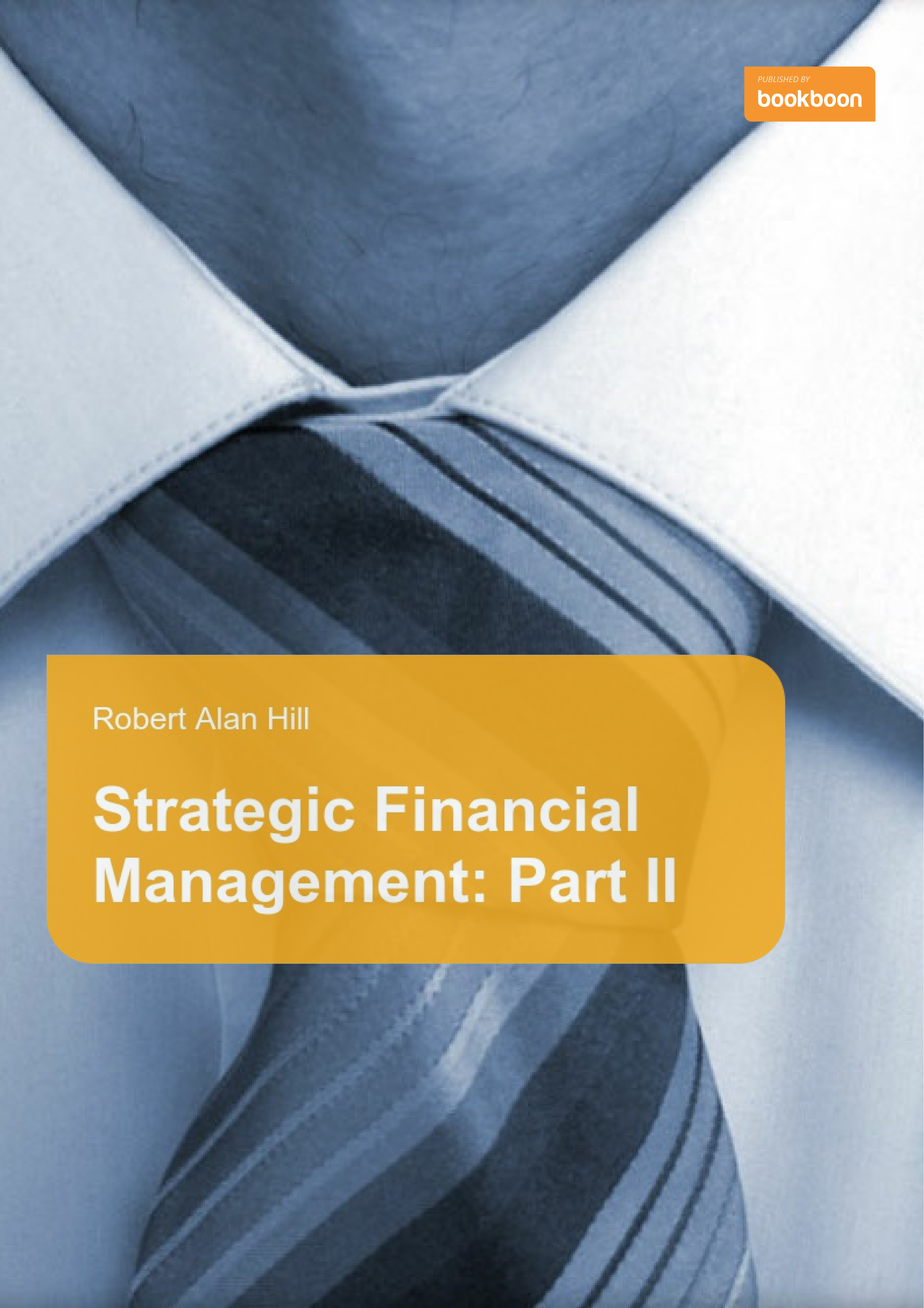

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Strategic Financial Management: Part II

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Finance & Wealth Decisions

Strategic Financial Management: Part II: Finance & Wealth Decisions
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With an eclectic record of University teaching, research, publication, consultancy and curricula development, underpinned by running a successful business, Alan has been a member of national academic validation bodies and held senior external examinerships and lectureships at both undergraduate and postgraduate level in the UK and abroad.

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Part One:
The Finance Decision

1 Equity Valuation and the Cost of Capital

Introduction

Chapter Two, Three and Four (Strategic Financial Management: Part I) provided a detailed explanation of the *investment decision* with only oblique reference to the *finance decision*, which determines a company's cost of capital (discount rate) designed to maximise shareholder wealth. But if wealth is to be maximised, management must determine what return their shareholders require from an investment and then only accept projects that have a positive NPV when discounted at that rate.

There is also the question as to what cut-off rate should apply to investment proposals if corporate finance were obtained from a *variety* of sources, other than ordinary shares? Each stakeholder requires a rate of return that may differ from the equity market and may be unique. In this newly *leveraged* situation, the company's *overall* cost of capital (rather than its cost of equity) measured by its *weighted*, *average cost of capital* (WACC) would seem to be the appropriate investment acceptance criterion.

> Given the normative assumption of financial management, the purpose of Strategic Financial Management – Part 2 is straightforward. How does a firm *maximise* corporate wealth by securing funds at *minimum* cost that not only provides *shareholders* with their desired rate of return, once investment takes place, but also satisfies the expectations of all *capital providers*?

To set the scene, Chapter One provides an explanation of the most significant *explicit, opportunity cost* of external funding available to management. The cost of ordinary shares measured by their rate of return, often termed the *equity capitalisation rate* or *yield.*

1.1 The Capitalisation Concept

In Chapter Two (Strategic Financial Management – Part 1) we defined an investment's present value (PV) as its relevant periodic cash flows (Ct) discounted at a constant cost of capital (r) over time (n). Expressed algebraically:

$$(1) \qquad PV_n = \sum_{t=1}^{n} C_t / (1+r)^t$$

The equation has a convenient property. If the investment's annual cash receipts are also *constant and tend to infinity*, ($C_t = C_1 = C_2 = C_3 = C_\infty$) their PV simplifies to the formula for the *capitalisation of a constant perpetual annuity*:

$$(2) \qquad PV_\infty = C_t / r$$

The term r is called the *capitalisation* rate because the transformation of a cash flow series to value (i.e. capital) is termed "capitalisation". With data on PV_∞ and r, or PV_∞ and C_t, we can also determine values for Ct or r respectively. Rearranging Equation (2) with one unknown:

(3) $C_t = PV_\infty . r$

(4) $r = PV_\infty / C_t$

These PV equations are vital to your understanding of various share valuation models, which define the possible cost of equity as a managerial cut-off rate for investment. So, let us define the models beginning with dividend valuation.

1.2 *Single*-Period Dividend Valuation

Assume you hold a share for *one year*, at the end of which a dividend is paid. You then sell the share *ex-div*, which means the new investor does not receive the dividend (you do) as opposed to *cum-div*, where the dividend is incorporated into price. Your current *ex-div* price, (P_0) is defined by the expected year-end dividend (D_1) *plus* the expected year-end share price (P_1) discounted at the appropriate rate of return for shares in that risk class, the cost of equity (K_e). Thus, we have the *single-period dividend valuation model*:

(5) $P_0 = (D_1 + P_1) / 1 + K_e = [(D_1 / 1 + K_e) + (P_1 / 1 + K_e)]$

Sequentially, if the new investor holds the share for a further year, then their *ex-div* price on acquisition (i.e. dated when you sold it) is also given by the single- period model.

(6) $P_1 = [(D_2 / 1 + K_e) + (P_2 / 1 + K_e)]$

Note however that if you held the share for two years, its current *ex-div* price would be the discounted sum of two dividends and the *ex-div* price at the end of year two, as follows:

(7) $P_0 = [(D_1 / 1 + K_e) + (D_2 / 1 + K_e)^2 + (P_2 / 1 + K_e)^2]$

1.3 *Finite* Dividend Valuation

Assuming the cost of equity K_e is constant; the current *ex-div* price of a share held for any *finite* number of years (n) and then sold equals:

(8) $P_0 = [(D_1 / 1 + K_e) + (D_2 / 1 + K_e)^2 + \ldots.. + (D_n / 1 + K_e)^n] + (P_n / 1 + K_e)^n$

Rewritten, this defines the *finite-period, dividend valuation model:*

$$(9) \qquad P_0 = \sum_{t=1}^{n} D_t / (1+K_e)^t + P_n / (1 + K_e)^n$$

where P_n equals the *ex-div* value at time period n, determined by the discounted sum of subsequent dividends.

$$(10)\ P_n = [\{D_{n+1}/(1+K_e)^{n+1}\} + \{D_{n+2}/(1+K_e)^{n+2}\} + \ldots.]$$

Activity 1

A potential shareholder anticipates a dividend per share of 10 pence and 11 pence in years one and two respectively, whereupon the shares are expected to be sold ex div for £3.00 each. If the equity capitalisation rate is 20 percent per annum, confirm that the maximum current *ex-div* price at which the shares should be purchased is £2.24.

1.4 General Dividend Valuation

If distributions tend to infinity, then by definition the final term of Equation (9) disappears altogether because the share is never sold. This is the *general dividend valuation model*:

$$(11) \qquad P_0 = \sum_{t=1}^{\infty} D_t / (1+K_e)^t$$

1.5 Constant Dividend Valuation

Finally, if we assume that dividends are *constant* in perpetuity ($D_t = D_1 = D_2 = D_3 \ldots = D_\infty$) and K_e is constant then the *general* model simplifies to the *constant dividend valuation model.*

$$(12)\ P_0 = D_1 / K_e$$

1.6 The Dividend Yield and Corporate Cost of Equity

We stated earlier that an appreciation of equity valuation models is a pre-requisite for understanding why shareholder returns provide the management of an *all-equity* firm with its cut-off rate for investment. To prove the point, let us rearrange the terms of Equation (12).

$$(13) \qquad K_e = D_1 / P_0$$

We have now defined the *dividend yield* published daily by the financial press throughout the world from stock exchange listings. Whilst the yield is based on an *abstract* constant dividend model, its use by investors as a corporate performance indicator is rational.

In an uncertain world where future dividend or price movements are unknown, it is reasonable to assume that without information to the contrary, future returns should at least equal today's ratio of a company's latest dividend to current share price. As a percentage, this dividend yield also enables investors to compare a company's performance over time, with its competitors, or the market, to establish whether its shares are over or under valued.

> A "golden" investment rule is *the higher the risk, the higher the return and lower the price*. For example, a firm declares a 20 pence dividend on shares currently trading at £2.00. The yield is 10 per cent. But shareholders interpret the dividend as "bad" news and after panic selling, price falls to £1.00. So, the yield doubles, not because of improved performance but increased risk. Investors are now paying *less* for the *same* dividend.

Management ignore dividend yields at their peril

Because dissatisfied shareholders can always seek investment opportunities elsewhere, the percentage dividend for every £100 they invest in a company should represent a managerial *benchmark* for accepting new projects of equivalent risk. The yield also represents a *minimum* project return if management retain profits for reinvestment, rather than pay a dividend. Recalling Fisher's Separation Theorem and Agency Theory from Chapter One (Strategic Financial Management – Part 1), firms that cannot *maintain* yields should distribute profits for shareholders to reinvest on the capital market. To summarise:

> The *current* dividend yield is an *opportunity* cost of capital which equals the *minimum* cut-off (discount) rate for new investment in an all-equity firm.

1.7 Dividend Growth and the Cost of Equity

For a company, the shareholder concept of *maintainable yield* based on the *constant dividend* model provides a convenient discount rate. Unfortunately, it is too simplistic. Assuming $D_1 = D_2 = D_3$ and so on, implies either a 100 percent dividend pay-out ratio or zero-growth, both of which are rarely observed in the real world. Most firms retain a proportion of earnings for profitable reinvestment to enhance shareholder wealth through dividend growth and capital gains. So, how does this affect the yield as a cut-off rate for investment?

Beginning with a valuation model let us assume that through retention financed investment dividends now grow at *a constant annual compound rate (g) in perpetuity*. Leaving aside the detailed mathematics (that you can download elsewhere) M.J. Gordon (1958) proved that the current *ex-div* price becomes:

(14) $P_0 = D_1 / K_e - g$ (subject to the non-negativity constraint that $K_e > g$)

> The Gordon *constant growth dividend model* defines the current *ex-div* share price by capitalising next year's dividend at the amount by which the desired equity return *exceeds* the constant rate of growth in dividend.

For example, if we assume that the next dividend per share is 20 pence, the shareholders' rate of return is 10 percent per annum and the annual growth rate is five percent

$$P_0 = D_1 / K_e - g = £0.20 / (0.10 - 0.05) = £4.00$$

> **Activity 2**
>
> Take growth out of the previous equation or use Equation (12) for the constant dividend model to confirm that P0 is only £2.00. What does this reveal?

The two equations illustrate an important consideration for rational investors when buying shares, namely how growth potential can uplift equity value.

Rearrange the terms of Equation (14) and we can also isolate the impact of constant growth on the shareholders overall return.

(15) $K_e = (D_1 / P_0) + g$

So now, the cost of equity as a managerial discount rate equals a dividend expectation divided by current share price, *plus a premium for growth*. Using our previous example:

$$K_e = (£0.20 /£4.00) + 0.05 = 5\% + 5\% = 10\%$$

1.8 Capital Growth and the Cost of Equity

Because dividend growth increases price, we can reformulate Equations (14) and (15) by focussing on the *capital gain* impact on equity value and the corporate cut-off rate rate.

If share price grows at a constant annual rate $G = (P_1 - P_0) / P_0$ then next year's price:

(16) $P_1 = P_0 (1 + G)$

From Equation (14) we also know that the current price based on dividend growth (g):

(14) $P_0 = D_1 / K_e -g$

So, logically share price one year from now must equal:

(17) $P_1 = D_2 / K_e -g = D_1 (1+g) / K_e -g$

Because the same share cannot sell at different prices, it follows from Equation (16) that the dividend growth rate (g) must equal (G) the annual growth in share price (capital gain). Equations (16) and (17) can therefore be redefined as follows:

(18) $P_1 = P_0 (1+g)$

A comparison of Equations (16) and (18) reveals that if share price grows at a rate G, this must equal g, the annual growth in dividends. If we substitute G for g into Equation (14), this produces a *dividend-capital gain model* equivalent to the Gordon growth model.

(19) $P_0 = D_1 / K_e -G$

The current *ex div* share price is determined by capitalising next year's dividend at the amount by which the desired rate of return on equity exceeds the percentage *capital gain*.

Activity 3

If a company's forecast dividend is 20 pence per share, price is expected to grow at five percent per annum, and the equity capitalisation rate is 10 per cent:

P0 = D1 / Ke -G = £0.20 / (0.10 - 0.05) = £4.00

Use the Gordon growth model to confirm that the current ex-div price still equals £4.00

Turning now to an equity capitalisation rate, which incorporates capital gains as a managerial

investment criterion, we can substitute G for g into Equation (14) and rearrange terms so that:

(20) $K_e = (D_1 / P_0) + G$ [from $P_0 = D_1 / K_e - g$ and $K_e = (D_1 / P_0) + g$]

This equation states that the *total* cost of equity comprises a *dividend yield* one year hence (D_1/P_0), plus a *capital gain yield* [$G = (P_1 - P_0) / P_0$] equivalent to the growth in dividends (g).

Activity 4

If a company currently trading at £4.00 per share with a forecast 20 pence dividend is expected to grow at five percent per annum, confirm that the equity capitalisation rate is 10 per cent using the appropriate *dividend and capital gain* models.

1.9 Growth Estimates and the Cut-Off Rate

So far so good, but if management wish to finance future projects by retaining profits in their quest for shareholder wealth, how do they calculate the growth rate?

Obviously, dividend and capital gains are rarely constant, which gives rise to complex valuation models that are beyond the scope of this text. But even if they are uniform, management still need annual growth estimators. Since the future is so uncertain, a simple solution favoured by management is to assume that the past and future are *interdependent*. Without information to the contrary, Gordon (*op cit*) believed that a company's anticipated growth should be determined from its financial history. Consider the following data:

Year	Dividend per Share (pence)
2005	20
2006	22
2007	24.2
2008	26.62
2009	29.28

Using the formula $(D_t\text{-}D_{t-1})/D_{t-1}$ we can determine annual dividend growth rates

Year	Annual Growth Rate	
2005–6	(22/20) -1	= 0.1
2006–7	(24.2/22) -1	= 0.1
2007–8	(26.62/24.2) -1	= 0.1
2008–9	(29.28/26.62)-1	= 0.1
Total		0.4

The *average* periodic growth rate, as an estimator of g, is therefore given by:

$g = 0.4 / 4 = 10\%$

Alternatively, we can calculate dividend growth by solving for g in the following equation and rearranging terms.

20 pence $(1+g)^4 = 29.28$ pence.

$:(1 + g) = \sqrt[4]{(29.28/20.00)}$

$g \quad = 1.10 - 1.00 = 0.10 = 10\%$

Activity 5

Using the previous data and the appropriate equations, confirm that the forecast dividend for 2010 should be 32.21 pence. If shares are currently priced at £2.68 and dividends are expected to grow at ten percent per annum beyond 2010, confirm that the equity capitalisation rate (managerial cut-off rate for new investment) is 22 per cent.

1.10 Earnings Valuation and the Cut-Off Rate

Whether or not growth is incorporated into the model, there is still no consensus as to whether dividends alone determine a share's value and hence the firm's cut-off rate for investment.

As long ago as 1961, the Nobel economic prize winners, Franco Modigliani and Merton Miller (MM) argued that given the problems of estimating retention-financed dividend growth, why not assume that dividends and retentions are *perfect economic substitutes*? Because if so; a company's share price and capitalisation rate can be determined by its *overall earnings*, rather than dividend policy. Since the future is uncertain, they also recommended a *one period model.*

According to MM, the current *ex div* share price (P_0) equals the anticipated earnings per share (E_1) plus the *ex div* price (P_1) at the end of the year, discounted at the shareholders' rate of return (K_e).Algebraically, their *single-period earnings model* is:

(21) $P_0 = (E_1 + P_1) / 1 + K_e = [(E_1 / 1 + K_e) + (P_1 / 1 + K_e)]$

Of course, earnings (like dividend) proponents confident with their forecasts need not restrict themselves to one period, or zero-growth. Assuming the cost of equity K_e is constant, the current *ex-div* price of a share held for any *finite* number of years (n) and then sold ex-div for P_n equals the *finite-period earnings model*

(22) $$P_0 = \sum_{t=1}^{n} E_t / (1+K_e)^t + P_n / (1 + K_e)^n$$

If n tends to infinity, then the *general earnings valuation model* is given by

(23) $$P_0 = \sum_{t=1}^{n} E_t / (1+K_e)^t$$

If annual earnings E_t are constant in perpetuity, Equation (23) simplifies to the *constant earnings valuation model*:

(24) $$P_0 = E_1 / K_e$$

We can also incorporate growth into the previous equation to derive a *constant earnings growth model* analogous to the *Gordon dividend model* such that:

(25) $P_0 = E_1 / K_e$ -g (again subject to the non-negativity constraint that $K_e > g$)

Review Activity

The only apparent difference between Equations (21) to (25) and our earlier dividend valuation models is the substitution of an earnings term (E) for dividends (D) in a *parallel* series of equations. However, because the *same share cannot trade at two prices*, the reformulation of corresponding P_0 equations to derive the cost of equity (K_e) may have important consequences for the managerial cut-off rate. Can you explain why?

If a company adopts a *full* distribution policy, where dividend per share *equals* earnings per share, then substituting E_t for D_t into either valuation models has no effect on the cost of equity (K_e).For example, reformulating the *constant valuation model* that solves for P_0:

If $D_t = E_t$ then $P_0 = D_t / K_e = P_0 = E_t / K_e$ and $K_e = D_t / P_0 = K_e = E_t / P_0$

But what if a company adopts a *partial* distribution policy (where $D_t < E_t$,).

Because the *same* share cannot trade at two prices, the equity return (K_e) must *differ* in the corresponding dividend and earnings equations if P_0 is to remain the same. Mathematically:

If $D_t < E_t$ but $P_0 = D_t / K_e = P_0 = E_t / K_e$ then $K_e = D_t / P_0 < E_t / P_0$

Moreover, if P_0 is identical throughout both series of dividend and earnings value equations, outlined earlier, then not only must the equity yield for dividends and earnings (K_e) differ, but a *unique* relationship must also exist between the two.

For example, if a *dividend yield* equals 10 percent per annum in response to a dividend of £1.00, the current share price should be

$P_0 = D_t / K_e = £1.00 / 0.1 = £10.00$

But if we now assume the *dividend-payout* ratio is 50 per cent and substitute the annual earnings per share of £2.00 into the previous equation, then subject to the *law of one price* (where P_0 still equals £10.00) we produce the following equation with *one unknown*.

$P_0 = E_t / K_e = £2.00 / K_e = £10.00$

Rearranging terms, we can therefore define the *earnings yield* as an alternative to dividends as a managerial cut-off (discount) rate for new investment.

(26) $K_e = E_t / P_0$

And solving for the earnings yield, we observe a difference to the dividend yield

$$K_e = E_t / P_0 = £2.00 / £10.00 = 20\% \quad > \quad Ke = D_t / K_e = £1.00 / £10.00 = 10\%$$

Not only do the two yields differ but note they exhibit an *inverse* relationship defined by the dividend payout (earnings retention) ratio. Because the same share cannot sell at different prices and the dividend per share is *half* the earnings per share, then the earnings yield must be *twice* the dividend yield.

1.11 Summary and Conclusions

We began our study of strategic financial management way back in Chapter One (Strategic Financial Management - Part I) with an explanation of how companies employ their overall cost of capital as an investment criterion designed to maximise shareholder wealth. You will recall that under conditions of reasonably perfect markets, certainty and equilibrium, the correct cost is defined as the minimum return required by investors from an alternative investment of equivalent risk (The Separation Theorem of Fisher).So, if an *all equity* company undertakes a capital project using the marginal cost of equity as its discount rate, the total market value of ordinary shares should increase by the project's NPV.

In this Chapter we therefore addressed the crucial issue of equity valuation and the derivation of its associated capital cost as a discount rate, from both a dividend and earnings perspective under growth and non-growth conditions. We concluded that an equity capitalisation rate based on earnings, rather than dividends, should be management's preferred cut-off rate for new investment. But what if fund sources other than share capital are available to management. How do these affect project discount rates in our newly leveraged firm?

1.12 Selected References

1. Fisher, I., *The Theory of Interest*, Macmillan (New York), 1930.
2. Gordon, M.J., *The Investment, Financing and Valuation of a Corporation,* Irwin, 1962.
3. Miller, M.H. and Modigliani, F., "Dividend policy, growth and the valuation of shares", *The Journal of Business of the University of Chicago*, Vol. XXXIV, No. 4 October 1961.

2 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 Preference	Earning per share (EPS) or Dividends plus growth Fixed Dividend
Loan Issues:	Secured and Unsecured Convertible	Interest payable plus any premium payable on repayment. 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 Three) 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).

2.1 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.

2.2 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) $$P_0 = I / 1+K_d + I / (1+K_d)^2 + ... I / (1+K_d)^\infty$$

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) $P_0 \quad = I / K_d$

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:

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

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 One. 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.

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

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

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

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):

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

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

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.

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

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;

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

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

$$I(1\text{-}t) = £8\ (1\text{-}0.30) = £5.60$$

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.

2.4 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 (Strategic Financial Management – Part 1). But in the real world there are others, one of which we must now consider, namely *issue costs*.

In Chapter One of this text 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) $K_d = I / P_0 (1\text{-}C)$

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

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

Review Activity

In preparation for Chapter Three 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:

$$(5\text{m} \times £1.20) + £6\text{m} + (4\text{m} \times £0.60) + (£2\text{m} \times 0.80) = £16\text{m}$$

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%

2.5 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 One 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.

3 Capital Gearing and the Cost of Capital

Introduction

If an *all-equity* company undertakes a capital project using the *marginal* cost of equity as its discount rate, the total market value of ordinary shares should increase by the project's NPV. However, most firms use a *mix* of ownership capital and borrowed funds from financial institutions for new investments. The relationship between the two is termed *capital gearing* or *leverage*. A company is highly geared (levered) when it has a significant proportion of borrowing relative to shares in its capital structure. It is lowly geared when the ratio of debt to equity is small.

In Chapter Two we observed that corporate borrowing is attractive to management because interest rates on debt are typically lower than equity and often qualify for tax relief As a consequence, a judicious amount of debt introduced into a firm's capital structure should lower the overall or *weighted average cost of capital* (WACC) employed as a cut-off rate for the appraisal of new projects, thereby increasing their expected NPV and corporate value.

You will also recall from Chapter Two that a company's component capital costs are derived by identifying the *opportunity cost* of each fund source using valuation models that determine debt and equity yields under various guises. Thus, our current analysis answers a logical series of questions, given the normative assumption of financial management, namely maximum profit at minimum cost.

How do individual capital costs combine to define WACC for use in investment appraisal?

How valid are the theoretical assumptions that underpin WACC computations?

What are the real-world problems associated with WACC estimations?

3.1 The Weighted Average Cost of Capital (WACC)

Let us begin our analysis by first defining an overall cost of capital in *taxless* world where management has access to only two sources of finance: equity and debt.

A general formula for WACC is given by the formula for a *simple weighted average*:

(1) $K = K_e (V_E / V_E + V_D) + K_d (V_D / V_E + V_D)$
where: K = WACC,
K_e = cost of equity
K_d = cost of debt
V_E = market value of equity
V_D = market value of debt

If we now introduce corporate taxation (at a rate t) the after tax cost of debt K_{dt} should be substituted into the preceding equation using the appropriate debt formulae from Chapter Two as follows.

(2) $K = K_e (V_E / V_E + V_D) + K_{d\,t} (V_D / V_E + V_D)$

This is equivalent to:

(3) $K = K_e (V_E / V_E + V_D) + K_d (1\text{-}t) [(V_D / V_E + V_D)]$

Equations (2) and (3) may be rewritten using simpler notation. For example, with tax:

(4) $K = K_e (W_E) + K_{dt} (W_D)$
where: W_E = the weighting applied to equity $(V_E / V_E + V_D)$
W_D = the weighting applied to debt $(V_D / V_E + V_D)$

Thus, a firm financed equally by equity and debt yielding 10 percent and 5 percent, respectively, would calculate its WACC using Equation (4)as follows:

K = 10% (0.5) + 5% (0.5) = 7.5%

Activity 1

Given the following company data:

K_e = 12%, K_d = 8%, V_E = £6 million, V_D = 4 million

Calculate WACC and jot down your thoughts on any assumptions that might validate its use as a discount rate for project appraisal before reading the next section

The individual costs of equity and debt capital are weighted by their proportion of the company's total market value. Using Equation (1) and simplifying:

$K = [(0.12 \times 0.6) + (0.08 \times 0.4)] / 1.0 = 0.104$

So, the WACC used as the company discount rate for new project appraisal is 10.4 percent.

3.2 WACC Assumptions

WACC use as a corporate discount rate for investment appraisal depends upon three assumptions.

- New projects have the same *risk-return* profile as the company's existing activities.
- Each project is *marginal* to the scale of existing operations.
- The company will retain its *existing* capital structure, leaving *financial risk* unchanged.

The reason for the first assumption is obvious. A company's component capital costs reflect the variability of future expected dividend and interest flows. Thus, it follows, that WACC also reflects the overall risk of these combined flows. So, if we use this figure as a discount rate in project appraisal, the new investment's risk-return characteristics must satisfy the company's existing expected dividend and interest payments.

The second assumption is also common sense. When firms consider new investment, the relevant costs refer to the returns that the company must earn on relatively small incremental additions to its total capital base. From an economic viewpoint, they are *marginal* costs of capital and are only applicable to the appraisal of marginal investments: projects that are small relative to the size of the company.

Finally, the third assumption is necessary because WACC can only provide an appropriate discount rate if new projects are financed in the *same proportion* as existing assets. This arises for two reasons.

If a company alters its capital structure, the weights applied to the component costs in the WACC calculation would also change, leading to a new discount rate.

A change in the capital mix (gearing) might also affect the investors' perception of the *financial* risk associated with their investment in the firm. They may then react by buying or selling (as opposed to holding) their securities, thereby affecting the respective yields which determine the WACC.

For example, a new debt issue could increase the uncertainly experienced by the shareholders when they recognise that debt-holders will receive their claim to earnings (interest) before any dividend payment. With increased risk, they sell their holding equity prices may fall because the market requires a higher return as compensation. For the firm, what seems a simple change in the debt-equity ratio is, therefore, a complex decision. Quite apart from revised weightings at new market prices, it must also consider the explicit *marginal* cost of issuing debt *and* the *implicit* cost to the shareholders of their increased financial risk. All three may combine to produce a drastic change in WACC.

Activity 2

Changes in the financial mix (gearing) of a company and the impact of risk on its overall cost of capital and value do not necessarily invalidate the use of WACC as an investment criterion.

Can you think of any reasons for this?

Whilst corporate investment decisions should determine a firm's overall cost of capital, management should avoid the mistake of always associating the explicit marginal costs of new capital issues with a specific project. Often it will be difficult, if not impossible to assign a particular project to a particular source of finance. A company's funds should therefore be viewed *collectively*. In as much as finance is withdrawn from a *pool* of funds to invest in new projects, the pool is replenished as fresh capital is raised from outside, or profits are retained. Thus, the cost of capital used for any particular project is not the cost of a specific source of funds, but the overall cost of the company's pool: namely WACC.

In the short run, it is frequently the case that certain funds might also be secured at advantageous rates depending upon prevailing market conditions. This will encourage firms to depart briefly from their long-run capital structure. Under such circumstances, however, WACC still represents an appropriate discount rate for long-term investment, providing the projects exhibit a similar risk-return profile.

Even if funds are raised explicitly from one source to finance an incremental investment, there are sound reasons for using the WACC as a discount rate, particularly if the change in the capital structure represents a short-run deviation from the desired capital mix. First, a rational choice of funds is a *financial* decision taken not in relation to the *investment* decision but in relation to the firm's long-term capital structure. Second, there are substantial economies of scale to be gained in terms of reduced issue costs by raising large amounts of capital from one source and then another.

3.3 The Real-World Problems of WACC Estimation

Given the assumptions of *homogenous* risk, *marginal* investment and a *stable* capital structure, WACC seems an appropriate *minimum* return criterion for new projects that will hopefully *maximise* wealth.

However, a company's overall cost of capital is a complex concept, which may include far more than shareholder dividend-growth expectations and fixed rates of debt interest. Moreover, the WACC model assumes that once they are determined, the variables selected for inclusion in the model are correctly defined and will not change. But think about it?

WACC is applied to investment projects that extend over numerous time periods. Thus, its value is likely to change with economic circumstances, thereby invalidating original NPV calculations. A simple problem concerns the estimation of after-tax capital costs determined by an existing tax regime that changes. More complex is the 2008 global financial meltdown, not only with revisions to interest rates but also equity yields and values characterised by markets unwilling to finance the most "blue chip" of firms.

Even if we ignore recent catastrophic events, it is important to realise that at any point in *normal* economic cycles, the cost of capital and financial mix for individual companies can vary considerably, even within the same sector. Some firms are naturally more risky than others. Different companies may have different capital structures, by accident if not design. As we shall discover, differences in WACC have important consequences for the relative economic performance of companies and wealth creation.

Review Activity

You are asked to evaluate an investment costing £100,000 and yielding £11,500 per annum for the foreseeable future, subject to the constraints that its acceptance will not alter the firm's existing risk-return profile and capital structure:

- Derive and explain WACC as a discount rate if the corporate tax rate is 25 per cent.
- Evaluate the project's viability by applying the NPV decision rule.
- Outline the implications for shareholder wealth.

The following information is available:

(i) Existing Capital Structure (£k at cost)

Ordinary shares (12 million)	12,000
Retained Earnings	4,000
6% Preference shares	2,000
6% Irredeemable Debentures	6,000

(ii) Ordinary Shares
The current market price (*ex div*) is £7.00. Forecast total dividends are £6 million, which represent 75 per cent of earnings. Dividends have been growing at an annual compound rate of 5 percent. If new ordinary shares were issued now the costs incurred would represent 25 pence per share and a reduction below market value of 50 pence per share would also be required to ensure full subscription.

(iii) Preference Shares
Despite a par value of £1.00, current trades are only at 43 pence with new issues at 40 pence.

(iv) Debentures
£100 loan stock currently priced at £92 would need to be issued at £90 per cent

The derivation of WACC is straightforward using the appropriate capitalisation formulae, incorporating tax and issue costs where appropriate.

- *Marginal* component costs are defined as follows:

Issue of ordinary shares = (dividend per share / net proceeds of issue) + growth rate
= (0.50 / 6.25) + 0.05 = 13%

Retained earnings = dividend yield + growth rate
= (0.50 / 7.00) + 0.05 = 12.1%

Preference Shares = dividend per share / net proceeds of issue
= 0.06 / 0.40 = 15%

Debentures (post-tax) = [interest per debenture (1 - tax rate)] / net proceeds of issue
= 6.00(1 - 0.25) / 90.00 = 5.0%

- *WACC is defined* by weighting these individual costs by their proportion in the company's existing capital structure and summating the products to arrive at their WACC. One method is to use balance sheet data as follows:

	Capital Structure (£ million)	**Weight**	Component Cost (%)	Weighted Cost (%)
Ordinary shares	12	0.50	13.0	6.50
Retained Earnings	4	0.17	12.1	2.06
Preference Shares	2	0.08	15.0	1.20
Debentures	6	0.25	5.0	1.25
Totals	24	1.00		11.01

Weighted Average Cost of Capital: Book Value

However, this approach invites criticism. Although the capital mix will not change, *book* weights have been applied to component costs when clearly *market values* consequential upon additions to the capital structure are more appropriate. What is required for *new* investment is a weighted average of its *marginal* costs of capital and not *historical* costs.

	Capital Structure (£ million)	Weight	Component Cost (%)	Weighted Cost (%)
Ordinary Shares	84.0	0.89	13.0	11.57
Retained Earnings	4	0.04	12.1	0.48
Preference Shares	0.8	0.01	15.0	0.15
Debentures	5.4	0.06	5.0	0.30
Totals	94.2	1.00		12.50

Weighted Average Cost of Capital: Market Value

The substitution of market values for book values in our WACC calculation raises the company's discount rate from 11.01 percent to 12.5 percent.

Project viability is established by applying the NPV decision rule to the project data using the12.5 per cent WACC based on market values as the cut-off rate. The NPV of the £100k investment yielding £11.5k in perpetuity is given by:

$$\text{NPV} = [(11{,}500 / 0.125) = £92{,}000] - £100{,}000 = (£8{,}000)$$

So, the project *under-recovers* and should be *rejected*. However, it is worth noting that if we had applied book values to WACC the project would appear acceptable.

NPV = [(11,500 / 0.1101) = £104,450] - £100,000 = £4,450

Even so, you will be in no doubt as to which decision is correct if wealth is to be maximised. Projects must always be evaluated in terms of current investment opportunities foregone. Hence, the market value of capital employed and its corresponding incremental yield are the correct factors to determine a firm's WACC as an overall cut-off rate for investment.

The shareholder wealth implications of the correct accept-reject decision using WACC as a discount rate can be confirmed by analysing the investment's impact on the equity yield. Using market weights from the previous table, let us first calculate the proportion of equity applied to the investment:

£100,000 (0.890) = £89,000

Next calculate the annual cash return available to the *new* ordinary shareholders.

	Capital Investment £	Capital Cost %	Investor Return £
Annual Cash Inflow			11,500
Retained Earnings £100,000 x 0.04	4,000	12.1	484
Preference Shares £100,000 x 0.01	1,000	15.0	150
Debentures £100,000 x 0.06	6,000	5.0	300
	11,000		934
Ordinary Shares			10,566

Finally, let us reformulate this cash return as a yield on the ordinary share issue associated with the investment.

Project equity yield = £10,566 / £89,000 = 11.87%

Since this is less than the 13 per cent *marginal* cost of new issues calculated at the outset of our analysis, we can confirm that the investment proposal should be rejected. You may also care to confirm that even if the 12.1 per cent cost of retained earnings were incorporated into the yield calculation to provide a more comprehensive measure of the equity rate (i.e. dividends plus retentions) the overall return would only be 11.88 per cent. Since this too, is lower than the 12.1 per cent yield on shares currently in issue, the project should still be turned down.

3.4 Summary and Conclusions

The previous Activity serves as a timely reminder that to maximise shareholder wealth, efficient financial management should comprise two distinct but *inter-related* functions.

- The *investment decision*, which identifies and selects opportunities to maximise expected NPV.
- The *finance decision*, which identifies potential fund sources required to sustain investment, evaluates the return expected by each and selects the optimum mix that minimises their combined cost (WACC).

As mentioned earlier, the detailed derivation of an optimal capital structure and minimum WACC is better left to a more advanced treatment of finance. What we have observed, however, is that the issue of lower-cost debt (which incorporates tax relief) rather than equity should reduce WACC and increase corporate value. But it is worth noting that this *may only be true up to a point*.

One school of thought (the traditional view) states that when debt is introduced into a firm's capital structure it may initially reduce WACC and increase total value. But when shareholders and debt financiers perceive that the gearing level is excessive, the WACC will increase again and value fall. This *saucer-shaped* WACC plotted against increasing leverage is caused by combining a higher return required on existing equity with higher interest rates on new debt issues to compensate both capital providers for the higher *financial risk* of their investment. Beyond some minimum point, incremental borrowing will not reduce the WACC. It increases because of the detrimental effect on existing equity prices, thereby increasing shares yields. In turn, this leads to higher marginal costs of debt on further increments of borrowing, resulting in subsequent increases in the cost of all the equity in issue.

A contrary view originally synthesised by Modigliani and Miller (MM) as far back as1958, for which there is considerable empirical support, maintains that WACC and value are *constant* irrespective of the level of gearing. MM maintain that, just like dividends and retained earnings, equity and debt are also *perfect economic substitutes*. Any change in the gearing ratio immediately elicits a compensatory change in the cost of equity to counter the change in the level of financial risk.

If you are perplexed don't worry. The *dynamics* of leverage, like much else in finance, are in total disarray since the 2008 global meltdown. Suffice it to say that, if a firm's capital structure is *stable*, managerial investment and financing decisions *should* be inter-related by the overall cost of capital.

> In terms of the *investment decision*, the WACC occupies a pivotal position as an opportunity cost criterion (return) which justifies the *finance decision*. A company wishing to maximise shareholders' wealth would only deploy funds if their marginal yield at least matched the rates of return its investors can earn elsewhere at commensurate risk.

3.5 Selected Reference

Modigliani, F. and Miller, M.H., "The Cost of Capital, Corporation Finance and the Theory of Investment", *American Economic Review,* Vol. XLVIII, No. 3, June 1958.

Part Two:
The Wealth Decision

4 Shareholder Wealth and Value Added

Introduction

Financial analysis is not an exact science and many of the theories upon which it is based are even "bad" science. The root cause of the problem is that most theoretical models are characterised by *rational* human behaviour in a *hypothetical* world of "efficient" markets where uncertainty is reduced to *measurable* probability. Thus, the theory itself may be logical but if the basic hypothesis is underpinned by *simplifying assumptions* without any empirical evidence, then its *analytical conclusions* may be invalid.

For example, the English economist J.M. Keynes (1936) writing during the Great Depression pointed to "the extreme precariousness of our estimates of the basis of knowledge on which our estimates of prospective yield have to be made". We have also observed that in their quest for value, today's management have no precise definition of what wealth maximisation means to shareholders, let alone other investors. Is it a dividend stream, future earnings, or some combination of the two that incorporates capital gains? A fundamental problem is whether a firm's decision to distribute profits, rather than to retain earnings for reinvestment and go for growth, has a differential impact on share prices and equity yields. If the answer is yes; then even an *all-equity* firm might find it impossible to model investment decisions that satisfy all shareholders' expectations.

More worrying is that management's perception of income may differ from investors, not simply because they employ different valuation models but because their behaviour is motivated by personal greed, rather than shareholder welfare (think Enron and sub-prime mortgages). So, we should not be surprised that without insider information, markets are periodically fuelled by rumour, speculation and crowd behaviour, which makes them inherently *inefficient* and unstable with a propensity to crash. Certainly, this alternative hypothesis (which also runs counter to *agency theory* outlined in Chapter One of Strategic Financial Management – Part 1) has emerged to explain the financial panic of 2008 and subsequent economic recession.

So, our *final* question is this. Without the *interna*l cash flow data upon which management base their strategic decisions, is it possible for investors to reformulate *external* accounting data to measure the consequences of these decisions? If so, the capital market may have some *control* over managerial behaviour that conflicts with wealth maximising criteria?

4.1 The Concept of Economic Value Added (EVA)

In a perfect capital market, optimum investment-finance decision models employed by management under risk and non-risk conditions should maximise corporate wealth through the inflow of cash at minimum cost. It is a basic tenet of financial theory that the NPV maximisation of all a firm's projects satisfies this objective. However, economists have long advocated the concept of *value added* as an alternative measure for wealth creation. For an excellent exposition see Dunning and Rowan (1968). Since the 1980s the concept has been commercially pioneered, notably by the American management consultants Joel Stern and Bennett Stewart III, so much so that it now has a considerable body of support, as evidenced by select references at the end of this chapter

Economic value added (EVA) represents a company's *periodic* "real" income measured by the difference between its *total* distributable profits and the monetary value of its *overall* cost of capital. The rationale for EVA is best explained by first defining all the components in the following serial equation:

(1) EVA = (EAT + Interest) - C.K = NOPAT - C.K = NOI - C.K

Total distributable profits are defined as annual *de-leveraged* earnings, which equal earnings after tax (EAT) *plus* interest. In the literature, this figure is also termed *net operating profit after tax* (NOPAT) or to introduce American parlance, *net operating income* (NOI).

Overall monetary cost of capital equals the total amount of capital (C) raised by the firm since its inception (through share issues, retained earnings, debt and capitalised expenditure such as R and D) multiplied by an estimate of its WACC (K) using market data..

> So, if distributable profit exceeds overall capital costs (i.e. EVA is positive) management have created wealth by exceeding the returns of all its stakeholders. Conversely, If EVA is negative, value has been destroyed and investors should place funds their elsewhere, unless new management is brought in.

4.2 The Concept of Market Value Added (MVA)

According to Stewart (1991) once investors are aware of a company's EVA, the information should impact on market value. This is best measured by the associated concept of *market* value added (MVA) based on the following equation, where V equals the current total market value of debt plus equity, and C equals the EVA term for total capital raised by the firm since its inception.

(2) $MVA = V - C$

> The interpretation of MVA is simple. If EVA is positive then the difference between V and C is positive and the company has created wealth (or *vice versa*). Of course, MVA improvements or deterioration also depend on factors apart from EVA, many of which may be beyond management's control (such as a banking crisis). But these need not concern us here. The important point is that within a company's sphere of influence, EVA must be a fundamental driver of market value.

4.3 Profit and Cash Flow

Unlike the earlier *cash driven* analyses of NPV with which you are familiar, EVA is based on *accounting* profits using NOPAT. So, how can the two concepts be equivalent?

From a *financing* perspective, we know that NOPAT is calculated by *de-leveraging* earnings, which entails adding back interest on debt capital to establish total distributable profits. But what of the principal *non-cash* expense customarily added back to accounting profit to derive cash flow, namely *depreciation*.

Depreciation remains deducted from NOPAT because it is the only way that accounting profit recoups the cost of investment. Remember, net cash inflows include depreciation because the cost of investment (I) is subtracted from their present value (PV) to determine NPV using the following formula.

$$NPV = PV - I$$

Of course, there are other anomalies that must be stripped from accounting income to produce a "cash equivalent". But if we are to believe Stewart (*op cit*) once these adjustments are performed, lifetime profit will approximate to lifetime cash surplus because all the accounting conventions will unwind.

4.4 EVA and Periodic MVA

Like EVA, MVA is a residual concept that defines what is left over after the total book value of capital (C) has been deducted from its total market value (V). Recalling Equation (2):

(2) $\text{MVA} = \text{V} - \text{C}$

Note that unlike *periodic* EVA, however, MVA is a *cumulative* measure of *lifetime* value added.

To measure the change in value over a *one-year* period, an *opening* MVA must be deducted from a *closing* MVA, which also isolates the effect of any new capital issues (I). Thus, our equation of periodic MVA is represented by:

(3) $\Delta\ \text{MVA} = \text{MVA}_{t} - (\text{MVA}_{(t-1)} + \text{I})$

So, if a firm's market valuation rose from £20 million to £26 million but capital of £9 million was injected during the year; corporate value would have fallen by £3 million overall.

Activity 1

To illustrate the inter-relationship between EVA and MVA consider the following company data.

V	NOPAT	C	K	Opening MVA
£m	£m	£m	%	£m
200	20	100	10%	90

- Calculate *periodic* EVA and *lifetime* MVA.
- Establish whether *periodic* wealth been created or destroyed using MVA.

Calculations for periodic EVA and closing MVA are determined by Equations (1) and (2).

$$\text{EVA} = \text{NOPAT} - (\text{CK}) \qquad = £20\text{m} - (£100\text{m} \times 0.1) \qquad = \qquad £10\text{m}$$

$$\text{MVA} = \text{V} - \text{C} \qquad = £200\text{m} - £100\text{m} \qquad = \qquad £100\text{m}$$

Wealth has also been created without any new investment over the period. Using Equation (3)

$$\Delta\ \text{MVA} = \text{MVA}_{t} - (\ \text{MVA}_{(t-1)} + \text{I}\ ) = £100\text{m} - (£90\text{m} + 0) = £10\text{m}$$

Note also the *perfect positive* relationship between the creation of *internal* EVA and the *external* DMVA. Market value of £10m is added to the company because the monetary return on investment exceeds the cost of finance by £10m. Mathematically, Equations (1) and (3) are therefore equivalent

(4) EVA = Δ MVA

4.5 NPV Maximisation, Value Added and Wealth

As a *cumulative* valuation, MVA should represent the stock market's assessment of a company's lifetime NPV. MVA maximisation should therefore be the primary managerial objective for any firm concerned with shareholder welfare. If we also accept our earlier proposition that for capital budgeting purposes, lifetime EVA is equivalent to lifetime net cash flow, it follows that if all future EVA is discounted to a present value using a post-tax WACC, the balance must be equivalent to the NPV of all a firm's projects. Thus we can define MVA using the following serial equality.

(5) MVA = PV (SEVA) = SNPV

To understand the equation implications for management and investors, let us examine it in more detail.

We already know from Equation (2) that MVA equals market value (V) minus book value (C).

(2) MVA = V - C

According to Stewart (*op cit*) it is also "a *mathematical truism* that market value is determined by discounting anticipated EVA using a WACC and adding it to the current capital balance, since an EVA summation approximates to lifetime free cash flow". So, we can define:

(6) $V = C + PV\ (\Sigma EVA)$

And taking the difference between Equations (2) and (6)

(7) $MVA = PV\ (\Sigma EVA)$

Because EVA excludes the cost of existing and new capital investments through depreciation adjustments, the balance must represent the equivalent NPV of all a firm's projects when it is discounted using a common WACC. Thus, MVA may be redefined as follows:

$$MVA = PV\ (\Sigma EVA) = \Sigma NPV$$

Activity 2

Using the following data and information from Activity 1, generate the appropriate equations to calculate the P V of all future EVA to derive the NPV of all capital projects.

V	NOPAT	C	K	Opening MVA
£m	£m	£m	%	£m
200	20	100	10%	90

As a reminder, first let us recalculate the EVA for Activity 1 using Equation (1).

$$EVA = NOPAT - (CK) = £20m - (£100m \times 0.1) = £10m$$

Using Equation (2) you will also remember that:

$$MVA = V - C = £200m - £100m = £100m$$

Using Equation (6) we can also define market value (V) as follows:

$$V = C + PV\ (\Sigma EVA) = £100m + £10m / 0.10 = £200m$$

(where PV (SEVA) is the present value of a *perpetual annuity*, using a WACC of 10 percent).

Now let us take the difference between the Equations (2) and (6) and review its implications.

$$MVA = PV\ (\Sigma EVA) = £10m\ /\ 0.10 = £100m$$

According to our hypothesis, the PV of all future EVA should also be equivalent to the NPV of all a company's past and future projects. So, returning to Equation (5) it follows that:

$$MVA = PV\ (\Sigma EVA) = \Sigma NPV = £100m$$

The importance of Equation (5) and the pivotal role of EVA as a performance measure linking *external* valuation to *internal* investment should not be underestimated. Because NOPAT can be derived from published company accounts and WACC estimates from stock market data, EVA provides investors with an element of control over dysfunctional management behaviour.

Of course, without more data we had to *assume* that the NPV in the previous Activity was equivalent to MVA and EVA. So finally, let us add to the data set and prove the case.

Assume the information relates to a company launched two years ago for £100m (C). Since then total market value (V) has risen to £200m without further capital issues. In the intervening period annual net cash inflow measured by NOPAT has been £20m per annum and the after tax WACC (K) a constant 10 per cent. Now threatened by takeover, let us use NPV analysis to confirm that predators should add an MVA *premium* of £100m to the £100m book value (C) for a "fair" value.

We know from Chapter Two, Three and Four (Strategic Financial Management: Part I) that the cash surplus at the end of an investment's life (even a company's) is its *net terminal value* (NTV) or discounted equivalent (NPV). With a post-tax discount rate (K) we can therefore introduce a fourth term into Equation (5).

(8) $MVA = PV\ (\Sigma EVA) = \Sigma\ NPV = \Sigma\ NTV\ /\ (1+K)^{n}$

The importance of this fourth term is that we are now in a position to derive S NPV and its equivalence to MVA and PV (SEVA) independently, using NTV.

From the data we can produce the following cash statement using a bank overdraft formulation (£m) to calculate the company's overall SNPV.

Time Period	t_0	t_1	t_2	
Opening Balance	-	(100)	(90)	
Cash Outflows				
Investment (C)	(100)	-	-	
Interest (CK)	-	(10)	(9)	(K = 10 %)
Totals	(100)	(110)	(99)	
Cash Inflows				
NOPAT	-	20	20	
Realised Value (V)	-	-	200	
Totals	-	20	220	
Closing Balance	(100)	(90)	121	= Σ NTV

$$\Sigma NPV = \Sigma NTV / (1+K)^n = 121 / (1.1)^2 = \underline{100}$$

Returning to Equation (8) a serial relationship that equates MVA with NPV using EVA as the *linkage* is now established

Review Activity

Throughout the text we have assumed that the *normative* objective of strategic financial management is to maximise shareholder wealth by maximising the expected NPV of all a firm's projects. Unfortunately, because there is no legal requirement for companies to publish this information, management could be pursuing an entirely different agenda based on self-interest, leading to a catastrophe like the 2008 market meltdown. Fortunately, investors may have a life-line if they care to use it.

Assuming that NPV is financially equivalent to EVA and ultimately MVA (and there is considerable evidence to support this) then the derivation of the latter by investors from publically available information should act as a control on sub-optimal managerial behaviour.

So, finally let us work through a simple numerical example (ignoring growth, issue costs, capital gearing and fiscal policy) that clarifies the inter-relationship between shareholder wealth and investment policy with reference to NPV and the value added concept.

Suppose a company is financed exclusively by ordinary share capital. This generates a net annual cash flow of £1 million in perpetuity that is always paid out as a dividend (*i.e.* earnings per share equals dividend per share). Also assume that the current market yield on equity used as the firm's cut-off rate for investment is 10 percent.

Using the *constant dividend valuation model* from Chapter One, we can define market value of the company (V) as its market value of equity (V_E) based on Ke the *perpetual capitalisation* of dividends (D_t).

$V = V_E = D_t / Ke = £1 \text{ million} / 0.10 = £10m$

Now assume the company intends to finance a new project of equivalent risk by retaining the next year's dividend to generate a net cash inflow of £2 million twelve months later, all of which will be paid out as a dividend. The questions we might ask ourselves are:

- How does this incremental investment, financed by dividend retention affect shareholder wealth?
- Can we confirm the investments impact on wealth using NPV analysis?

The managerial investment decision can be presented in terms of the shareholders' revised future dividend stream.

	t_0	t_1	t_2	t_3	…	$t_{¥}$
£ million	£	£	£	£		£
Existing dividends		1	1	1		1
Project cashflows		(1)	2	-		
Revised dividends		-	3	1		1

If we now compare market values (V) with or without the new investment using the PV of each dividend stream (V_E):

$V = V_E$ (revised) = £3 million / $(1.1)^2$ + [(£1 million / 0.10)] / $(1.1)^2$ = £10.744m

$V = V_E$ (existing) = £1 million / 0.10 = £10m

ΔV = MVA = £0.774m

Thus, if the project is accepted management creates MVA because the PV of the firm's equity capital (V_E) will rise and shareholders will be £744,000 better off.

Turning to NPV analysis, we can also confirm this wealth maximisation decision without even considering that the dividend pattern has changed.

You will recall that *external* MVA is equivalent to the creation of *internal* EVA, which also corresponds to the NPV of new investments. Applying the familiar DCF capital budgeting model to the project cash flows, we can prove this as follows

$$\text{NPV} = (£1\text{million}) / (1.1) + £2 \text{ million} / (1.1)^2 = £744{,}000$$

So, shareholders may relinquish their next dividend but gain an increase in the value of ordinary shares (from £10m to £10.744m overall). In other words, the company has created value (MVA) by accepting a project with a positive NPV of £744,000.

4.6 Summary and Conclusions

Modern finance theory reduces future uncertainty to quantifiable risk so we can estimate an investment's prospective yield using classical probability theory. This approach is based on a fundamental proposition, namely the efficient market hypothesis (EMH) that assumes investor rationality and freedom of information in reasonably perfect markets with few barriers to trade. But if nothing else, geo-political and economic events post-millennium, culminating in global financial meltdown and recession, should convince us otherwise. So whilst the material presented in this text provides a framework for the analysis of investment and finance decisions it remains to be seen whether it is a "castle built on sand".

Chapter One (Strategic Financial Management: Part I) chronicled why academics and analysts throughout the twentieth century gravitated towards a *normative* objective of strategic financial management based on shareholder wealth maximisation using the opportunity cost of capital concept as an investment criterion.

Chapter Two, Three and Four (Strategic Financial Management: Part I) focussed on the managerial investment decision with only oblique reference to derivation of its cut-off rate. We observed that moving from a world of certainty to uncertainty; corporate wealth maximisation should be equivalent to the expected NPV maximisation of all a firm's projects, using probability and utility theory. Turn to recent world events, however, and serious questions arise as to how far corporate management have embraced wealth maximisation criteria.

Chapter One, Two and Three (Strategic Financial Management: Part II) introduced the impact of the finance decisions on investment decisions for *all-equity* firms wishing to fund new projects through retained earnings. We modelled dividends and earnings to derive the market capitalisation of equity as a project cut-off rate under growth and non-growth conditions and explained their equivalence. Moving on to firms financed by a *miscellany* of funds, the objective was to derive an *overall* marginal cost of capital (WACC) as an appropriate cut-off rate. We concluded that the use of WACC for project appraisal must satisfy three conditions. New projects must be *homogenous* with respect to the firm's current business risk (otherwise investor returns will change). The capital structure must remain *stable* (otherwise the weightings applied to investor returns will change. The project must be *marginal* relative to the scale of the firm's existing operations to minimise possible losses.

Chapter Four (Strategic Financial Management: Part II) modelled an alternative to NPV maximisation using the value added concept based on *freedom of information*. We confirmed that if a company creates EVA from project investment then total market value should increase by an equal amount (MVA) which is equivalent to project NPV. Because negative EVA means wealth is destroyed it should alert investors to negative NPV associated with unacceptable decisions taken by management on their behalf. Value added therefore represents an external control on the consequences of managerial action that companies ignore at there peril.

Finally, if you wish to visualise all the pieces of the puzzle put together, take a look at the diagram below. Reproduced from Chapter One *(Strategic Financial Management: Part I)*, it should be familiar but hopefully, it should now make more sense.

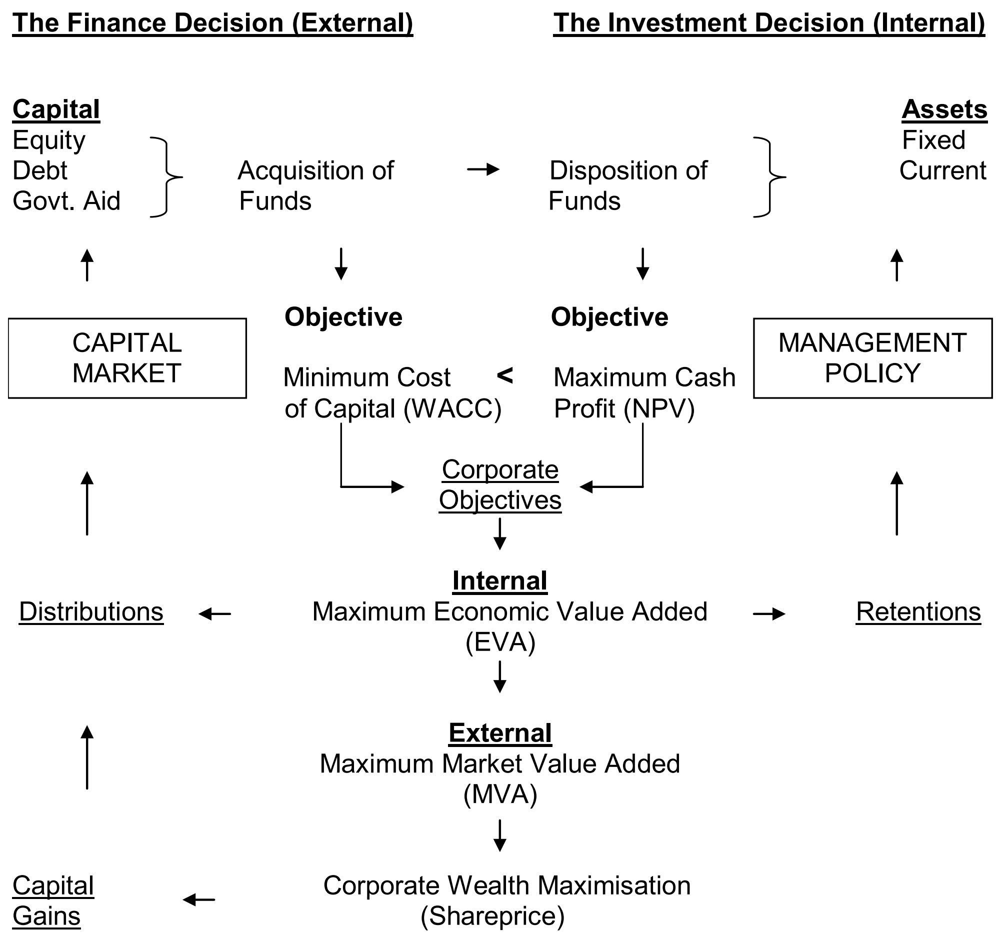

Figure 1.3: Strategic Financial Management

4.7 Selected References

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