The Cost of Capital

1 Background

As investors desire to obtain the best/highest return on their investments in securities such as shares (Equity) and loans to companies such as debentures (Debt), these returns are costs to the companies paying these Dividends (on equity) and Interest (on Debts)! It all depends on the perspective from which we chose to view the calculation (are we **Earning** or **Paying**?)

Companies MUST consider the cost of financing they receive in the form of equity or debt if they are to manage their finances better; cheaper finance cost to the company means higher profitability and in most cases, superior cash flow. Generally, the cost of EQUITY has no tax effect but the cost of DEBT finance to companies are technically SUBSUDISED by tax since INTEREST (cost of Debt) can be claimed for tax purposes in so far as it is 'wholly, exclusively and necessarily' incurred for business purposes.

2 The Cost of Equity

Assumptions of the Dividend Valuation Model (DVM)

- Investors only buy shares to acquire a future dividend stream.
- All investors have homogeneous (i.e. identical) expectations of this future dividend stream.
- The stock market is extremely efficient at pricing securities.
- Present Value (PV) of dividend stream = current share price (current market price of share).

REMEMBER:

Our focus is the COST OF EQUITY (shares/securities) NOT DEBT (debentures)!

Example – Assuming CONSTANT dividend streams of income (Investors' perspective)

A plc has paid a dividend of 50p per share for many years. This is expected to continue for the foreseeable future. A plc's current share price is £2.50 **ex div.** You are required to calculate the cost of equity of X plc, K_e.

Solution:

Present value (PV) of dividend stream = current share price (see assumption 4 above please)

$$\frac{50p}{K_e} = 250p \quad \Rightarrow \quad K_e = \frac{50\,p}{250\,p} = 20\% \text{ per annum}$$

Note: **Current share price used is Ex. Div. (i.e. without the next dividend payment)**

Constant dividend divided by Cost of Equity equals Current share Price

Assuming INCREASING dividend streams of income (Investors' perspective)

To deal with an increasing perpetuity we need a formula.

PV of dividends = current share price

$$\frac{D_1}{K_e - g} = P_0 \quad \text{or} \quad K_e = \frac{D_1}{P_0} + g$$

Example

D plc has just paid a dividend of 30p per share. Shareholders expect dividends to grow at 5% pa. The current share price is £1.80 ex div.

D_1 = 30p x 1.05 = 31½ p

P_0 = 180 p

$K_e = \frac{D_1}{P_0} + g = \frac{31½}{180p} + 5 = 22½\%$

Note: If the market capitalisation is given in cum div terms it will need to be converted to the ex div equivalent for use in the formula.

The Gordon growth model

If a large proportion of earnings is retained and reinvested now rather than being paid out as dividend then the company will grow. Thus by forgoing dividends now the shareholders will receive higher dividends in future.

Estimating growth from the Gordon model

If given profit and loss and balance sheet information growth can be estimated as follows:

- First we calculate the retention or plough back rate from the profit and loss account. (If 100% profit is retained = 100% retention rate)

  $\text{Retention rate} = \frac{\text{retained profit}}{\text{profit after tax}} \times 100\%$

- Secondly we calculate the return on capital employed (ROCE) from the profit and loss account and balance sheet (as normally done in Ratio analysis or Interpretation of Accounts)

  $\text{ROCE} = \frac{\text{profit after tax}}{\text{opening net assets}} \times 100\%$

- Finally, multiply the two ratios together to estimate dividend growth.

  g = retention rate × ROCE

Limitations of this method

- The accounting ratios calculated are assumed to remain constant over time (which is illogical in reality)
- The model uses accounting data (which can be manipulated to suit management objectives)
- The model only works correctly if the company is all equity financed (assumes the company has no debt; this is not practical in most cases)

The historical pattern method to calculating Dividend Growth RATE

An alternative approach to calculating dividend growth is to examine past growth and assume that shareholders will expect this pattern to be repeated in future.

Example

G plc is about to pay a dividend of £50m in total. When G plc first obtained a stock market listing four (4) years ago, it paid a dividend of £30m in total. Over the last four years there have been no changes in the share capital of G plc. You are required to estimate the annual rate of dividend growth.

Solution

$£30m \times (1 + g)^4 = £50m$

$g = 13.62\%$ per annum

3 The Cost of Debt

Based on equivalent assumptions to those used in the DVM above, we conclude that:

- PV interest stream = Market Value (MV of debenture) Note: **(DEBT in this case!)**

The tax system gives tax relief on interest payments by allowing tax deductions from company's Profit & Loss account (thus REDUCING taxable profit). This has the effect of reducing the Cost of DEBT or what do you think?

Lower Tax means lower cost of finance as WITHOUT the tax relief, the company will pay HIGHER tax bills and the full cost of the loan BUT in this case, you pay the FULL interest BUT save on TAX, see it? Therefore the true cost to the company of servicing the debentures will be **after** the tax relief subsidy is taken into account.

Example – irredeemable debentures

M plc has some 8 per cent coupon irredeemable debentures in issue trading at 90 ex int. Corporation tax is 30 per cent with no lag in payment. Interest is paid annually.

Solution

PV of after–tax interest = current debenture price

$$\frac{£8(1-0.30)}{K_d} = 90$$

$$K_d = \frac{5.60}{90} = 6.2\% \text{ per annum}$$

Note: The calculation is made 'Ex. Int.' (meaning **Exclusive** of the next Interest to be received)

Redeemable debentures

A redeemable debenture will pay the holder interest for a number of years, then will be redeemed for a capital sum by the company (i.e. company will BUY BACK debt – Debentures). Here an IRR computation is appropriate.

Example

N plc has some 10 per cent coupon debentures in issue redeemable in five years at par. They are currently trading at 90 ex int. Interest is paid annually. Tax is at 30%.

Solution

The cost of debt would be the IRR of the following debt flows (as they affect the company) estimated by interpolation in the usual way:

Cash flow	£	
t_0	90.00	Benefit to company of retaining debentures
$t_1 – t_5$	(7.0)	Net of tax interest cost
t_5	(100.0)	Redemption cost

The cost of debt is sometimes known as the 'gross redemption yield' in exam questions.

4 The Weighted Average Cost of capital (WACC)

Calculating WACC

A three-step approach is taken to calculating the cost of the pool of **long-term funds** used to finance operations (the weighted average cost of capital or WACC).

Step 1 Isolate the company's sources of long–term funds. (SEPARATE Equity from Debt)

Step 2 Use appropriate models to calculate the cost of each source individually. (for Equity, DVM, Constant Dividend streams or Increasing Dividend streams; for Debt, adjust for tax etc – see 2 and 3 above to refresh these models)

Step 3 Calculate the weighted average cost of capital by weighting each source according to market value. NOTE – USE MARKET VALUES **NOT** BOOK VALUES

Example - WACC

S plc has the following summarised balance sheet at 31 December 20X3.

	£m
Ordinary shares of 50p nominal value	10
Reserves	20
10% irredeemable debentures	10
Net assets	40

The current **share** price is £1.20 **ex div** and a dividend of 15p per share has been paid for many years. The **debentures** are trading at 90 **cum int.** Interest is paid annually and the corporation tax rate is 30 per cent.

You are required to calculate the traditional weighted average cost of capital at 31 December 20X3.

Solution

Step 1 Isolate sources of long–term funds.

The only sources relevant to X plc are the ordinary shares and the irredeemable debentures.

Step 2 Calculate cost of each source

$K_e = \frac{15p}{120p}$ = 12½% per annum

$K_d = \frac{10(1-0.3)}{90-10}$ = 8.375% per annum

Step 3 Weight out according to market value.

Source	MV	£m	Cost	WACC
Equity	10m × 2 × £1.20 =	24	12.5%	9.375
Debt	10m × $\frac{£80}{£100}$ =	8	8.375%	2.094
		32		11.469

WACC = 11.47%

This represents the overall annual cost of servicing the pool of funds the company uses to finance its operations in the long run.

Limitations of WACC

If we use the existing WACC as the hurdle rate in NPV computations (benchmark), we are assuming that when new funds are raised to finance new projects, the cost of capital will be unchanged, i.e.:

- The proportion of debt and equity remain unchanged.
- The operating risk of the firm is unchanged.
- The finance is **not** project specific.

5 The theory of Capital structure

The question

Does the mix of debt and equity used by the company - i.e. its capital structure - make a difference to shareholder wealth? If it does, we need to know how to manipulate the capital structure for our shareholders' benefit. If it does not we can ignore it.

Modigliani and Miller (M&M) 1958

Suppose that two companies (A, B) are identical in all respects other than capital structure and consider their efficiency in generating spending power (corporate wealth). By 'identical' we mean that they have the same projects with the same risk and the same operating profits (£100,000). At this stage all taxes are ignored and a perfect capital market is assumed.

Perfect capital market assumptions

Typical features of a perfect market are as follows.

- Everybody in the marketplace has perfect information.
- There are no barriers to entry or exit such as transactions costs.
- Nobody can individually influence market prices — everybody is a price taker.
- There is a single interest rate for borrowing and lending (no spread).
- There are homogeneous products.
- There are no distorting corporate or personal taxes.

Company A, all equity, provides £100,000 cash to spend with a risk related to that of the underlying projects. Company B, geared, provides two cash flows (interest and dividends) totalling £100,000, also with a risk related to that of the underlying projects.

Rational investors would be indifferent between the two packages outlined. This tells us that logically the two companies must have the same value on the market as they ultimately have the same efficiency in spending power generating potential and risk.

Conclusions from the 1958 analysis

Value of equity of all equity financed company (V_u) = Value of equity plus value of debt in equivalent risk geared company (V_g)

It appears that different capital structures have no impact on the total value of a company then all capital structures appear to be optimal — we can ignore the issue of capital structure completely.

Modigliani and Miller 1963

However, a fact ignored in the original theory was that the corporation tax system gives tax relief on debt interest payments but not on dividend payments. Using the same example as above, but including corporation tax, Company B would now be able to pay out more to its investors than A due to the tax relief on debt interest. (Tax provides advantage to company B).

This would be realised by all investors on our perfect market who would be prepared to pay more for all the securities of the geared company than for the equity of the all equity company. (i.e. ALL equity companies loose out on Tax benefits provided by Gearing so investors will favour geared company to ALL equity companies). This sounds strange considering that in Financial analysis/Ratio Analysis, Gearing is BAD NEWS!

Thus we arrive at the very famous M&M 1963 equation:

$$V_g = V_u + DT_c$$

Value of geared company = Value of ungeared company + PV of tax shield (MV debt × tax rate)

Example

G plc has operating cash flows of £12m pa in perpetuity. Its Debt:Equity (D:E) ratio is 1:2, based on market values, and it pays corporation tax at 30%. An identical all equity company has a cost of capital of 15% pa.

Calculate the market values of G's debt and equity.

- The equivalent ungeared company would have a total MV of:

  $V_u = \frac{£12m \times 0.7}{0.15}$ = £56m

- Using M&M (V_G) = $V_u + DT_c = 56 + 0.3D$
- As D:E is 1:2, **D =** ⅓ total value of **G =** ⅓ **V_g**
- $V_G - 0.3 (\frac{1}{3} V_G) = 56$, giving V_G = £62.2m
- Thus D = £20.7m E = £41.5m

Conclusion on capital structure

We should now realise that every time debt is issued the shareholders benefit owing to the increased value of the tax shield generated by debt. Therefore logically we should always issue debt to finance expansion. The optimal capital structure is 99.9 per cent debt at the extreme (in M&M's 1963 world).

6 M&M and the cost of capital (WACC)

It can be proved algebraically that in an M&M 1963 world the weighted average cost of capital (WACC) and the cost of equity (K_{eg}) can be predicted from a given gearing level by the formula:

WACC = $K_{eu}\left[1 - \frac{Dt}{E+D}\right]$ This is given on the formula sheet in the exam.

$K_{eg} = K_{eu} + (K_{eu} - K_d)\frac{D}{E}(1 - t)$ This is not given in the formula sheet and must be learned.

The symbols used in these equations have the usual meanings., but note:

K_d = Cost of debt before tax

Example

The following information is relevant to X Plc.

K_{eu} =15% pa; K_d = 10% pa; t = 33%; D = £16.7m; E = £33.5m.

Calculate K_{eg} and WACC.

WACC = $K_{eu}\left[1 - \frac{Dt}{E+D}\right]$

= 15% x $\left[1 - \frac{£16.7m \times 0.33}{£50.2m}\right]$

= 15% x [1 – 0.11]

= 13.35% per annum

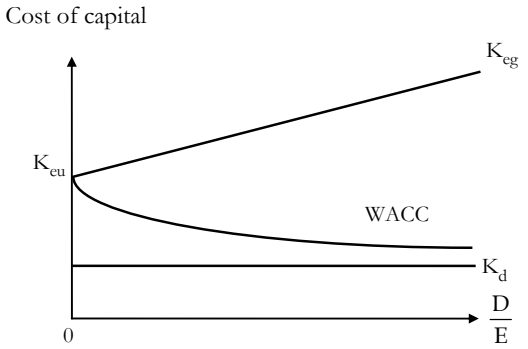
K_{eg} = $K_{eu} + (K_{eu} - K_d)\frac{D}{E}(1 — t)$

= 15% + (15% – 10%) x $\frac{£16.7m}{£33.5m}$ x 0.67 = 16.67% per annum

The WACC figure can be checked using the traditional WACC equation given on the formula sheet.

Gearing and risk

The cost of capital at varying levels of gearing (M&M 1963)



- As we increase the amount of debt in the capital structure the WACC falls and tends towards K_d at extreme gearing levels.
- As we gear up the cost of equity increases — **BUT** not at such a rate as to outweigh the tax subsidy on debt.
- This increase in the cost of equity is caused by the introduction of **financial risk** now imposed upon the shareholders by the introduction of **more and more debt,** which causes the shareholders to demand a **financial risk premium** to compensate them for the increased risks imposed on them.

Flaws in the 1963 hypothesis

- The assumption of a perfect market

  One assumption underlying a perfect capital market is that **investors** have perfect information. This does not hold in reality because investors are starved of information about a company's future. **Debenture holders** may call in the receiver if a company cannot pay the interest due, even if the company may be able to pay back such interest in the future.

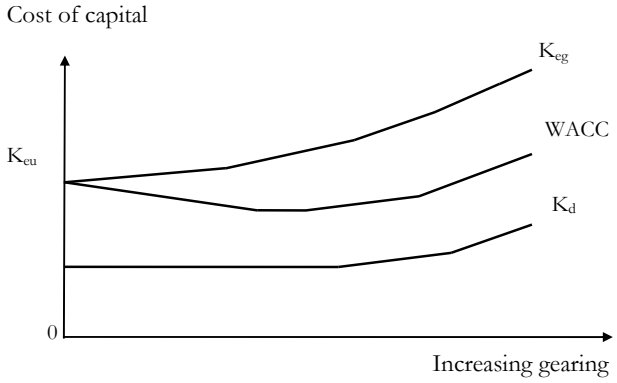
- The costs of bankruptcy

  The problem from a **shareholder's** point of view of such an 'incorrect' bankruptcy is that the assets will be sold off piecemeal and may realise substantially less than their economic values (present value of future cash flows they would generate).

If we reconcile back to the real world we can probably come up with a revised 1963 equation.

$$Vg = Vu + Dt - \text{Expected present value of bankruptcy associated with our geared company}$$

7 The traditional view of capital structure



- The cost of debt starts off low because of the tax shield and its low risk. Eventually the company runs out of assets to offer as security and has to issue 'junk bonds' which are high risk. **The cost of debt rises.**
- The cost of equity rises gradually as the company gears up. At high levels of gearing the shareholders also start to worry about imminent bankruptcy and the **cost of equity rises sharply.**
- Overall, the WACC falls in the early stages as the company gears up, because of the introduction of cheap, efficient debt. However as bankruptcy worry bites, driving up the cost of debt and equity sharply, the **WACC will also start to rise.**