engages in business activities that are similar to those associated with the project under consideration and that has publicly traded shares. The returns from this pure-play company's shares can then be used to estimate the ordinary share beta for the project. In instances where pure-play companies are not available, financial managers can classify projects according to their systematic risks and can use a different discount rate for each classification. This is the type of classification scheme illustrated in figure 11.4.

KEY TERMS

finance balance sheet a balance sheet that is based on market values of expected cash flows

multistage-growth dividend model a model that allows for varying dividend growth rates in the near term, followed by a constant long-term growth rate; another term used to describe the mixed (supernormal) dividend growth model discussed in chapter 7

pure-play comparable a comparable company that is in exactly the same business as the project or business being analysed

weighted average cost of capital (WACC) the weighted average of the costs of the different types of capital (debt and equity) that have been used to finance a company; the cost of each type of capital is weighted by the proportion of the total capital that it represents

SUMMARY OF KEY EQUATIONS

Equation	Description	Formula
11.1	Finance balance sheet identity	MV of assets = MV of liabilities + MV of equity
11.2	General formula for weighted average cost of capital (WACC) for a company	$k_{\text{Company}} = \sum_{i=1}^{n} x_i k_i = x_1 k_1 + x_2 k_2 + x_3 k_3 + \cdots + x_n k_n$
11.3	After-tax cost of debt	$k_{\text{Debt after-tax}} = k_{\text{Debt pre-tax}} \times (1 - t)$
11.4	CAPM formula for the cost of ordinary shares	$k_{os} = R_{rf} + (\beta_{os} \times \text{Market risk premium})$
11.5	Constant-growth dividend formula for the cost of ordinary shares	$k_{os} = \frac{D_1}{P_0} + g$
11.6	Perpetuity formula for the cost of preference shares	$k_{ps} = \frac{D_{ps}}{P_{ps}}$
11.7	Traditional WACC formula	$\text{WACC} = x_{\text{Debt}} k_{\text{Debt pre-tax}}(1 - t) + x_{ps} k_{ps} + x_{os} k_{os}$

SELF-STUDY PROBLEMS

11.1 The market value of a company's assets is $3 billion. If the market value of the company's liabilities is $2 billion, what is the market value of the shareholders' investment and why?

11.2 Comics'R'Us Ltd has borrowed $100 million and is required to pay investors $8 million in interest this year. If the corporate tax rate is 30 per cent, then what is the after-tax cost of debt (in dollars as well as in annual interest) to Comics'R'Us?

11.3 Explain why the after-tax cost of equity (preference or ordinary shares) does not have to be adjusted by the corporate tax rate for the company.

11.4 Dempsey's Ltd has debt claims of $400 (market value) and equity claims of $600 (market value). If the cost of debt financing (after tax) is 11 per cent and the cost of equity is 17 per cent, then what is Dempsey's weighted average cost of capital?

11.5 You are analysing a company that is financed with 60 per cent debt and 40 per cent equity. The current cost of debt financing is 10 per cent, but due to a recent downgrade by the rating agencies, the company's cost of debt is expected to increase to 12 per cent immediately. How will this change the company's weighted average cost of capital if you ignore tax?

CRITICAL THINKING QUESTIONS

11.1 Explain why the required rate of return on a company's assets must be equal to the weighted average cost of capital associated with its liabilities and equity.

11.2 Which is easier to calculate directly, the expected rate of return on the assets of a company or the expected rate of return on the company's debt and equity? Assume that you are an outsider to the company.

11.3 With respect to the level of risk and the required return for a company's portfolio of projects, discuss how the market and a company's management can have inconsistent information and expectations.

11.4 Your friend has recently told you that the Commonwealth Government effectively subsidises the cost of debt (compared to equity use) for companies. Do you agree with that statement? Explain.

11.5 Describe why it is not usually appropriate to use the coupon rate on a company's bonds to estimate the pre-tax cost of debt for the company.

11.6 Maltese Falcone Ltd has not checked its weighted average cost of capital for 4 years. Company management claims that since Maltese Falcone Ltd has not had to raise capital for new projects since that time, they should not have to worry about their current weighted average cost of capital since they have essentially locked in their cost of capital. Critique that statement.

11.7 Ten years ago, Victoria Gas issued preference shares with a price equal to the par amount of $100. If the dividend yield on that issue was 12 per cent, explain why the company's current cost of preference shares is likely not equal to 12 per cent.

11.8 Discuss under what circumstances you might be able to use a model that assumes constant growth in dividends to calculate the current cost of equity capital for a company.

11.9 Your manager just finished calculating your company's weighted average cost of capital. He is relieved because he says that he can now use that cost of capital to evaluate all projects that the company is considering for the next 4 years. Evaluate that statement.

QUESTIONS AND PROBLEMS

★ BASIC | ★★ MODERATE | ★★★ CHALLENGING

★ BASIC

11.1 **Finance balance sheet:** Markit Ltd has total debt obligations with a book and market value equal to $33 million and $32 million, respectively. It also has total equity with a book and market value equal to $24 million and $63 million, respectively. If you were going to buy all of the assets of Markit Ltd today, how much should you be willing to pay?

11.2 **WACC:** What is the weighted average cost of capital?

11.3 **Current cost of a bond:** You are analysing the cost of debt for a company. You know that the company's 14-year maturity, 10.55 per cent bonds are selling at a price of $1050.24. The bonds pay interest semiannually and have a face value of $1000. If these bonds are the only debt outstanding for the company, what is the after-tax cost of debt for this company if the corporate tax rate is 30 per cent?

11.4 **Tax and the cost of debt:** How is tax accounted for when we calculate the cost of debt?

11.5 **Tax and the cost of debt:** Fafincare Ltd has earnings before interest and tax equal to $500. If the company incurred interest expense of $200 and pays tax at the corporate tax rate of 30 per cent, what amount of cash is available for Fafincare Ltd's investors?

11.6 **Cost of ordinary equity:** List and describe each of the three methods used to calculate the cost of ordinary equity.

11.7 **Cost of ordinary shares:** Hallmark Tyre Ltd just paid a $1.70 dividend on its ordinary shares. If Hallmark Tyre is expected to increase its annual dividend by 6.90 per cent per year into the foreseeable future and the current price of Hallmark Tyre Ltd's ordinary shares is $17.25, what is the cost of ordinary equity for Hallmark Tyre Ltd?

11.8 **Cost of ordinary shares:** Fast Way Ltd is expected to pay a dividend of $1.10 in a year from today on its ordinary shares. That dividend is expected to increase by 5 per cent every year thereafter. If the price of Fast Way Ltd shares is $13.75, what is Fast Way Ltd's cost of ordinary equity?

11.9 **Cost of ordinary shares:** Lock Stage's ordinary shares are expected to pay an annual dividend equal to $1.55, and it is commonly known that the company expects dividends paid to increase by 11.10 per cent for the next 2 years and by 2 per cent thereafter. If the current price of Lock Stage's ordinary shares is $16.93, what is the cost of ordinary equity capital for the company?

11.10 **Cost of preference shares:** Luxury Cruises has preference shares outstanding that pay an annual dividend equal to $13 per year. If the current price of Luxury Cruises preference shares is $144, what is the after-tax cost of preference shares for Luxury Cruises?

11.11 **Cost of preference shares:** Pearson Autos has preference shares outstanding that pay annual dividends of $16, and the current price of the shares is $77. What is the after-tax cost of new preference shares for Pearson Autos if the flotation (issuance) costs for a new issue of preference shares are 5 per cent?

11.12 **WACC:** Describe the alternatives to using a company's WACC as a discount rate when evaluating a project.

11.13 **WACC for a company:** Share Ltd has a capital structure that is financed, based on current market values, with 21 per cent debt, 19 per cent preference shares and 60 per cent ordinary shares. If the return offered to the investors for each of those sources is 11 per cent, 12 per cent and 18 per cent for debt, preference shares and ordinary shares, respectively, what is Share Ltd's after-tax WACC? Assume that the company's corporate tax rate is 40 per cent.

11.14 **WACC:** What are direct out-of-pocket costs?

11.15 **Finance balance sheet:** Describe why the total value of all of the securities financing the company must be equal to the value of the company.

★★ MODERATE

11.16 **Finance balance sheet:** Describe why the cost of capital for the company is equal to the expected rate of return to the investors of the company.

11.17 **Current cost of a bond:** You know that the after-tax cost of debt capital for Red Port is 8.9 per cent. If the company has only one issue of 5-year maturity bonds outstanding, what is the current price of the bonds if the coupon rate on those bonds is 12.71 per cent? Assume the bonds make semiannual coupon payments and the corporate tax rate is 30 per cent.

11.18 **Current cost of a bond:** Eternity Ltd has issued bonds that never require the principal amount to be repaid to investors. Correspondingly, Eternity Ltd must make interest payments into the infinite future. If the bondholders receive annual payments of $92 and the current price of the bonds is $876, what is the after-tax cost of this borrowing for Eternity Ltd if the corporate tax rate is 40 per cent?

11.19 **Cost of debt for a company:** You are analysing the after-tax cost of debt for a company. You know that the company's 12-year maturity, 9.5 per cent coupon bonds with a face value of $1000 are selling at a price of $1200. If these bonds are the only debt outstanding for the company, what is the after-tax cost of debt for this company if the corporate tax rate is 30 per cent? What if the bonds are selling at par?

11.20 **Cost of ordinary shares:** Stronghold Ltd's ordinary shares currently sell for $41 per share. The company believes that its shares should really sell for $54 per share. If the company just paid an annual dividend of $2 per share and the company expects those dividends to increase by 6 per cent per year forever (and this is common knowledge to the market), what is the current cost of ordinary equity for the company and what does the company believe is a more appropriate cost of ordinary equity for the company?

11.21 **Cost of ordinary shares:** Write out the general equation for the price of a share that will grow dividends very rapidly for 4 years after the next predicted dividend and thereafter at a constant, but lower, rate for the foreseeable future. Discuss the problems in estimating the cost of equity capital for such shares.

11.22 **Cost of ordinary shares:** You have calculated the cost of ordinary equity using all three methods described in the chapter. Unfortunately, all three methods have yielded different answers. Describe which answer (if any) is most appropriate.

11.23 **WACC for a company:** A company financed totally with ordinary equity is evaluating two distinct projects. The first project has a large amount of non-systematic risk and a small amount of systematic risk. The second project has a small amount of non-systematic risk and a large amount of systematic risk. Which project, if taken, will have a tendency to increase the company's cost of capital?

11.24 **WACC for a company:** Contemporary Products Ltd currently has $200 million of market value debt outstanding. The 9 per cent coupon bonds (semiannual pay) have a maturity of 15 years,

a face value of $1000 and are currently priced at $1024.87 per bond. The company also has an issue of 2 million preference shares outstanding with a market price of $20. The preference shares offer an annual dividend of $1.20. Contemporary Products also has 14 million ordinary shares outstanding with a price of $20.00 per share. The company is expected to pay a $2.20 ordinary dividend 1 year from today, and that dividend is expected to increase by 7 per cent per year forever. If the corporate tax rate is 40 per cent, then what is the company's weighted average cost of capital?

11.25 **Choosing a discount rate:** For Imaginary Products Ltd in problem 11.24, calculate the appropriate cost of capital for a new project that is financed with the same proportion of debt, preference shares and ordinary shares as the company's current capital structure. Also assume that the project has the same degree of systematic risk as the average project that the company is currently undertaking (the project is also in the same general industry as the company's current line of business).

11.26 **Choosing a discount rate:** If a company anticipates financing a project with a capital mix different than the company's current capital structure, describe in realistic terms how the company is subjecting itself to a calculation error if it chooses to use its historical WACC to evaluate the project.

★★★ CHALLENGING

11.27 You are analysing the cost of capital for MacroSwift Ltd, which develops software operating systems for computers. The company's dividend growth rate has been a very constant 3 per cent per year for the past 15 years. Competition for the company's current products is expected to develop in the next year, and MacroSwift Ltd is currently expanding its revenue stream into the multimedia industry. Evaluate using a 3 per cent growth rate in dividends for MacroSwift Ltd in your cost of capital model.

11.28 You are an external financial analyst evaluating the merits of a share. Since you are using a dividend discount model approach to calculate the cost of equity, you need to estimate the dividend growth rate for the company in the future. Describe how you might go about that process.

11.29 You know that the return of Cycles-r-us's ordinary shares reacts to macroeconomic information 1.00 more times than the return of the market. If the risk-free rate of return is 4.80 per cent and market risk premium is 6 per cent, what is Cycles-r-us's cost of ordinary equity capital?

11.30 In your analysis of the cost of capital for an ordinary share, you calculate a cost of capital using a dividend discount model that is much lower than the calculation for the cost of capital using the CAPM model. Explain a possible source for the discrepancy.

11.31 Hardy Trucks has a preference share issue outstanding that pays an annual dividend of $1.30 per year. The current cost of preference shares for Hardy Trucks is 10.80 per cent. If Hardy Trucks issues additional preference shares that pay exactly the same dividend and the investment banker retains 5.10 per cent of the sale price, what is the cost of new preference shares for Hardy Trucks?

11.32 Enigma Ltd management believes that the company's cost of capital (WACC) is too high because the company has been too secretive with the market concerning its operations. Evaluate that statement.

11.33 Discuss what valuable information would be lost if you decided to use book values in order to calculate the cost of each of the capital components within a company's capital structure.

11.34 The cost of equity is equal to the:

a expected market return.
b rate of return required by shareholders.
c cost of retained earnings plus dividends.
d risk the company incurs when financing.

11.35 Dot.Com has determined that it could issue $1000 face value bonds with an 8 per cent coupon paid semiannually and a 5-year maturity at $900 per bond. If the corporate tax rate is 30 per cent, its after-tax cost of debt is closest to:

a 7.2 per cent. **b** 7.4 per cent.
c 7.6 per cent. **d** 7.8 per cent.

11.36 Morgan Insurance Ltd issued a fixed-rate perpetual preference share 3 years ago and placed it privately with institutional investors. The share was issued at $25.00 per share with a $1.75 dividend. If the company were to issue the preference shares today, the yield would be 6.5 per cent. The share's current value is:

a $25.00. **b** $26.92.
c $37.31. **d** $40.18.

11.37 Gearing Ltd has an after-tax cost of debt capital of 4 per cent, a cost of preference shares of 8 per cent, a cost of equity capital of 10 per cent, and a weighted average cost of capital of 7 per cent. Gearing Ltd intends to maintain its current capital structure as it raises additional capital. In making its capital-budgeting decisions for the average-risk project, the relevant cost of capital is:

a 4 per cent. **b** 7 per cent.
c 8 per cent. **d** 10 per cent.

11.38 Suppose the cost of capital of Gadget Ltd is 10 per cent. If Gadget Ltd has a capital structure that is 50 per cent debt and 50 per cent equity, its before-tax cost of debt is 5 per cent and the corporate tax rate is 30 per cent, then its cost of equity capital is closest to:

a 12 per cent. **b** 14 per cent.
c 16 per cent. **d** 18 per cent.

SAMPLE TEST PROBLEMS

11.1 Balanced Ltd has three different product lines of business. Its least risky product line has a beta of 1.7, while its middle-risk product line has a beta of 1.8 and its most risky product line has a beta of 2.1. The market value of the assets invested in each product line is $1 billion for the least risky line, $3 billion for the middle-risk line and $7 billion for the riskiest product line. What is the beta of Balanced Ltd?

11.2 Ellwood Ltd has a 5-year bond issue outstanding with a coupon rate of 10 per cent and a price of $1039.56. If the bonds pay coupons semiannually and the face value is $1000, what is the pre-tax cost of the debt and what is the after-tax cost of the debt? The corporate tax rate for the company is 30 per cent.

11.3 NT Copper Ltd expects its growth in ordinary share dividends to be a very steady 1.5 per cent per year for the indefinite future. The company's shares are currently selling for $18.45, and the company just paid a dividend of $3.00 yesterday. What is the cost of ordinary share equity for this company?

11.4 Who's Time Portals has a preference shares issue outstanding that pays an annual dividend of $2.50 per year and is currently selling for $27.78 a share. What is the cost of preference shares for this company?

11.5 Old Time New Age Ltd has a portfolio of projects with a beta of 1.25. The company is currently evaluating a new project that involves a new product in a new competitive market. Briefly discuss what adjustment Old Time New Age Ltd might make to its 1.25 beta in order to evaluate this new project.

ENDNOTES

1. Q1 Resort and Spa, www.q1.com.au; Skypoint 2015, 'Facts and history', www.skypoint.com.au/Observation-Deck/Facts-and-History.aspx.
2. According to Truong G, Partington G & Peat, M 2008 'Cost-of-capital estimation and capital-budgeting practice in Australia', *Australian Journal of Management*, vol. 33, no. 1, June: 'NPV, IRR and Payback are the most popular evaluation techniques.

Discounting is typically by the weighted average cost of capital, assumed constant for the life of the project, and with the same discount rate across divisions. The WACC is usually based on target weights for debt and equity. The CAPM is widely used, while other asset pricing models are not. The discount rate is reviewed regularly and is updated as conditions change. In most companies, project analysis takes no account of the value of imputation tax credits.'

3. The total expected cash flows at Boeing also include cash flows from projects that the company is expected to undertake in the future, or what are often referred to as *growth opportunities.* This idea is discussed in detail in later chapters. For our immediate purposes, we will assume that these cash flows are expected to equal $0.
4. We will discuss how companies finance their assets in more detail in chapters 13 and 14. For the time being, we will simply assume that a company uses some combination of debt and equity. Here we use the term *debt* in the broadest sense to refer to all liabilities, including liabilities on which the company does not pay interest, such as accounts payable. As is common practice, we focus only on long-term interest-bearing debt, such as bank loans and bonds, in the cost of capital calculations. The reason for this is discussed in the next section.
5. We are ignoring the effect of tax on the cost of debt financing for the time being. This effect is discussed in detail in section 11.2 and explicitly incorporated into subsequent calculations.
6. Recall that we discussed the concept of financial market efficiency in chapter 6.
7. These types of costs are incurred by companies whenever they raise capital. We only show how to include them in the cost of bond financing and, later, in estimating the cost of preference shares, but they should also be included in calculations of the costs of capital from other sources, such as bank loans and common equity.
8. Some companies issue a type of share that has an equity claim on only part of the business.

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