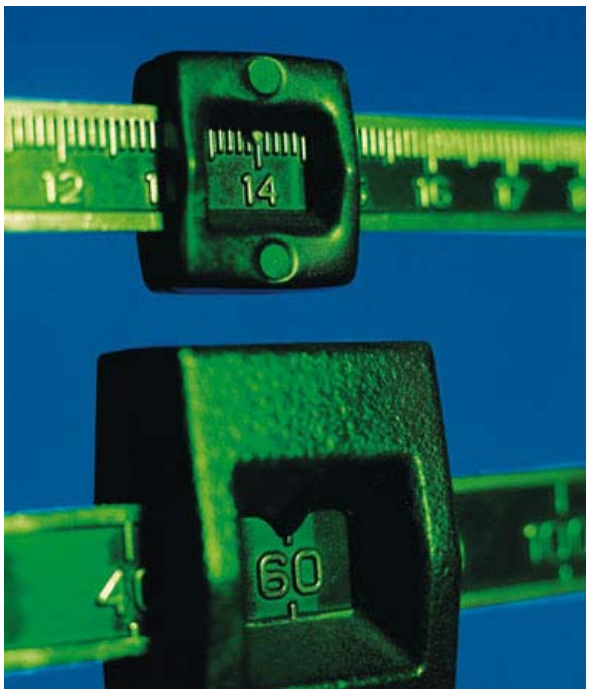
MANAGEMENT ACCOUNTING – FINANCIAL STRATEGY

Calculating a weighted-average cost of capital is a key skill for P9 students, as it's very likely to be examined. **William Parrott** shows how it's done.



In essence, the weighted- average cost of capital (WACC) is a simple concept. An entity's cost of capital is an average of the costs of all the finance sources within the company weighted by the total market value of each source.

Consider, for example, a company with three sources of finance: equity, preference shares and debt (*see table 1*). The company's WACC would be calculated as follows: WACC = (17% × 23 ÷ 42) + (13% × 5 ÷ 42) + (6% × 14 ÷ 42) = 12.86%.

Note that the cost of debt should be post tax, as a company is granted tax relief on interest it pays. Although a WACC formula is included in the formula sheet provided in the exam, a weighted-average calculation is something that candidates should have come across at school and be able to do without referring to the sheet.

Students must check that they can quickly and accurately input the calculation above into their calculator and produce the correct answer. It is wise to make a mental estimate whenever you perform any such calculation. You will then notice if the calculator produces an odd result and so have a chance to correct it. In this case, we know that the average must lie somewhere between the highest and lowest costs of finance in the table. Equally, because the company has more equity finance than any other type, the result should be closer to 17 per cent than six per cent. So when we calculate 12.86 per cent we can be confident that it is probably correct.

1 Simple WACC scenario

Source	Cost of finance	Market value
Equity	17%	$23m
Preference shares	13%	$5m
Debt (post tax relief)	6%	$14m
		$42m

The WACC calculated can then be used as the discount rate when appraising a potential project, as long as the following two conditions apply:

- The project carries a similar business risk to that of the firm's current operations.
- Undertaking the project will not require significant new funds to be raised that may affect the company's financial risk.

When calculating a WACC we make the important assumption that it is the company that's financed, not individual projects. Hence all of the company's finance sources are pooled and the average cost of the pool – the WACC – is used as the company's discount rate and is applied to all relevant projects. This is known as the pooling assumption.

The weighty issue is that students must be able to calculate the cost of equity and the cost of debt. Unfortunately, there are numerous techniques to learn. Individually, each one is not particularly difficult, but candidates who fail to invest enough time in this area will get them muddled and fail to identify the correct approach called for by a particular situation.

The following two scenarios will demonstrate the key techniques required.

Scenario one

The AG Company is financed using the following methods:

- Equity. The company has 20 million shares, which are trading at $3.70 per share. It has an equity beta of 1.15.
- Preference shares. The company has ten million $1 seven per cent preference shares, which are trading at $0.91.
- Debt. AG has $30m par value of eight per cent debentures, which are redeemable at par in six years' time. The debentures are trading at $101 per cent.

The return on the market is 11 per cent, the return on government stock is five per cent and the corporate tax rate is 30 per cent.

You are required to calculate the WACC of the AG Company.

Solution to scenario one

The cost of equity can be calculated using either the dividend valuation model (DVM) or the capital asset pricing model (CAPM). An exam question is unlikely to indicate which method should be used, so students need to be able to decide according to the information that is provided. CAPM should be used in this case, as AG's equity beta has been provided. The CAPM formula provided is $k_e = R_f + (R_m - R_f)\beta$ where:

- k_e is the cost of equity.

- R_m is the return on the market (given in the scenario as 11 per cent).
- R_f is the risk-free return – ie, the return on government stock that's deemed to be risk free (given in the scenario as five per cent).
- ß is the equity beta (given in the scenario as 1.15).

We can, therefore, put these values into the equation provided to find that the cost of equity is: 5% + (11% – 5%) × 1.15 = 11.9%.

The total market value of equity must also be calculated, because it's required for the weightings. This equates to the number of shares multiplied by the share price: 20m × $3.70 = $74m.

Note that some scenarios will give the market premium or the excess market return instead of the return on the market. That is simply $R_m – R_f$, so in this question the figure would be 11% – 5% = 6%. Where the market premium is given, the calculation of the cost of equity is slightly quicker – as long as you don't get confused.

The cost of preference shares is derived using a formula, which has also been provided. It is $k_{pref} = d \div P_0$ where:

- k_{pref} is the cost of preference shares.
- d is the annual preference dividend, which can be worked out as $1 × 7% = $0.07.
- P_0 is the current ex-dividend market value of the preference share ($0.91).

We can again put these figures into the formula to get: $k_{pref} = 0.07 \div 0.91 = 7.69\%$.

The total market value of the preference shares must also be calculated, as we did with the equity: 10m × $0.91 = $9.1m.

Note that the calculation above has been done on a per share basis, but this formula will work using totals as well. Students should choose whichever method is easier according to the way the information has been provided. Unless the scenario indicates otherwise, you can assume that a share value is ex-dividend.

The cost of redeemable debt is estimated by finding the internal rate of return (IRR) of the cash flows arising from the company's point of view – post tax relief on interest paid. To calculate an IRR, two net present values should be calculated and then be used in the interpolation formula to derive the rate. This formula is a technique that should be remembered from previous studies.

There are numerous methods of presenting this calculation. For an example of one of these, see table 2. I have chosen discount rates of five per cent and ten per cent, because the cost of debt usually lies between two figures. If the NPV at five per cent turns out to be negative, then the second discount rate used should be lower than five per cent instead of ten per cent.

The cost calculation is best done using values relating to one bond or debenture. The par value of one bond will be $100 unless the question indicates otherwise. The market value is given in the scenario as $101 per cent. This looks odd, but simply means that a bond with a par value of $100 is trading at $101, or 101 per cent of its par value.

The value for post-tax interest in table 2 is the annual interest cost after tax relief. It is found as follows: – $100 × 8% × (1 – 0.3) = $5.60, where 0.3 is the corporate tax rate as a decimal and eight per cent is the interest rate or coupon on the bond. Remember that the interest is always paid on the $100 par value of the bond.

To decide which cash flows should be shown as negative and which should be shown as positive, it may be helpful to think of the company buying its debt back from the market and cancelling it. The market value is negative in this case, as it's the cost of buying a bond back at its current price. The post-tax interest and the redemption value are then both positive, as these are cash flows the company will save in the future if the bond is cancelled now. In fact, if the positives and negatives are reversed, the same result will arise, but the method suggested here keeps the figures as simple as possible for the IRR calculation.

The total market value of the redeemable debt must also be calculated. In effect, dividing the total par value of the bonds by 100 calculates the number of bonds issued. This should then be multiplied up by the market value of each bond to give the total market value. In this case the calculation is: $30m × 101 ÷ 100 = $30.3m.

Now that we have determined the cost and total market value of each of the company's sources of finance, the

3 Calculation of AG's WACC

Source	Cost of finance	Market value
Equity	11.90%	$74.0m
Preference shares	7.69%	$9.1m
Debt (post tax relief)	5.45%	$30.3m
		$113.4m

2 Calculation of AG Company's internal rate of return

Timing	Cash flow	$	Discount/ annuity factor	Net present value at 5% discount rate	Discount/ annuity factor	Net present value at 10% discount rate
T_0	Market value	(101)	1.000	(101.0)	1.000	(101.0)
T_{1-6}	Post-tax interest	5.60	5.076	28.4	4.355	24.4
T_6	Redemption value	100	0.746	74.6	0.564	56.4
				2.0		(20.2)

So AG's Company's internal rate of return = 5% + [2.0 ÷ (2.0 + 20.2)] × (10% – 5%) = 5% + 0.09 x 5% = 5.45%

WACC can be found as before. From table 3, we have the following calculation: the AG Company's weighted-average cost of capital is: (11.9% × 74.0 ÷ 113.4) + (7.69% × 9.1 ÷ 113.4) + (5.45% × 30.3 ÷ 113.4) = 9.84%.

Scenario two

The JS Company is financed using the following methods:

- Equity. The company has a market capitalisation of $87m. It's about to pay a dividend of $7.2m, which represents a four per cent increase on the previous year. This growth rate is expected to continue into the future.
- Irredeemable debentures. The company has $20m par value of nine per cent irredeemable debentures. These are currently trading at $112 per cent.
- Overdraft. JS has an overdraft of $9m on which interest is charged at eight per cent. This is viewed as part of the company's long-term finance.

The corporate tax rate is 30 per cent.

You are required to calculate the JS Company's WACC.

Solution to scenario two

Because information about dividends has been provided this time, the DVM is the appropriate model to use. The DVM formula provided is $k_e = [d_0 (1 + g) \div P_0] + g$, where:

- k_e is the cost of equity.
- d_0 is the most recent dividend paid or about to be paid. This is given in the scenario as $7.2m.
- g is the forecast annual dividend growth rate. This is given in the scenario as four per cent.
- P_0 is the ex-dividend market value of the equity. As the dividend is about to be paid, the market capitalisation given must be cum dividend. To calculate the ex-dividend market value, the dividend about to be paid must be subtracted as follows: $87m – $7.2m = $79.8m. (The total market value of the equity to be used in the weightings must also be an ex-dividend market value.)

4 Calculation of JS's WACC

Source	Cost of finance	Market value
Equity	13.38%	$79.8m
Preference shares	5.63%	$22.4m
Debt (post tax relief)	5.60%	$9.0m
		$111.2m

Putting these values into the formula provided, we can work out that the cost of equity is ($7.2m × 1.04 ÷ $79.8m) + 0.04 = 0.1338, or 13.38%.

As with the first scenario, the calculation above has been done on a per share basis, but this formula will work using totals as well. Students should choose whichever method is easier according to the way the information has been provided. In many scenarios the forecast growth rate in the dividends will not be provided. Candidates should be able to estimate this growth rate by using the Gordon growth model or by averaging past dividend growth.

The cost of irredeemable debentures is calculated using the formula provided. This is $K_{d\ net} = i(1 – t) \div P_0$ where:

- $K_{d\ net}$ is the post-tax cost of debt.
- i is the annual interest paid. In this case, it's $100 × 9% = $9.
- t is the corporate tax rate. This is given in the scenario as 30 per cent.
- P_0 is the ex-interest market value of the debt. This is given in the scenario as $112.

Putting these values into the formula provided, we can work out that the post-tax cost of debt = $9 × (1 – 0.3) ÷ $112 = 0.0563, or 5.63%.

The total market value of the JV Company's irredeemable debt must also be calculated. This is done in the same way as the total market value of redeemable debt: total market value = par or book value × current market value ÷ 100. In this case, it's: $20m × 112 ÷ 100 = $22.4m.

The cost of the overdraft equals the current interest cost × (1 – tax rate). In JV's case, it's 8% × (1 – 0.3) = 5.6%.

Because an overdraft is not traded, there is no total market value, so the book value is taken as the best approximation to the total market value. In this case, it's given as $9m.

Now that the cost and total market value of each finance source in the JS Company has been calculated, the WACC can be found as before. From table 4, we have the following calculation: the firm's WACC = (13.38% × 79.8 ÷ 111.2) + (5.63% × 22.4 ÷ 111.2) + (5.6% × 9.0 ÷ 111.2) = 11.19%.

Candidates should try to become as confident as possible with the basic WACC calculations illustrated. You'll then be better able to deal with the complications that will arise in the paper. The information you need will not be presented so clearly in an exam question; it will be spread around the scenario. If you are to extract the necessary information successfully, you must be sure about what you're seeking.

In cases where a project has different business risk from the company's existing operations or where undertaking the project would cause a change in the company's' financial risk, you will need to use risk-adjusted WACC and adjusted present value techniques. Having a good understanding of WACC is extremely useful when considering these more complex techniques.

William Parrott is a tutor at Kaplan Financial.

P9 further reading

D Watson and A Head, *Corporate Finance – Principles and Practice* (third edition), FT/Prentice Hall, 2003.
B Ryan, *Corporate Finance and Valuation*, Thomson Learning, 2006.
J Ogilvie, *Management Accounting – Financial Strategy CIMA Official Learning System*, CIMA Publishing, 2008.