6 Debt Valuation and the Cost of Capital

Introduction

Firms rarely finance capital projects by equity alone. They utilise long and short term funds from a variety of sources at a variety of costs. No one source is free. Moreover, as the following table reveals, some have an *explicit* cost but others only an *implicit* or *opportunity* cost. For example the marginal cost of earnings retained for new investment is measured by the current return foregone by shareholders, whereas debt is sourced at an explicit market rate of interest. Explicit or not, in order to establish the *overall* cost of capital as a project discount rate, management must first identify the current (marginal) cost of each type of capital employed (debt, as well as equity).The component costs must then combined to form the marginal, *weighted average cost of capital* (WACC).

Source of Finance	**Capital Cost**
Share Issues: Ordinary	Earning per share (EPS) or Dividends plus growth
Preference	Fixed Dividend
Loan Issues: Secured and Unsecured	Interest payable plus any premium payable on repayment.
Convertible	Present interest, plus future EPS (with normal conversion price typically above current market price)
Retained earnings	Shareholder return: EPS or Dividends plus growth
Depreciation	Opportunity cost
Short-term borrowings	Market rate of interest
Deferred taxation	Opportunity cost
Deferred payments to creditors	Opportunity cost, plus any loss of goodwill and administrative costs
Reduction in stocks	Opportunity cost, plus any loss of goodwill and loss of sales
Reduction in debtors	As above
Debt factoring	Above base rate
Sale of excess or idle assets	Alternative yield
Sale of property and lease back	Leasing cost plus, any capital appreciation
Research and Development	Opportunity cost
Unallocated Overheads	Opportunity cost

To understand the conceptual derivation of WACC (which we shall consider in Chapter Seven) let us analyse the value and cost of the most significant alternative to equity as an external source of finance, namely corporate borrowing in the form of debentures (or corporate bonds and loan stock to use American parlance).

6.1 Capital Gearing (Leverage): An Introduction

Corporate borrowing is attractive to management because interest rates on debt are typically lower than the cost of equity. Debt-holders accept lower returns than shareholders because their investment is less risky. Unlike dividends, interest is *guaranteed* and a *prior* claim on profits. As creditors, debt-holders are also paid before shareholders from the sale of assets in the event of liquidation. Interest payments on debt also qualify for corporate *tax relief*, which does not apply to dividends, thereby reducing their *real* cost to the firm.

> The introduction of borrowing into the corporate financial structure, termed capital *gearing* or *leverage*, can therefore lower the overall return (cut-off rate) that management need to earn on new investments relative to *all-equity* funding. Consequently, the expected NPV of geared projects should rise with a fall in their discount rates, producing a corresponding increase corporate wealth.

6.2 The Value of Debt Capital and Capital Cost

As marketable securities, the principles of loan valuation are similar to those for equity but less problematical. Stock is issued above, below or at *par* value depending on economic conditions. However, the annual cash return is known from the outset. It always equals a specific rate of interest relative to par value (termed the *coupon rate* or *nominal* yield). The stock's life might also be specified in advance with a guaranteed capital repayment (i.e. *redeemable* as opposed to *irredeemable* debt). Ignoring tax for the moment:

- The current price of any debenture (bond) is determined by a summation of future interest payments, plus the redemption price (if applicable) all discounted back to a present value.
- The annual cost of corporate debt or *yield* (to redemption if applicable) is the discount rate that equates current price to these expected future cash flows, namely their Internal *Rate of Return* (IRR).

In the case of *irredeemable* debentures, about to be issued or subsequently trading at par, the market price and IRR obviously equal the par value and *coupon rate* respectively. However, if *price differs from par value*, either at issue or when the debt is later traded, the *IRR no longer equals the coupon rate*. To see why, let us define the price of debt (P_0) at any point in time.

$$(1)\ P_0 = I / 1+K_d + I / (1+K_d)^2 + \ldots I / (1+K_d)_\infty$$

where: I = interest (the coupon rate expressed in money terms) received per annum in perpetuity

K_d = the company's annual cost of debt defined as an IRR percentage.

Since the annual interest payment is fixed in perpetuity, Equation (1) simplifies to the familiar valuation formula for a level annuity: interest divided by current market price:

(2) $P_0 = I / K_d$

If we rearrange terms, the cost of debt equals the investment's IRR defined as the annual money interest divided by current market price:

(3) $K_d = I / P_0$

And because interest (I) is constant year on year, it follows that if P_o rises (or falls) then K_d must fall (or rise) proportionately.

Turning to *redeemable* stock, the nominal return to debt-holders in the year of redemption will be uplifted by the redemption price payable. Thus, when debt is issued or whenever investors trade debentures, the current yield (K_d) is found by solving for the IRR in the following *finite* equation.

(4) $P_0 = [(I / 1 + K_d) + (I / 1 + K_d)^2 \ldots.+\ldots. (I + P_n / 1 + K_d)^n]$

rewritten as follows:

$$(5)\quad P_0 = \sum_{t=1}^{n} I / (1+K_d)^t + P_n / (1 + K_d)^n$$

where: n = the number of periods to redemption,

P_n = the redemption value at time period n.

Irrespective of whether debt is redeemable, irredeemable, currently traded or about to be issued:

- The cost of capital (K_d) always equals an internal rate of return (IRR).
- The IRR equates current price to the discounted future cash receipts that the loan stock produces.
- Only if the current price and redemption value (if any) equal the par value will the IRR equal the coupon rate (nominal yield).

If a debt issue has a coupon rate which is below the prevailing market rate of interest defined by its current IRR then by definition current market value (price) will be below par value and vice versa.

Activity 1

Use the previous equations to calculate current debt yields if a company issued:

- £100 irredeemable debentures with a 10 percent coupon rate
- £100 debentures with the same coupon rate, redeemable at par ten years hence

You may assume that in both cases, similar debentures currently trade below par at £90.00 (conventionally termed as £90 per cent).

What do these calculations mean to investors and corporate management?

Given current market conditions both £100 issues must be priced at £90 to ensure full subscription.

If *irredeemable* debentures are issued at £90 percent with a *money* coupon rate of £10 per annum, it follows from Equation (3) that the current yield or cost of debt:

K_d = £10 / £90 = 11.1%

If *redeemable* ten year debt was issued at the same price with the same coupon rate, we must derive the current yield by solving for IRR using Equation (5).

$$P_0 = \sum_{t=1}^{10} £10 / (1+K_d)^t + £100/ (1+K_d)^n = £90$$

Now the annual cost of debentures K_d is approximately 11.8%

For the investor, both debenture formulae perform the same functions as the equity models presented in Chapter Five. Even though interest is fixed and a redemption date may be specified, debentures can be traded at either a premium or a discount throughout their life. Thus, the current rate of interest, like an equity yield, is only a guide to the *true* return on life-time investment. In a world of uncertainty it can only be determined by incorporating the capital gain or loss *retrospectively* when the security is sold. In the case of redeemable debentures, held from issue through to redemption, this *ex-post return* calculation is termed the *yield to maturity* or *redemption yield*.

The current yield on debentures K_d therefore represents the return from holding the investment, rather than selling at its current market price. It is an implicit *opportunity cost of capital*, because it is the minimum return below which debenture holders could transfer their funds elsewhere for a market rate of interest of equivalent risk, (Fisher's Separation Theorem again).

For the company, a successful debenture issue must therefore match the risk-return profile (yield) of loan stock currently trading on the market. In an untaxed economy (more of which later) this rate of interest required by investors represents the company's *marginal* cost of capital for this fund source. As such, K_d is the relevant measure for assessing any new project financed by loan stock.

Returning to our previous Activity, if management wish to maximise corporate wealth using ENPV criteria then the 10 per cent coupon rate (nominal yield) is irrelevant. To be more precise, new projects should be financed by irredeemable debt at a "real" cost of 11.1 per cent discount rate, rather than redeemable debt with a cost of 11.8 per cent. Remember: the lower the discount rate, the higher the ENPV and *vice versa*. So at one extreme, a project discounted at the coupon rate might be accepted, whilst at the other, the redeemable rate signals rejection. Either way, corporate wealth is compromised; with a worst case scenario where the cash flows for a project's accepted using the coupon rate as a discount rate will not service debt, forcing the firm into liquidation.

To conclude, projects financed by debt (just like equity) should always be evaluated using a *marginal* cost of capital and not the *nominal* yield Only if the incremental return equals the current yield will the marginal cost of raising additional finance equal the current cost of capital in issue and attract investors.

6.3 The Tax-Deductibility of Debt

Whilst tax regimes differ throughout the world, one policy many governments have in common that we need to consider is the treatment of debenture interest as an allowable deduction against a firm's tax liability. Not only does this lower the "true" cost of corporate borrowing but also widens the gap between yields on debt and equity explained earlier.

> Providing management can generate sufficient taxable profits to claim the tax relief on debt interest, the higher the rate of corporation tax, the greater the fiscal benefit conferred on the company through issuing debt, rather than equity to finance its investments.

In the preceding valuation models K_d represents the *gross* return received by investors *before* satisfying their *personal* tax liability. What is important to the company, however, is the project discount rate defined by this gross return *after corporation tax*.

To prove the point, let us first consider *irredeemable* debt (i.e. with no redemption value) with a level interest stream in perpetuity. The valuation model *incorporating* tax is given by:

$$(6)\ P_0 = I(1\text{-}t) / K_{dt}$$

where: P_0 = the current martet price of debt,
I = annual interest payments
t = rate of corporation tax
K_{dt} = post-tax cost of debt

So, if we rearrange terms, the "real" cost of debt to the company after tax is

(7) $K_{dt} = I(1-t) / P_0$

And because the investors' *gross* return (Kd) equals the company's cost of debt before tax, it follows that with a tax rate (t) we can also rewrite Equation (7) as follows;

(8) $K_{dt} = K_d (1-t)$

In a world of corporate taxation, the capital budgeting implications for management are clear.

(9) $K_{dt} < K_d$

To maximise corporate wealth, the post-tax cost of debt should be incorporated into any overall discount rate as a cut-off rate for investment.

Equation (6) onwards might seem strange, since P_0 is still the market value of the debentures held by investors represented by the future cash flows which they expect to receive. But it is important to remember that we are now modelling income-value relationships from the *company's* perspective.

The interest cash flows capitalised on the right-hand side of Equation (6) are therefore *net* of corporation tax, which do not concern investors directly. So, if a company pays £100,000 a year interest on irredeemable debentures with a market price of £1 million and the rate of corporation tax is 25 percent, its effective cost of debt defined by Equation (7):

$$K_{dt} = [£100,000 (1-0.25)] / £1 \text{ million} = 7.5\%$$

Turning to *redeemable* debt, the company still receives tax relief on interest but often the redemption payment is not allowable for tax. To calculate the post-tax cost of capital it is necessary to derive an IRR that incorporates tax relief on interest alone by solving for K_{dt} in the following *finite* equation:

$$(10) \quad P_0 = \sum_{t=1}^{n} I (1-t) / (1+K_{dt})^t + (P_n / 1 + K_{dt})^n$$

Consider five-year debt with a 15 percent coupon rate, redeemable at £100 par, issued at £90 percent. If the annual rate of corporation tax is 33 percent, we can determine the post-tax cost of debt by solving for K_{dt} in the following equation.

$$P_0 = £90 = \sum_{t=1}^{n=5} £15\,(1-0.33) / (1+K_{dt})^t + (£110 / 1 + K_{dt})^n$$

$K_{dt} = 13\%$

Activity 2

A company's irredeemable debt has a coupon rate of 8 percent and a market value of £76 percent. Corporation tax is 30 percent and the firm's has sufficient tax liability to set off against its interest.

Calculate the investor's gross return and the company's effective cost of debt.

Comment on the disparity between the two and the capital budgeting implications for management.

Investors receive the following gross return before personal taxation:

$$K_d = £8 / £76 = 10.53\%$$

The post-tax cost to the company for providing this return is;

$$K_{dt} = £8(1-0.30) / £76 = 7.36\%$$

Loan interest reduces the corporate tax bill. For every £8 distributed to investors as interest, the company effectively pays:

$$I(1-t) = £8\,(1-0.30) = £5.60$$

The £2.40 difference represents tax relief contributed by the tax authorities.

Turning to capital budgeting, if management finance new investment by issuing debt, this must reflect current post-tax yields of equivalent risk. Each £100 block will be priced at £76. The post-tax cost of debt capital (K_{dt} =7.36%) represents the discount rate that equates the amount raised to the PV of future cash flow required to service this new issue (interest less tax relief).

The tax adjusted cost of debt (K_{dt}) is the IRR that represents the true corporate cost of new debt issues. If the ENPV of a prospective debt-financed project discounted at this IRR is positive, then its return will exceed the cost of servicing that debt and management should accept it.

6.4 The Impact of Issue Costs

The introduction of a tax bias into our analysis of the cost of debt is our first example of a *barrier to trade* that runs counter to the *Fisherian* world of perfect competition outlined in Chapter One. But in the real world there are others, one of which we must now consider, namely *issue costs*.

In Chapter Five we hypothesised that dividends and earnings are *perfect economic substitutes*. At the beginning of this chapter we also stated that the cost of retained earnings is best measured by an opportunity cost, namely the shareholders' return foregone. But even if we ignore the dividend-earnings debate, how do we measure this?

In imperfect markets, a fundamental difference between a new issue of ordinary shares (like any other financial security) and retained earnings are the *issue costs* associated with the former. As a consequence, the marginal cost of equity issues is more expensive than retentions, which explains why management hold back earnings for reinvestment

To prove the point, using previous notation and our knowledge of equity valuation for a constant dividend stream (D) in perpetuity, let us introduce issue costs (C) into the *constant dividend valuation model.*

The *marginal* cost of an ordinary share P_o issued by a company is now given by:

(11) $K_e = D / P_o (1 – C)$

By definition, this is higher than the cost of retained earnings, since the latter do not incur issue costs. The cost of retained earnings is simply equivalent to the current dividend yield forgone by *existing* shareholders, namely their opportunity cost of capital:

(12) $K_e = D / P_o$

Note that also, that if we substituted earnings (E) for dividends (E) into both of the previous equations; management's preference for retentions, rather than dividend distributions, would still prevail in the presence of transaction costs.

Returning to the cost of loan stock, issue costs also increase the marginal cost of capital. This is best understood if we first substitute issue costs (C) into the cost of *irredeemable* debt in a *taxless* world. Like the equity model, the denominator of Equation (3) is reduced by issue costs.

(13) $K_d = I / P_0 (1-C)$

If we now assume that debt interest is tax deductible, the post-tax cost of debt originally given by Equation (7) also rises.

(14) $K_{dt} = I (1-t) / P_0(1-C)$

Review Activity

In preparation for Chapter Seven and the data required to derive a weighted average cost of capital (WACC) as a cut-off rate for investment, use the information below to calculate:

- The *total* market value of the company's equity plus debt,
- The *marginal* cost of each fund source.
- 5 million ordinary £1 shares currently quoted at £1.20, £6 million in retained earnings, 4 million preference shares currently quoted at 60 pence and £2 million debentures trading below par at £80,
- Ordinary and preference shares currently yielding 20 per cent and 10 per cent, respectively,
- Ordinary dividend growth of 5 per cent per annum,
- New issues costs of 20 pence per share for ordinary and preference shares,
- A 10 per cent pre-tax debt yield.
- A 20 per cent rate of corporation tax

Total market value is the summation of ordinary shares, retained earnings, preference shares and debentures. With the exception of retained earnings derived from *historical* cost based accounts, all capital issues are valued at their *market* price as follows:

(5m × £1.20) + £6m + (4m × £0.60) + (£2m × 0.80) = £16m

Marginal Component Costs are based on *market* values, not *book* (nominal or par) values because management require today's yields to vet new projects. Component costs should therefore be underpinned by current returns for each category of investor who may finance projects. However, the company's ultimate concern, (rather than investors) is its own *break-even* income stream that may differ from the multiplicity of views held by proprietors and creditors. Consequently, the firm's component costs not only incorporate any tax effects, but also the costs of capital issues as follows:

Issue of ordinary shares = Dividend / Net proceeds of issue, plus the growth rate

= [(£0.24 / £1.00] + 5% = 29%

Retained earnings = Dividend yield, plus the growth rate

= 20% + 5% = 25%

Preference share issue = Dividend / Net proceeds of issue

= £0.06 / £0.40 = 15%

Debentures (after tax) = (interest /net proceeds of issue) multiplied by (1-tax rate)

= (£10.00 / £80.00) × (1- 0.20) = 10%

6.5 Summary and Conclusions

In Chapter One our study of strategic financial management began with a hypothetical explanation of a company's overall cost of capital as an investment criterion designed to maximise shareholder wealth. By Chapter Five we demonstrated that an *all equity* company should accept capital projects using the marginal cost of equity as a discount rate, because the market value of ordinary shares will increase by the project's NPV.

In this chapter we considered the implications for a project discount rate if funds were obtained from a variety of sources other than the equity market, each of which requires a rate of return that may be unique.

For the purpose of exposition, we analysed the most significant alternative to ordinary shares as an external source of funding, namely redeemable and irredeemable loan stock. We observed that corporate borrowing is attractive to management because interest rates on debt are typically lower than equity yields. The impact of corporate tax relief on debenture interest widens the gap further, although the tax-deductibility of debt is partially offset by the costs of issuing new capital, which are common to all financial securities.

In this newly *leveraged* situation, the company's overall cost of capital (rather than its cost of equity) measured by a *weighted average cost of capital* (WACC) would seem to be a more appropriate investment criterion. So, given the solution to your latest Review Activity, let us formally analyse how management can combine the component capital costs from various fund sources to derive a WACC as a discount rate for project appraisal.