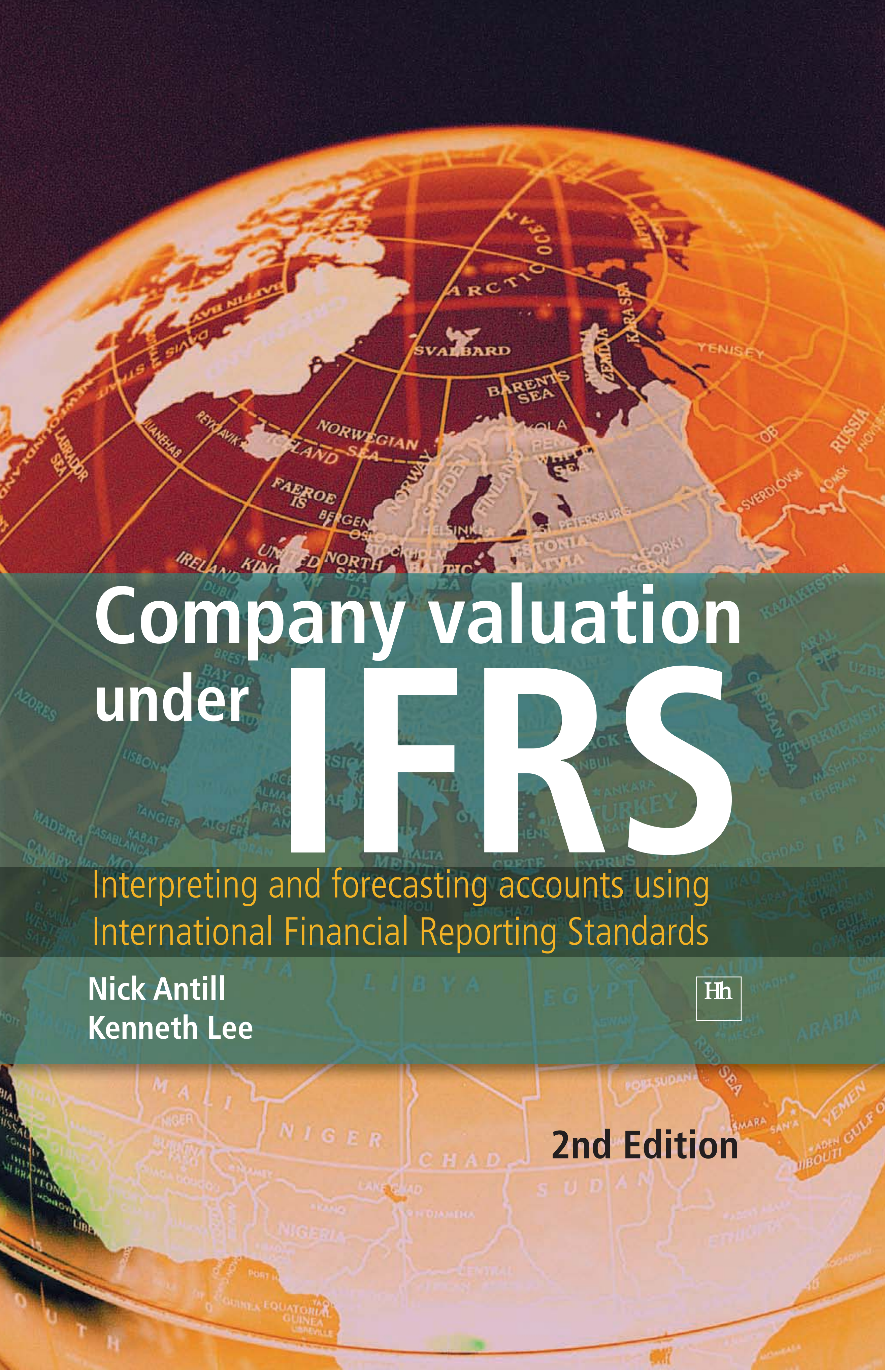

Company valuation under IFRS

Interpreting and forecasting accounts using International Financial Reporting Standards

Nick Antill
Kenneth Lee

2nd Edition

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Interpreting and forecasting accounts using International Financial Reporting Standards

by Nick Antill and Kenneth Lee

HARRIMAN HOUSE LTD

3A Penns Road
Petersfield
Hampshire
GU32 2EW
GREAT BRITAIN

Tel: +44 (0)1730 233870
Fax: +44 (0)1730 233880
email: enquiries@harriman-house.com
web site: www.harriman-house.com

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For our families

‘Those who understand compound interest are more likely to collect it, those who don’t are more likely to pay it.’ – *Paulos*

‘Professional investment may be likened to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preference of the competitors as a whole; so that each competitor has to pick, not the faces which he himself finds prettiest, but those which he thinks likeliest to catch the fancy of other competitors, all of whom are looking at the problem from the same point of view.’ – *Keynes*

Contents

Index of exhibits

Chapter One

Chapter Two

Chapter Three

Chapter Four

Chapter Five

Chapter Six

Chapter Seven

About the authors

Nick Antill:

Since 2000, Nick has divided his time between training and consultancy in the areas of energy and finance, and currently works as a financial trainer and as a consultant for Citi Investment Research. Previously, he spent 16 years in the City of London as an equity investment analyst specialising in European energy companies, finishing as head of the European team at Morgan Stanley. He began his career in the oil industry, where he worked as an economist with BP and Saudi Aramco. Previous publications include (with Robert Arnott) '*Valuing oil and gas companies*'.

Kenneth Lee:

In what now seems like a previous life, Kenneth was an accountant and tax consultant with Arthur Andersen in Dublin. He then held various positions in the financial training business culminating in becoming the accounting specialist at BG Training. There he trained analysts from all the major banks and published '*Accounting for Investment Analysts*: *an international perspective*'. In 2004, Kenneth joined Citi Investment Research as the accounting and valuation analyst for Europe where he publishes and presents on the interpretation of reported IFRS numbers for investors and valuation issues generally. He is a fellow of the Institute of Chartered Accountants in Ireland, a member of the Securities Institute, an associate of the Institute of Taxation in Ireland and a CFA charterholder.

Preface to first edition

At the high point of the tension between Mr Eliot Spitzer and the big US investment banks, the *Wall Street Journal* published an article in which it commented unfavourably on a piece of investment research which had just been published by a US investment bank. In it, the analyst had recommended an equity, in part on the basis of a discounted cash flow valuation in which, it transpired, capital expenditures had been added to the stream of cash that was being discounted, rather than deducted. The firm responded promptly with a second piece of research on the same equity. It acknowledged the mistake in its previous research, which it had corrected in the second. The new research also contained a number of other adjustments to its forecasts for the company concerned. And the result? Its 'target price' for the share concerned had increased, not decreased.

This at the end of a decade or more in which two of the most commonly heard comments in financial institutions were,

> *'It does not matter – it is only a non-cash item,'*

and

> *'EBITDA [earnings before interest, taxation, depreciation and amortisation] is a measure of cash flow into the company'.*

What matters is not just that both of these propositions are completely false. It is also that they are symptomatic of an approach to the analysis, and valuation, of companies that is entirely misguided, and that was closely related to the grotesque mis-pricing of equities during the late 1990s.

If it is true that the value of a company is the net present value of the discounted stream of cash flow that it will generate between now and infinity, two reasonable questions follow:

From where do we get our estimates of these streams of cash flow?
What discount rate should we be using?

If we start with the first question, accrued benefits and costs are clearly relevant to these future streams. And if they are relevant then why is it repeatedly stated that they do not matter?

The authors believe that profit, not cash, is king.

This is not to deny that measures of profit during any particular period will be dependent on the accounting conventions used by the company, or even that they are malleable, without even having to go to the extent of deliberate misrepresentation. But the scope for manipulation is being reduced by rapid convergence on two main accounting standards:

- International Financial Reporting Standards (IFRS), and the
- US Financial Accounting Standards (FASs).

Most quoted EU companies must report under IFRS after January 1st, 2005. And the two boards that set these two standards are themselves working towards harmonisation on a single internationally accepted system of Generally Accepted Accounting Practices (GAAP).

Sadly, this does not at all mean that interpretation of accounts will become unimportant, or that there will not be room for legitimate differences of opinion over company performance. However prescriptive the accounting convention, there will always be room for manoeuvre when companies report. The authors believe that in practice there are a relatively small number of key issues that investors need to understand and consider when interpreting company reports and accounts, and that these will remain even after further convergence of accounting standards. But that does not mean that an appropriate response is to declare accounting profits irrelevant, and to revert to simple reliance on cash flows as a tool for valuation.

How the book is structured

This book is set out in eight chapters.

Chapter One

The first chapter states the main thesis, which is that it is in effect impossible to value a company without reference to profit and capital employed. Attempts to avoid this simply result in implicit assumptions (usually foolish ones) replacing explicit assumptions (however wrong the latter may be). In addition, it argues that far from being unimportant, accruals represent key information about value, whether or not it is represented in the framework of a discounted cash flow (DCF) model.

Chapter Two

Chapter two attempts to explode another myth, that the cost of capital for a company is an unambiguous figure, and that it is stable. Neither is the case. We show how the traditional Weighted Average Cost of Capital (WACC) can be reconciled with a more transparent approach based on Adjusted Present Value (APV), and argue that the traditional framework within which practitioners operate has at its core an assumption about the value of tax shelters that has led to systematic overvaluation of the benefits from leverage, another cause of the catastrophic fall in equity markets after the turn of the Millennium. In addition, there is an ambiguity at the heart of the treatment of debt in the standard Capital Asset Pricing Model (CAPM). Different interpretation of the risk premium on corporate debt results in very different estimates for WACC, and for the value of the enterprise.

In addition to creating tax shelters, leverage also creates option value for shareholders, and this is systematically missed in intrinsic value models of companies. It can only be captured systematically as a transfer of option value from the bond-holder to the shareholder. Chapter two closes with a discussion of this application of real options theory, relating a discussion of whether or not the risk premium on debt is market risk or specific risk to the correct use of these models as applied to capital arbitrage (the trading of alternative capital instruments issued by the same company).

Chapter Three

Economists talk about net present value (NPV) and internal rate of return (IRR). Investors talk about returns on capital employed (ROCE). But a company's accounting return on capital employed is not the same as the internal rate of return that it earns on its assets. There are several ways of attempting to address this problem, none wholly satisfactory. What they tell us is that depreciation charges are not necessarily equivalent to impairment of value, and that the capitalisation and depreciation of fixed assets is a key component of the way in which accounts can influence perceptions of valuation. Chapter three explains the problem, and looks in some detail at one proposed panacea, Cash Flow Return On Investment (CFROI). This is shown to be a rearrangement of the standard discounted cash flow methodology, with potential advantages in the case of capital intensive companies with long asset lives. The chapter points to one direction in which accounting practice may continue to move, namely, fair value accounting.

Although relatively short, the first three chapters provide the theoretical framework for what follows, which comprises a discussion of accounting issues and then their applications to valuation models.

Chapter Four

It would be wrong to assume that convergence on a single, globally accepted accounting standard would result in the elimination of all valuation problems. Arguably the world's most prescriptive accounting standards are those of the USA, which has not prevented the various high profile debacles of the early years of this Millennium. Chapter four takes a different approach. Instead of concentrating on accounting standards, it concentrates on what investors need to know, and the ways in which accounts do or do not provide them with the information that they need. In this, the longest section of the book, the authors address key accounting issues from two approaches: the latest changes in proposed accounting treatment, and the implications for market valuation of the companies. These include such topical areas as pensions accounting, accounting for derivatives, off balance sheet finance and accounting for stock options.

Chapter Five

The fifth chapter begins by taking the theoretical and the accounting points discussed in the first four chapters and discussing their application to the forecasting and valuation of a real company. It turns out that a large part of the problem relating to the latter task concerns treatment of the terminal value of the company, which relates to what happens after the explicit forecast period.

If an industry is exceptionally profitable, capital will flood it. If it is hopelessly unprofitable, retrenchment follows. And, in the long run, no company grows faster than nominal gross domestic product (GDP), or, in the end, it takes over the world. So, company returns on capital will regress to their cost of capital, and their growth rates will ultimately fall to below nominal GDP growth rates? Well, yes and no. This debate takes us to the heart of definitions regarding what constitutes capital and what constitutes an operating cost. One of the authors was taught at university that more useful than a conventional report and accounts would be a 'carefully annotated cash flow statement'. Chapter five demonstrates that, far from this being true, one of the problems with valuing companies is a direct result of the fact that much of what would ideally be capitalised is not. If it were then the task of monitoring performance and deriving market values would be much easier.

After a full discussion of a stable, mature company, the chapter concludes with suggested treatment for companies that are expected to have a significant change to their balance sheet structure, are cyclical, are asset light, or are growth stocks. Each presents its own problems.

Chapter Six

Accounts were designed by bankers, and the system of double entry reflects this history. But most reports and accounts are prepared by industrial companies. Accounting conventions largely reflect the problem of reporting the performance of a business that utilises fixed assets to add value to raw materials, and which is mainly financed by a combination of debt and equity. But there are large parts of the equity market that do not fit this model well, for one reason or another. Chapter six addresses the techniques required to interpret the accounts of and to value companies in areas such as banking, insurance, mineral extraction and regulated utility industries, where particular treatments are needed and where in some cases accounting rules are very specific to the industry.

Chapter Seven

In chapter seven we address the modelling and valuation of mergers and acquisitions, which should be entirely independent of the accounting question as to whether or not goodwill is capitalised and amortised. But it is extremely important, however the company accounts, to interpret correctly its underlying profitability, or the value added or subtracted by the merger will not be captured in valuation models.

Chapter Eight

The final section of the book is entitled ‘Conclusions and continuations’. Our conclusion is that far from cash, it is profit that is king, and that to understand a company’s value it is profits and balance sheets that are required, not simple streams of cash. That there will always be disagreements about what to put into the profits and balance sheets, for the past as well as for the future, is what the makes the subject of investment endlessly fascinating.

Two of the more obvious continuations from this book relate to discount rates and to the incorporation of contingent claims (option values) into intrinsic value analysis. We explore this in some detail with respect to the option relationship between the holders of debt and equity, but not for the other applications of real option theory, such as options to expend, to defer to scrap, etc. As is the case with capital arbitrage, we believe that there is a close relationship between the limitations of the CAPM and the insights offered by option pricing models, and suggest that extensions of the connection between these approaches represents a potentially valuable area for future research.

Supporting web site

The web site supporting this book and containing all of the more important models used in the text can be found at:

www.harriman-house.com/ifrs

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An IFRS briefing

What is IFRS and why does it exist?

IFRS stands for International Financial Reporting Standards. International standards were originally introduced to achieve two objectives:

- Produce high quality standards
- Work to improve harmonisation of preparation and presentation of financial statements

If an investor, analyst or supplier is trying to understand the performance of a company, in isolation or against its peers, then having accounting rules in different countries that generate completely different reported earnings and balance sheets is hopelessly confusing. International standards have been developed to eliminate these differences and the potential inefficiency in capital markets this might cause. In addition, emerging economies find it very useful to have a suite of high quality accounting standards to use which can provide credibility to their reported performance.

Who developed the standards?

The international standards board (IASB), and its predecessor committees developed the accounting standards that form IFRS. In fact the standards consist of documents called IFRS as well as older standards called International Accounting standards (IASs). There have been many influences on the development of IFRS. However, most would accept that the US standard setter (The FASB), will continue to have a significant influence on the developments of IFRSs given the convergence agenda between the two.

Who will use it?

The decision by the EU in 2005 to adopt IFRS for listed companies contributed to the momentum behind IFRS adoption throughout the world. So IFRS is used in Europe already. In addition, many Asian countries have adopted IFRS or are in the process of doing so. China essentially adopted IFRS in 2007, albeit with a few relatively minor differences (see appendices for details). It is the Americas where IFRS is not yet dominant. However, the recent decision by the SEC to eliminate the requirement for a reconciliation from IFRS to US GAAP for foreign registrants is a major step forward. In addition, consideration being given to allowing domestic US companies to use IFRS also strengthens the global position of IFRS. We have included a list of countries and their accounting standards in the appendices.

Are the IFRS standards well drafted?

We broadly welcome the adoption of IFRS by an increasing number of countries. The elimination of accounting differences and the improvements to disclosure will be important steps forward for capital market efficiency. We also see the standards as a reasonable compromise between the practicality of implementation and the underpinning rigour of the concepts. However, there are problems. IFRS introduce volatility and there are concerns as to whether this will be interpreted appropriately. Furthermore, certain IFRS offer significant choice and this can undermine the credibility and comparability they are trying to portray. However, overall we would feel that IFRS is a good suite of standards that are analyst/investor friendly.

What is the impact of IFRS adoption on valuation?

The affect on valuations is very hard to predict. But there are a few comments that, can be made. First, the accounting input to static multiples such as Price to Book or Enterprise Value (EV) to EBIT, will change for a variety of accounting reasons. It remains to be seen whether the market input to these metrics will change to maintain the status quo. We would envisage this to be unlikely to happen for all companies and therefore for some the market may deem the new accounting information more relevant than the previous GAAP. Second, if perceptions of debt change then this may cause discount rates to shift as the weighting of debt changes in a WACC calculation as more comes on balance sheet. Having said that, there are reasonable arguments for suggesting that within a range of debt levels WACC is relatively unchanged for shifting capital structures. Nonetheless the potential for change in discounts rates exists. Third, if earnings and book values change to the degree predicted then we might expect profitability measures (returns) to be different. These are a key input to any standard DCF or economic model. Finally, there may well be a tax impact from all of these changes which would result in a change to cash costs.

Preface to second edition

During the three years that have separated this from the first edition, IFRS has gone from being a planned innovation for European quoted companies to becoming a truly global accounting standard, adopted, almost fully adopted, or planned to be adopted, across the globe. As the second edition goes to print, a crucial addition to the list is China, which is adopting the standard for companies reporting their 2007 annual results. A new Appendix provides an update on the list of standards, and on the status of their adoption outside the original European countries.

Moreover, the planned confluence of IFRS and US-GAAP is proceeding via the removal of the requirement for companies whose shares are listed on Wall Street to translate their accounts from IFRS to US GAAP, and by the suggestion that US companies might at some time in the future be permitted to file accounts under IFRS in preference to US GAAP. Given that international US groups already account under IFRS for most of their non-domestic operations, and then have to translate these into US GAAP for the consolidated accounts, this would clearly represent a great simplification for them.

So, one of the key justifications for the shape of the book, that it is increasingly the case that familiarity with and an ability to incorporate into models of a fairly limited number of key IFRS accounting standards would permit the sensible assessment, forecasting and valuation of a large number of internationally diverse companies, has been well supported by subsequent events.

If some things have changed considerably, then others remain predictably, if not comfortably, unchanged. The Preface to the first edition was a response to the lack of rigour that was applied to equity valuation during the late 1990s, with the predictable consequence of a severe bear market during the early years of the new millennium. Whether or not techniques of equity valuation have become more rigorous, the new decade brought its new bubble, this time in all forms of credit: sub-prime mortgages, unsecured personal credit, or commitments to private equity. The effect was then magnified by the additional leverage created through collateralised debt obligations (CDOs).

Much of the content of the accounting sections of this book was, and remains, related to interpretation of financial liabilities that are either not recognised or not fully recognised on balance sheets. And much of the content of the forecasting and valuation sections relates to the significance of accruals. Valuing companies should not merely be a matter of extracting cash flows from accounts and extrapolating them. Non-cash items of various kinds matter enormously, whether they comprise the writing down of a loan portfolio, or the revaluation of a pension liability or property portfolio, none of which are cash items. The 2007 credit crunch merely reaffirms the importance of accruals.

In addition to bringing the accounting references up to date, the second edition also has a new section on property, or real estate, companies, with discussions of relevant accounting, modelling and valuation approaches, and a glossary of relevant terminology. There has also been a methodological addition. An explanation of the construction of three period models, with intermediate fade periods, has been added. The authors would like to thank Harry Stokes for his assistance with the development of the recommended approach to valuation of property companies.

Chapter One

It's not just cash; accounts matter

1. Introduction – Valuation refresher

Before addressing the key valuation technology that underpins our views let us refresh some core ideas about equity valuation.

Valuation language is based around financial ratios

Open any financial pages from a newspaper, and you will be confronted by tables of share prices, accompanied by at least two ratios: Price/Earnings (P/E) and dividend yield. P/E is a measure of the share price divided by the last year's earnings. Dividend yield is the dividend paid by the company during the past twelve months, divided by the share price. The first is a measure of payback period: how many years is it before I earn my money back? The second is a measure of income yield: what am I going to receive in income on a pound or Euro invested?

There is a third ratio in the triumvirate which is rarely shown, though, ironically, academic testing shows that it has the highest explanatory value in predicting future share price movements. This is the ratio of Price/Book (P/B) which is the ratio of the share price divided by the per share value of shareholders' equity in the balance sheet. This tells me what premium I am paying over the amount that has been invested in the business in subscriptions to equity capital or in retained earnings.

The three ratios are clearly related. To the extent that companies retain earnings, rather than paying them out, they increase the book value of their equity. Moreover, the same considerations will determine whether I am prepared to buy a share on a high P/E ratio, a low dividend yield or a high P/B ratio. In each case I should be happier to pay more for a company that looks safe, is highly profitable, or grows faster than others.

True returns: the IRR and NPV rule

When companies make investment decisions, they go beyond simple calculations of payback. More sophisticated approaches include calculating the internal rate of return (IRR) on the investment, or using a required discount rate to calculate a present value (PV), from which the investment cost can be deducted to derive a net present value (NPV). If the latter is positive, invest: if not, do not invest.

The same consideration applies to shares. We can move beyond simple multiples to derive present values, and much of this book is concerned with interpreting accounts and building models that do this accurately. But it should not be forgotten that just as there is usually a relationship between payback periods and IRRs (fast payback usually goes with a high IRR) so there is usually a relationship between simple share price ratios, so long as they are sensibly interpreted, and the results of a more sophisticated valuation model.

Valuation models: sophistication versus simplicity

In extreme simplifying cases (where the stream of cash flow is flat, or grows steadily in perpetuity) the output of a sophisticated valuation model and the application of a simple ratio will both give the same answer. It is only when the cash flows are unstable that we benefit from a more detailed approach. This is as true for companies as it is for projects.

Enterprise value rather than equity

When valuing shares there are two basic approaches: value the equity directly or value the business (debt plus equity), and then deduct the debt component to leave the equity value. The key advantage of using the latter route is that it separates the valuation of a business from the issue of how it is financed. It also involves using cleaner accounting numbers. The ratios mentioned so far (P/E, P/B and dividend yield) relate purely to equity, but similar versions are often also constructed for enterprise valuations (e.g. EV/invested capital or EV/NOPAT [Net Operating Profit after Tax]). An EV approach is often more intuitive than attempting to value equity directly. For example, in valuing your house, the sensible approach would be to value it on the basis of the rental yield that it would generate, and then subtract the mortgage, rather than to think in terms of cash flows net of interest payments. In practice, nobody would do the latter for a house, so why do so for a company?

The problems of cashflow

A final point. Readers may have seen reference to another group of ratios. These relate not to book capital, or to earnings, or to income, but to cash flow from operations. One of the aims of this book will be to encourage readers to use these figures (cash earnings per share, EBITDA to enterprise value) with extreme caution. Firstly, they rarely measure a real cash number. Secondly, to the extent that they do, they do not represent a sustainable stream, as they precede the investments that a company must make to survive. In pure form, they can only help to provide liquidation values, not going concern values.

Reconciling multiples with present values

Much of the above will (we hope) be clearer by the end of this chapter. At first sight, the formulae that we shall be using may not seem to bear much resemblance to the familiar P/Es and yields from the daily newspaper. But we hope that our readers will be reassured, by the end of this chapter, that the resemblance is very close indeed, and that there are good reasons for proceeding with the slightly more sophisticated approaches.

Actually, we have taken the precaution of relegating all mathematical proofs to a Mathematical Appendix. Those who are interested will find all that they need to derive their valuations formally, but this is by no means essential. From the authors' experience, while most practitioners constantly use the ideas of this chapter, only a tiny proportion of them could explain why they work! Our aim is to provide all readers with the tools to model and value companies properly, and to make the supporting theory available to those who are interested.

2. Distributions, returns and growth

Many books on valuation have been written in order to propound the virtues of one mechanical approach as against another. So the devotees of DCF, EVA™, CFROI, dividend discounting and residual income all battle it out. We shall explain all of these variants on intrinsic valuation as the book progresses, but our concerns are a little different. We shall have something to say about which approaches we regard as more desirable in practice, to address specific types of company. However, one point should be made right at the start. Correctly handled, the main valuation methodologies should all generate the same result for any one company, whether or not it is cash or economic profit that is discounted, or whether the streams are to capital or to equity.

What matters far more than the mechanics of how to translate a forecast into a valuation is where the assumptions that feed the forecasts come from, and the interplay between interpretation of historical accounts and forecasting of prospective ones. These connections are, we believe, often systematically ignored or even misunderstood.

Let us begin by keeping the picture simple. Take a company that has no debt in its balance sheet. Every year, it generates (we hope) some profit. Profit is struck after deductions not only for cash costs, such as cost of goods sold (COGS), employment costs, taxation, and so on, but also after a provision for the deterioration of the fixed assets that will one day have to be replaced. This provision is known as depreciation. So, in our very simple example, cash flow into the company is the sum of net profit and depreciation. Cash out takes the form of capital expenditure, increase in working capital (inventory and receivables, less payables), and dividends to the shareholders.

Furthermore let us assume that the company is going to run with no debt and no cash in the balance sheet. So dividends each year must equal the cash flow after capital expenditure and change in working capital (free cash flow). Exhibit 1.1 illustrates the profit and loss account, cash flow statement, and balance sheets for Constant company.

Exhibit 1.1: Constant growth company accounts

Profit and loss account

Year	**0**	**1**	**2**	**3**	**4**	**5**
Profit and loss account						
Sales		1,000	1,050	1,103	1,158	1,216
Operating costs		(750)	(788)	(827)	(868)	(912)
Profit		250	263	276	289	304
Tax		(100)	(105)	(110)	(116)	(122)
Earnings		150	158	165	174	182

Balance sheet

Year	**0**	**1**	**2**	**3**	**4**	**5**
Balance sheet						
Fixed assets	1,000	1,060	1,123	1,189	1,259	1,332
Working capital	500	515	531	547	565	583
Total assets	1,500	1,575	1,654	1,736	1,823	1,914
Equity	1,500	1,575	1,654	1,736	1,823	1,914

Cash flow

Year	**0**	**1**	**2**	**3**	**4**	**5**
Cash flow						
Earnings		150	158	165	174	182
Depreciation		100	106	112	119	126
Cash flow from operations		250	264	278	293	308
Capital expenditure		(160)	(169)	(178)	(188)	(199)
Change in working capital		(15)	(16)	(17)	(17)	(18)
Dividend (=free cashflow)		(75)	(79)	(83)	(87)	(91)
Net cash flow		0	0	0	0	0

Now, suppose that we know what is an appropriate discount rate to apply to the dividend (free cash flow) stream that we expect to receive from our company. We can use the standard discounting formula to convert all the future cash flows into present values, as follows:

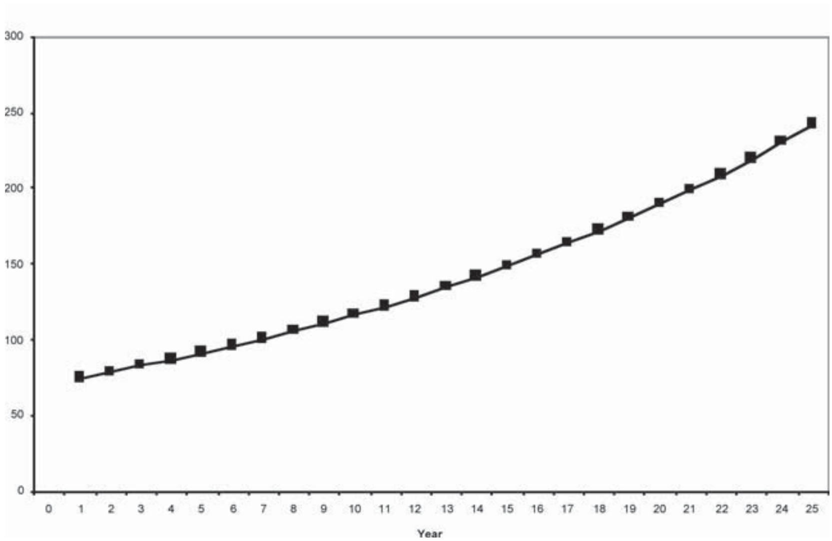
$$PV = CF_t \;/\; (1+k)^t$$

where PV is the present value of a cash flow in year t (CF_t) discounted at a cost of equity (k).

Companies are not generally expected to be wound up at any particular date in the future. So, unlike the situation with a bond, we are discounting a stream that continues to infinity. This is one of the particular problems of valuing equities, the other being that even the medium term cash flows are uncertain. So unless we want to use an infinitely large spreadsheet, somewhere we have to call a halt, and assume that from that point onward the company will grow at a constant speed. This could be negative, or zero, or positive, but is generally taken to be positive.

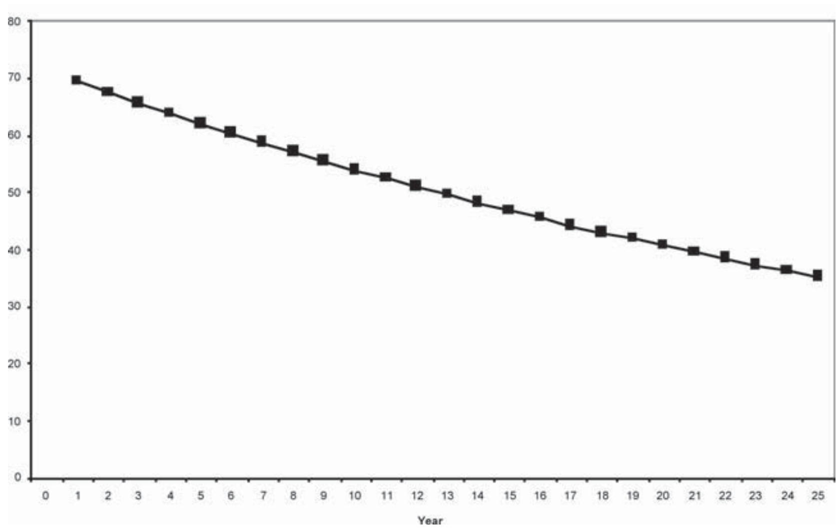
So how do we calculate a present value for a stream that is going to grow to infinity? Exhibit 1.2 illustrates the problem.

Exhibit 1.2: Nominal dividend projection



Our problem is that each of the forecast items is getting bigger. But there is solution. So long as our discount rate is larger than our growth rate, by the time that the stream of dividend has been discounted to present values, instead of expanding, it contracts. The same stream of dividend is illustrated in the form of present values in Exhibit 1.3.

Exhibit 1.3: Discounted dividend projection



So now all the projections are getting smaller, and as we add them up, they become progressively less significant to the answer. It is now intuitively plausible that there should be a simple formula that would tell us what the sum of all these present values tends towards, as the stream of dividends gets longer and longer, and there is indeed such a formula. It is known as the Gordon Growth model, and it is as follows:

```
V = D*(1+g)/(k-g)
```

where V is the value now, D is last year's dividend, g is the growth rate, and k is the discount rate. Clearly, it will only yield a sensible result if the discount rate is bigger than the growth rate (k>g). (A proof of the Gordon Growth model is provided in the Appendix.) As the Gordon Growth model is a general formula for valuing perpetuities with a flat compound rate of growth, it applies equally whether we are valuing a stream of dividend or a stream of cash flow from operations.

So that is all that we need to do to value a company, then. We project our financial items for a few years, and then assume a constant growth rate at a sensible level, and convert our stream of dividends after the final explicit forecast into a so-called terminal value. If we add together the present value of the next few dividends and the present value of the terminal value (because it is a value at the end of the forecast period, and we want to bring it back to today's date), then we get the value, now, of the equity in the company. And that is it.

Exhibit 1.4 shows a valuation of Simple Co., which pays dividends that rise from 5.0 to 9.0 over the next five years (clearly not a constant compound rate) and then grow at 5 per cent compound from a base level of 10.0 in year 6. Because year 6 is being used as a base to value all the dividends that include and follow it, it is often referred to as the 'terminus'. Along with the discount rate of 10 per cent, if we apply the Gordon Growth model to it we arrive at a future value of the terminal value of 200.0. That is to say that a share in Simple Co. will be worth 200.0 in five years' time. We want a value now. So we need five factors by which to discount the individual dividends and the terminal value. The standard formula for discounting a value is:

$$PV = FV / (1+k)^n$$

where PV=present value, FV=future value, k=discount rate and n=number of years.

Notice that the terminus is discounted for 5 years, not 6. This is despite the fact that it is based on a year six dividend. The reason is that the Gordon Growth model has as its first term the cash item that you expect to receive in one year's time. So a stream which begins in year six is capitalised as a value in year five, and we then have to bring it back to now by discounting it back another five years.

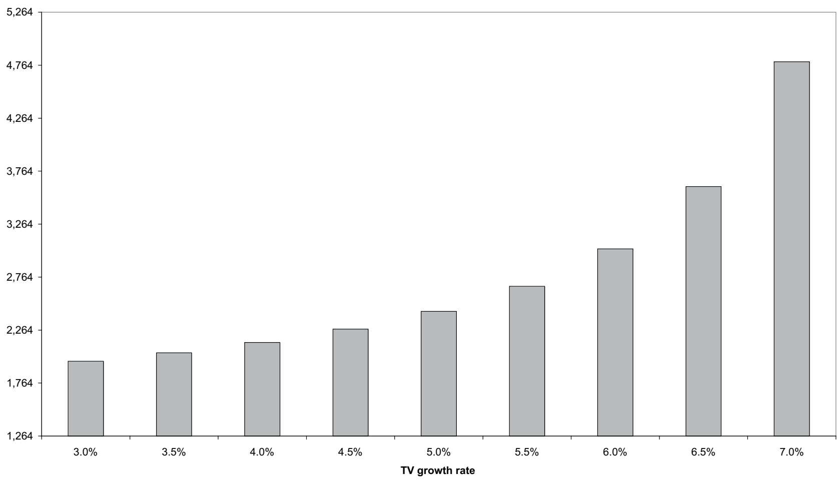
Exhibit 1.4: Simple Co dividend discount model

Simple Co. **Year**	**1**	**2**	**3**	**4**	**5**	**Terminus**
Discount rate	10%					
Growth in terminus	5%					
Dividend	5.0	6.0	7.0	8.0	9.0	10.0
Discount factor	0.9091	0.8264	0.7513	0.6830	0.6209	0.6209
FV terminal value						200.0
Discounted dividend	4.5	5.0	5.3	5.5	5.6	124.2
Value per share	150.0					

Sadly, for the vast majority of valuation models currently in use in banks, investment institutions and companies, that is indeed it. Of course they are adjusted to permit companies to be financed both with debt and with equity (a point to which we shall return later) and they accommodate accounts which include goodwill, provisions and other items (often badly – that is another point to which we shall return). But in principle, this is how most of them work, and it is dangerously simplistic.

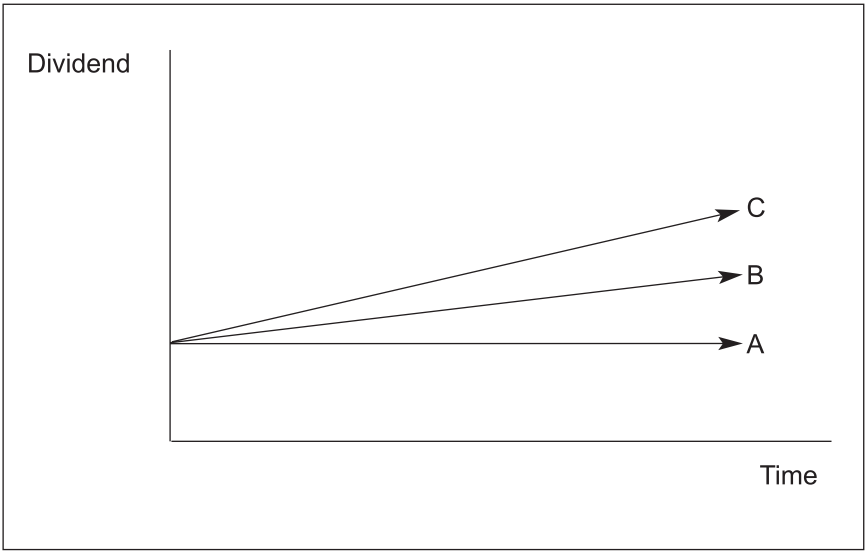
Let us return to Constant company and change the rate of growth in the terminal value calculation. The resulting effect on value is illustrated in Exhibit 1.5.

Exhibit 1.5: Value versus growth



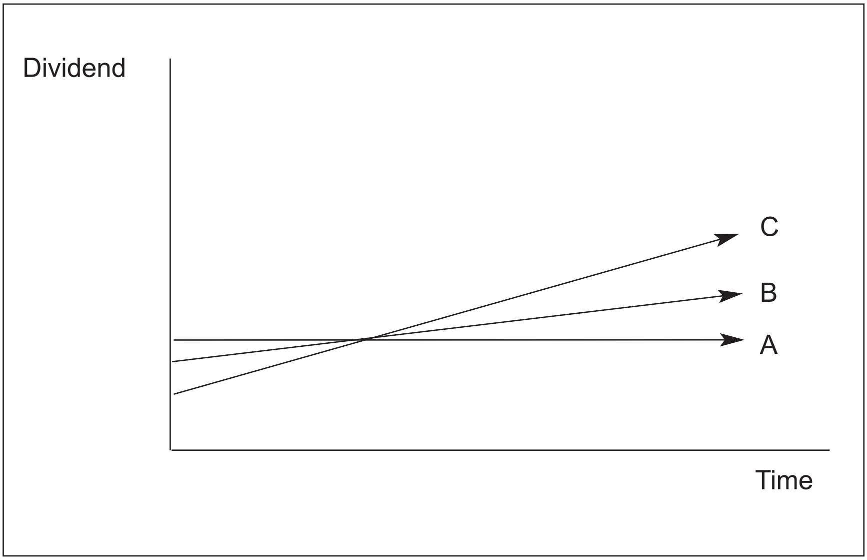
Well, that is impressive! Tiny changes in growth rate are having an increasingly enormous effect on our value. (The first 1,264 of value is coming from the 25 years of forecast dividend, so the columns are illustrating merely the impact of changes in the assumed growth rate after 25 years!) But is this realistic? To answer the question, let us think back to the components of the Gordon Growth model: dividend, growth rate, and discount rate. What we are doing is changing the growth rate and leaving the other two unchanged. Is this plausible? Can we grow at different speeds and still distribute exactly the same amount of dividend? Surely not. If we want to grow faster then we need to retain more of our profits within the company, and reinvest them to grow the business. An extreme case is what happens if we distribute all of our profit, and do not grow at all. So what our first calculation did was to assume that the choices look like those in Exhibit 1.6. It assumed that we are free to imagine that the same company could plausibly grow at different growth rates without any change to the amount of its profit that it ploughs back into the business, which is ridiculous.

Exhibit 1.6: Possible cash flows (1)



But the reality is that if a company wants to grow faster, it has to reinvest more of its profits. And if it chooses to pay out more of its profit, then the trade-off will be slower growth. So the real choices confronting investors actually look more like the streams of dividend illustrated in Exhibit 1.7.

Exhibit 1.7: Possible cash flows (2)



So, there is a trade-off. We can have more cash distributed to us now, but accept that the stream will grow more slowly, or we can take less out of the company now, let it reinvest more, and enjoy a higher rate of growth in our income. What sets the terms of the trade-off? The return that we make on the incremental equity that we are reinvesting.

There is a formula for this (with, again, a proof in the Appendix). This is it:

```
g = b*R
```

where g is growth, b is the proportion of profits that are reinvested in the business, and R is the return that we make on the new equity.

Notice, incidentally, that the return that we make on new equity does not have to be the same as the return that we are making on existing equity. Suppose that we had a wonderful niche business making fantastic returns, luxury shops on ideal sites, for example. It might be that they could continue to produce a very high return for us, on the existing investments. But if we were to invest some of the profits in new sites, perhaps less good ones, then our returns on new equity would be below that on the existing equity. It is the return on the incremental equity that generates the incremental profit.

Usually, we think about this relationship the other way round. Rather than setting the retention ratio and the return, it often makes more sense to set the growth rate and the return, and let the retention ratio be a result. Then:

```
b = g/R
```

The proportion of our profit that we pay out, which is the first item in the stream of cash that we are trying to discount, is (1-b) so our dividend in any one year will be:

```
D = Y*(1-g/R)
```

where Y is earnings.

Substituting this into the Gordon Growth model gives:

```
V = Y*(1-g/R)/(k-g)
```

where Y is earnings, G is growth, R is return on incremental equity, k is the discount rate and g is the growth rate.

Now we have a formula which will value for us streams of cash that look like our more realistic example, in Exhibit 1.7. This begs an important question. What happens to our value if we assume that a company has a choice between different levels of reinvestment, and subsequently, of growth?

Let us take a concrete example. Exhibit 1.8 shows a table of resulting values per share based on a set of input assumptions, and then for what happens as we alter either the growth rate or the return on incremental equity. For the base case we shall use a return on equity of 10 per cent, a growth rate of 5 per cent, and a discount rate of 8 per cent. Then we shall flex the input assumptions for the performance of the company. Let us look at the extremes first. If the company pays out all of its profits, and does not grow, then the return on incremental equity is irrelevant because there is not any. The value will simply be earnings divided by the discount rate. Now, suppose that the company earns exactly the same return on new investments as the rate at which the market discounts them. Clearly, they can have no impact on its value, and the growth rate becomes irrelevant. New investments, and the earnings growth that results, only matters if the return that the company makes on them is above or below its cost of equity. Growth can be bad. Look at what happens if we push up the growth rate with $R<k$!

Exhibit 1.8: Company valuation sensitivities

Profit	100
ROE	10.0%
g	5.0%
k	8.0%
Value	**1,667**

		Growth rate				
		4.0%	4.5%	5.0%	5.5%	6.0%
ROE	11.0%	1,591	1,688	1,818	2,000	2,273
	10.0%	1,500	1,571	1,667	1,800	2,000
	9.0%	1,389	1,429	1,481	1,556	1,667
	8.0%	1,250	1,250	1,250	1,250	1,250
	7.0%	1,071	1,020	952	857	714

There are real examples of companies that have driven their share prices down to the point at which they are worth less than they would be if management promised never, ever, to make another incremental investment. Generally, they get taken over in the end. In these days of shareholder activism an alternative is the removal of the management by a group of institutional shareholders.

Let us take some time to review what we have discussed so far in this chapter. Of course the examples have been kept simple. We are looking at constant growth companies, with stable returns on incremental investment. We have kept debt out of the picture. Both of these assumptions can be relaxed. We shall do that in later sections of this book. But what we have already done makes it absolutely clear that it is impossible to value a company without taking views on profitability.

Think again about our simple extrapolation exercise from Exhibit 1.6. Knowing what we do now, we can see that there must have been an implicit assumption about returns on equity for each rate of growth. If a company can grow faster while paying out the same amount of dividend and reinvesting the same amount of equity, then it must be making higher and higher returns on the incremental equity. As a small exercise, look at Exhibit 1.9. Ask yourself, is it investing too much or too little to produce an assumed growth rate of 5 per cent?

Exhibit 1.9: Growth question

Profit	–	100
Depreciation	–	50
Cash flow	–	**150**
Capital expenditure	–	(60)
New working capital	–	(10)
Free cash flow	–	**80**

This company has profit of 100. It is reinvesting 20 per cent of its profit and growing at a rate of 5 per cent annually. So its return on incremental equity must be 25 per cent! And the faster the assumed rate of growth, the higher the assumed return must be. No wonder Exhibit 1.5 gave us such exciting valuations as we began to increase the assumed growth rate.

The conclusion is that you cannot have a pure cash flow model that does not (at least implicitly) make assumptions about profitability. Implicit assumptions are dangerous. Much better to make them explicit. But where, in the real world, are they going to come from? Clearly, they are likely to be heavily influenced by the company's real historical experiences, and those of its competitors, as represented in their reports and accounts. Which, in turn, means that the numbers in companies' financial statements do matter a lot.

Having committed the heresy of arguing that discounted cash flow models are ultimately dependent on accounts for their assumptions, we shall now go one step further, and argue that valuation should include lots of items that do not reflect cash flow at all, and should exclude lots of items that are real, measurable, cash flow into the company. Put like that it may sound complicated, so let us make it very clear. Accruals matter.

3. Cash, accruals and profits

Imagine a property company which earned a 5 per cent annual rental yield on the market value of its property. In addition, the market value of its existing property portfolio goes up by 5 per cent every year. Meanwhile, its administrative and financing costs also represent 5 per cent of the market value of its portfolio each year.

This is a very simple company to understand. It has zero free cash flow prior to new investments in new properties, and to the extent that it does grow its cash flow is negative. Its value goes up each year to the extent of its new investments, and because of the 5 per cent increase in value of the opening property portfolio.

Now imagine trying to build a discounted cash flow of the company. So long as it was growing, it would have negative cash flow. Once it stopped growing it would have zero cash flow. But the value of its portfolio would be rising at 5 per cent compound, without any new investment. At any stage, it would be possible to turn this accrual into cash. Just liquidate the portfolio and realise the value. What we want is an approach to valuation that recognises the fact that the company has added 5 per cent to the value of its opening portfolio, without this having to be reflected in its cash flows.

What we have in our property company is two forms of accretion of value. The first is a realised cash stream of rental payments. The second is an unrealised increase in property values. To be set against these are the administrative and financing costs, both of which are again streams of actual cash.

Now let us take a different example. Suppose that we were analysing a power generation company, all of whose plants are nuclear. These might be expected to generate substantial amounts of cash flow most of the time, since the operating cost of a nuclear plant is low. But its decommissioning costs are not. So the accounts of the nuclear power generator may be characterised by a profit that is net of a very large provision for the eventual decommissioning of its plant.

This is the opposite of our property company. Discounting a stream of cash flows growing to infinity on the basis of this company's accounts would give a ridiculously high value to the company, because it would implicitly assume that its power stations would never be decommissioned. So could we solve the problem by taking the provisions that it has built up in its balance sheet and subtracting them from our valuation, as if they were debt? No, because this would only deal with the cost associated with the decommissioning of this generation of power stations. What about the ones that they will build to replace these? After all, we are extrapolating the sales to infinity, so we should also be extrapolating these large, highly irregular, costs to infinity.

This is going to create pretty odd looking discounted cash flow models. In some cases we are going to find ourselves adding into our definition of 'cash flow' things that are not cash items at all, namely, unrealised benefits. Then, in other cases, we are going to subtract from our cash flows items that are also not cash items at all, namely, provisions that represent a real cost to the company.

Note: Now, there is no reason at all why companies cannot be modelled using the framework of a DCF, so long as such adjustments are made. In effect, we exclude cash flow that does not belong to us, and we add back accrued benefits that we have not realised but could in principle have realised.

4. The Economic Profit model

This is an appropriate point at which to introduce the main alternative to DCF: the economic profit model. Just as DCF can be applied either to equity (dividend discounting) or to capital (firm free cash flows), so the economic profit model can be applied either to equity (residual income) or to capital (often referred to as EVA™).

Instead of thinking about value as being created by a stream of future cash flows, the economic profit model thinks of value as being a balance sheet item (what we spent on the asset) plus or minus a correction for the fact that it earned more or less for us than we expected it to. We shall show you below that the two approaches yield the same result, whether we stick to our simple equity-only constant growth company, or move on to something that looks more like the real world. But the attraction of economic profit models is that because they start with balance sheets and profit they naturally accommodate accruals as having an impact on the valuation. If the value is struck using profits that are net of a deduction for (say) decommissioning costs, then there is no risk of the valuer forgetting the adjust for the accrual, as he or she might in the case of the DCF approach discussed above. That said, as we shall see in later chapters, we shall often want to include some accruals and exclude others, so the reality is that whichever valuation is used, thought and care have to go into the process of defining either what constitutes free cash flow or what consititutes profit.

Instead of expressing the Gordon Growth model in terms of income, let us instead express it in terms of shareholders' equity.

```
V = D/(k-g)
```

was where we started.

```
D = B*R*(1-b)
```

where B is book value (shareholders' equity), R is return on equity and b is retention ratio, so the Gordon Growth model can be rewritten as:

```
V = B*R*(1-b)/(k-g)
```

Since, as we have seen, G = b*R,

```
V = B*(R-g)/(k-g)
```

Exhibit 1.10 shows what happens to the Price/Book value of the company as we alter the assumptions for growth rate and the return on equity, and it is similar to the earlier table calculated using the income-based formula. The same comments naturally apply about the relationships between profitability, growth and value. Why are the answers only the same for the row in which return on equity equals 10 per cent? Because in Exhibit 1.9 above, we had 1,000 of installed capital earning a 10 per cent return to give a profit of 100, and we flexed the assumed returns on new capital. Here we are assuming that both new and old capital earn the same return. The distinction is crucial (though often ignored in valuation models) and we shall return to it in Chapter five.

Exhibit 1.10: Price/book sensitivities

ROE	10.0%
g	5.0%
k	8.0%
Value	**1.67**

		Growth rate				
		4.0%	4.5%	5.0%	5.5%	6.0%
ROE	11.0%	1.75	1.86	2.00	2.20	2.50
	10.0%	1.50	1.57	1.67	1.80	2.00
	9.0%	1.25	1.29	1.33	1.40	1.50
	8.0%	1.00	1.00	1.00	1.00	1.00
	7.0%	0.75	0.71	0.67	0.60	0.50

An insight into this version of valuation can be gleaned by what happens if we set growth at zero. Then the ratio of value to book is simply the ratio of return on equity to cost of equity. So, if we always make a return on equity of 8 per cent and we discount at 8 per cent we shall always be worth our book value. If we make a return of 10 per cent with a discount rate of 8 per cent and do not grow, then our Price/Book value would be 10/8=1.25. Now look at the circled value in the table for a 10 per cent ROE and a 5 per cent growth rate. The fair value Price/Book ratio is 1.67. This implies that the value that is added by the ability to make new investments which grow the company at 5 per cent annually justifies the difference between a Price/Book ratio of 1.25 and a Price/Book ratio of 1.67.

We shall use both valuation methodologies in the examples given later in this book, but will have to be slightly more sophisticated in separating out the returns achieved by old capital and the returns expected from incremental capital, when we turn to real company examples. The point to grasp here is that there is fundamentally no difference between valuing a company in terms of a stream of dividend income or in terms of a series of earnings and book values.

5. The real world of specific forecasts

Of course, most companies do not conform to the assumption of constant growth. In practice, we are not going to be able to forecast specific numbers to infinity, so what ends up happening is a hybrid of specific forecasts and a so-called terminal value: the future value of the business at the point at which we give up with the specific forecasts and assume that the company becomes a constant growth company. This is conventionally taken to be when it is mature and at a mid-cycle level of margins and profitability.

We have claimed, but not shown, that our two methodologies will handle a stream of cash flows, or returns, that are different from one another every year. The discounted stream of cash flow to equity can be written as follows:

$$V = \sum D_t/(1+k)^t$$

where $\sum$ represents the sum of series from time t=0 to t=∞. The alternative valuation can be written as:

$$V = B_0 + \sum X_t/(1+k)^t$$

where B_0 is the book value now and X_t is the residual income that the company is expected to earn in year t. X can be written as:

$$X_t = Y_t - B_{t-1} * k$$

which is to say that residual income is earnings (Y) minus a charge for the equity that we were employing in the business at the start of the year.

The challenge is to demonstrate that the two measures of value, the discounted stream of dividend and the opening book value plus the discounted stream of residual income, will always provide the same value, and we provide a proof of this in the Appendix. Intuitively, the connection is that a dividend in any year can be expressed as the earnings achieved minus the growth in book value during the year. Discounting dividends ascribes value to the dividend. Discounting residual income ascribes value to the earnings but then increases the future charges for equity for the extra equity ploughed back into the business. The two must equate to one another.

So it makes no difference whether we discount a stream of cash flow to equity in the form of a conventional dividend discount model, or whether we discount a stream of residual income (the difference between profit and a charge for equity) and then add it to the opening balance sheet equity.

One advantage of the latter is that there is no presumption, if one is thinking in terms of profits rather than dividends, that there is any particular cash flow attached to the calculation. Accrued benefits or charges are intuitively fine within the residual income framework. This is less true for discounted dividend or discounted cash flow models, since it seems highly counter-intuitive to start with a stream of cash and then to deduct part of it and add on unrealised gains to get to a reasonable valuation. But that is what you have to do if the model is to produce a reasonable valuation. This is why many academics prefer residual income-type models.

6. Introducing debt

We started with a constant growth company which was only financed by equity, and discovered that even that could only be properly analysed with reference to accounting entities such as profits and balance sheets. We then made matters worse by accepting that whatever the form of our model, it would to have to take account of accruals. We then generalised it to relax the constant growth assumption, which made no difference to anything, except that it is not practicable to forecast individual years to infinity. But however far forward we project individual years, that represents no methodological problem, just a practical one.

Now we are going to relax the assumption of no debt (or cash) in the balance sheet. Intuitively, it should make no difference whether we discount cash flows to capital at a cost of capital or cash flows to equity at a cost of equity. Again, we leave the proof to the Appendix, but the point is that:

$$V_E = V_F - V_D$$

where the three values stand for equity, the total firm, and debt, respectively. What we need to know is that it makes no difference whether we value equity directly as:

$$V_E = D*(1+g)/(k-g)$$

or as:

$$V_E = FCF*(1+g)/(WACC-g)-V_D$$

where FCF is last year's free cash flow, and WACC is the weighted average cost of capital.

Free cash flow is calculated as being after a notional taxation rate, which is levied on operating profit, to derive a so-called Net Operating Profit After Taxation (NOPAT). Exhibit 1.11 shows the calculation of NOPAT and free cash flow for a constant growth company partially financed by debt. The same value will be derived, if the calculation is done correctly, whether the company is valued by discounting its free cash flows at the weighted average cost of capital and deducting the value of the debt, or whether its free cash flows to equity are discounted at a cost of equity (as we have done up to this point). (The relationship between the two discount rates will have to await the next chapter. Here it must be taken as read.)

Exhibit 1.11: NOPAT and free cash flow

EBIT	100	
- Notional tax @ 40%	(40)	
= NOPAT	**60**	
+ Depreciation	50	Net Investment
- Capital expenditure	(60)	
- New working capital	(10)	
= Free cash flow	**40**	

There are two important points to note in this calculation. The first is that the taxation charge is a notional one, so that the free cash flows are calculated on the presumption that the company is fully equity financed. The cash flows are unleveraged. The second point is that the net of the three items, depreciation, capital expenditure and change in working capital, represents net investment. They are the proportion of NOPAT that is ploughed back into the business and the free cash flow is that which is paid out. For a really unleveraged company, NOPAT equals earnings and free cash flow equals dividend, which is what we assumed in our simplified discussions above.

So we now have four possible ways of valuing a company: using cash flow to equity (dividend discounting); cash flow to capital (DCF); using economic profit to equity (residual income) or economic profit to capital (EVA™). Just as equity can be valued either by discounting free cash or by adjusting its book value for its economic profit, so can capital. And they all give us the same answer, but they all depend on accounts for the forecasts, They must all be adjusted to take account of accruals. It is absolutely not true that discounting cash flows releases us from either obligation.

To spell this out, the only non-cash charge that is not included in the numerator of our valuation model is depreciation of tangible assets or amortisation of intangible ones. In a DCF model, cash flow is NOPAT (including accruals) less net investment (capital expenditure and change in working capital minus depreciation and amortisation). In an economic profit model, NOPAT again includes accruals. Capital, from which the charge for capital is derived, grows with capital expenditure and change in working capital and is reduced by depreciation. So all non-cash items other than depreciation should be reflected in the stream of cash flow, or profit, that is being discounted, or they will end up being ignored. The only difference between the two models is that in a DCF depreciation is a source of cash, and in an economic profit model it reduces future capital charges.

Chapter Two

WACC – Forty years on

Introduction to CAPM

1. What do risk and return mean in the financial sense?
2. How do investors trade them off against one another?
3. Are assets assessed individually, or as parts of portfolios, and why does this matter?
4. How can we quantify the appropriate discount rate to apply to the cash flows of an asset?
5. Companies are financed by a combination of debt and equity, so how does shifting the balance between them affect the discount rate that an efficient market will apply to its cash flows?

Miller and Modigliani addressed the fifth question. The answers to the first four questions lead us to the Capital Asset Pricing Model (CAPM). The development of this branch of investment theory is associated with, among others, Markowitz, Sharpe and Lintner.

1. Risk and Return

Exhibit 2.1 describes the risk and return characteristics of three different assets: a government bond, a share in a large company, and a receipt for a bet placed on a horse-race. That the three assets represent risk-taking of increasing proportions is not hard to understand. What may be less clear is why the return promised by the third asset is negative, and not positive.

In financial terms, return is the mean (arithmetic average) expected return to be derived from an asset, taking into account all of the possible outcomes and weighting them by their probabilities. It is possible that a bet on an outsider to win will generate a high return to the gambler, but it is improbable. Bookies make money by setting the odds so that they are highly likely to pay out less in prizes than they take in stakes. In other terms, the expected return on a bet on a horse is negative, as will be familiar to most who have enjoyed an afternoon at the races.

Exhibit 2.1: Risks and returns

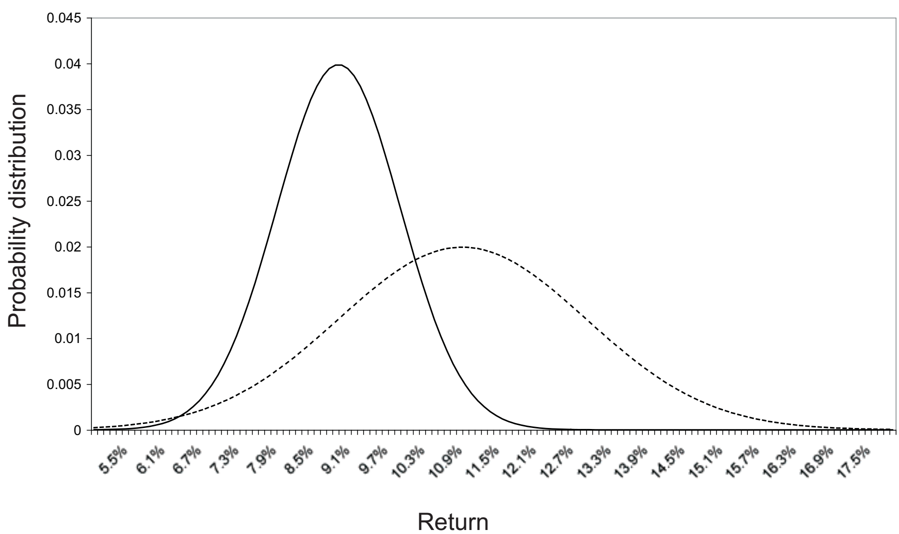
The Third Item is NOT Recommended

• Government Bond	• Low return, low risk
• Large Cap Equity	• Medium return, medium risk
• 2.20 at Kempton Park	• ***Negative*** return, high risk

If by return we imply the mean expected return from holding the asset, how can we quantify risk? It is generally taken to be defined in terms of the dispersion of the range of possible outcomes. If the outcome is known, or known within a very narrow range, then the investment is low risk. If the outcome is highly uncertain, then this means that the investment is high risk. The probability distribution of all the possible outcomes from two investments are illustrated in Exhibit 2.2.

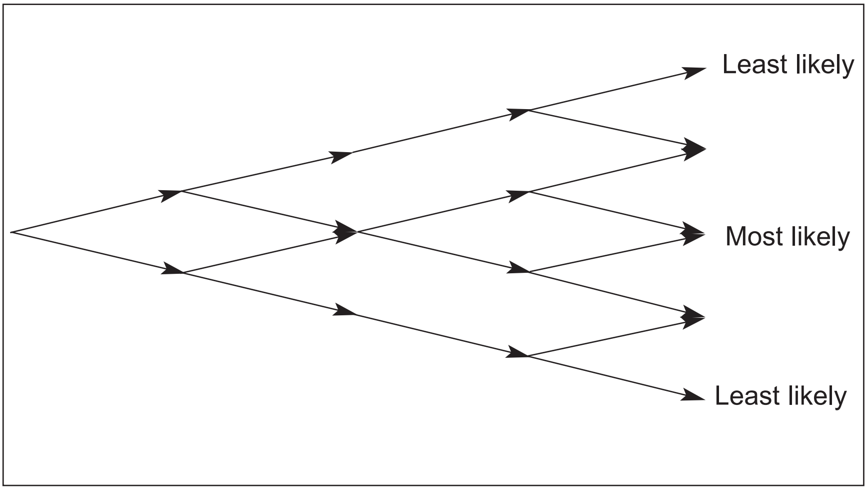
The continuous curve illustrates all of the possible outcomes for an investment with a mean expected return of 9 per cent, with a standard deviation (measure of dispersion of outcomes) of 1 per cent, and the dotted curve illustrates all the possible outcomes for an investment with a mean expected outcome of 11 per cent and a standard deviation of 2 per cent.

Exhibit 2.2: Probability distributions of returns



The curves have been drawn assuming that the appropriate probability distribution for the two assets is normal (a bell-shaped curve). This cannot necessarily be assumed to be the case. It is certainly not the case for the bet at the horse race, for which there are only two outcomes: a small probability of a high return if the horse wins, or a high probability of the loss of the stake (100 per cent return) if the horse does not win. The assumption that expected returns are normally distributed holds good for assets in which the returns are composed of compounding small positive or negative increments over a long series of periods, in each of which the probability of a gain or a loss is 50 per cent. This is a reasonable model of what happens to share prices. They tend to rise and fall in small incremental movements, following a so-called random walk, which compound over time to generate annual returns. This pattern through time is illustrated in Exhibit 2.3, in which the extent of the up and down movements is a function of the volatility of the share (measured by standard deviation), and the probability attaching to the possible final outcomes is clearly greater in the centre of the distribution and lower at the extremes. As the number of periods approaches infinity, the resulting distribution gets closer and closer to a normal distribution.

Exhibit 2.3: Binomial share price progression



2. Diversification and portfolio effects

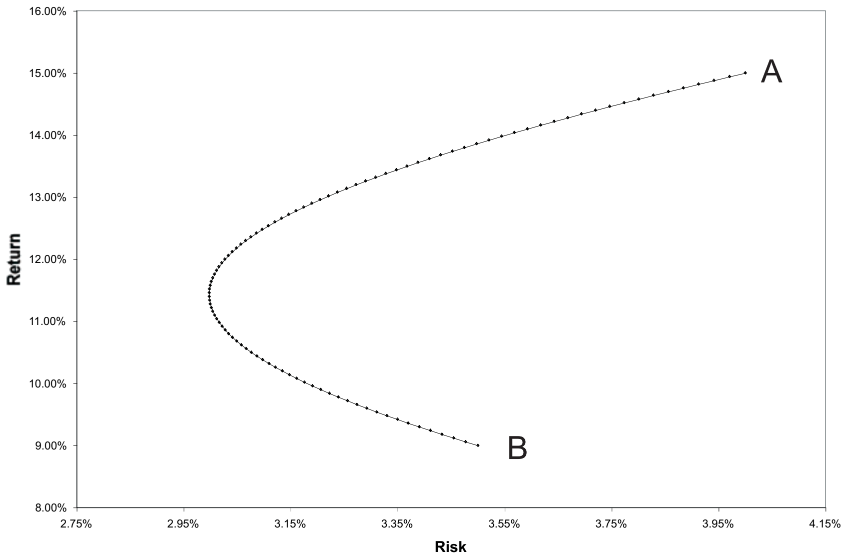
The bedrock of modern portfolio theory is that investors do not look at investments in isolation from one another. They think in terms of the risk and return characteristics of their overall asset portfolio. So far, we have assumed that we are examining a single investment in isolation. But investors do not hold only one asset in their portfolios. Private individuals, for instance, would typically own a house, some valuable personal effects, cash, be the beneficiaries of assets held on their behalf in a pension scheme, have taken out a life insurance policy, and possibly own equities, either directly or more commonly in pooled funds such as unit trusts or investment trusts.

Imagine owning shares in just two companies: British Airways and British Petroleum. There are clearly a large number of factors that could increase or decrease the value of either share, but one item that they have in common is a very strong dependence on oil prices. An overall increase in the price of oil is good news for BP, as this will increase its revenues, but it is bad news for British Airways, as it will increase its costs. (Aviation kerosene represents one of the larger operating costs for any airline.)

This implies two things. It implies that an investor who holds an appropriate combination of BP and British Airways in his, or her, portfolio need not worry about movements in the oil price. And it implies that the share prices of BP and British Airways will tend to move in opposite directions if there is a sharp change in the oil price. In this context, the oil price is known as a diversifiable risk, since holding more than one share allows it to be diversified away. The fact that the two shares will not always move together implies, in statistical terms, that they have a correlation of less than 1. Correlation can range from 1, for assets that move together systematically, to -1, for assets that move against one another systematically (as BP and British Airways might, if the oil price was the only factor to change the value of their shares).

Exhibit 2.4 shows the range of possible portfolios that it is possible to create by holding a combination of two assets, A and B, where A has an expected return of 15 per cent with a standard deviation of 4 per cent, and B has an expected return of 9 per cent and a standard deviation of 3.5 per cent. If the expected returns to the two shares were perfectly correlated then the range of possible portfolios would be described by a straight line drawn from A to B.

Exhibit 2.4: Two stock portfolio



But this is not realistic because returns on shares are not perfectly correlated with one another, as we saw in our discussion of BP and British Airways. There are times when they will move independently of one another, or even systematically in opposite directions. The curve representing possible investment portfolios constructed from the two shares in Exhibit 2.4 is drawn using the assumption that there is a fairly low correlation of 0.3 between the expected returns offered by the two shares. The combination of shares that offers the lowest risk, with a standard deviation of about 3 per cent, is less risky than either of the two shares held in isolation, and offers a return of about 11.5 per cent, which is some 2.5 per cent higher than the return offered by the lower risk share, B, held in isolation (though less high than the 15 per cent return offered by A held in isolation). We shall not provide the derivation of the formula for the standard deviation of a two-stock portfolio in this book (we refer the reader to any standard statistics textbook), but it is the simplest case of the 'variance/covariance' model and is as follows:

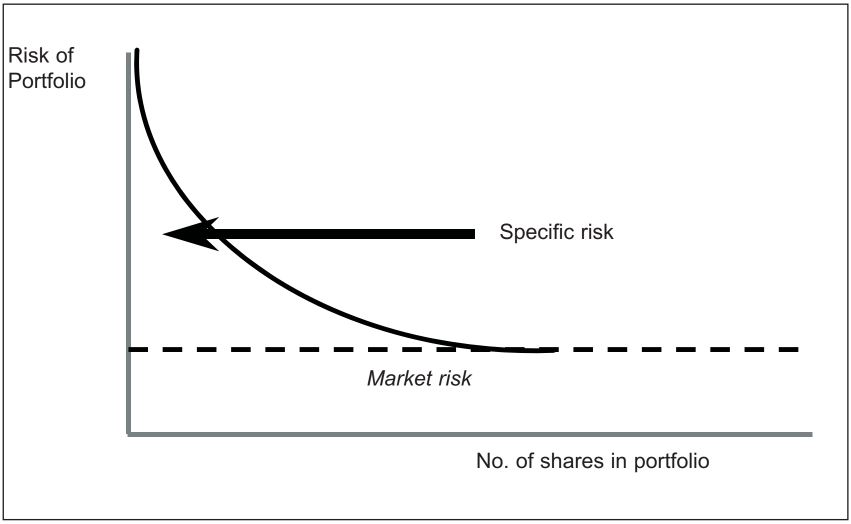
$$SD_{AB}=(W_A{}^2*SD_A{}^2+W_B{}^2*SD_B{}^2+2*W_A*W_B*SD_A*SD_B*R_{AB})^{0.5}$$

there are obviously more than two possible choices of asset to put into a portfolio, even if we restrict our analysis to equities only. For any group of shares, changing their weightings within the portfolio will result in the creation of an envelope of possible balances of risk and return. Evidently, an efficient portfolio is one that extends as far to the top and left (high return and low risk) of the chart as possible.

This was the point that Markowitz reached in his analysis. Its extension into the full CAPM model came later, with the work of, among others, Sharpe and Lintner.

CAPM's starting point was that as we increase the number of shares in the portfolio, its volatility declines until it reaches an irreducible minimum: the volatility of the equity market portfolio as a whole. Exhibit 2.5 illustrates what happens to the risk of a portfolio as more stocks are added to it. As specific risks are diversified away the investor is left only with un-diversifiable risk, which is otherwise known as market risk or systematic risk.

Exhibit 2.5: Diversification and risk



2.1 CAPM and the market line

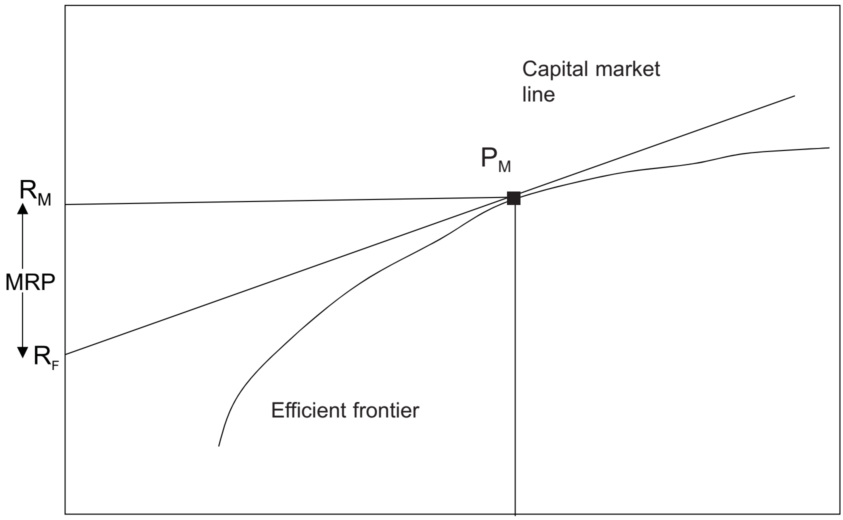
We noted above that an efficient portfolio would be well diversified. We could, however, construct a portfolio badly (filling it, for example with lots of house-builders, all of whom would boom and bust together with the oscillations of the house-building cycle). The range of portfolios open to investors thus includes an envelope of efficient ones, those in which the trade-off between risk and return is relatively favourable, and a much larger choice of inefficient ones, where the return could be improved upon for any acceptable degree of risk.

In Exhibit 2.6, the efficient frontier represents the risk-return characteristics of all of the available efficient portfolios. For any particular degree of risk there is no better available return than the one on the line. Above the line is unachievable.

Below the line is inefficient.

But in addition to assets that have risk attached to them there is also one asset that offers a risk-free return. This is a long-term government bond. The return is risk free because the risk of default is deemed to be negligible, and because the return is fixed, so long as the bond is held to redemption. Hence the position of the risk free asset on the chart. It offers a low return at no risk.

Exhibit 2.6: Capital market line



Since investors can hold a portfolio which comprises a combination of the risk-free asset and one portfolio, the one at the tangent of the efficient frontier and the capital line, it follows that they will always do this. Imagine an investor who held an equity portfolio on the efficient frontier to the left of the market portfolio. He could improve his returns at no additional risk by holding the appropriate mix of the risk free asset and the market portfolio, and would always benefit from doing this.

The extension of the capital market line to the right of the market portfolio is explained by the fact that investors can sell government bonds that they do not own (go short of the risk free asset) and buy more equities, thus increasing their risk and return through leverage.

The final stage in the argument is that the portfolio of choice must be the market portfolio. If it were not then presumably investors would shun the shares that made the portfolio sub-optimal and buy more of the shares that improved the portfolio's characteristics. As they did this they would force down the price of the former and drive up the price of the latter until they had eliminated the benefit that derived from selecting only certain stocks. In other words, in a perfect market the only optimal portfolio will be the market portfolio.

The CAPM theory results in a very simple formula for the required return on any individual asset. It is a function of three items: the risk free rate, the market risk premium, and the impact that the asset has on the risk of the investor's portfolio, known as its Beta (see below). Mathematically, the formula is:

$$K_E = R_F + MRP * Beta$$

2.2 Pausing for breath

By this point the argument may seem to be distinctly unreal, and it may be worth briefly reviewing the steps in our argument, highlighting a few of the assumptions, and discussing the realism of the conclusion, which is that rational investors will only hold combinations of two assets: the risk free asset and the market portfolio.

We began by defining return as mean expected return and risk as the standard deviation of expected returns. We went on to assume that risk was normally distributed, and then introduced the concept of correlation between expected returns and portfolio effects. This led us to the idea of an efficient frontier of investments. The fact that there is a risk free asset implied that a line (a tangent, in fact), could be drawn from a portfolio holding the risk free asset to a single portfolio on the efficient frontier implies that for all levels of risk, the relevant point on the line will offer the highest available return, so rational investors will all hold combinations of the risk free asset and one portfolio, which, in an efficient market, must be the market portfolio.

How realistic is all this and how reasonable are the assumptions? Defining return as mean expected return is probably uncontroversial, but defining risk in terms of volatility is not, nor is the assumption of risks being normally distributed. A commonsense approach would be to argue that it is the risk of company failure, of losing one's investment, that should weigh most heavily with investors, rather than the notional volatility of a portfolio over time. The cost of bankruptcy is ignored in CAPM, as it is effectively assumed that returns to assets are the product of a long succession of small incremental positive and negative movements during which investors can instantaneously adjust their portfolios with no transaction costs. One would therefore expect the model to be least successful at explaining the pricing of two types of assets: the capital of distressed companies, and assets which are highly illiquid, such as venture capital investments; or very large projects, where investors would find it impossible to diversify their portfolios effectively. This is exactly what we find in the real world. Pricing illiquidity is very difficult. Pricing default risk is easier, because option pricing techniques are applicable, and we revert to this approach later in this chapter.

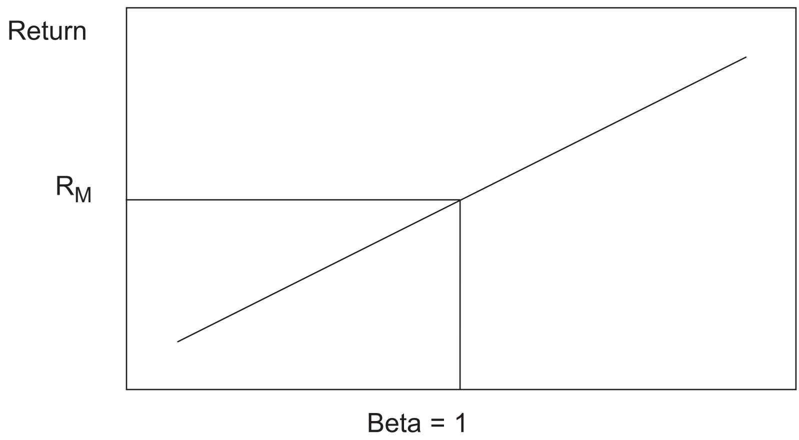
Finally, there is the question of time horizons. The CAPM assumes that investors all measure risk and return over the same period. If they do not, or if the period is not what economists have assumed it to be, all historical measures aiming to prove or disprove the theory are unsound. Time horizons also complicate the notion of the risk free rate and the market risk premium. The risk free rate is actually a yield curve, not a single number. And there is no reason why the market risk premium should be a stable premium applied to each year's cash flows.

2.3 What is a Beta?

The CAPM analysis above implies that the factors that drive asset prices may be divided between two categories: specific risk, which is diversifiable, and for which investors therefore do not demand a return, and market risk, which is un-diversifiable, and for which they do demand a return. It follows from this that, under this approach, investors will demand returns from assets not because of the uncertainty of the returns from the asset, but because of the contribution of the asset to the uncertainty of the returns that they will obtain from their entire portfolios. An asset that increases the volatility of the portfolio is a high risk asset, and one that reduces the volatility of the portfolio is a low risk asset. To understand the point, imagine a share in a company which was very volatile, but which was not driven by fluctuations in the economic cycle; an oil exploration and production company might be a good example. Although it is itself volatile, it will not contribute to the volatility of the overall portfolio, and might even reduce it in times of crisis in the oil market. If CAPM is correct, investors will not demand a high return for undertaking the specific risk, and will be content with a fairly average return since they are undertaking only fairly average systemic (or un-diversifiable) risk.

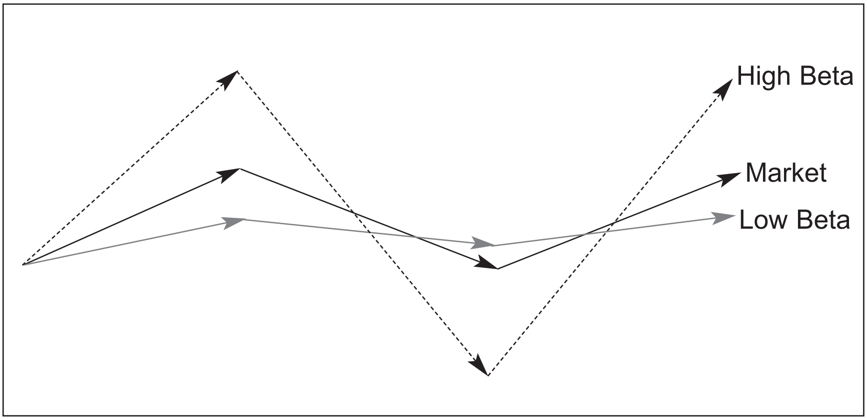
Reverting to Exhibit 2.6 for a moment, shares that have a high covariance with the equity market (that go up more than the market when it goes up and fall more than the market when it falls) will have the effect of increasing the volatility of the portfolio, as against the market portfolio. Increasing the weight of these shares would pull the investor's portfolio to the right of the market portfolio, and shifting the weight from these to shares with a lower covariance with the overall equity market would have the effect of pulling the overall portfolio to the left. Since we know that the two asset portfolio, represented by the risk free asset and the market portfolio, is optimal, it follows that the premium over the risk free rate that is required of any asset may be read straight off a line, the security market line, which related to its impact on the volatility of the overall portfolio. The security market line, which related required returns to covariance with the market portfolio, or Beta, is illustrated in Exhibit 2.7.

Exhibit 2.7: Security market line



Beta is defined in terms of covariance with the market. Stocks with a higher than average covariance with the market are high Beta, and stocks with a lower than average covariance with the market are low Beta. It is important to understand that CAPM does not imply that all that drives share prices is equity market movements. What CAPM does is to assume that shares are driven by market movements and by stock specific factors, but that it is only their exposure to the former that determines their risk as part of an investor portfolio. Exhibit 2.8 illustrates the point.

Exhibit 2.8: Beta as measure of covariance

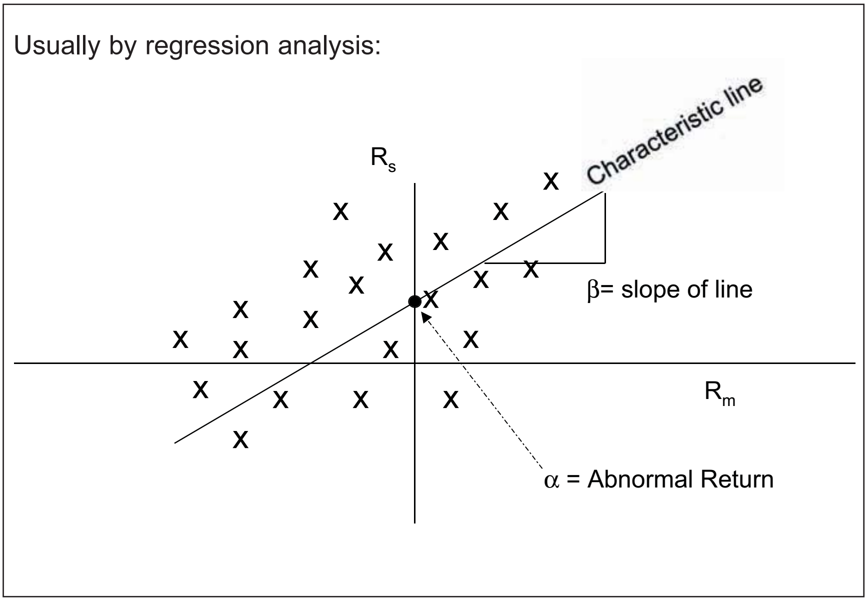


Examples of high Beta stocks are those where the company supplies one of the more volatile components of the overall economy, such as housebuilding, or those that are very sensitive to asset prices, such as life insurance companies. Examples of low Beta stocks are utilities, or food retailers. A point to which we shall return is the fact that the Beta of a share can be increased or decreased by the company financing itself with more or less debt.

Measuring Betas is normally done by a partial regression of the returns on the asset over a run of periods against returns on the overall equity market over the same periods. Exhibit 2.9 shows a plot of returns on a stock versus returns on a market over a series of periods, often, in practice, monthly returns over three or five years. The historical Beta of the stock is then estimated using the slope of the resulting line. There are clearly statistical problems with this. The correlation coefficients for individual companies are often very poor. And, in any case, the theory applies to expected Betas, not historical ones. In practice, Betas are generally calculated in this way, using databases such as those marketed by Bloomberg or DataStream.

There are two problems with standard calculations for Beta. The first is that they are backward looking, whereas it is prospective Betas that should drive discount rates. The second is that the statistical significance of many of the calculations is very poor. Finally, there is the usual problem with time-periods. Over what period should we be measuring Betas?

Exhibit 2.9: Estimating Betas

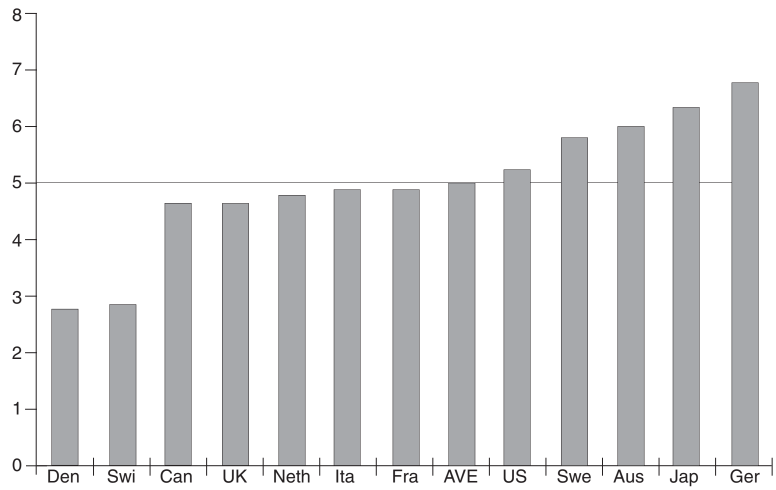


2.4 What is the Market Risk Premium?

Let us return again to Exhibit 2.6. An assumption that underlies it is that the market portfolio is expected to offer a higher return than a risk free asset. This is clearly sensible. While investors can diversify away all the specific risks to which equities are exposed, they cannot diversify away market risk, so they must be compensated for assuming it. Once we know what the price of market risk is, then we can draw the capital market line, and use it to read off the required return for any individual equity. But where do we get the market risk premium from?

As with Betas, one approach is to look at history. Data have been collected (in the UK in the form of the Equity-Gilt Study and more recently by the London Business School, in the USA by Ibbotson) that compare returns on different asset classes annually. There is a technical question that arises when doing this exercise. Should each year be treated as an individual entity, and the annual returns be arithmetically averaged, or should the whole period of decades be treated as a single entity, in which case the annual return derived will be a geometric average? We tend to the latter view, but would note that as with Betas the more crucial question is whether the expected future figures are the same as the actual historical ones.

Exhibit 2.10: 20th Century market risk premia



Source: ABN/LBS

Exhibit 2.10 shows estimates of measured historical annual returns from equities minus returns from holding long term government bonds, for a range of equity markets over the entire twentieth century. The average is about 5 per cent, implying that on average equities have offered returns of about 5 per cent more than bonds over this period.

An alternative approach is to try to calculate expected returns from the equity market by estimating future dividend growth. The formula of the expected return from the equity market, derived by a very simple rearrangement of the Gordon Growth model discussed in Chapter one, is as follows:

r = D*(1+g)/P + g

As at the end of 2003, the historical yield for the UK FT All Share index was 3.12 per cent. The prospective equivalent might be about 3.15 per cent. Long term nominal dividend growth could reasonably be estimated at about 4.5 per cent annually, implying a return from holding the UK equity market of 7.65 per cent. At the same date, the 10 year government bond had a redemption yield of 4.77 per cent. Subtracting this from the prospective return implies a market risk premium of 2.88 per cent. Given the inherent inaccuracy of the forecasts, about a 3 per cent market risk premium seems a reasonable assumption. Various attempts have been made to derive implicit projections of the market risk premium over historical periods, and the consensus seems to be that it has generally been in the range of 3 to 4 per cent, somewhat lower than the actual premium achieved during the 20th Century.

2.5 Comments on CAPM

The CAPM tends to be used fairly unquestioningly by practitioners in the financial market. This is partly because it seems to work reasonably well and partly because it is simple to apply. Where it clearly breaks down, as in illiquid venture capital investments, it is simply ignored.

There have been two main attempts to provide an alternative. The first, Arbitrage Pricing Theory (APT) replaces the assumption that there is one factor driving required returns to a share (its exposure to market risk) with a multifactor approach, which requires a multiple regression analysis to identify coefficients for the different factors, generally including market risk. This may provide better explanations for historical share prices, and even more accurate measurements of Betas, but it is very time-consuming, and there is no strong evidence that the approach has a better predictive value in assessing the cost of equity than a simple CAPM approach.

The second is based on statistical work originally produced by Fama and French, which showed that equity returns may be better explained with reference to Beta and two different variables, size and price/book value. The significance of the latter factor has been the subject of much controversy, but a benefit of this approach may be its emphasis on liquidity. Other analysis has suggested that adjusting a market cost of capital for size and financial leverage offers better explanations for historical returns than does CAPM. But as Betas and financial leverage are closely connected, the main benefit from this approach may be the same as that of Fama and French, namely adjustment for liquidity. In practice, equity analysts do one of two things. They either (and this is the majority) use the standard CAPM approach, or they may use discount rates in which a market cost of capital is adjusted for leverage and liquidity.

3. The problem of growth

The literature on discount rates is more than usually bifurcated between the simplistic and the almost incomprehensible. Part of the problem is that practitioners, and practical training, all depend on theory that was developed by Miller and Modigliani almost half a century ago, while more recent economic studies have been largely ignored by practitioners. In addition, whereas all of the valuation methodologies discussed above represent demonstrably consistent variants on the same basic formula (so that the choices become those of convenience, and the issues those of implementation) this is not true of discount rates. Different formulae really do imply different assumptions about the world, and will result in different valuations if applied to the same accounting inputs. So it is even more important that we understand them.

Miller and Modigliani are chiefly remembered for the related propositions that, assuming no taxation and no default risk, the value of a company is unaffected by its financial leverage (because investors can manage their own balance sheets to create whatever leverage they want) and by its payout ratio (because today's over-distribution will have to be recovered tomorrow).

What was really important about their work was the conclusions that it implied for the cost of equity, as leverage increased. Since the value of the business was unchanged by altering the leverage (a stream of $100 a year that had been worth $1,000 a year if discounted at 10 per cent was still worth $1,000) the effect on the cost of equity of any change in the given level of financial leverage could be computed readily. Exhibit 2.11 shows the annual cash flow, the discount rates, and the value, that attaches to the same assets, financed by different balances of financial leverage, with the debt, equity and capital valued separately.

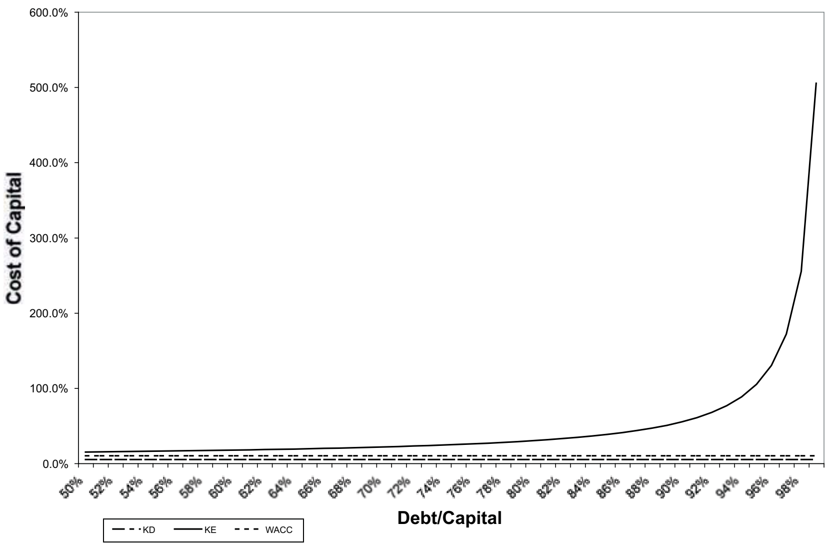
Exhibit 2.11: Capital value decomposition

WACC and its components – No growth

Source of capital	Annual receipt (CF)	Discount rate (k)	Capital value (V)	Note
Debt	25	5%	500	V=CF/k
Equity	75	15%	500	V=CF/k
Capital	100	10%	1,000	V=CF/k

If the value of the assets is unchanged by the shift in financing structure, then that is another way of saying that the weighted average cost of capital (WACC) does not change as the blend of debt and equity changes. Increasing the gearing has the effect of increasing the cost of a diminishing portion of equity and increasing the portion represented by low cost debt. The weighted average remains unchanged. Exhibit 2.12 shows a chart of the movements in the cost of equity, the cost of debt, and the weighted average cost of capital as the gearing increases.

Exhibit 2.12: Leverage and WACC



So far, so conventional. This is the point at which the textbooks move on to the talk about tax shelters and the cost of default risk. But let us stop here a moment and explore a point that often gets left out.

The valuations in Exhibit 2.13 are derived by dividing annual cash flow by the discount rate. \$100 a year discounted at 10 per cent is worth \$1,000. But what if the cash flows are growing? Well, we know how to value a growth perpetuity. So, just as an example, let us take the 50 per cent debt financed example from Exhibit 2.11, and assume that the company, instead of not growing, is going to grow at 3 per cent annually. We use the Gordon Growth model to value the cash flow streams independently, and then to value the company using a weighted average cost of capital.

Exhibit 2.13: Impact of growth on values

WACC and its components – 3% growth				
Source of capital	**Annual receipt (CF)**	**Discount rate (k)**	**Capital value (V)**	**Note**
Debt	25	5%	1,250	V=CF/(k-g)
Equity	75	15%	625	V=CF/(k-g)
Capital	100	10%	1,429	V=CF/(k-g)

What is happening here? We do not get consistent value at all. The sum of the parts is bigger than the whole, which is not what we want to see. The reason is that in dividing by 'k-g' the impact on values is not linear as we increase 'g'. It will have a disproportionately large impact when applied to smaller values of k. This is very unsatisfactory, and illustrates an equally important truth about the original Miller and Modigliani analysis to the fact that it was based on a tax-free and default-free world. It was also premised on a no-growth world. Techniques for building tax and default risk into the original framework have been known and used for years. But the significance of the impact of growth on valuation has not been similarly emphasised, which is very odd since its potential impact on valuations is far greater, and most valuation models do assume constant growth after a forecast period.

Our approach to the practical calculation of discount rates is therefore going to differ from that conventionally followed in text-books, since we shall take pains to think through the implications of all of our actions on growing, not merely on static, streams of cash.

> The customary practitioners' approach, unfortunately, is to use a theoretical structure that works perfectly in a static world, and then to misapply it to a growing one.

Unfortunately, the result is systematic overvaluation, of the sort illustrated in Exhibit 2.13.

So as we build tax shelters and default risk into our discount rates we must try to establish an approach that is robust when applied to growth companies. It must be said at this point that the authors claim no originality with respect to the analysis, except, perhaps, to the manner of presentation. The bibliography provides references in which all of the theory has been presented, but perhaps because of its complexity it has not yet entered commercial practice. That is what we aim to change.

4. Leverage and the cost of equity

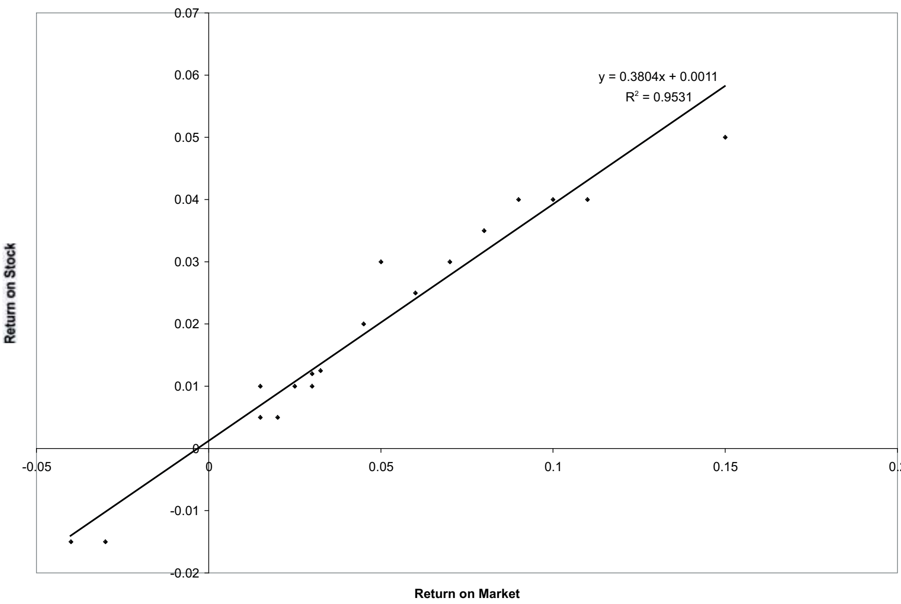
Let us return to Exhibit 2.12 for a moment. Because we are in a world with no default risk, the cost of debt does not change, and should be equivalent to a risk free interest rate. The redemption yield on a long term government bond is often used as a proxy. As the gearing changes, the cost of equity changes, so that the value of the company remains unchanged. The formula for the cost of equity under the standard Capital Asset Pricing Model (CAPM) is as follows:

$$K_E = R_F + (R_M - R_F) * B$$

where K_E is the cost of equity, R_M is the expected return on the overall equity market, R_F is the risk free rate, and B is the Beta of the share.

As we have seen, Beta is conventionally explained as a measure of covariance of returns on the share with returns on the equity market as a whole. The underlying assumption (with which we are not going to argue) is that investors hold equities as part of portfolios of assets. They are therefore unperturbed by the volatility of expected returns on individual assets. They only care about volatility of returns on the portfolio as a whole. Betas are typically measured by taking runs of historical data over specific periods (perhaps monthly data over 5 years) and measuring the slope of a line of best fit between returns on the share and returns on the market. An example is illustrated in Exhibit 2.14.

Exhibit 2.14: Calculation of equity Beta



In this instance, the Beta is 0.38, which is relatively low, and market returns explain 95 per cent of stock returns, which is high enough to be statistically persuasive. Real measurements are often not statistically significant.

In a perfectly efficient market, the intercept would be at zero. To the extent that there is a positive or negative intercept this is known as Alpha. Active portfolio managers seek positive Alpha shares. Unit tracking portfolios are built on the premise that Alphas are random and unpredictable. In this example, there is a negligible positive Alpha.

The main operational determinant to the Beta of a company's shares is the extent to which demand for its products is correlated with economic cycles. But there is also a direct link with financial structure. Even a very stable, non-cyclical business can be turned into a high Beta equity if it is largely funded by debt, as this will make the returns to the equity shareholder highly volatile. The basic formula that links Beta to leverage (if we ignore default risk) is the following:

$$B_L = B_A * (1 + V_D / V_E)$$

where B_L is the leveraged Beta, B_A is the unleveraged (or asset) Beta, V_D is the market value of debt, and V_E is the market value of equity.

Deleveraging measured, leveraged Betas into unleveraged Betas is done by using the equivalent formula:

$$B_A = B_L / (1 + V_D / V_E)$$

the easiest way to conceptualise this formula is to think about what happens if there is an equal weighting of debt and equity in the market value of a company. Then, the ratio V_D/V_E is equal to 100 per cent. Any change in the value of the overall assets will be magnified by a multiple of 2 when applied to the equity, as illustrated in Exhibit 2.15.

Exhibit 2.15: Leveraged assets

	Asset value	Debt	Equity
Opening	100	50	50
Closing	110	50	60
% change	10%	0%	20%

So we have a mechanism, in our risk free and untaxed world, for recalculating the impact of any level of gearing on the cost of equity. We just deleverage it to find the cost of equity to the underlying assets, and then releverage it back again.

5. Building in tax shelters

The simplest approach to a tax shelter is to see it as an addition to what the firm would be worth on an unleveraged basis. In other words, we value the company on the basis of its unleveraged cost of equity, and then add in a value for the cash that it conserves for its providers of capital, through paying less tax if it is leveraged than it it is unleveraged. This distortion arises because taxation is levied on profit after interest payments, so interest is deductible against corporation tax but dividend payments are not. In effect, what is happening is that three parties are sharing the operating profits generated: the bondholders, the government and the shareholders (in that order). If the providers of capital shift the balance from equity to debt, then their combined take increases at the expense of that of the government.

The conventional WACC/DCF approach is to handle tax shelters by alteration to the discount rate. This, it is argued, falls as leverage increases (because of the tax shelter), until the company becomes over-leveraged, and distress costs boom, at which point the discount rate starts to rise dramatically.

Our approach will be rather different. Instead of treating tax shelters as changing the discount rate we shall begin by valuing them as an independent asset in their own right, and then add the result to the value of the unleveraged assets. This approach is known as Adjusted Present Value (APV). It will enable us to make explicit the connections between value and growth that get bundled up in the conventional WACC calculation. The formula that underpins APV is the following:

$$V_F = V_D + V_E = V_A + V_{TS} - DR$$

where V_F=value of firm, V_D=value of debt, V_E=value of equity, V_A=value of unleveraged assets, V_{TS}=value of Tax Shelter and DR is the value of the default risk.

The traditional WACC/DCF approach picks up the entire value in one calculation by adjusting the WACC for the impact of the tax shelter. We shall approach the valuation of the unleveraged assets and the tax shelter separately, and then make sure that we can reconcile our WACC with the APV valuations. As we shall see the differences between our recommended formulae and those in general use relate to the treatment of the tax shelter both in the formula for leveraging and deleveraging equity Betas and in the formula for adjusting WACC for changing leverage, for the same reason in both cases. We shall be discounting the tax shelter at the unleveraged cost of equity, and the standard approach discounts it at the gross cost of debt.

The discount rate that should be applied to unleveraged cash flows is obvious. It is the unleveraged cost of equity. The question is what is the discount rate that should be applied to the tax shelter. Miller and Modigliani assumed that the appropriate rate was the gross cost of debt. So, if a company pays 5 per cent interest and has a 40 per cent marginal rate of taxation then its net cost of debt for a WACC calculation is as follows:

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5%*(1-40%)=3%
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To see why this is so, look at Exhibit 2.16.

For every 100 dollars that I borrow, I pay 5 dollars a year in interest, and reduce my tax bill by 2 dollars a year. The net cost to me is 3 dollars a year. Dividing all of these numbers by 5% (or multiplying by 20) gives us a total value of the debt of 100 dollars, comprising a value of the tax shelter of 40 dollars, and a net financial liability to the company worth 60 dollars. This analysis is so seductive that it is rarely questioned, yet there are severe problems with it.

Exhibit 2.16: Conventional tax shelter calculation

Tax shelter ($)	**Capital amount**	**Interest rate**	**Cash flow**
Gross debt	100	5.0%	5
Tax shelter	40	5.0%	2
Net debt	60	5.0%	3

The first problem is a practical one. We have seen in Exhibit 2.13 above that if we move from a no-growth world to a growth world, the impact of growth unbalances calculations of value in favour of streams that are being discounted at a low discount rate. So if we discount growing tax shelters at the cost of debt, which is lower than the cost of equity, then relatively low growth rates can result in very large values for the tax shelter. In the extreme case, if the company is assumed to grow at its cost of borrowing then the value of the tax shelter becomes infinite. Exhibit 2.17 illustrates the value of unleveraged assets and tax shelters calculated for a constant growth company at three different growth rates, and the allocation of value between the two components.

Exhibit 2.17: APV for varying growth (1)

APV valuation	Annual CF	k	Value at different growth rates		
			0%	2%	4%
Assets	100	10%	1,000	1,250	1,667
Tax shelter	10	5%	200	333	1,000
Firm	110		1,200	1,583	2,667

The second problem is a theoretical one. Are tax shelters really equally risky (or, more properly, as riskless) as the company's outstanding debt? To generate a tax shelter a company has to generate a profit. The tax shelter is a function of a difference between two levels of pre-tax profit: that which the company would have generated on an unleveraged basis and that which it would generate after paying interest on a given level of debt. It is not the risk attaching to the interest payment itself that is relevant. It is the risk attaching to the marginal amounts of profit generated in the two examples.

Let us illustrate the point with a real example. In 1996, the Kuwait Petroleum Corporation put up for sale its UK North Sea assets (held through a company called Santa Fe Petroleum). The assets were eventually bought by the Norwegian exploration and production company, Saga Petroleum, at a price that implied the use of a relatively low discount rate. This was partially justified by the fact that Saga borrowed the consideration, and that it had a marginal rate of taxation on its Norwegian operations of 78 per cent. If you can pay interest at a net rate of 22 cents in the dollar then money seems cheap.

The two years that followed the acquisition, 1997 and 1998, were characterised by the Asian economic crisis. Oil prices collapsed. By the end of 1998 Saga was not making the profits that were required to shelter its interest payments. In its year end accounts it was required to write down the acquired assets. This put a severe strain on its balance sheet, and the company responded with an attempted rights issue, which was not supported by its shareholders. During 1999, while oil prices were recovering, it lost its independence. At no point was Saga unable to pay the interest on its debts. So did it make sense to value the tax shelter by discounting it at the cost of debt? Clearly not. But that is exactly what happens when you say that the net cost of debt is the gross cost of debt times one minus the marginal rate of tax (the basis of almost all company valuation models)!

If what we are discounting is really a profit stream, not a stream that relates to interest, surely it should be the cost of equity, rather than the cost of debt, that is the relevant discount rate? In reality, the whole concept of a single cost of debt or equity (even in any one year) is oversimplified, but if we are going to use one number then it makes more sense to use the unleveraged cost of equity throughout. Exhibit 2.18 illustrates what happens to our previous example if we substitute the unleveraged cost of equity for the cost of debt in the valuation of the tax shelters. And the result looks a lot more plausible.

Exhibit 2.18: APV for varying growth (2)

APV valuation	**Annual CF**	**k**	**Value at different growth rates**		
			0%	2%	4%
Assets	100	10%	1,000	1,250	1,667
Tax shelter	10	10%	100	125	167
Firm	110		1,100	1,375	1,833

So we now have a perfectly workable methodology for valuing a company, if we continue to ignore distress costs resulting from over-leverage. We calculated the unleveraged cost of equity to the company by deleveraging its measured Beta. We then use that discount rate both to discount operating cash flows and tax shelters. We then add the two values together to derive a value for the company, deducting the value of the debt to derive a value for the equity.

5.1 Reconciliation with WACC/DCF

Not only is what has been outlined above not the standard approach, it is not even consistent with the standard approach. Traditionally, corporate valuations are done by discounting operating cash flows at a single discount rate, the weighted average cost of capital. This comprises in weighted components the leveraged cost of equity and the net of taxation cost of debt. We saw above in Exhibit 2.11 that in a risk free world with no growth it made no difference whether we valued the two components of capital as one or separately, but that it did start to matter once growth rates were built into the analysis. Ignoring growth for a moment (we shall return to it) even the no-growth value of a company will be different depending on whether we value tax shelters at the gross cost of debt or at the unleveraged cost of equity.

It is shown in the Appendix that the two approaches on the value of the company imply a difference between two equations for the calculation of equity Beta. The first is the one that we used above:

$$B_L=B_A*(1+V_D/V_E)$$

where B_L=leveraged Beta, B_A=asset Beta, V_D=value of debt and V_F=value of equity.

And the more popular alternative is as follows:

$$B_L=B_A*[1+V_D/V_E*(1-t)]$$

where the other variables are as above and t is the rate of corporation tax.

This formula still ascribes no risk to debt, but is consistent with the assumption that the tax shelter that accrues as a result of leverage should be discounted at the gross cost of debt, rather than (as we used above) the unleveraged cost of equity. Clearly, the second formula will make debt more attractive than the first, as it will result in a lower increase in the cost of equity. Its derivation also, quite explicitly, assumes no growth in the cash flows. For a growth company it is simply inaccurate.

The conventional WACC formula is as follows:

$$WACC=K_E*V_E/V_F+K_D*(1-t)*V_D/V_F$$

where the other variables are as above and V_F=value of firm (debt plus equity)

We are going to use our formulae for leveraging and in Exhibit 2.19 show that the same cash flows produce the same value, whether the APV or WACC/DCF methodology is used, so long as we discount tax shelters our way, using the unleveraged cost of equity. Exhibit 2.19 shows the value of a company with a stream of free cash flow starting at 100 and rising at 3 per cent annually, under a consistent set of assumptions about discount rates.

Exhibit 2.19: APV/WACC – risk free debt

Row	Unleveraged value		Notes
1	*Rf*	*4.00%*	Risk free rate
2	*MRP*	*3.50%*	Market risk premium
3	B_A	0.8	Asset Beta
4	K_A	*6.80%*	Unleveraged cost of equity
5	FCF	100	Free cash flow
6	*g*	*3.00%*	Growth
7	$\mathbf{V_A}$	**2,632**	**Value with no tax shelter**
	Leveraged APV		
8	BV_D	1,000	Book value of debt
9	V_D	1,000	Market value of debt
10	*DRP*	*0.00%*	Debt risk premium
11	*I*	*4.00%*	Interest rate
12	*t*	*30.00%*	Tax rate
13	$K_D*(1-t)$	*2.80%*	Net cost of debt
14	TS	12	Tax shelter
15	V_{TS}	316	Tax shelter valued at unleveraged cost of equity; not cost of debt
16	V_{A+TS}	2,947	Value including tax shelter
17	*DR*	0	Default risk
18	$\mathbf{V_F}$	**2,947**	**Value including tax shelter and default risk**
	WACC/DCF value		
19	V_D/V_F	*33.93%*	Weighting of debt derived iteratively=weighting from APV
20	V_D/V_E	*51.35%*	Debt/Equity
21	B_D	0.0	$B_D=(I-R_F)/MRP$
22	B_L	1.2	$B_L = B_A*(1+V_D/V_E)-B_D*V_D/V_E$; not $B_A*[1+V_D/V_E*(1-t)]-B_D*V_D/V_E*(1-t)$
23	K_E	*8.24%*	Leveraged cost of equity
24	*WACC*	*6.39%*	Conventional weighed average
25	$\mathbf{V_F}$	**2,947**	**WACC=APV**
26	*WACC*	*6.39%*	WACC = $K_A - I*t*V_D/V_F$

The unleveraged cost of equity in row 4 is calculated using the cost of equity formula discussed above. All the values are derived using the Gordon Growth model:

$$V = CF_{t+1} / (k-g)$$

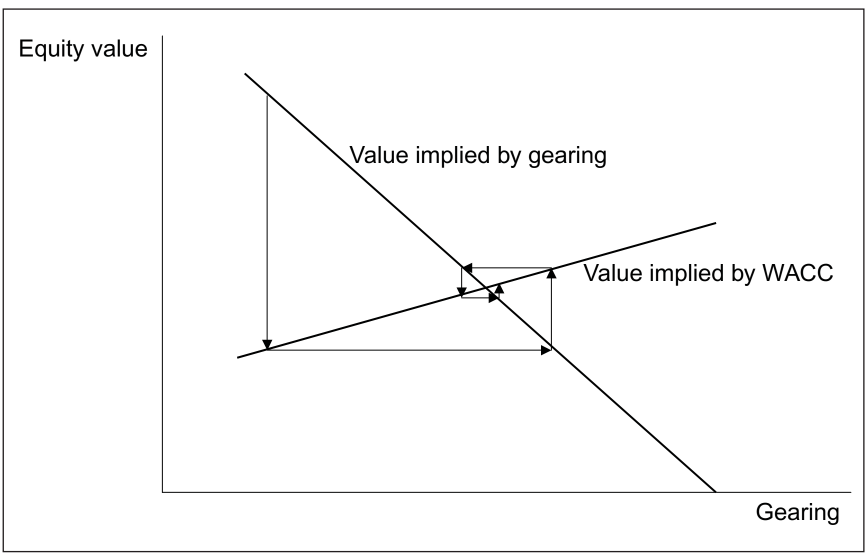
where V=value, CF_{t+1}=next year's cash flow, k=discount rate and g=growth rate.

The tax shelter in row 14 is just the 1000 debt times the interest rate of 4 per cent (row 11) times the tax rate of 30 per cent (row 12). The interest rate is the risk free rate (row 1), as there is as yet no default risk in our example. The tax shelter is valued using the unleveraged cost of equity, in accordance with our discussion above. The APV valuation (row 18) is the sum of the unleveraged value (row 7) and the value of the tax shelter (row 15), as there is no cost of default risk (row 17).

In the WACC/DCF value, the leveraged Beta in row 22 is calculated using the formula that is consistent with valuing tax shelters at the unleveraged cost of equity, not the gross cost of debt. (The version of the formula is that which also takes default risk into account, but as the Beta of debt in row 21 is zero, this does not affect the calculation.) The resulting leveraged cost of equity, in row 23, is then used as part of a standard WACC calculation, using the gearing in row 19 (derived iteratively) and the respective costs of debt and equity in rows 13 and 23. The iteration works because there is only one consistent pair of values for the value of the equity and the implied WACC.

To see this, it is helpful to think of leverage as working in two ways. For any given level of debt, if the gearing rises then this implies a lower value of the equity. On the other hand, in a risk free world, a higher gearing implies a higher tax shelter, which implies a higher value for the equity. There is only one point at which the two factors are consistent, as is illustrated in Exhibit 2.20.

Exhibit 2.20: Iteration of WACC



The result of all of this is that the value in row 18 (APV) is the same as the value in row 25 (WACC).

In row 26 of Exhibit 2.19, WACC is calculated using the appropriate formula for discounting tax shelters at the unleveraged cost of equity:

$$\mathbf{WACC=K_A-I*t*V_D/V_F}$$

where WACC=weighted average cost of capital, K_A=the unleveraged cost of equity, I=gross interest rate, t=tax rate, V_D=value of debt and V_F=value of firm.

This derives the same WACC as the conventional weighted average calculated in row 24. In both cases the figure is higher than would be derived if the tax shelter was discounted at the gross cost of debt. We have seen the difference between the two calculations for leveraged Betas above. We conclude with the differences for direct calculation of leveraged WACC (again, the proofs are in the Appendix).

The more common formula for WACC, using the assumption that the appropriate discount rate for tax shelters is the gross cost of debt, is as follows:

$$\mathbf{WACC=K_A-[(K_A-g)/(I-g)]*I*t*V_D/V_F}$$

where the variables are as in the last formula and g=growth.

The comparison is striking. The more usual formula will have two effects, the former of which is obvious, and the latter of which is not. It will produce lower answers for WACC and a higher value of the tax shelter because the cost of equity will be higher than the cost of debt. So far, so obvious. And it will produce progressively lower and lower discount rates the faster that the company is expected to grow.

> So, all other things being equal, a faster growing company, that distributes less of its cash flow and reinvests a higher proportion of it, will be subject to a lower discount rate than an otherwise identical company that distributes most of its cash flow and grows slowly!

Yes, this is probably ridiculous, but it is the inevitable effect of increasing g if K_A is higher than I, which it always should be.

Increasing the growth rate in the latter formula will have the effect of reducing the market leverage, which puts an upper limit on the gearing, but this does not alter the fact that the overall effect is for WACC to decrease as growth increases.

We therefore have two reasons for discounting tax shelters at the unleveraged cost of equity:

1. We are discounting a stream that relates to profit, not to interest payments.
2. If we discount tax shelters for growing companies at the gross cost of debt then the effect of increasing the growth rate is to reduce the discount rate, which seems implausible.

We have risked belabouring the question of tax shelters, but they loom large (implicitly and explicitly) in the discount rates that valuation models apply. The 1990s was a period when companies were under unprecedented pressure from their bankers and their shareholders to buy back equity, in an attempt to increase shareholder value through increasing the efficiency of their balance sheets. At the same time, growth by acquisition was popular not just in mature sectors of the market but also in sectors such as technology, media and telecommunications (the so-called 'TMT's) that were perceived as offering fast growth. Many of the transactions were made for cash consideration, as leverage was favoured. The results can certainly not be blamed in total on abuse of discount rates. They merely played their part.

5.2 Default risk and the cost of debt

Liquidation rarely achieves an attractive value for a company's assets, which is why both debt and equity shareholders are often willing to accept financial reconstruction, despite the fact that the former may have to commute much of their debt into equity, and the latter to accept extreme dilution. Recovery rates depend on the type of business and are higher if assets are easily separable. But even with quite asset rich companies, recovery rates even for senior creditors are generally well below 100 per cent. Junior creditors often lose a significant proportion of their capital, and equity shareholders frequently lose all of it. Hence distress costs: as the risk of failure looms, it has a substantial impact on the cost of capital.

Let us defer discussion of companies that are teetering on the brink of failure for a moment, and begin with treatment of a relatively well capitalised company. Holders of debt in this company will only ascribe a very low probability to its failure during the life of its outstanding debt, whatever that may be. But there is some small risk of default, even in a safe company, and this probability, times the expected loss in the event of default, has to be loaded onto the cost of debt to the company. It takes the form of a risk premium, versus the cost of borrowing to the government over an equivalent period. The calculations that we have done up to now all ignored this risk, and assumed that the cost of debt to the company was equal to the cost of debt to the government.

Let us return to our APV and DCF valuations in Exhibit 2.19 and repeat the exercise by assuming that the company has a cost of borrowing which is in excess of the risk free rate, reflecting its market gearing, its interest cover, and the security of its assets (the latter of which is invisible in this example). The result in displayed in Exhibit 2.21 opposite.

Exhibit 2.21: APV/WACC – implied Beta of debt

Row	Unleveraged value		Notes
1	*Rf*	*4.00%*	Risk free rate
2	*MRP*	*3.50%*	Market risk premium
3	B_A	0.8	Asset Beta
4	K_A	*6.80%*	Unleveraged cost of equity
5	FCF	100	Free cash flow
6	*g*	*3.00%*	Growth
7	**V_A**	**2,632**	**Value with no tax shelter**
	Leveraged APV		
8	BV_D	1,000	Book value of debt
9	V_D	800	Market value of debt
10	*DRP*	*1.00%*	Debt risk premium
11	*I*	*5.00%*	Interest rate
12	*t*	*30.00%*	Tax rate
13	K_D*(1-t)*	*3.50%*	Net cost of debt
14	TS	12	Tax shelter
15	V_{TS}	316	Tax shelter valued at unleveraged cost of equity; not cost of debt
16	V_{A+TS}	2,947	Value including tax shelter
17	*DR*	*0*	Default risk
18	**V_F**	**2,947**	**Value including tax shelter and default risk**
	WACC/DCF value		
19	V_D/V_F	*27.14%*	Weighting of debt derived iteratively=weighting from APV
20	V_D/V_E	*37.25%*	Debt/Equity
21	B_D	0.3	B_D=(I-R_F)/MRP
22	B_L	1.0	$B_L = B_A*(1+V_D/V_E)-B_D*V_D/V_E$; not $B_A*[1+V_D/V_E*(1-t)]-B_D*V_D/V_E*(1-t)$
23	K_E	*7.47%*	Leveraged cost of equity
24	*WACC*	*6.39%*	Conventional weighed average
25	**V_F**	**2,947**	**WACC=APV**
26	*WACC*	*6.39%*	WACC = K_A - I*t*V_D/V_F

To highlight the differences between this calculation and the previous one we shall concentrate on the consequences of the default risk on debt. This has been estimated in row 10 and results in a drop in the market value of the debt (row 9). (We have assumed that the interest stream is a perpetuity, whereas in reality corporate debt would have a finite duration so the impact on its value would be smaller. This in no way alters the rest of the analysis.)

The APV value in row 18 has been set to equal the DCF value derived in row 25, and the cost of default risk in row 17 is derived from the difference between the APV before the default risk and the WACC/DCF value. We showed in Exhibit 2.21 above that if the gross cost of debt to the company is set at the risk free rate, the APV and the WACC/DCF values are the same. If there is a default risk, then this is picked up in the discount rate calculated as a WACC, but not in the APV, as this uses unleveraged discount rates throughout.

In the WACC/DCF value, the gearing in row 19 is an iterated result as before. The Beta of debt is implied from its risk premium and calculated in row 21. The leveraged equity Beta in row 22 now makes use of the full leveraging formula, including the term relating to the Beta of debt, and the proof of this and the more common version are both provided in the Appendix. As with the risk-free valuation above, the formula for the WACC which is built up from the unleveraged cost of equity (in row 26) is consistent with the WACC calculated from its weighted components.

There is still a problem with this analysis. It is that the value of the company with default risk built into the cost of debt is the same as the figure that we derived earlier without default risk being built into the cost of debt. The reason is that we have used an implied Beta of debt and a leveraging formula for the cost of equity which has that Beta of debt embedded in it.

> In other words, the formulae are assuming that the higher cost of debt is entirely attributable to market risk and not to specific risk. The additional risk that has been loaded onto the debt is therefore being deducted in the Beta of the equity.

Let us try another approach, this time assuming that the Beta of debt in row 21 is zero, and that all of the debt risk premium in row 10 can be ascribed to specific risk, with no market risk, and therefore no Beta of debt. Exhibit 2.22 below is in all respects identical with Exhibit 2.21 above, except for the assumption that the debt has a Beta of zero.

Exhibit 2.22: APV/WACC – zero Beta of debt

Row	Unleveraged value		Notes
1	*Rf*	*4.00%*	Risk free rate
2	*MRP*	*3.50%*	Market risk premium
3	B_A	0.8	Asset Beta
4	K_A	*6.80%*	Unleveraged cost of equity
5	FCF	100	Free cash flow
6	g	*3.00%*	Growth
7	**V_A**	**2,632**	**Value with no tax shelter**
	Leveraged APV		
8	BV_D	1,000	Book value of debt
9	V_D	800	Market value of debt
10	*DRP*	*1.00%*	Debt risk premium
11	*I*	*5.00%*	Interest rate
12	*t*	*30.00%*	Tax rate
13	K_D*(1-t)	*3.50%*	Net cost of debt
14	TS	12	Tax shelter
15	V_{TS}	316	Tax shelter valued at unleveraged cost of equity; not cost of debt
16	V_A+$_{TS}$	2,947	Value including tax shelter
17	*DR*	(211)	Default risk
18	**V_F**	**2,737**	**Value including tax shelter and default risk**
	WACC/DCF value		
19	V_D/V_F	*29.23%*	Weighting of debt derived iteratively=weighting from APV
20	V_D/V_E	*41.30%*	Debt/Equity
21	B_D	0.0	Assume debt Beta is Zero
22	B_L	1.1	$B_L = B_A*(1+V_D/V_E)-B_D*V_D/V_E$; not $B_A*[1+V_D/V_E*(1-t)]-B_D*V_D/V_E*(1-t)$
23	K_E	*7.96%*	Leveraged cost of equity
24	WACC	*6.65%*	Conventional weighed average
25	**V_F**	**2,737**	**WACC=APV**
26	*WACC*	*6.36%*	WACC = K_A - $I*t*V_D/V_F$

In this instance, the value that we derive for the firm is lower than it was with a risk free cost of borrowing, which looks more reasonable. None of the increased cost of debt is being absorbed by an assumed reduction in the leveraged equity Beta, because the Beta of debt is assumed to be zero. Here, we are explicitly assuming that the rules of CAPM do not apply to debt. It is all specific risk that is being priced into the premium, not market risk.

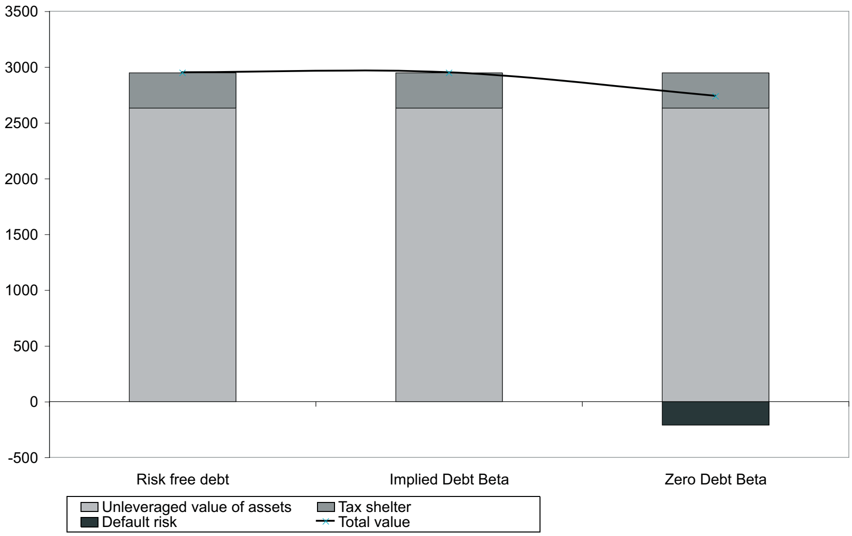
Notice also that in this case the calculated WACC in row 26 remains similar to that of the previous two examples, whereas the WACC based on a weighted average of the cost of debt and equity yields a higher discount rate, because the assumptions of CAPM are being infringed. Specific risk, as well as market risk, is being priced. (The small change in row 26 is attributable to the change in weight of debt and equity in the market value.)

Let us compare the three values. The first, in Exhibit 2.19 assumed that the company borrowed at the risk free rate. There is no default risk, just a tax shelter. This is clearly not possible in the real world. The second, in Exhibit 2.21, assumed that the company pays a risk premium in its cost of debt, and attributes an implied Beta to the debt. Because the Beta on the debt then reduces the leveraged Beta of equity, the result is that the company is worth the same as it would have been worth in the absence of the premium on the cost of debt. Value has simply been shifted from debt to equity. The third, example, Exhibit 2.22, example is the most realistic, though it flouts the assumptions of CAPM. In this case, all of the debt risk premium is deemed to be specific. The Beta of the debt is assumed to be zero. And the resulting value is higher than that of the unleveraged company but lower than that of the leveraged company with an implied Beta of debt.

The three calculations are charted in Exhibit 2.23 below. The first bar is an impossibility, as no company can borrow at the risk free rate. The first realistic alternative is not to borrow, and simply to be worth the value of the unleveraged assets. The middle bar shows what happens if we borrow and use an implied Beta of debt. The right bar shows what happens if we borrow and assume a zero Beta of debt. The truth lies somewhere between the two, but for many companies it may be reasonable to assume that most of the default risk on debt is unrelated to market risk, and in effect assume a zero Beta for the debt.

The obvious way to resolve the issue would be to measure the Betas of traded debt. Unfortunately, it is difficult enough to get statistically reliable measures for the Betas of equity. For debt, where the figures are clearly likely to be lower anyway, it is effectively impossible.

Exhibit 2.23: Value build-up



5.3 Implications of our analysis

We parted company with conventional approaches to discount rates by analysing the value of the assets and of tax shelters for a growing firm independently of one another, in a risk-free world. This enabled us to reconcile APV and WACC/DCF analysis, so long as we valued tax shelters at the unleveraged cost of equity, rather than at the cost of debt. We showed alternative formulae for leveraging of Betas and for calculations of WACC, which are often wrongly taken for granted and, in our view, abused. Finally, we introduced default risk into the analysis, and showed how the difference between the WACC/DCF and the APV approach could be used to derive an implied distress cost. This brought the analysis back to a conventional WACC/DCF framework, but left us with a choice between whether or not to assume that the risk premium on debt reflects market risk or specific risk. The latter seems more realistic but specifically breaches the assumptions underlying the CAPM.

It should be noted, moreover, that our formulae for calculation of WACC will derive significantly different conclusions with respect to the impact of increases in leverage from those commonly used. Our benefit from leverage will be lower. Our discount rates will be higher. And our resulting valuations will be lower.

6. Time varying WACC

One of the more pernicious consequences of the traditional approach to discounting is that a WACC is conventionally calculated and then applied mechanically to all future cash flows, despite the fact that the appropriate discount rate for a particular year is a function of the company's market leverage in that year, and very few companies are expected to maintain a constant leverage over time. Since all of the formulae that we used for leveraging and deleveraging are consistent with one another, they can also be applied to models with specific forecasts followed by constant growth terminal values, of the kind that we shall be discussing in Chapter five. This will require us to use the iterative process that we described above to calculate the value that produces consistent figures for the market value of the equity and the discount rate used for each year in our forecast, as a separate calculation. Each year's cash flow is then discounted at a different rate each year as it is brought back to the present. So, we start by iterating a value and a WACC for the terminus, and then bring it back year by year, discounting the year-end value of the company and that year's cash flow (or economic profit) at a different rate for each year of the specific forecast period.

We shall illustrate all this in Chapter five, but would make two points now. Firstly, it is not correct to calculate time-varying WACCs using book leverage, any more than it is if a single rate is being used. Secondly, it is not correct to discount each item of cash flow or economic profit at the same rate compounded 'n' times if it is 'n' years away. If a company is equity financed now but will create tax shelters in future then it is not right to discount its year 10 cash flow ten times at the year 10 discount rate. It should be discounted ten times at different discount rates for each year.

An alternative to time-varying WACC (or APV, which values the tax shelter separately) is just to apply a single, target, gearing to the calculation of the WACC that will be used for all forecast years. This is slightly wrong, since in reality the rate should vary, but is an acceptable short-cut since it is the rate that applies to the long term cash flows that will have the main impact on the result. In this case, it should still be remembered that it is the market value of the debt and equity that sets the rate, not the book value.

Apart from leverage, there is an additional reason for changing the discount rate each year, which we have already discussed. This is that the risk free rate is actually a yield curve, and it may be significant for firms that have high or low growth cash flows if we wrongly value them by assuming a discount rate based on a single risk free rate.

7. The walking wounded – real options and capital arbitrage

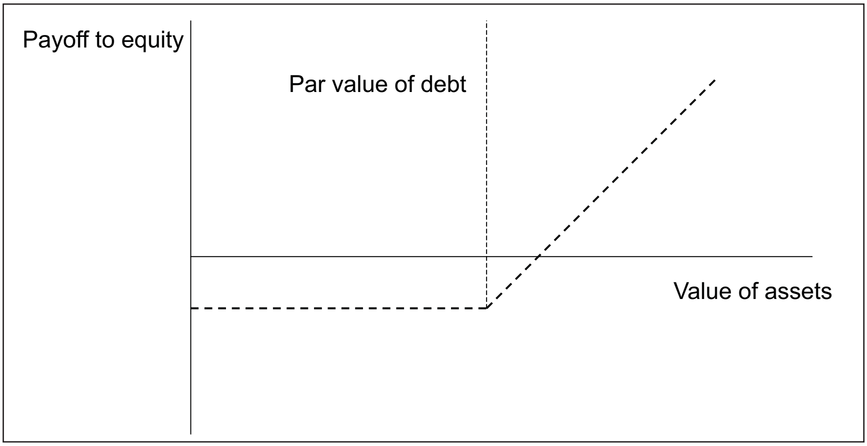
Real options analysis has become extremely fashionable among academics, if not among practitioners. On this occasion, we tend to the view that the practitioners are generally right. There are considerable difficulties in translating a valuation methodology that was developed for financial derivatives and applying it to real assets. Derivative valuation techniques depend on the possibility of creating equivalent portfolios comprising debt and the underlying asset, on instantaneous and cost-free arbitrage, and (often) on the range of expected returns on the underlying asset being normally distributed. Most real options breach all of these conditions. There is one clear exception. It is the put option conferred by limited liability on equity shareholders. This is generally not a particularly valuable asset. In severely distressed companies, it can be very valuable indeed.

Just how valuable is illustrated by the comment that is occasionally made that the best way to make money in the stock market is to buy shares that are being tipped as 'sell' by investment analysts. This is not a coincidence. It follows from the nature of the value offered by equity in barely solvent companies, and from the valuation methodology followed by most equity research analysts. Analysts mainly measure intrinsic value, and ignore option value.

Investment analysts generally value the equity in a company by using a discounting methodology to value the assets of the company, and then subtracting debt and other liabilities to derive an equity valuation. This result is often known as an intrinsic value.

Now imagine buying shares in a company which is almost insolvent. The intrinsic value of the shares is almost zero. If the value of the assets were to fall by even a small amount, the company would be insolvent and the shares would be worthless. But if the value of the assets rises by even a fairly small amount then the value of the shares will rise steeply. This is a classic payoff for a call option that is just in the money, as illustrated in Exhibit 2.24. Equity investors start to make money when the value of the assets exceeds the sum of the par value of the debt and the price paid for the equity at time of purchase (equivalent to the price of the option).

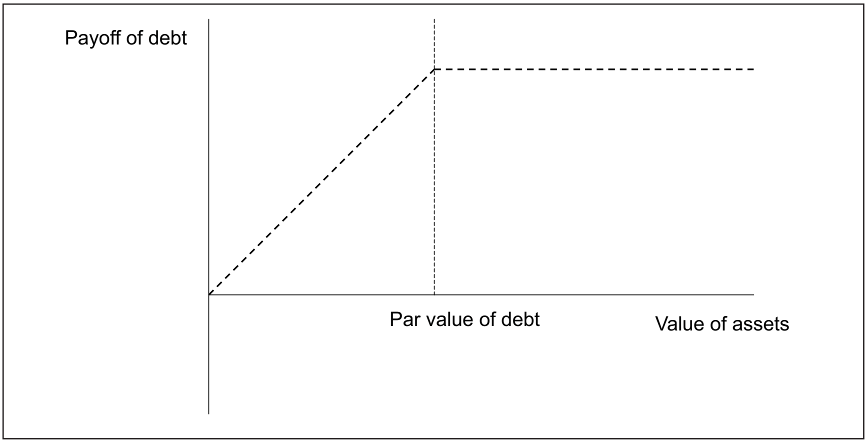
Exhibit 2.24: Equity as call option



If the value of the assets is lower than the par value of the debt, shareholders in a limited liability company are free to walk away, leaving the company with the creditors. At above the par value of the debt, the intrinsic value of their equity rises in line with the value of the assets.

Another way to think about the nature of the option is to imagine that instead of buying a call on the assets, the shareholder had instead achieved the same effect as is achieved by limited liability through buying a put option from the creditors. In this instance, the value of the equity would rise as the value of the assets rose, but would fall only to the exercise price of the put. Below that, any further loss would be attributable to the writers of the put. If we think from the point of view of the writer of the put, not the buyer, he receives his payment so long as the value of the assets stay above the exercise price of the option. Below that price his receipts decline until if the asset falls in value to the exercise price minus the price that he received for the put option. Below that point, he loses money. This payoff is shown in Exhibit 2.25.

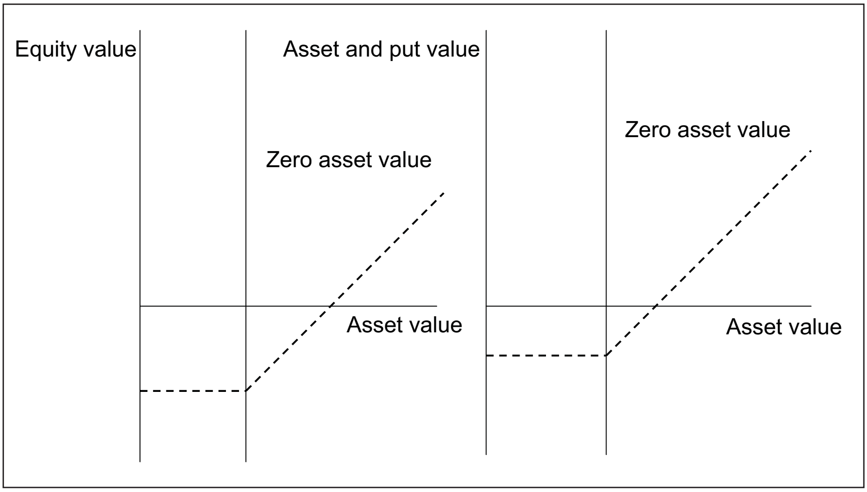
Exhibit 2.25: Debt as written put



At any value of the assets which is above the par value of the debt, the creditor receives the par value of the debt. At values between the par value of the debt and zero, the value of his asset is eroded. At asset values of less than zero, he receives nothing. The payoffs to a creditor are therefore identical to those of a writer of put options.

Options are subject to a phenomenon known as put-call parity. That is to say that there is no difference between holding assets and a put option, which protects the downside risk (at a cost), or holding an equivalent value divided between cash and a call option. In both cases the portfolio will track that of the underlying asset upwards. And in both cases falls in value are limited, in the first case by the put option and in the second by the cash. Let us take an example. If I hold a portfolio of shares and a put option then I am exposed to the upside in the market, protected from the downside, and have paid an insurance premium (the cost of the put option). If I hold a call option and cash then I am also protected from the market falling (except for the cost of the call option, which I shall have lost). But if the market goes up then I participate, except for having paid a premium for the benefit of the call option. In both cases, I have given away a bit of value to protect myself against a market decline. If we exclude cash from the picture, put-call parity is as illustrated in Exhibit 2.26.

Exhibit 2.26: Put-call parity



The two diagrams look almost identical, other than the lower base value on the left hand side. The left half of Exhibit 2.26 shows the payoff to equity as being identical to that of a call option, where the payoff only begins to be positive when the value of the assets exceeds the market capitalisation of the equity and the par value of debt. The right-hand chart shows the payoff to holding the underlying asset, with a put option. The pattern is the same, but the portfolio starts to pay off at a lower asset value and is restricted on the downside at a higher value. This is because of the role of cash in the put-call parity equation discussed above. If:

Call + Cash = Asset + Put

Then:

Call = Asset + Put - Cash

Or, in the language of equity in limited liability companies:

> Equity equals the assets of the business minus debt plus the value of the right to walk away if this is advantageous.

It is the right to walk away that is missed in standard, intrinsic value models.

In recent years, emergence of hedge funds as a significant asset class has been associated with an increase in so-called 'capital arbitrage', by which investors take net neutral positions in different capital instruments issues by the same company, in the hope of profiting from elimination of anomalies that may have emerged between their prices. The purest forms of capital arbitrage involve trading options against the underlying equity, or convertible bonds against a combination of debt and equity (or equity derivatives). But if a significant misevaluation of the option element of the relationship between debt and equity opens up, then this offers a further opportunity for arbitrage. It is one that should be negotiated with some care, as the example below illustrates.

7.1 Intrinsic value and time value: a refresher

This book is primarily concerned with intrinsic values, and for a full discussion of the valuation of options we refer the reader to one of the many textbooks on the subject. For those who already have some background in option theory, or who merely wish to be able to make some sense of the rest of this chapter, the basics are as follows.

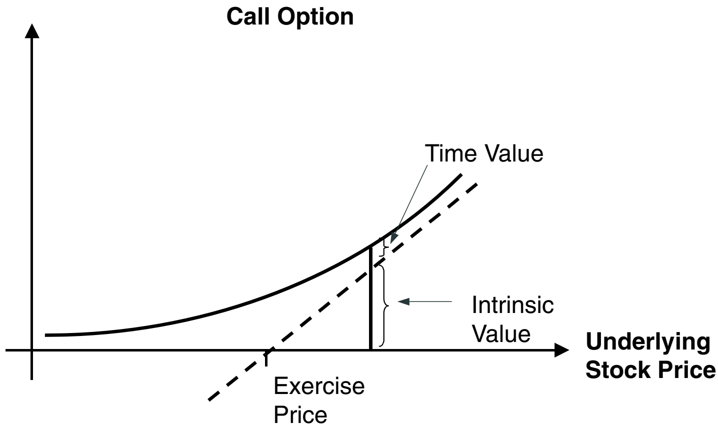
Options comprise the right, but not the obligation, to buy or sell at a pre-arranged price either up to or on a particular date. The value of an option is set by five variables:

1. The option exercise price
2. The price of the underlying asset
3. The length of the exercise period
4. The volatility of the underlying asset
5. The risk free rate

An option price can be divided between its intrinsic value and its time value. Options will always trade at a premium to their intrinsic value, and the time value represents the largest part of their value when they are either out of the money (have a negative intrinsic value) or are just on the money. As their intrinsic value increases, the time value becomes a smaller part of their overall value, which is why option values are most important for distressed companies. Exhibit 2.27 shows the relationship between the intrinsic value and the time value for a call option as the value of the underlying asset changes.

Exhibit 2.27: The components of an option price

The *time value* of an option is the option price minus the intrinsic value.



An example: Vivendi Universal

The tables and charts in Exhibit 2.28 illustrate a valuation of the equity and debt in Vivendi Universal, at the high point of worries surrounding its debt level, in April 2003. It is fairly self-explanatory, though it should be noted that the valuation and forecast cash flows on part 2 of the model were those produced by an investment analyst at the time, based on information then available. Because the volatility of the underlying assets is not directly visible, this is derived in part 3 using the standard two-asset variance-covariance model, as illustrated in the BP/British Airways portfolio discussed above. The Black-Scholes model in part 5 is adjusted to take loss of cash flow into account when valuing the option, and a period of two years was taken to be the life of the option, as that was the point at which a significant tranche of Vivendi's debt was payable. The chart illustrates the extent to which the company's equity was undervalued, and its debt overvalued, even if the fair asset values on which it was based were correct.

The commonsense way to think about this is to argue that if a company has an enterprise value that is very close to the par value of its debt, then there is a significant risk that it will default on its debt. So the debt must trade at a discount to its par value. In Vivendi's case it was trading at 95 per cent of its value, but the model implied that it should at the time have been trading at 74 per cent of its value. If value is being subtracted from the debt then it is being added to the equity. So the model shows that, if the valuations on which it is based were correct, the equity had an intrinsic value of €38,981 (fair enterprise value) minus €33,220 million (net debt), a total of €5,761. The market was actually valuing the equity at €13,499 million, versus a theoretical value of €14, 538 million. Not bad, but a disaster if you just said that it should be trading at €5,761 million!

Readers may be reminded of our analysis of default risk above. At very high levels of risk, the debt starts to behave more like equity, and the assumption that debt has a significant Beta becomes more realistic. In addition to detracting from the value of the firm, the risk that attaches to debt does represent a diminution of the risk that attaches to equity.

What option pricing does is to provide a systematic way to allocate the shift in value between debt and equity. It can be thought of as either the value of the put option that the bond-holder confers on the equity-holder, or as the time-value of the call option inherent in the purchase of equity. Put-call parity says that they must be the same thing.

Exhibit 2.28: Vivendi Universal

1. Accounting and market inputs to model (€ million)

Equity market value:	
Price per share	12.40
Shares in issue	1,089
Market capitalisation	**13,499**
Book net debt calculation:	
Cash	(5,024)
Marketable securities	(1,713)
Cash and equivalent	(6,737)
Long term debt	26,073
Short term debt	13,884
Total debt	39,957
Net debt	**33,220**
Market value of debt:	
Market price of debt (% of book)	*95%*
Market value of debt	**31,559**
Enterprise value	**45,058**

2. Estimated fair value and cash flow of enterprise (€ million)

Group interest:	
Media (consolidated)	22,716
Media (associates)	1,836
Telecoms	13,051
Environment	1,886
Other	630
Overhead adjustment	(1,138)
Group asset value	**38,981**

Cash flow to investors:	
Interest	635
Dividend	0
Cash flow to investors	**635**

Source: Deutsche Bank

3. Volatility calculations

Share price volatility:	
Period of measurement (days)	30
Measured S.D. over period	*46.6%*
Annual S.D.	*162.5%*
LN annual S.D. of share price	***96.5%***

Debt price volatility:	
Period of measurement (days)	30
Measured S.D. over period	*46.7%*
Annual S.D.	*162.9%*
LN annual S.D. of debt price	***96.6%***

Inputs for volatility calculation:	
Debt to capital ratio	*70.0%*
LN annual S.D. of stock price	*96.5%*
LN annual S.D. of debt value	*96.6%*
Correlation between values of debt and equity	**-0.559**

Volatility calculation:	
Weight of equity (We)	*30.0%*
Weight of debt (Wd)	*70.0%*
Variance of equity value (Ve)	*93.1%*
Variance of debt value (Vd)	*93.4%*
Correlation between values of debt and equity (CORRed)	-0.559
Annual variance of firm value (S.D.^2)	*32.3%*
LN annual S.D. of firm value	***56.8%***
*[Var firm = We^2*Ve+Wd^2*Vd+2*We*Wd*S.D.e*S.D.d*CORRed]*	

4. Option model inputs and results (€ million)

Inputs to model:	
S = Estimated value of firm's assets	38,981
E = Book value of debt	33,220
S.D. = S.D. of enterprise value	*56.8%*
T = Weighted average duration of debt (years)	2
r = Risk free rate	*4.0%*

Theoretical values of equity and debt:	
Value of equity	14,538
Value of debt	24,443
Enterprise value	38,981
Market value debt/book value debt (%)	*73.6%*
Target share price	13.35

5. Black Scholes option valuation model

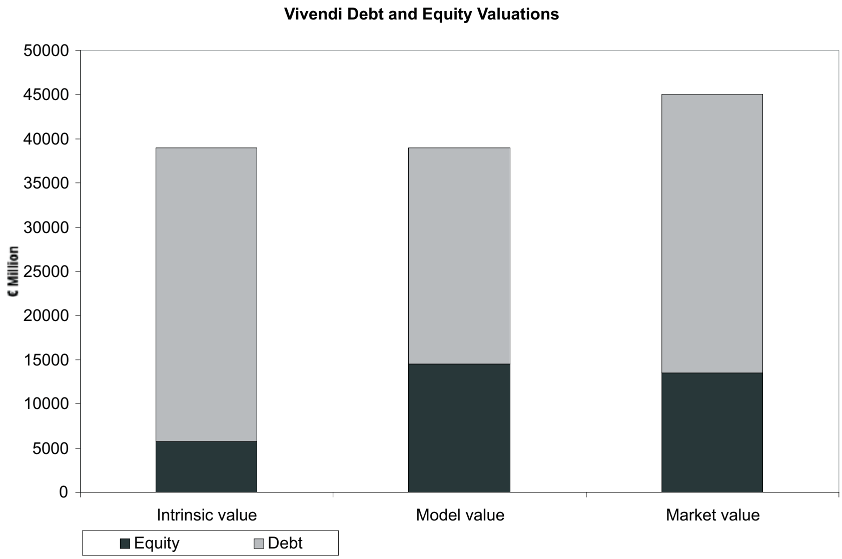
Basic inputs:	
Asset value (S)	38,981
LN annual standard deviation of asset value (S.D.)	*56.8%*
Exercise price (E)	33,220
Annual periods (T)	2.00
Risk free rate (R)	***4.0%***

Adjustment for project cash flow:	
Enter either: Annual cash flow from project	635
Or enter: Yield from project	
Yield for option calculation	*1.6%*

Model outputs:	
Value of call	14,538
Value of put	7,485

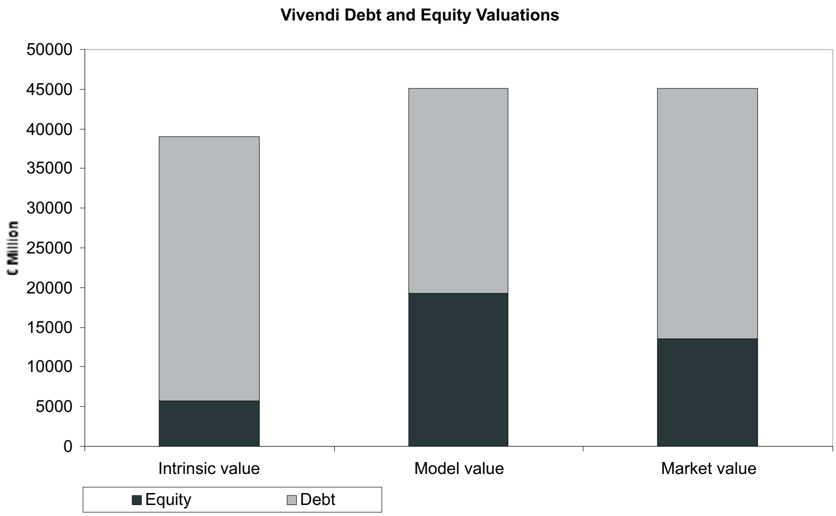
Model variables:	
Asset value	38,981
Exercise price	33,220
Years to expiry	2.00
Risk free rate	*4.0%*
Standard deviation	*56.8%*
Variance (S.D.^2)	*32.3%*
Yield	*1.6%*
d1	0.65934
N(d1)	0.74516
d2	-0.14440
N(d2)	0.44259

Equity as a Call Option



Clearly, rather than using an independent valuation of the assets, it is possible to use the market value implied by the sum of the market values of the equity and the debt, and then just to use the model to reallocate this value between the two components of the capital structure. Exhibit 2.29 opposite shows what happens to the final slide if precisely the same model that was used above is amended to make the estimated fair value of the assets equal to the market value of the assets. The ascribed value to both equity and debt would have been greater in this case (rightly, as events turned out), and much of the upside would have been allocated to the equity.

Exhibit 2.29: Vivendi – market values



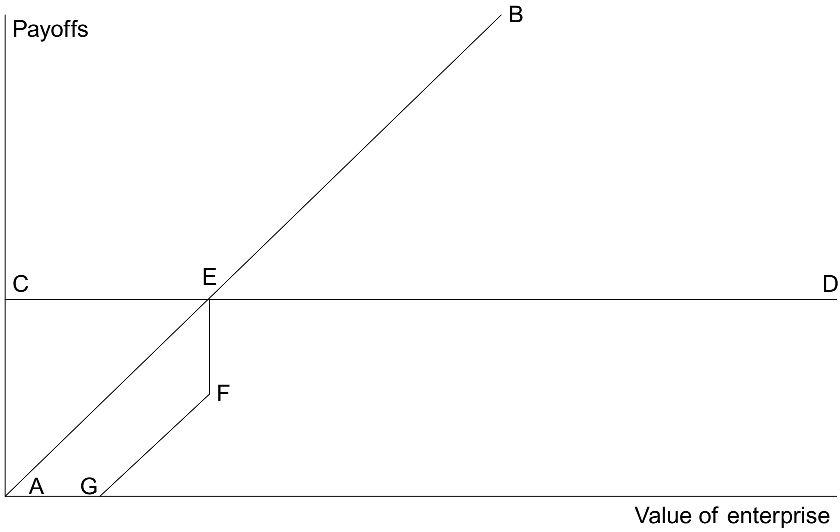
7.2 What happened to default risk?

Readers may remember that we had two extreme possibilities when interpreting the risk premium on debt when conducting an intrinsic valuation of a company. The first was to assume that all of the premium related to market risk, to ascribe a Beta to the debt, and to recycle that risk which was being assumed by the debt out of the cost of equity. The second was to assume that all of the risk relating to debt was specific.

> What we are doing in our option model is precisely equivalent to the first assumption above: that all of the loss of value resulting from risk that attaches to the debt gets transferred into additional value to the equity. But if we assume that all the risk that attaches to the debt is specific, then the full impact of the risk premium on the debt should be subtracted from the value of the company in the option model, as it is in the intrinsic value model.

The two choices are illustrated in Exhibit 2.30.

Exhibit 2.30: Payoffs to equity and debt



In this slide, the line from A to B is the set of possible enterprise values that we are considering prior to specific default costs, and the line from C to D denotes the par value of the company's debt. Then, as above, the intrinsic value of the equity is the standard call options payoff represented by the line from C to E to B. The payoff to the debt is the standard short put option payoff represented by the line from A to E to D.

Now suppose that the risk premium on debt does not represent market risk which is recycled back into the value of equity through a reduction in its Beta to reflect the Beta of debt, but that the debt has no Beta.

The line from B to E to F to G now represents the set of possible enterprise values for the company, with the vertical from E to F representing a default cost that is a specific risk. The payoff to the equity is still represented by the line from E to C to B, but the payoff to the debt is now represented by the line from G to F to E to D.

There has been an overall loss of value to the firm versus the first case, just as there was when we considered the implications of zero Beta debt for intrinsic values.

The deduction from the value of the enterprise, which falls to the debt, is the area of the quadrilateral A to E to F to G. So the value of our enterprise can be represented as the sum of the value of the two options prior to the cost of the specific default risk, minus the cost of the specific default risk.

> It is as if we took our second case from Exhibit 2.21, in which all of the risk premium on the debt was ascribed to its Beta, and then decided that we were going to cut the value of the debt again, to reflect default risk, and that this time the loss of value would not be recycled via the Beta of the equity.

7.3 Implications for arbitragers

What this analysis implies is that just as ignoring the option relationship between debt and equity holders may result in a massive undervaluation of the equity in a company if that option is valuable, so might naïve application of the standard option model result in considerable overvaluation of the entire enterprise. If we start with an estimated enterprise value and then allocated it using option models between debt and equity we may ignore default risk. Starting with the market value of the enterprise value, rather than an estimated enterprise value, should avoid this, but is clearly very limiting. We may not always believe that the market is right about the enterprise value.

Readers may be interested to refer back to the Vivendi example. There, the analyst's estimates of fair value were significantly below, not above, the market enterprise value. It is reasonable to suppose that the analyst's sum-of-the-parts valuation represented a fairly cautious approach to the market values of the business in the event of forced liquidation.

The market value of the enterprise may or may not include a deduction for specific risk. As we have seen, whether the capital market demands compensation only for market risk or for specific risk as well remains an open question. One sample is not enough to support the contention that the analyst's value includes default costs while the market value does not.

> The question of whether or not specific risk is priced will not merely affect the resulting estimate of enterprise value. It will also change the allocation of that enterprise value between debt and equity, because the loss of value resulting from the specific risk of default represents a deduction from the payoffs that attach to the debt, but does not alter the payoffs to the equity.

8. International markets and foreign exchange rates

Before concluding our analysis of discount rates, some comment should be made about the practical problem that shares are traded on different stock exchanges, and that companies are priced, report and operate in different currencies.

The CAPM works from only two assets: the risk free asset and the market portfolio. Both are deemed to be global, and the latter includes all asset classes, including property, works of art, etc. In practice is it not easy to establish the Beta of a Titian painting, so the assumption is ignored. It is customary to use local risk free rates and Betas against the local market. But this creates more problems. Imagine a European chemicals company that for some reason delisted from the German market and relisted in Paris. The German market has more cyclical stocks on it than the French, so it would have a higher Beta against the French market than against the German. One could compensate for this by saying that the equity risk premium is higher in Germany. CAPM would say that it is not, and that the German market is higher Beta than the French market against the global portfolio, but this is in practice not measurable.

Foreign exchange issues matter mainly because of the risk of applying a Euro or Dollar-based discount rate to a stream of cash flow that is generated in a high inflation country. In this situation, it is important (and should be possible) to make sure either that the fast growth stream of local forecasts is translated into a slower growth stream of hard currency forecasts, or that an appropriate (higher) discount rate is applied to the higher inflation stream of forecasts.

9. Conclusions on discount rates

The theory surrounding discount rates is probably the most interesting aspect of valuation, but it is also complicated. The result is that practitioners tend to apply a series of formulae for WACC and for leveraging and deleveraging Betas whose implications are not generally understood, and that are in any case inappropriate for growing companies, even though most models finish up with a terminal value that explicitly assumes a growth rate to infinity.

We built up our analysis of discount rates by starting with the unleveraged cost of equity, then adding tax shelters, and then subtracting the cost of distress, but checked for consistency in the case of constant growth companies all the way through. This, as well as common sense, dictated that tax shelters should be discounted at the unleveraged cost of equity, not the gross cost of debt.

From the point of view of the holder of debt, the risk premium is a measure of the value of the put option that has been transferred to the equity shareholder. This insight implies an alternative approach to valuing debt and equity which is particularly appropriate in the case of companies that are on the brink of insolvency, because the option will have a relatively high value relative to its intrinsic value. Standard approaches to valuation, including those that we shall be working with for the rest of this book, ignore this option value, as it is relatively small for well capitalised companies.

This still begs the question of where the unleveraged cost of equity comes from, and, as we have indicated, there are problems with the CAPM. It remains the most widely used approach, but there are good empirical reasons for replacing Betas with alternative factors reflecting size, leverage and liquidity. And there is a very real risk, even if we discount tax shelters at the unleveraged cost of equity, that we shall add back the value of the tax shelter to the company and not properly subtract the cost associated with default risk, unless we make the assumption that the risk premium that attaches to debt is all related to specific risk, and that the Beta of debt is zero.

The two extreme assumptions are either to assume that all of the default risk that attaches to debt is attributable to market risk, which is probably very unrealistic, or to assume that none of it is attributable to market risk, which is probably closer to the truth for most companies. In the case of very risky companies, it will clearly not be true, and a deduction for the specific cost of default needs to be made.

9.1 Practical recommendations

The practical and theoretical difficulties with the theory surrounding discount rates (both CAPM and the impact of leverage) have not been fully resolved. Because they are difficult they are often ignored by practitioners, which may be very dangerous. As with the choice of valuation model to use out of the four discussed in Chapter one, we would recommend a pragmatic approach to deciding how to handle discount rates, depending on what the key issue is that is to be addressed. Points to bear in mind are the following:

1. Are the cash flows and the discount rate in the same currency?
2. Does it matter if we use one risk free rate or do we need to model using the yield curve (which would require a time-varying model, whether WACC or APV)?
3. Do we have a group of homogenous enough companies to try to get to an industry asset Beta in which we can have some confidence?
4. Is a significant proportion of what we are valuing attributable to tax shelters, in which case we want to use APV?
5. What are we going to assume about the Beta of debt?
6. Is the company's balance sheet structure going to change enough for this to be significant to its value, in which case we need to use either APV or time-varying WACC (in both cases being sure to discount the tax shelter at the unleveraged cost of equity, and to adjust the cost of debt for default risk)?

7. Is the company so risky that there is a significant option component to the value of the equity?

Rather than providing a single menu for the selection of discount rates, we should prefer to leave readers equipped to determine which approach to use after answering for themselves the questions above. Our examples in Chapters five and six will include selection of and calculation of appropriate methodologies and discount rates for valuation.

Chapter Three

What do we mean by 'return'?

Introduction

Economists and accountants do not mean the same thing when they use the term 'return'. To an economist, an Internal Rate of Return (IRR) is a term of art with a specific mathematical meaning. It means the discount rate that if applied to a stream of cash flows will provide a present value that equates to the cost of the investment. Put another way, the IRR is the discount rate that gives a result such that the Net Present Value (NPV) of the investment is exactly zero.

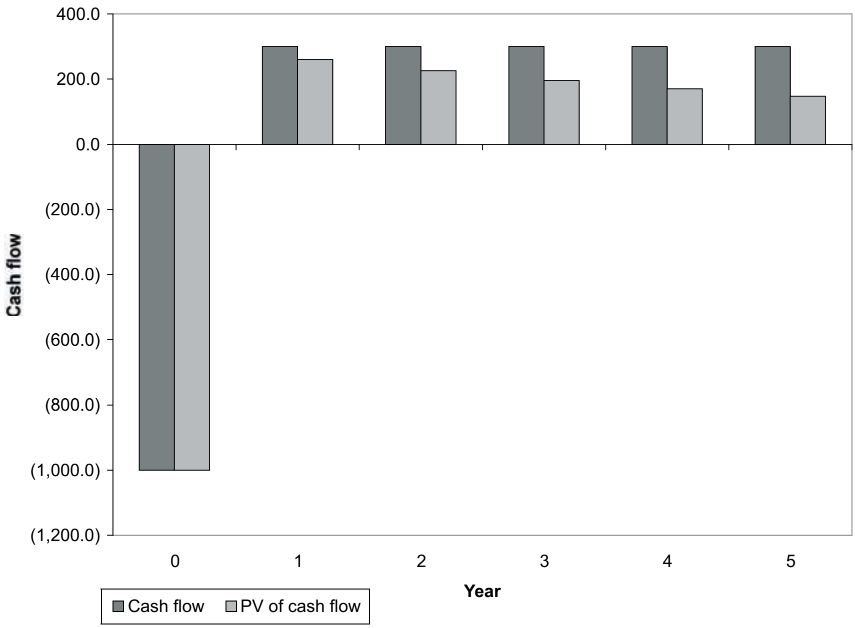
To an accountant, a return on capital employed (ROCE) is a fraction, of which the numerator is operating profit generated in a particular year and the denominator is the amount of capital that was employed to generate the profit.

There are two important differences between the two definitions. The first is that the IRR is a figure that is calculated using cash flows over the life of the project, not just for one year. The second is that the IRR is based on cash flow numbers and the ROCE is based on accounting profits and balance sheets. We went to some lengths in Chapter one to demonstrate that it was not practically possible to forecast corporate cash flows without having recourse to profits and balance sheets. Surely, we are not now going to reverse that conclusion? No, we are not, but we are going to temper it with a recognition that if we use accounting returns on capital as a proxy for economic returns, which is what we really want, then in most real-life examples the former is only an approximation for the latter. This obviously begs the question of whether or not it would be possible to restate accounts in such a way as to permit accurate measures of returns. There is at least one methodology that is commercially available and marketed to address this problem, and there are also some sectors of the equity market in which companies often provide information that makes more accurate assessment of returns possible. Our approach will be as follows. First, we shall explore the problem. Then we shall look at the solution proposed by Cash Flow Return On Investment (CFROI). Finally, we shall comment on ways in which accounts are, and could be made more representative of, value creation, a direction in which accounting practices are already moving. Thus, the last of our theoretical chapters connects with one of the more important issues to be addressed in Chapter four: the capitalisation and depreciation or revaluation of fixed assets.

1. IRR versus NPV

Exhibit 3.1 illustrates the cash flows for a project as they are often portrayed in financial literature. The 'down' bars in year zero represents the initial investment, and reflects cash outflow for the investor. The up bars in subsequent years represent annual cash flows, and reflects prospective cash inflow for the investor. Discounting has the effect of diminishing the cash flows as they are brought back to year zero values.

Exhibit 3.1: Project cash flows



If we calculate the cumulative cash flows over the 6 years, without discounting, then the cumulative cash flow from the project is a positive 500. If we use a discount rate of 15.2 per cent, which is the IRR for the project, then the NPV (which comprises the initial cash outflow and the present value of the subsequent cash inflows) is zero. This is illustrated in Exhibit 3.2 below.

Exhibit 3.2: Project cash flows and NPV

Project cash flows						
Year	**0**	**1**	**2**	**3**	**4**	**5**
Cash flow	(1,000.0)	300.0	300.0	300.0	300.0	300.0
Cumulative cash flow	500.0					
Factor	1.000.0	0.8678	0.7530	0.6534	0.5670	0.4921
PV of cash flow	(1,000.0)	260.3	225.9	196.0	170.1	147.6
NPV	0.0					
Discount rate	*15.2%*					

We can illustrate the fact that the IRR is 15.2 per cent in a different way. Suppose that we recalculated the present value of the project at the beginning of each year. Then if we calculated the profit for the year as the cash flow that the project generated minus the impairment to its value each year, then the result should reflect a 15.2 per cent return on the opening capital. Let us have a look. The calculations are represented in Exhibit 3.3.

Exhibit 3.3: ROCE=IRR

Economic accounting						
Year	**0**	**1**	**2**	**3**	**4**	**5**
Cash flow	(1,000.0)	300.0	300.0	300.0	300.0	300.0
Opening PV of cash flows	0.0	1,000.0	852.4	682.3	486.2	260.3
Closing PV of cash flows	1,000.0	852.4	682.3	486.2	260.3	0.0
Impairment of value	1,000.0	(147.6)	(170.1)	(196.0)	(225.9)	(260.3)
Profit	0.0	152.4	129.9	104.0	74.1	39.7
ROCE (opening capital)	*0.0%*	*15.2%*	*15.2%*	*15.2%*	*15.2%*	*15.2%*

The first row repeats the undiscounted cash flows from Exhibit 3.2. The second calculates the present value of the project at the beginning of each year. As the discount rate used is 15.2 per cent, the project's IRR, this is tautologically zero at the start of year 0. The third row calculates the present value of the project at the end of the year, at the same discount rate. Again, the figure of 1,000 is tautological. Profit is then calculated as the cash flow from operations for the year minus the impairment of value for the year (the fall in present value for the project). In year 0, 1,000 is spent to create 1,000 of value. In subsequent years, cash flow exceeds the impairment of value, and if the resulting profit is divided by the opening present value then the resulting return is always 15.2 per cent. This calculation is analogous to calculation of a lease payment, in which interest would substitute for profit and amortisation of principal for impairment of value.

But, of course, this is not what happens in conventional accounting. Exhibit 3.4 shows the same calculation performed for the same asset, but substitutes straight line depreciation for impairment of value and opening and closing capital for opening and closing present values.

Exhibit 3.4: Conventional ROCE calculation

Conventional accounting						
Year	**0**	**1**	**2**	**3**	**4**	**5**
Cash flow	(1,000.0)	300.0	300.0	300.0	300.0	300.0
Opening capital	0.0	1,000.0	800.0	600.0	400.0	200.0
Closing capital	1,000.0	800.0	600.0	400.0	200.0	0.0
Depreciation	0.0	(200.0)	(200.0)	(200.0)	(200.0)	(200.0)
Profit	0.0	100.0	100.0	100.0	100.0	100.0
ROCE (opening capital)	*0.0%*	*10.0%*	*12.5%*	*16.7%*	*25.0%*	*50.0%*

The difference between this and Exhibit 3.3 above lies in the depreciation being calculated as a straight line figure derived by taking the investment amount and dividing by the useful life. In reality, the impairment of value that results from retirement date for the asset approaching accelerates. The cost of losing something in 24 years rather than 25 years is much less than the cost of losing something in 2 years rather than 3 years. Yet conventional accounting does not accommodate this, with only two approaches to depreciation being acceptable: straight line, or declining balance. The latter is even worse from the point of view of misrepresenting economic reality.

In fairness, the problem for accountants is that our exercise involved the assumption that we can predict future cash flows. Traditionally, this would have been regarded as an imprudent basis for accounting. But the dividing line between traditional historical cost accounts and fair value accounting has become much more blurred in recent years. This is partly because of the pressure to reflect the value of derivatives and other assets on balance sheets at market value. In addition, both in the areas of capitalisation of goodwill and of other intangible assets, and in the application of ceiling tests to all fixed assets, there is a gradual shift towards a greater reflection of market values in published balance sheets. If ever taken to its logical conclusion, this would eliminate our problem, or rather, replace it with a new one: assessing the reasonableness of the assumptions that underlie the claimed market values. This is already an issue for insurance companies (embedded value accounting), oil companies ('SEC 10' NPVs) and all companies with complex derivatives in their balance sheets, which are subject to what Warren Buffet has memorably described as 'mark to myth' accounting. We shall return to all of these issues later, but first would note two things about our calculations.

The first is that the difference between internal rate of return and accounting returns on capital will tend to be worst in the case of companies with assets that have long asset lives and whose cash flows are expected to rise over the life of the asset. It will tend to be most acute for utilities, oil companies and insurance companies, and it is no surprise that managements, bankers and investors in all of these sectors set little store by unmodified historical cost accounts.

The second is that the problem will be mitigated considerably if the company has a portfolio of similar assets in it, all of different ages. Let us return to our example one last time but instead of assuming a one-asset company instead assume that our company has within it 5 assets, of differing ages. Exhibit 3.5 shows its simplified accounts for the year.

Exhibit 3.5: Mature company ROCE

Mature company	
Cash flow	1,500.0
Opening capital	3,000.0
Closing capital	3,000.0
Depreciation	(1,000.0)
Profit	500.0
ROCE (opening capital)	*16.7%*

This is better than the results for a new or an old asset, but there is still a significant difference between 16.7 per cent and the right answer, which is 15.2 per cent. And the closeness of the results will depend on the shape of the cash flows that are generated by the assets over their lives, and by the phasing of capital expenditure within the company. In reality, company capital expenditure often goes in waves. This will tend to result in companies that have recently undergone a period of low investment achieving high accounting returns on capital employed, and companies that have just undergone a period of high capital expenditure looking rather unprofitable.

Before we rush to the conclusion that accounts are treacherous things after all, and that we should return to discounting cash flows and ignoring profits and balance sheets, reflect on a question that we discussed in Chapter one: where do we get our forecasts of cash flows from? Generally, the answer is: from accounting projections of the corporation that we are trying to value. So we are stuck with accounting numbers. The question is how we can try to make them as meaningful as possible.

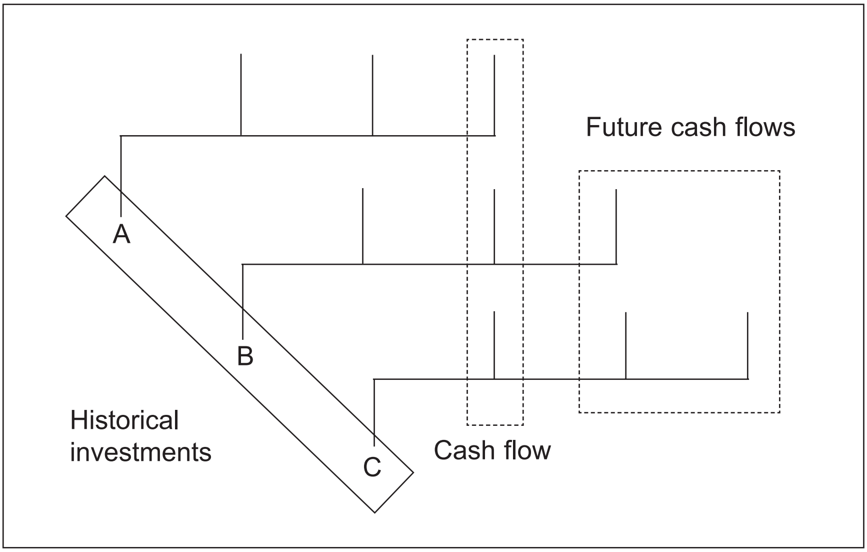
The best known attempt to construct a valuation model that is explicitly aimed at solving this problem is Cash Flow Return On Investment (CFROI), popularised by Holt (now owned by Credit Suisse First Boston).

2. Calculating CFROI

One approach to the problem, as we have seen, is for accounts to reflect fair values. In this instance the simple ratio of profit divided by capital equates to the IRR that the company is achieving. But accounts are not created that way and (from the outside, at least) it is generally impossible to recreate them by revaluing all the assets every year.

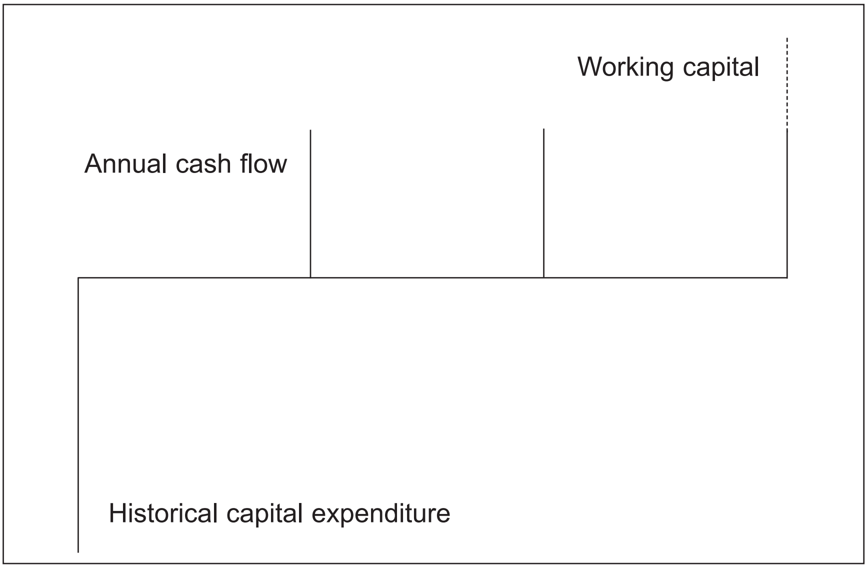
If we cannot revalue the assets we want then to go back to modelling cash flows directly, as we did in Exhibit 3.2, but then we run into another problem. We do not get corporate cash flows by asset. Often, we just get the information for the business as a whole. CFROI starts with this constraint and makes a simplifying assumption: that we can use the company's cash flow from operations, its historical stream of capital expenditure, and the life of its assets to construct a model that looks like Exhibit 3.6, but which applies to the corporate entity as a whole. Exhibit 3.6 illustrates what CFROI sets out to do.

Exhibit 3.6: Basics of CFROI calculation



In this example, the company has assets with a life of three years. Investments A are in their third year of life, B in their second and C in their first. All that we can ascertain from the accounts about their cash generation is the total cash flow in the current year. The insight is that if we add together the three historical annual investments, and then relate this total to a series of three annual corporate cash flows, then we can use this to calculate an internal rate of return for the company as a whole. This calculation is illustrated in Exhibit 3.7.

Exhibit 3.7: CFROI=corporate IRR



The company's CFROI is simply the IRR calculated for this model. Notice that the cash flow for the final year includes release of working capital, as if the company were to be liquidated.

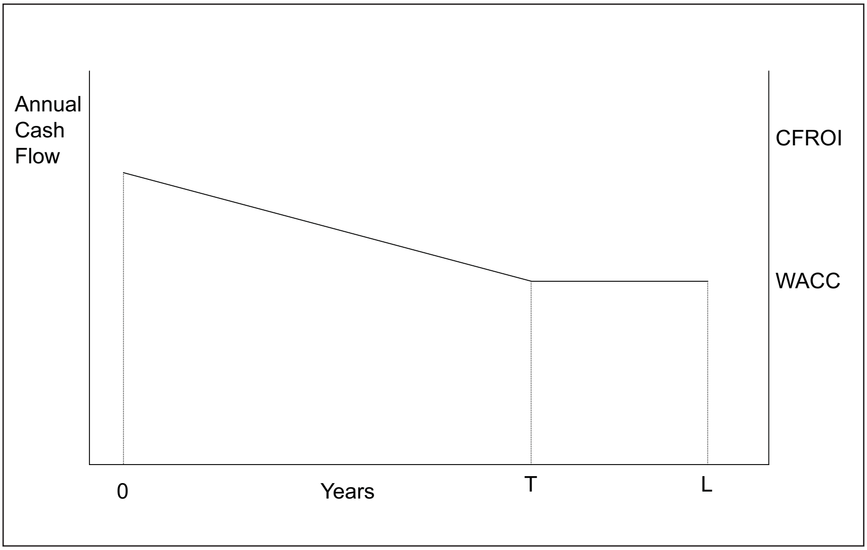
Let us return to the previous exhibit, 3.7. Two of the years of investment, B and C, comprise assets that have a remaining life. We do not know what they are generating, but we can calculate their average remaining lives as their net book values divided by the annual depreciation charge. In our example this figure will approximate to one year, so we calculate the value of the existing assets as being one year's cash flow, discounted for one year. Clearly, if the company had assets with an average remaining life of five years, the value of the existing assets would be calculated as a discounted stream comprising five years' cash flow, with working capital released at the end.

And what about future investments? That is why we needed to calculate the CFROI. Suppose that the company is currently achieving a return on investments that is in excess of its cost of capital, then the standard assumption would be that over time this would be driven by competition back into line with its WACC. We can then model the value that will be added by a future stream of investments by assuming that although each year's capital expenditure will be higher than the last, the spread that it earns over the WACC is less than the last, with the result that after a reasonable period (whatever that might be), no further value is added, so no further calculations need to be undertaken to value the company. This concept is known as a 'fade', and we shall return to it when we look at practical issues in valuation in Chapters five and six.

There are some additional complications if the approach that we have now discussed is to be applied in the way that HOLT applies it. The first relates to inflation. Our company had assets with a life of only three years. Many capital intensive companies have assets with a life of 15 years or more. In this case just adding up the stream of historical investments and relating them to current cash flow is misleading, as inflation will result in understatement of the capital required to generate current cash flow. The solution is to restate everything in real terms, escalating the historical investments into current day money. The resulting CFROI is then real, rather than nominal, and should be related to a real cost of capital.

The second complication relates to the tapering of returns. Rather than assuming that existing assets continue to generate their current cash flows, and that new investments generate even cash flows over their lives, HOLT applies the fade not just to cash flows generated by new assets in their first year, but also to individual annual cash flows from existing and new assets on a year by year basis. So each component of the cash flows that is being discounted is fading year by year to a level that implies that the return on the individual investments fades towards the cost of capital. Exhibit 3.8 illustrates the effect of the fade on cash flows from existing assets.

Exhibit 3.8: Cash flow from existing assets



In this chart, L is the remaining life of the assets. T is the point in the future at which it is assumed that competition has beaten down returns so that CFROI=WACC. The period from 0 to T is the fade period. The left-hand Y axis shows projected cash flow from the existing assets, ignoring release of working capital. The right-hand Y axis shows the CFOI that was used to calculate them.

New assets are modelled in exactly the same way. Each year's investment is bigger than the last, inflated at the real growth rate of the firm. It generates a stream of cash flow that declines each year until it reaches a level, at year T, that equates to a level at which, if it had been maintained over the life of the investment, its IRR would be equal to the WACC. There is no need to model investments made after year T, since they have no impact on the value of the firm. The life of the model needs only to be to the point at which all investments made before year T have generated all of their annual cash flows, so the model life will be T plus L. Clearly, for a company whose CFROI is expected to fade into line with its WACC over a period of, say, 8 years, and whose assets have a total life of 15 years, this implies that the full model will extend over 23 years.

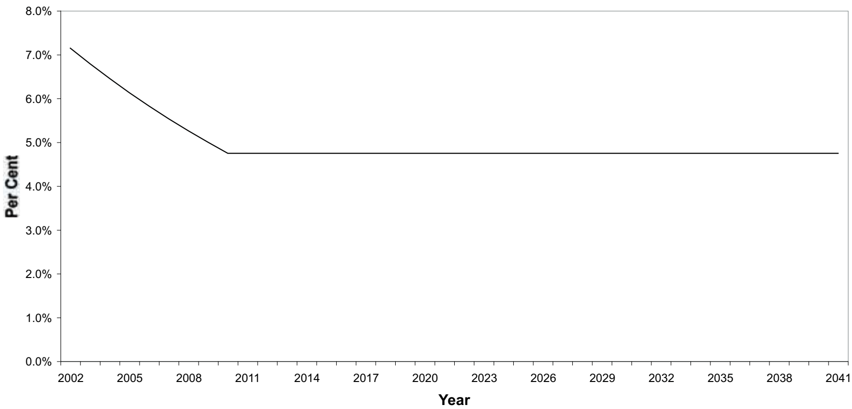
We have discussed CFROI with the use of diagrams because, unlike the valuation models discussed in Chapter one, it makes minimal use of formulae but is instead a large, detailed, calculation which has to be done on a year by year basis for a specific company. There is no terminal value based on a constant growth formula, and the annual cash flows are derived separately for the existing assets and for the projected new investments. We shall talk through a set of detailed exhibits for a real company in the next section. Our methodology may not be exactly identical to that used by HOLT, but it is very similar, and in any case one of the attractions of the CFROI approach is that it is extremely flexible. We shall defer discussion of its disadvantages until it has been adequately explained.

2.1 CFROI example

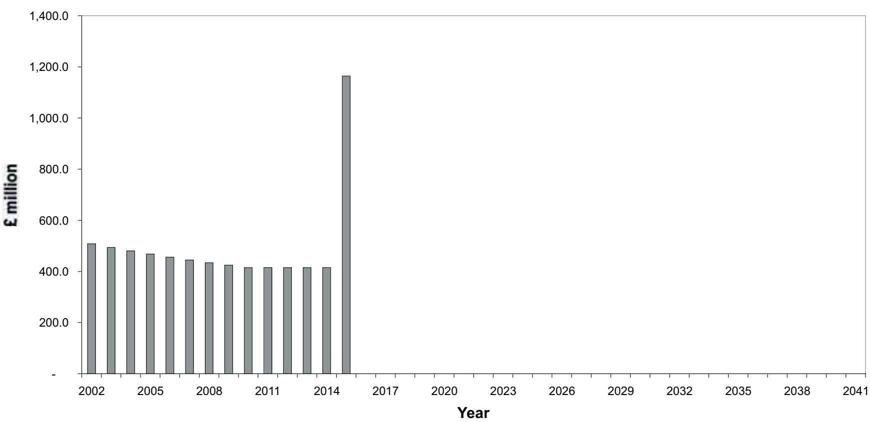
Exhibit 3.9 below illustrates the outputs from a real, detailed, CFROI model. Again, we shall spare the reader all the numbers, but have represented the outputs graphically, in the hope that this will make the methodology as clear as possible. The model is of the UK food retailer, Safeway, and was built in 2002, a year ahead of the bid for Safeway from Morrison. At the time, Safeway's assets had a gross asset life of 21 years, and a remaining net asset life of 13 years, implying an average asset age of 8 years. It was assumed that an appropriate fade period during which the company's CFROI would fade from its then current level to equal its WACC was 8 years, implying that only investments made prior to 2010 (year 8) needed to be modelled. Thus, the model needs to extend out by a total of 29 years, comprising 8 years of fade period and the 21 year life for the investments made in year 8. The template used was designed to handle up to 40 years of combined fade period and asset life, and the charts illustrate the full 40 year period in each case, to give a sense of chronological proportion.

Exhibit 3.9: CFROI model of Safeway

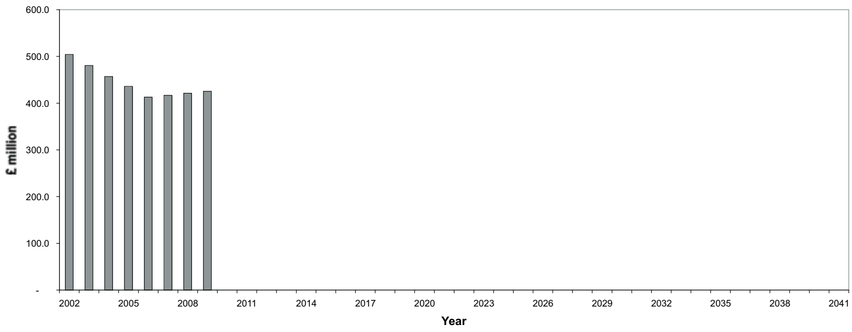
1. CFROI and forecast CFROI



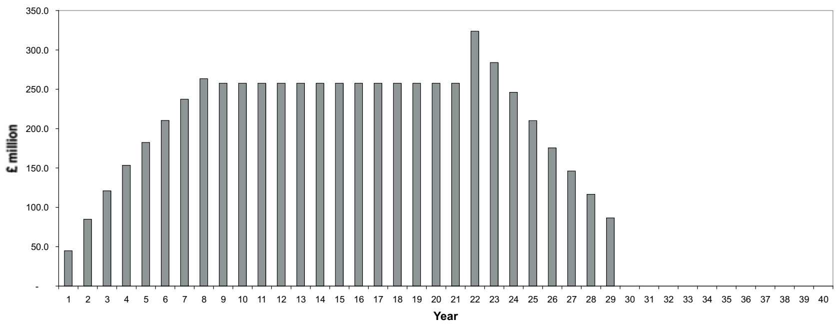
2. Cash from existing assets



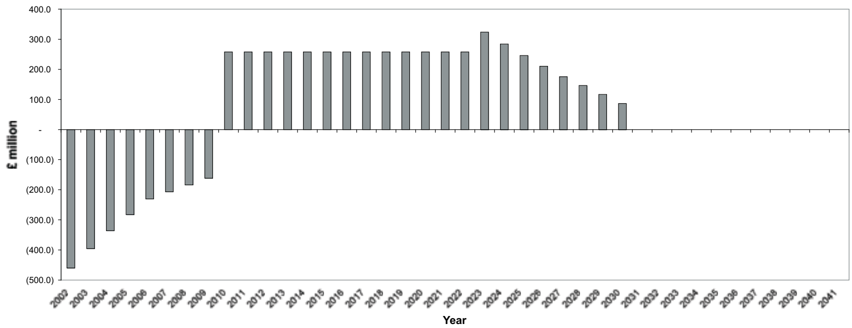
3. Forecast investments (incl. W.C.)



4. Cash from new assets



5. Net cash flow (new assets)



6. Net cash flow (all assets)

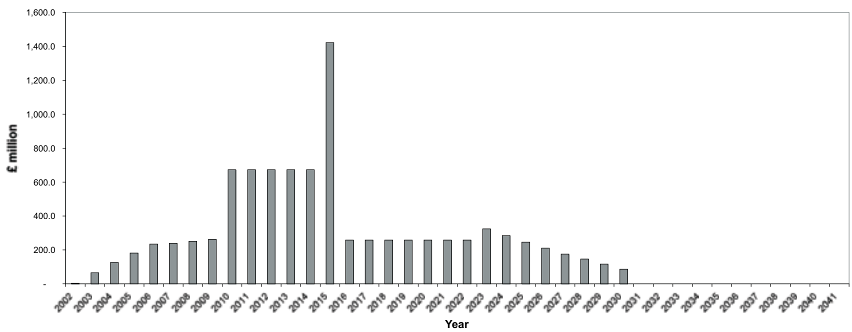


Chart 1 simply shows what happens to CFROI over time. It is assumed to fade over 8 years into line with the company's WACC, after which it remains at that level.

Chart 2 shows the cash flows that are projected from the existing assets. They have a remaining life of 13 years, and the large amount for year 13 reflects release of the company's existing working capital. Annual cash flows fall over the 13 years because the firm's CFROI is fading towards its WACC.

Chart 3 shows forecasted investments, and extends only 8 years because all new investments undertaken after year 8 have an NPV of zero (IRR=WACC). Capital expenditure for the first 5 years is explicitly forecast to start high and then fall. The company had been through a period of underinvestment. After year 5 the model takes over, with an assumed real underlying growth of 1 per cent annually.

Chart 4 shows the cash flows that are projected from new investments. They rise to year 8 as new investments are made, and they are flat from year 8 to year 21, as cash flows stop fading after year 8 (IRR=WACC). In year 21 they bounce with the release of the non-depreciated working capital from the year 1 investment. And after that they fall as assets are retired.

Chart 5 shows the net cash flows that are projected from new investments. The difference between this and the previous chart is the assumed cash outflows related to the investments in new assets shown in Page 3.

Chart 6 pulls together all of the above. Discounting these cash flows gives the value of the company, as does adding together the discounted value of the cash flows in charts 2 and 4.

2.2 Conclusions regarding CFROI

The first point to make about the CFROI methodology is that it is a subset of the standard discounted cash flow to capital approach discussed in Chapter one. What is different about it is the way in which it goes about projecting what the cash flows are actually going to be. Instead of using corporate projections for a period, followed by a terminal value based on an assumed growth rate and return on capital employed, it separates the task of modelling existing assets and future assets, and generates separate streams of cash flow for the two. Existing assets are assumed to produce streams of cash that fade towards that which is implied by a CFROI that equals the company's WACC. Each new year of new investments generates its own stream of cash, and is modelled as if it were an individual asset, with a steam of cash receipts that fades in line with the returns assumed for the old assets. After year T, when CFROI=WACC, new investments can be ignored, and the model need only run off the cash flows from investments that have already been made before year T.

But look again at chart 6 in Exhibit 3.9. Do these cash flows really look like those that you would expect any stable, low growth company to generate? Probably not. They are an artificial construction, not a realistic projection. Moreover, they are highly dependent on the assumed asset life. Growth rates and fades are issues with which analysts have to grapple, whatever the methodology used. But asset lives are not. One could say that what CFROI does is to replace one problem with another. Using conventional accounts leaves us dependent on return on capital calculations that are economically inaccurate. Breaking with them and switching to CFROI leaves us dependent on calculations of internal rate of return that are in turn highly dependent on the assumed life of the company's assets. And what about companies whose assets do not generate flat streams of real cash flow?

Finally, there is the question of what to do about accruals. It was bad enough thinking through what to do with them in a standard WACC/DCF model. Easier in an economic profit model: we just left them in. But they are hard, though not impossible, to build into a CFROI model. The latter is explicitly based on cash flows and net present values, and provisions of all kinds would really also have to be built into the cash flow streams. In the case of decommissioning costs, this should not be impossible. Just as non-depreciating assets could be released, decommissioning costs could be deducted. But when it comes to pension provisions, life could get harder.

Overall, our suggestion would be that the problems created by converting forecasts into a CFROI structure exceed the benefits for most companies. Exceptions might be companies that have very long asset lives, and very regular cash flows from operations. Some utilities would be candidates for this treatment.

3. Another approach: CROCI

We should in fairness make reference to another approach, namely Cash Flow Return on Capital Invested (CROCI). This has been developed as a proprietary methodology by Deutsche Bank equity research department, and in principle is an adjusted version of an economic profit model. The main adjustment is to restate all of the accounts on a current cost basis, to avoid overstatement of profitability resulting from inflation. But the methodology also allows for the use of different approaches to depreciation, including that used by the company, a standard asset life set by the investment bank (based on industry norms), and amortisation, (effectively what we called impairment of value in Exhibit 3.3 above). As used by Deutsche Bank, the main point of their methodology is to emphasise returns to capital, rather than equity, and to eliminate the impact of inflation, but it can be used to substitute impairment of value for depreciation in the calculation of achieved returns on capital employed.

4. Uses and abuses of ROCE

Companies and analysts need to be aware of the distortions introduced by straight line depreciation. In particular, there is likely to be a systematic bias whereby companies that have invested heavily look less profitable than they really are and companies that have underinvested look more profitable than they really are. As investment often goes in medium term cycles, this is an important effect.

The impact of the effect is likely to be greatest with companies that have long-lived assets, especially if cash flows are expected to grow over the life of the asset. A gas pipeline would be a fine example.

Something clearly needs to be done to correct for this when valuing companies. One approach is to model existing assets and then to assume additional value added from new investments. This need not take the form of a CFROI analysis, which aggregates cash flow from existing assets. In many cases they can be modelled separately. Indeed, CFROI could be seen as a special case (complete aggregation) of an asset-based company valuation.

It is unlikely to be helpful to model most companies in this way. Separating out the existing and future assets of Procter and Gamble, for example, would be very hard. Most of the assets are intangible. How do we separate investments in building new brands from the marketing costs associated with this year's sales? And, as intangible assets are mainly not capitalised, we shall get no help whatever from looking at notes regarding fixed assets in the accounts, either with respect to the scale of historical investments, nor with gross and remaining asset lives.

So in general we shall be thrown back on corporate, accounting based models. Of course, it would be nice if companies were to provide us with information that would permit us to adjust fixed assets to fair value, and to accrue fair value additions and impairments through the profit and loss account. In some sectors of the equity market we already can.

Chapter Four

Key issues in accounting and their treatment under IFRS

Introduction

The premise of much of the material in this book is the importance and value relevance of accounting information. This importance extends from the detail and disclosure of accounting information that is afforded to the user and the subjectivity of many of the other alternative sources of information.

Furthermore, the move toward consistent accounting across the globe increasingly makes rigorous comparison and analysis of accounting information more feasible than was previously the case. In addition we have the 'fair value' orientation of many of the accounting standards that form the corpus of IFRS. This means that balance sheets will reflect more up-to-date values which, for some areas at least, will be more relevant for users.

Accounting and valuation

At the risk of repeating oneself it is still worth restating some of the key themes in the text so far. First, accounting information is highly relevant for valuation. The level of disclosure, recognition of non-cash economic flows (as well as lots of cash ones), matching and substance over form principles all lead to an investor friendly information source. Second, the linkages between the balance sheet, income statement and cash flow, once properly understood, can reveal the true profitability and efficiency of the business through the calculation of economically meaningful returns. Third, the alternatives, which essentially involve using cash measures of performance, suffer from a number of potential flaws:

- Ignore key economic flows merely because they have not been paid/received in cash
- Is highly volatile if capital expenditure is included
- Lacks disclosure (e.g. no segmental analysis of cashflow numbers)
- Can be manipulated (e.g. delay paying suppliers or offering generous discounts – both would enhance cashflow but are potentially very damaging for the business)
- More difficult to use return measures as we do not have an integrated balance sheet that reflects cumulative retained 'cash' earnings

Notwithstanding the above we are well aware of the potential difficulties of using accounting information. In particular history has shown that management will often seek to manipulate subjective accounting rules to maximize the short-run performance of the firm. Therefore it is often useful to carefully look at cash earnings in addition to accruals based profit. However, the idea that, as a non (pure) cash flow, earnings are irrelevant is not a defensible position in the view of the authors.

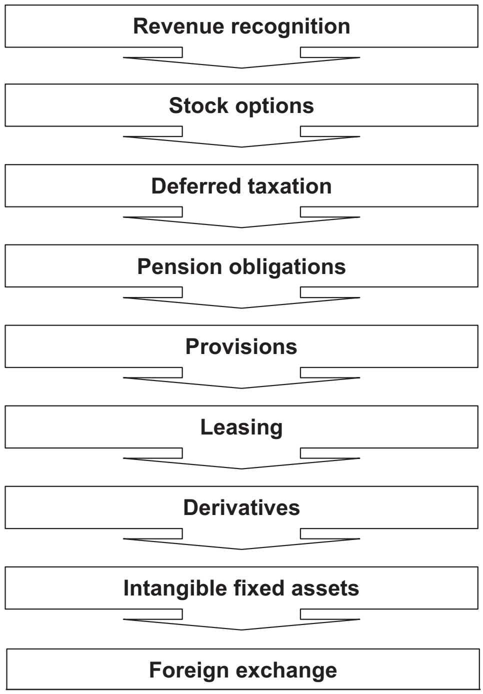
Finally it should also be emphasised that accounting information will often need to be adjusted for specific valuation methodologies. This does not mean that the information itself is necessarily flawed. Instead the IASB, and others, has developed a very general model of accounting with the broadest appeal. It has ensured that the major disclosures and information content is there and it is up to users to decide on how to use it. This text, and in particular this chapter, is themed around how we think it should be used.

This chapter addresses the key areas of accounting that tend to present problems for valuers. Each issue is addressed in a systematic way around six themes:

- Why is the issue of relevance to investors?
- What is GAAP under IFRS?
- What is the US GAAP treatment if different from IFRS?
- What are the financial analysis implications?
- Case study example
- What are the modelling and valuation implications, together with any adjustments, leading from GAAP?

Issues relating to accounting for business combinations are covered in Chapter 7. Accounting issues relating to banks, insurance, utilities, oils and real estate are addressed in their respective specialist chapters. The key topics addressed are illustrated in Exhibit 4.1.

Exhibit 4.1: Technical accounting areas covered



1. Revenue recognition and measurement

1.1 Why is it important?

When interpreting historical accounts, importance is generally ascribed to revenue because it is seen as a key driver of both profitability and cash flow. But it is important to recognise that revenue does not actually equate to a stream of cash inflow. This is why, for example, the widely-used EBITDA figure should not be treated as a measure of cash flow. It includes sales made on non-cash terms, provisions and accrued expenses, to name but a few, none of which are cash flow items. This is not a problem that can be addressed by reverting to cash-based measures, since if a company is actually accruing revenue that will be paid subsequently this is clearly material to its value. Moreover, some businesses, such as publications, receive cash up front as consideration for a stream of product that will be delivered over the rest of a year, or longer. In that situation, it would clearly be inappropriate to allocate all of the revenue to the quarter in which it was received.

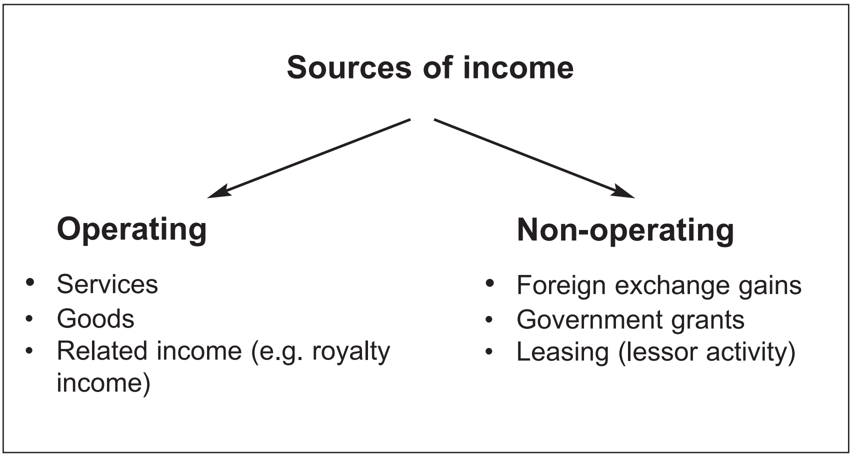
So we need a realistic measure of accrued revenue, not of cash received. Obviously, this creates a risk – that the measure of revenue that is accrued in a company's accounts, and possibly extrapolated in forecasting models, is not realistic. During the severe downturn in the telecommunications industry after the Millennium, there were several cases of companies that booked large amounts of revenue, and therefore of profit, that were subsequently reversed in later quarters. The message for the user of accounts, therefore, is that we need a measure of accrual, but one that is realistic.

Although revenue recognition complexities are often associated with new economy or high-tech businesses, issues still arise in the most traditional of sectors. For example, some analysts may argue that a supermarket is a simple business and that its revenue streams are well defined and revenue manipulation is not a significant issue. The Dutch retailer, Ahold, shattered this illusion. Ahold, in common with many other retailers, offers a variety of promotional enticements to customers such as vouchers, volume discounts (e.g. 3 for the price of 2) and loyalty reward schemes. The accounting for these marketing techniques is not clearcut under most GAAPs (see below). Ahold's misdemeanours, in the view of the SEC, were so significant that operating earnings for 2001 and 2002 had to be adjusted for a $500 million overstatement. Ultimately many of the key members of the board had to leave, such was the reaction to such startling revelations. The message is clear – an analyst must be very familiar with the revenue recognition issues in their sector in order to understand and value companies properly.

1.2 What is current GAAP under IFRS for revenue recognition?

In a broad sense, the term revenue refers to sources of income for a business enterprise. Most forms of business activity generate revenues from a range of different sources. For our purposes it is useful to distinguish between operating and non-operating revenues. Exhibit 4.2 below illustrates such an approach with examples.

Exhibit 4.2: Sources of income



For most analysts the key topic for analysis is those streams of income derived from core business activity, i.e. sales of core products and services. Therefore this section will focus on this topic. This is not to say that non-operating revenues may not be important. A summary of the accounting treatments that apply to such ancilliary revenue sources is provided in Exhibit 4.3 below.

Exhibit 4.3: Non-operating revenues

Source of revenue	Accounting treatment
Government grants	Revenue grants treated as income as related expense is incurred Capital grants treated as deferred credits
Foreign exchange gains	Gains on trading transactions are reported as reductions in operating expenses Gains on financing transactions are reported as part of finance charges
Leasing	If capital leases then immediate recognition of total sale value of assets under lease treated as revenue If operating lease then spread profit over lease term giving revenue, in the form of rental receipts, in each year of the lease term

We ascribe the term revenue recognition to the issue of when a particular source of revenue should be recognised. This timing issue is of crucial importance for calculating profit margins and for gaining an appreciation of historical performance. This is especially so where the product of the historical analysis will be a view about future sales and growth. Almost all valuations for industrial concerns entail a forecast of revenues. Indeed many other facets of valuations and associated models are driven off the sales forecasts. For example operating costs are typically linked to sales forecasts. Furthermore most models also use revenue figures as drivers for less obvious items such as property, plant and equipment. Therefore revenue numbers and related information, such as segmental disaggregations, are of significant importance to valuers. An analyst must have a strong knowledge of the revenue recognition issues in his/her sector in order to forecast this core number competently.

In addition to the issue of timing we also have the issue of measurement of the revenue i.e. what number appears in the financials. This tends to be less problematic than the recognition point. In common with many other accounting topics, fair values should be used in the measurement of revenues. This would mean that revenue would have to be discounted if the terms of the transaction where such that the time value of money is material. Given the relatively straightforward nature of the measurement issue the remaining parts of this chapter will concentrate on the timing issue.

1.2.1 Some broad principles

There are two broad approaches to revenue recognition: the critical event approach and some approach based on the passage of time. The critical event approach essentially recognises revenues when a significant event occurs. For example in the real estate sector the critical event might be when contracts are exchanged or when transactions are legally complete. The passage of time approach might also be used in the property sector to recognise rental income as time passes. Companies can employ both approaches for different sources of revenue.

Historically revenue recognition derived from industry practice rather than being addressed explicitly by accounting standards. Two basic conditions have emerged as the drivers for revenue recognition timing which supplement the more general approaches outlined above. The first condition is that prior to recognising revenue the 'sale' must be realised i.e. either the company has received the cash or expects to (for example, the customer is of good credit worthiness). This condition could be satisfied by a company having an appropriate credit control system in operation. The second condition is that the revenues must be earned. In other words the work relating to the revenue under consideration for recognition must be complete.

In many ways GAAP based on these principles existed without many difficulties for a considerable period of time. However, increasingly complex business activity eventually exposed the simple conditions as being inadequate. Those bemoaning the obsession of GAAP with rules and favouring a more principles based system might express disappointment that further detailed rules have evolved. However, further guidance is almost certainly required given the diversity of business activity. This inevitably leads to rules and so in many ways some level of detail is necessary to ensure an adequate level of comparability of application. For example consider the case of a mobile phone company selling a one year contract to an individual. The contract encompasses both the provision of call services and the mobile phone itself. Applying our principles based approach the realised condition will be met as credit worthiness checks will have been performed. Furthermore, the mobile phone sale is also complete whereas the call services are quite obviously not. The issue is what amount of revenue is to be recognised at the point where the customer signs the contract? It is obvious that a simple model is inadequate. It would provide the mobile phone company with significant latitude for recognition. In an international context the required further guidance is provided in the form of IAS 18 *Revenue*.

IAS 18 accepts that any approach to revenue recognition cannot hope to encapsulate the complexities of all types of commercial activity. Therefore it provides a generic approach but provides exceptions to it – for example, long term contracts which are covered by IAS 11 *Construction contracts*.

IAS 18 sets out various conditions that must be satisfied before revenue can be recognised. It has distinct criteria for both services and goods. Exhibit 4.4 summarises these criteria.

Exhibit 4.4: IAS 18 Revenue recognition criteria

- Significant risks and rewards transferred
- Seller retains no control
- Revenue can be measured*
- Economic benefits will probably flow to the seller*
- Costs can be measured*
- Stage of completion can be measured**

* Criteria apply to both goods and services
** Applies to services only

The simpler the business activity the more straightforward the application of the conditions. The standard makes it particularly clear that for the sale of goods the first criteria is most critical. This reflects the essentially economic ('risk and reward') approach adopted in many international accounting standards.

1.3 US GAAP Focus

In broad terms US GAAP and IFRS are consistent. The key difference is that US GAAP contains lots of explicit guidance including sector specific examples whereas IAS 18 is much more general in nature. This may well lead to different revenue treatments in very particular circumstances. It is worth noting that the IASB and FASB continue to work on a joint project regarding revenue recognition concepts.

Some guidance under US GAAP is based on rules issued by the SEC, in particular Staff Accounting Bulletin (SAB) 101. A summary of this is provided below.

SAB 101 was issued in late 1999 and it proposed four requirements prior to the recognition of revenues:

Persuasive evidence of an arrangement (e.g. orders, customer agreements etc)

↓

Delivery has taken place or services rendered

↓

Seller's price is fixed and can be determined

↓

Collectability is reasonably assured

Here are some of the more important areas of SAB 101:

	Issue	**Description**	**Acctg treatment**
1.	Consignment sales	Inventory transferred to a third party (typically customer) but seller retains risks and rewards.	Not recognised as revenue until transfer of risks and rewards irrespective of legal title.
2.	Non-refundable payments	Up front payments	Only recognise if the up front portion represents payment for a discrete earnings process.
3.	Set-up fees	For example a telecom company charges a phone set-up fee.	Do not recognise immediately, Instead, spread over the longer of the term of the arrangement or expected period of service.
4.	Right of return	If a right of return exists then revenues can only be recognised if the amount of future returns can be estimated.	SAB 101 sets out the relevant issues to be considered when assessing if this is the case.

1.4 Financial analysis implications

Given that it is such a crucial number the guidance in IAS 18 is fairly light and it is no surprise that both the FASB and the IASB have an ongoing project to develop further detailed accounting guidance on revenue recognition to tighten up the entire area. Many of the accounting scandals of 2000 et seq were grounded in revenue recognition abuses. For example see the extract from the Wall Street Journal below (Exhibit 4.5).

Exhibit 4.5: Global Crossing

> ***Analysts Say Global Crossing Used Aggressive Accounting***
> *These contracts were attractive to upstart telecom firms such as Global Crossing because they could book most of the 20-year revenue upfront as one lump sum. Meanwhile, Global Crossing would offer to buy similar capacity in another area from the same carrier. Then it would book those costs as a capital expense, allowing it to show large revenue increases with little or no operating expenses.*
> **Wall Street Journal**

Revenue recognition issues

Analysts need to be aware that there are a number of different areas where revenue recognition issues are complex and deserve some attention. These include the following:

1. **Warranties**
   It would appear that the problem is how much of the initial revenues should be allocated to the warranty and spread over its lifetime. In essence the question is: has the warranty been earned? If it has been earned at the point of sale then all of the warranty revenue would qualify for immediate recognition, with a provision being made for the potential future costs of the repairs. For example the accounting policy note for The Dixons Group plc in the 2002/03 financials categorically states that 'extended warranty and service contracts are included in turnover in the period in which they are sold'.

2. **Vouchers**
   These are used extensively in the retail sector. For example, if a two for the price of one product promotion is offered is it appropriate to recognise the revenues from the sale of both products with the free element being recorded as a cost? There is a lack of specificity about the accounting treatment of vouchers and in many ways this may have led to the significant problems at the US subsidiary of Ahold. One would expect the treatment of this issue would be similar to that for discounts. Trade discounts (i.e those that are

guaranteed) are typically treated as a reduction in revenues whereas those discounts that depend on another event are treated as a cost if they occur (e.g. a settlement discount for early payment). IAS 18 is not explicit on this point.

3. **Subscriptions**
   Subscriptions (for example a magazine) are realised immediately but are not actually earned until the magazines are issued. In the meantime the cash received is classified as deferred income (unearned income) and classified in liabilities.

4. **Advertising revenues**
   Again establishing realisation is typically not a problem. However, the issue that then requires analysis is has the revenue been earned. Is it earned when the advertising is complete (i.e. ready for publication)? Normal practice is to recognise the revenues as the production process proceeds. For other advertising management services the 'earnings' event will normally be the advertising going public.

5. **Software revenues**
   Again this is an area where judgment is required. For example a software contract often contains both software installation and maintenance components. The initial part of the contract (that relates to installation) can be recognised immediately, but the maintenance component must be spread on a time basis. This permits a wide range of flexibility.

6. **Real estate transactions**
   Revenue can be recognised either at the point of contract exchange or on the completion of contracts. To many familiar with property transactions this appears reasonable enough. However, be aware of the flexibility this provides. For example the directors of a company might change their accounting policy to reflect contract revenues on an exchange basis as against the previous completion policy. This would result in an influx of profits that would otherwise have been deferred to future periods.

7. **Barter transactions**
   If similar goods/services are exchanged then no revenue would be recognised. For dissimilar goods/services fair values are used for revenue recognition purposes. This is designed to avoid transactions such as capacity swaps (see exhibit 4.5 above).

8. **Non-refundable up front payments**
   Typically the non-refundable dimension is irrelevant for the more economic approach under IFRS. The critical event will still be the provision of the service/goods. If the revenue has not been earned then up-front fees are, in essence, deferred income. Upfront fees for arranging loans in the financial sector are one example. Under IFRS these will have to be deferred and recognised as part of 'interest.'

9. **Installation fees**
   The treatment depends upon whether the installation fees are significant. If not then merely include the fees in the sales price of the goods. Therefore the revenue recognition point will be that for the sale of goods, which is normally delivery.

10. **Right of return**
   The risk here is that revenues are recognised and then the customer effectively cancels the sale, thereby challenging the assumption that the revenue recognition criteria have been met. If an enterprise is exposed to predictable returns then it is probable that the full amount of revenue can be recognised and a provision made separately for the cost of the returns. If however there is a significant amount of unpredictable returns then it may be that revenue recognition must be postponed until the patterns of return become more predictable.

11. **Consignment sales**
   This is a situation where sales are made but the goods remain with the seller. In general terms, once legal title passes then a sale can be recorded. However, further conditions such as payment terms should be normal and the goods are on hand and ready for delivery. These conditions should really only be an issue in very unusual circumstances.

Basic analytical steps

So what can users actually do to help gain a reasonable understanding of such a broad and important area? The following identifies some basic analytical steps:

1. Gain a thorough understanding of the revenue recognition issues in their sector.
2. Understand the accepted practice and related GAAP support (or lack thereof) in the sector.
3. Document the accounting policy chosen by each entity in the sector and consider any divergence and how this might impact on comparable company analysis.
4. Watch out for signs of trouble relating to revenues:
    a. Unexpected changes in revenues
    b. Increasing disparity between profit and cash
    c. Unexpected ballooning of accounts receivable in working capital
    d. Change in the segment mix, especially if unexpected and or inconsistent with strategy
    e. Significant revenues or increasing proportion coming from a related party

1.5 Case example

It is actually quite difficult to use case studies to illustrate revenue recognition points as the disclosures under various GAAPs tend to be somewhat limited. The main issue to look at, as outlined in the paragraph above, is the revenue recognition policy for the company. To illustrate the point we have reproduced extracts from the accounting policies of two property companies:

Exhibit 4.6: Property company revenue recognition

Turnover
Turnover represents amounts received and receivable in respect of housing, land and commercial property sold and amounts receivable in respect of construction and other work completed during the year. Turnover excludes the sale of properties taken in part exchange. In the case of long term contracts turnover is recognised on a percentage of completion basis.

Source: Crest Nicholson Annual Report 2003

Profits on Sale of Properties
Profits on sale of properties are taken into account on the completion of contract. Profits arising from the sale of trading properties acquired with a view to resale are included in the profit and loss account as part of the operating profit of the group. Profits or losses arising from the sale of investment properties are calculated by reference to book value at the end of the previous year, adjusted for subsequent capital expenditure, and treated as exceptional items.

Source: Hammerson Directors' Report and Financial Statements 2003

As we can see Hammerson recognises the revenues based on completion whereas another choice would be on the basis of exchange of contracts. In certain circumstances these events may be months apart. The absence of detailed rules leaves the choice to the company. Furthermore Crest Nicholson employs the 'percentage complete' methodology for long term contracts. This is consistent with IFRS. Under other GAAPs the completed contract method is used. This will change with the advent of IFRS.

We can also see this in the context of a telecoms business such as Deutsche Telekom below. This policy reflects the basic principle that irrespective of when the company will actually receive the cash it is the 'performance' (called delivery here) that drives recognition (see bold highlight).

Exhibit 4.7: Deutsche Telekom revenue recognition

Accounting policies

Net revenues contain all revenues from the ordinary business activities of Deutsche Telekom. For example, these include revenues from the rendering of services and the sale of goods and products that are typical for Deutsche Telekom. Net revenues are recorded net of value-added tax (VAT) and sales related reductions. They are recognised in the accounting period concerned in accordance with the realisation principle. The T-Com division, which accounts for the major proportion of Deutsche Telekom AG's sales, recognises its revenues as follows:

T-Com provides customers with narrow and broadband access to its fixed-line network. It also sells, leases, and services telecommunications equipment for its customers and provides other ancillary telecommunications services. T-Com recognises service revenues **when the services are provided in accordance with contract terms.** The revenue and related expenses associated with the sale of telecommunications equipment and accessories are recognised when the products are delivered, provided there are no unfulfilled company obligations that affect the customer's final acceptance of the arrangement. Revenue from rentals and lease payments is recognised monthly as the fees accrue.

Source: Deutsche Telekom AG Financial statements as of December 31, 2003

1.6 Building valuation models: What to do

Whether the model is constructed in the form of a DCF or an economic profit model, the relevant figure is clearly the accrued revenue, not cash receipts. For companies in which there is a significant difference in any one period between these two items, extrapolating cash receipts is likely to be highly misleading. This implies two conclusions for valuation models. The first is that it is necessary to assess what is an appropriate accrual, which will be dependent on the accounting rules discussed above. The second is that when running DCF valuations we shall actually be valuing a stream of notional 'cash flow' which will include accruals. Otherwise only one side of a coin is being taken into account. If a contractor has fulfilled a significant part of a contract, but has only received expenses as payments on account, it is clear that his cash flows may be significantly understating his value creation. If a publisher sells a large number of subscriptions over a period considerably longer than that of the accounting period just reported, he has received cash that creates liabilities against which supply of product will be made in subsequent period. Ignoring this fact overstates value creation.

These points do not seem as odd if the form of valuation model chosen is an economic profit model, since we are accustomed to non-cash items appearing in profit and loss accounts. But it is crucial to understand that the same issues apply even within the format of a DCF model.

2. Stock options

2.1 Why is it important?

In many sectors, such as technology and telecommunications, the remuneration of executives contains a significant component of stock options. These options provide management and other employees the opportunity to participate in the capital growth of the business. At the same time they achieve a level of goal congruence, i.e. harmonising the objectives of management and shareholders. In order to understand corporate performance fully, analysts must appreciate the cost of this significant component of remuneration. If it bypasses the income statement then this may have significant implications for comparable company analysis as well as accurate profitability assessment. Furthermore, if a PE approach to valuation is to be employed then the analyst needs to be aware of how the potential dilution resulting from stock option compensation is reflected in EPS numbers. And the same point applies to intrinsic value models; there is a cost associated with the dilution.

2.2 What is current GAAP under IFRS for stock options?

Accounting for employee compensation would not typically be construed as an area of controversy or complexity. Yet recent debates have shown that achieving a broad consensus is a significant challenge.

Essentially, there are two key accounting issues relating to stock options that must be resolved. First, what is the compensation charge to be recognised in the income statement? Second, what is the impact, if any, on diluted EPS?

2.2.1 The Compensation Charge

Until recently, there was no guidance on this issue under International Financial Reporting Standards (IFRS) and very little in most national GAAPs. Therefore, US GAAP, in the form of SFAS 123 and APB 25 *Accounting for Stock Issued to Employees*, were the appropriate reference points. There are two broad approaches to calculating the compensation cost:

i. Intrinsic value approach

The intrinsic value of a stock option is calculated as the difference between the market price of the underlying and the strike price of the option.

So, if a share is trading in the market at €5 and an option offers the holder the right to buy it for €4 then this option has an intrinsic value of €1. Options with intrinsic value are termed in-the-money. If the right to buy (strike or exercise price) is the same as the current market price then the option is said to be at-the-money. If the market price is lower than the strike it is called an out-of-the-money option. Intrinsic value can never be negative; it is simply zero. A crucial point to note is that generally the intrinsic value is measured at grant date only.

ii. Fair value approach

The intrinsic value approach fails to recognise that options have more than intrinsic value. Even if an option is out of the money, the price of its underlying could rise and bring it into the money. This other element of value is termed time value. One broadly accepted method of calculating the fair value of an option is to use some form of Black-Scholes model, although approaches such as those involving a binomial model (often called a 'binomial lattice') may also be appropriate, especially for income-bearing assets, such as equities.

2.2.2 The International Accounting Standards Board (IASB) response

Many hoped that the IASB would simply ignore this issue. In warning off the IASB from considering the issue, Phil Livingston made the following comment:

> *' ... we had been through 10 years of debate on this subject in the U.S., and were not interested in reopening the huge wounds that resulted from the battle with the FASB ... Neither side has changed its view of this issue, and neither will. I suggested that they recognise the reality that stock option accounting is not going to change in the U.S. Therefore, they should get the issue off their plate and adopt a disclosure-based standard using whatever valuation method they deem theoretically correct.'*
> **November 2001, Financial executive**

However, the IASB published IFRS 2 *Share Based Payment* in 2004. This standard provides that fair values must be used for stock options. A simple example will illustrate the approach enunciated in IFRS 2.

- Johnson plc gives 2000 options to a member of staff.
- The options have a strike price of €5. The current market price is €5.
- The options are given to the staff member in return for his services.

- The vesting period is 3 years.
- A Black-Scholes model of the option would produce a fair value per option of €3.

Number of options	2,000
Fair value (in total)	€6,000
Number of years during vesting period	3
Annual charge	€2,000

Note that in the example above, the vesting period is the period between option grant date and the date when the option holder can actually exercise it (so called vesting date).

As mentioned before many commentators reacted negatively to the idea of the IASB reopening old wounds so it is no surprise that they would react negatively to the IASB's proposals.

2.2.3 How are options reflected in diluted EPS?

IAS 33 *Earnings per Share* states that the treasury stock method should be used to reflect the dilutive element for stock options. The key point to note is that under this approach options are only reflected if they are in-the-money. Out-of-the-money or at-the-money options are not included at all. Therefore, there is potential for 'latent dilution' and thus diluted EPS may fail to fully reflect the dilutive potential of stock options. Given this, it is unlikely that it is an acceptable alternative to stock option expensing.

2.3 US GAAP focus

The FASB has attempted to introduce a standard that is, for all intents and purposes, similar to IFRS 2 discussed above.

2.4 What are the implications for financial analysis?

Some years ago US companies were given a choice of approaches to stock option expensing; intrinsic value or fair value. Most US corporates chose the intrinsic value approach with fair value disclosures. Presumably this is based on the fact that it would enhance EBIT when compared to the fair value approach (fair value is always greater than intrinsic value). European companies had typically followed an intrinsic value approach as well. By adopting this form of treatment companies were able to ensure that they could achieve a zero compensation charge for the stock option component of remuneration by simply issuing stock options at the money. For example, see the extract from CISCO's financials in Exhibit 4.9 below.

Irrespective of what accounting standards say, there has been no unanimity about whether options should be expensed. However, now that companies have used the standard in practice, the objections appear muted. To the authors the arguments seem cogent. Options have value. If a company grants generous options to its employees then for an investor this may make the company a less attractive investment due to the potential future dilution. There must be a reflection of this cost in the income statement.

A fundamental issue will be whether the user of the financials truly believes that the expense is a real economic cost. We firmly believe it is. Once an acceptance is made of the validity of option expensing as a concept attention must turn to the credibility of the number itself. Naturally if one is fair valuing anything which does not have a liquid market then there will be a significant degree of subjectivity. In particular, certain inputs to any option valuation model, such as volatility, tend to influence the result greatly, and yet there is no accepted methodology for estimation. This has lead one commentator to suggest that IFRS 2 was a standard in 'random number generation'.

However, we must bear in mind that these numbers will be audited. Audit firms are unlikely to accept volatility and other estimates that are inconsistent with their observations of the markets and of other clients.

Furthermore, disclosures to be made by corporations will allow users to assess the quality of the calculation, at least to some degree.

The other area of concern is that companies are free to make estimates of the number of employees who will actually forfeit their options. The most common form of forfeiture is the departure of the employee. Exhibit 4.8 below illustrates how the numbers work under IFRS 2.

Exhibit 4.8: Stock option forfeit

Example 1

A corporate grants 100 share options to each of its 500 employees (50,000 options). The vesting period is three years and a binomial lattice model of the option gives a fair value of €15. The expectation is that 20% of employees will leave over the period and therefore the forfeiture rate is 20%. Assume these forfeiture rates turn out to be accurate.

Year	Calculation	Expense	Cumulative expense
1.	[50,000 X 80% X €15]X 1/3	€200,000	€200,000
2.	[[50,000 X 80% X €15] X 2/3] - 200,000	€200,000	€400,000
3.	[50,000 X 80% X €15] - 400,000	€200,000	€600,000

Example 2

If the forfeiture estimate changes as time progresses then the company will make adjustments in each year to ensure the overall result is up to date on a cumulative basis.

So the example is as above except:

- In year 1 20 people leave and the company reassesses its estimated forfeiture rate at 15%.
- In year 2 a further 22 employees leave and the company reassesses the forfeiture rate at 12%.
- In year 3 a further 15 employees leave meaning that over the 3 years 57 employees left.

So eventually 44,300 (443 employees at 100 options each) options vest at the end of year 3. The relevant entries over the years would be as follows:

Year	Calculation	Expense	Cumulative expense
1.	[50,000 X 85% X €15] X1/3	€212,500	€212,500
2.	[[50,000 X 88% X €15] X 2/3] - 212,500	€227,500	€440,000
3.	[50,000 X 88.6% X €15] - 440,000	€224,500	€664,500[1]

Source: Adapted from IFRS 2 (IASB, 2004)

[1] The final cumulative total of €664,500 is based on the 44,300 options at €15 each

The key point to note is that the forfeiture rate could be used to smooth the income statement number. For example, if a company could accelerate cost recognition if it set a low forfeiture rate in the early periods. Alternatively costs could be deferred if a high forfeiture rate was initially set.

2.5 Case example

As there is currently no accounting standard in Europe we do not have experience of applying IFRS 2 until it becomes mandatory in 2005. However, we have reproduced the policy note for Cisco below in Exhibit 4.9. It shoes that no compensation expense arises for stock options. This will change in the future in the EU and is expected to change in the US as well. Therefore the analyst is really faced with estimation of the numbers that will arise as against interpretation of the numbers that currently exist.

Exhibit 4.9: US GAAP practice – CISCO

The Company is required under Statement of Financial Accounting Standards No. 123, "Accounting for Stock-Based Compensation" ("SFAS 123"), to disclose pro forma information regarding option grants made to its employees based on specified valuation techniques that produce estimated compensation charges. These amounts have not been reflected in the Company's Consolidated Statements of Operations because no compensation charge arises when the price of the employees' stock options equals the market value of the underlying stock at the grant date, as in the case of options granted to the Company's employees.

Cisco published information

2.6 Building valuation models: What to do

The argument that stock options are not an expense to the business and should therefore not be reflected in the profit and loss account is analogous to the argument that a provision for decommissioning plant is a non-cash item and should not be included in a discounted cash flow valuation. The latent dilution that is likely to result from the exercise of stock options will be a cost to existing shareholders if and when it occurs, and the challenge is to build this cost into our valuation methodology.

It is necessary to make an important distinction here. This is between options that have already been granted, and options that based on expectations the company may grant in the future. Treatment of options that have already been granted is fairly straightforward.

The more sophisticated, and more accurate, approach is to subtract the fair value of the outstanding options from the value of the company, and then to calculate the value of the shares by dividing the result by the number of shares currently in issue and outstanding. In this version, the options are treated as a financial liability, and this fully reflects their latent value.

The less sophisticated, though more common, approach is to calculate a diluted value per share by increasing the number of shares used in the calculation to include the dilutive options. This calculation takes into account only the in-the-money options, and then calculates the proportion of them that are dilutive by dividing the average exercise price by the current share price and subtracting the result from one, to derive a percentage. The logic is that if options are exercised at a price of 100p and the share price is 150p, then the cash raised by the exercise would permit the company to cancel two thirds of the options, and the remaining one third would be dilutive.

There is no doubt that the former approach is more accurate if all that we are worried about is history, but suppose that we were confronted by a company that was clearly likely to continue to remunerate its employees through the issue of share options. A naïve cash flow approach to valuation would fail to pick up this projected cost. It will appear in the profit and loss account as a non-cash cost, and it has not yet been reflected in the grant of share options. So what do we do with it?

The answer must be that it is an accrual that we should deduct from our forecasts of cash flow or NOPAT in our valuation models, just like any other accrual. If we are running a DCF model, the projected costs associated with stock options should be left out of (i.e deducted from) the cash flows that we value, and if we are running an economic profit model, NOPAT should be calculated after deducting these costs. As with the treatment of other accruals, the correct treatment of stock options is more intuitive in the framework of an economic profit analysis, but it can be handled correctly whichever valuation approach is used.

Failure to deduct for the accrual will result in overvaluation of the company. To see why, imagine two otherwise identical companies. One states that from now on it will only pay its employees in cash, and raises their salaries to reflect this. The other evidently intends to continue to pay them in a combination of cash and stock options issued on the money, with no intrinsic value. (We assume that fair value of the stock options brings the value of their remuneration into line with that of the employees in the first company.) Failure to take into account the cost associated with projected issues of new options – not just with the historical already existing ones – will result in the second company appearing to be worth more than the first one.

3. Taxation

3.1 Why is it important?

Taxation is one of the more confusing areas of accounting. The terminology is opaque and the numbers are often driven by rules in legislation that have little to do with sensible economics. However, for analysts a clear understanding of taxation is vital. Firstly, it is a core cost for all companies irrespective of the specific sector. Secondly, there can be significant value attached to certain tax numbers such as tax losses. It is not untypical to find a complete mistreatment of these potentially important items in valuation models. Thirdly, tax has important implications for the cost of capital as discussed in Chapter two.

3.2 What is current GAAP under IFRS for taxation?

3.2.1 Taxation refresher

It is very important to distinguish between the two types of tax that we see in a typical set of financials; current taxation and deferred taxation. We shall deal with current taxation initially prior to returning to the thorny issue of deferred taxation.

Current taxation

During each accounting period the company must estimate how much taxation is due on the profits that are generated in the accounting period. This is calculated as:

`Profits chargeable to tax X local tax rate.`

Profits chargeable to taxation are pre-tax accounting profits adjusted for tax purposes. A typical calculation of taxable profit would be:

Profit before taxation (per the accounting income statement)	X
Add back disallowables:	
• Accounting depreciation	X
• Certain non-cash expenses such as general provisions	X
Less allowables:	
• Tax depreciation	(X)
• Cash expenses (i.e the cash equivalent to the disallowed costs)	(X)
Profits chargeable to tax	**X**

Once calculated the entry to record the current taxation will be:

Increase taxation liability in the balance sheet	**X**
Increase taxation expense in the income statement	**X**

3.2.2 Deferred taxation

As we have seen above, there are differences between accounting profit as determined by accounting standards on the one hand and taxable profit as determined by the tax authorities on the other. These differences give rise to an accounting concept known as deferred tax. We will use a simple example to explain this (Exhibit 4.10).

Exhibit 4.10: Deferred tax example

(Figures in £)

Income statement	**Year 1**	**Year 2**
Profit before tax and royalty income	200,000	200,000
Royalty income	50,000	-
Profit before taxation	250,000	200,000
Taxation		
Current	- 80,000	- 100,000
Deferred	- 20,000	20,000
Profit after taxation	150,000	120,000
Tax computation		
Accounting profit before taxation	200,000	200,000
Royalty income (cash basis)		50,000
Taxable profits	200,000	250,000
Taxed @ 40%	**80,000**	**100,000**

From this example we can see that royalty income is taxed on a cash receipts basis but accounted for on an *accruals* basis. If the royalty is received in a different period from when it is earned then there will be a *timing difference*; i.e. an item has gone through both the income statement and the tax computation, but in a different period. The income statement as presented pre-deferred taxation does not reflect the economics of the business. In the year with the higher profit we have a lower tax charge and vice versa. This means that the income statement does not show the underlying profitability of the business. It distorts trends; year 1 *is* better than year 2 but the difference is exacerbated by taxation. In addition, insufficient liabilities have been recognised in the first year. At that stage the company has essentially crystallised a tax liability by earning profits but while the profit has been recognised, the associated taxation liability has not.

We can use deferred taxation to make appropriate adjustments to overcome these problems. As can be seen from the discussion of post deferred taxation balance sheets below, we have adjusted the taxation charge to reflect the tax cost of earning the royalty income in the first year. This transfers the taxation cost to the year when the income is recognised in the income statement. In addition this also achieves proper recognition of liabilities as we have a tax liability (deferred tax provision) on the balance sheet. This provision is then paid in the second year as the tax moves from being deferred to being current.

A simple way to calculate the required adjustment is to calculate the timing difference and apply the relevant tax rate to it. So for example in the first year the originating timing difference is £50,000. At a tax rate of 30 per cent this gives rise to a deferred taxation adjustment of £15,000. A similar but reversing entry takes place in year 2.

The entries are:

- **Year 1**: Increase tax cost and increase deferred tax provision by £15,000
- **Year 2**: Decrease tax cost and decrease provision for deferred taxation by £15,000

3.2.3 Balance sheet focus

It is important to note that IFRS, in this case IAS 12, actually uses a balance sheet approach to deferred taxation. This means that IFRS use a concept known as temporary differences, rather than the conceptually much more straightforward timing differences. Temporary differences arise where the tax value of an asset/liability is different from the accounting value. In many cases this will provide the same answer as timing differences; it is just a difference in emphasis. However, it does mean that more differences relating to deferred taxation will arise than under a timing difference system. For example, revaluations of fixed assets must be reflected in deferred taxation under IAS 12 as the tax base of the asset will not reflect the revaluation whereas the accounting value for depreciation purposes will do so.

3.2.4 Advanced example

Exhibit 4.11 below is more difficult. Here we can see that the temporary differences (note we shall use this term from now on rather than timing differences) arise from the difference between the tax and accounting bases for this asset. In reality this will reflect the difference between accounting depreciation and tax depreciation.

The various columns in the table work as follows:

- **Column 1** – This is the net book value (NBV) of the asset calculated as cost less accumulated depreciation.
- **Column 2** – This is the tax base calculated as cost less tax allowances at an accelerated 75 per cent per annum on a reducing balance basis.
- **Column 3** – This represents the difference between the accounting and tax asset values i.e. temporary differences.
- **Column 4** – Deferred taxation is calculated as the temporary differences multiplied by the tax rate, in this case 30 per cent. This is a liability (see below).
- **Column 5** – This is the change in the deferred tax liability and would be included in the income statement charge.
- **Columns 6 & 7** – Both sum to the initial investment of £200,000.

Note the inputs underneath the spreadsheet that are driving the computations.

Exhibit 4.11: Temporary differences

Temporary differences (£)

Column	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Period	NBV	Tax base	Temporary differences	Deferred taxation @ 30%	Movement to P&L	Tax Allowances	Accounting Depreciation
1	180,000	50,000	130,000	39,000	39,000	150,000	20,000
2	160,000	12,500	147,500	44,250	5,250	37,500	20,000
3	140,000	3,125	136,875	41,063	-3,188	9,375	20,000
4	120,000	781	119,219	35,766	-5,297	2,344	20,000
5	100,000	195	99,805	29,941	-5,824	586	20,000
6	80,000	49	79,951	23,985	-5,956	146	20,000
7	60,000	12	59,988	17,996	-5,989	37	20,000
8	40,000	3	39,997	11,999	-5,997	9	20,000
9	20,000	1	19,999	6,000	-5,999	2	20,000
10	0	0	0	0	-6,000	1	20,000
					0	200,000	200,000

Inputs:

Cost	200,000
Useful life (years)	10
Tax rate	30%
Allowance (declining balance)	75%

Why in this example do we have a deferred taxation liability? It is because profits in year 1 have only been reduced by a £20,000 depreciation charge whereas taxable profits have suffered a £150,000 deduction. This means that taxable income would £130,000 lower than accounting income (£150,000 - £20,000). We know from the earlier part of this section that current tax is based on taxable profits (rather than accounting profits). Therefore if we were just to ‘plug in’ the current tax charge we would show a high profit in the accounts with a small tax charge. In addition from a balance sheet perspective we would not be showing a full liability for the tax cost of the profits being recognised. We can see from the example that ultimately accounting depreciation does catch up with tax allowances and so the deferred taxation cancels. However, in the meantime deferred taxation ensures that the income statement and balance sheet produce superior and more complete information.

3.2.5 Deferred tax assets

These arise in the opposite situation to that outlined above – when taxable profits are high compared to accounting profits and liabilities are therefore overstated. Another source of deferred tax assets is operating losses – these have been recognised in the income statement but not in the tax computation which merely reported a ‘nil’ result. Another way of thinking about this is to imagine that if a company makes a loss of, say £10m, it should be able to recover this against future tax liabilities. Therefore the actual economic cost of the loss is £10m X (1-t) - i.e. less than the actual loss recognised. This ‘shield’ is an asset as it will be available to decrease future tax liabilities.

Of course this analysis assumes that sufficient future profits will be earned to recover the value of these losses. Under IFRS only those deferred tax assets that are recoverable from future profits are allowed to be recognised. Therefore, the asset associated with these losses only has value if future profits are earned. Hence the risk relating to deferred tax assets is the same as the risk of earning future profits. This point is essentially the justification, outlined in Chapter 2, for discounting tax shields at the unlevered cost of equity rather than the much lower cost of debt. The ability to earn future profits is more risky in terms of recovery than the returns on debt instruments.

3.3 US GAAP Focus

The differences here relate to the detailed application. In broad terms the standards are similar and the IASB/FASB are addressing some of the differences in the short term.

Key differences:

- US GAAP provides exemptions from the idea that all temporary differences should be recognised. These relate to leveraged leases, undistributed earnings of subsidiaries and certain (development) costs in the oil and gas industry.
- US GAAP requires the use of an enacted rate of tax for deferred tax purposes whereas IAS 12 will allow the use of a 'substantially enacted' one. For example if a government was expected to change the future tax rate then this new rate would be more readily useable under IFRS rather than US GAAP.
- Classification of deferred tax assets and liabilities under IFRS is always non-current. Under US GAAP the classification follows the asset/liability to which it relates.
- Different rates are used for deferred taxes on inter-company transactions. IAS 12 requires the use of the buyers' tax rate whereas US GAAP requires the seller's rate to be used.

3.4 Implications for financial statement analysis

Deferred taxation makes financial statements more useful. There are a number of useful deferred taxation disclosures that valuers should master in order to glean as much information as possible about the nature of the company's tax charge:

- The actual current taxation charge note explains what elements of the tax charge come from current, as against deferred, taxation.
- The current tax charge also highlights any overseas tax issues (e.g. non reclaimable tax credits on the remittance of overseas earnings) as well as over/under provisions relating to the accuracy of estimating historic tax charges.
- The deferred tax reconciliation explains why the accounting profit before tax multiplied by the statutory tax rate in the home country does not equal the tax expense in the income statement. Examples of typical differences would include:

1. non-deductible expenses (e.g. entertainment expenditure in most tax jurisdictions);
2. non-taxable income;
3. different tax rates from overseas.

- Calculating an effective tax rate is an important step in analysing tax information. Because of deferred taxation we know that some of the distortions to the tax charge have been eliminated. Therefore the normal way to calculate this is to take accounting PBT and divide this into the tax expense (both current and deferred). This is in essence a blended rate as for multi national companies it will reflect the tax rates in all the jurisdictions in which the enterprise operates. The alternative, calculating tax numbers in different countries on a divisional basis, is fraught with difficulties but may offer some interesting insights.
- If a user has reversed out any non-recurring items, such as exceptionals, then the associated taxation will need to be eliminated as well. Unfortunately this information is often not disclosed in which case the user can do worse than simply apply the effective rate to the exceptional item. If one could specifically identify a country where the exceptional had occurred then a more specific adjustment might be possible.

3.5 Case example

We have reproduced the three key tax notes that need to be examined:

- Breakdown of the tax expense from the income statement (Exhibit 4.12);
- Reconciliation of the tax expense to the accounting profit times the ‘home’ statutory rate (Exhibit 4.13);
- Deferred taxation note (Exhibit 4.14).

Exhibit 4.12: Income statement analysis of tax charge

(a) Analysis of charge in year	**2003 £m**	**2002 £m**
Current tax:		
UK corporation tax at 30.0% (2002 – 30.0%)	382	348
Prior year items	(56)	(29)
Overseas taxation	8	8
Share of joint ventures and associates	19	9
	353	336
Deferred tax		
Origination and reversal of timing differences (i)	54	35
Prior year terms	10	–
Share of joint ventures and associates	(2)	–
	62	35
Tax on profit on ordinary activities	415	371

Source: Tesco plc Annual Report and Financial Statements 2003

- Prior year amounts – as taxation calculations are not finalised by the reporting date for the company estimates are used. Once the final figures come through the estimates are adjusted but only against next year's taxation expense.
- Overseas tax is charged on Tesco's activities abroad. As this is a positive number it shows that the tax is charged at rates higher than 30 per cent.
- Associate taxation discloses the share of the tax charge that related to investments that are equity accounted.
- Deferred taxation will result from the application of the tax rate to timing differences as described above.

Exhibit 4.13: Reconciliation of tax expenses

(b) Factors affecting the tax charge for the year

The effective rate of corporation tax for the year of 25.9% (2002 – 28.0%) is lower than the standard rate of corporation tax in the UK of 30.0%. The differences are explained below:

	2003	**2002**
	%	**%**
Standard rate of corporation tax	30.0	30.0
Effects of:		
Expenses not deductible for tax purposes (primarily goodwill amortisation and non-qualifying depreciation)	3.9	3.4
Capital allowances for the year in excess of depreciation on qualifying assets	(3.3)	(2.8)
Differences in overseas taxation rates	(0.8)	(0.4)
Losses on property disposals not available for current tax relief	–	0.3
Prior year items	(4.4)	(2.4)
Other items	0.5	(0.1)
Effective rate of corporation tax for the year	25.9	28.0

(c) Factors that may affect future tax charges

Deferred tax assets of £16m in respect of tax losses carried forward have not been recognised due to insufficient certainty over their recoverability.

Source: Tesco plc Annual Report and Financial Statements 2003

This note is often referred to in the accountancy profession as a tax reconciliation as it ties in the reported profit before tax multiplied by the statutory tax rate in the country of the holding company with the actual tax charge in the income statement. Starting with the UK statutory rate the major points of comment are as follows:

Differences in overseas tax rates simply refers to other countries in which the group has operations having different statutory rates.

Non-deductibility of goodwill and other expenses increases the tax rate as profit is smaller after goodwill is deducted but tax is unchanged. This therefore increases the apparent tax rate. This is why we generally use a pre-goodwill earnings number for our effective calculations.

Capital allowances in excess of depreciation – this is a reference to timing differences. If tax depreciation is higher than the accounting equivalent the effective rate will be lower.

The prior year adjustments appear to show that Tesco has overestimated its tax liability in the last two years. It has therefore reduced subsequent estimates and hence the effective rate in the current year. Also note the unrecognised deferred taxation asset – these can only be recognised where recoverability is effectively guaranteed.

Exhibit 4.14: Deferred taxation note

Deferred taxation	**Amount provided**	
	2003	**2002**
	£m	**£m**
Excess capital allowances over depreciation	526	432
Other timing differences	(14)	8
Losses carried forward	(7)	–
	505	440

Source: Tesco Plc Annual Report and Financial Statements 2003

This note explains the source of the deferred taxation numbers. These relate to historic capital allowances (also known as tax depreciation) being in excess of accounting depreciation. This will mean that, in the future the tax to pay will be higher as much of the tax benefit is exhausted.

3.6 Building valuation models: What to do

Deferred tax represents a significant problem both when modelling company accounts and when converting those forecasts into a valuation. We shall take the two separately. From inside the company – or if it provides adequate information – it is possible to calculate future deferred tax provisions or reversal of provisions in the fashion illustrated above. But what happens if we do not have this information?

In most cases it is not plausible to try to model on an asset by asset basis. Instead, it may be reasonable to look at the history of the company's tax charges over the past few years. In a simple case, if the company is mature, but still growing slowly, there may be a reasonable proportion of its annual tax charge that may be assumed to accrue as deferred tax each year and never to be paid, because as the company continues to grow, it continues each year to create capital allowances in excess of its depreciation charges.

Even in the case of growing companies it cannot necessarily be assumed that deferred taxation provisions will not reverse. If capital expenditure is switched from one subsidiary to another then capital allowances created in the new market cannot be utilised to lower taxable profits in the mature market. The risk is that the opposite happens. Tax that has been charged but not paid in previous years becomes payable.

There is also one very common example of the accrual of simple timing differences that is worth remembering. When companies make provisions for restructuring, they generally do apply tax to them, because when the severance payments and other costs are incurred, they will probably be allowable costs. So in the year of the provision, there is likely to be a negative deferred tax charge, as tax is paid on profit before the charge. But this will probably reverse in the years afterwards, in which there is no impact on the profit and loss account but cash costs of restructuring are incurred, and reduce the tax liability. During this period, there will probably be positive deferred tax, as tax payments are lower than the tax charge in the profit and loss account.

Turning to valuation, there are two key questions to ask about any provision. The first is, 'Will the liability in the balance sheet ever crystallise?' and the second is, 'Do the future provisions in the cash flow statement represent a stream of cash that will ultimately have to be paid out to somebody or not?' In the case of deferred tax, unusually, it may be reasonable to assume that the answer to both questions is 'No', in which case we are assuming that the balance sheet provision is effectively equity and that the cash flow stream is effectively profit. But it is very dangerous to assume this without considering the implications of your forecasts for taxation. What would happen to a company that had large amounts of provision for deferred taxation in its balance sheet if, perhaps as a result of being subject to a leveraged buy-out (LBO), it were to dramatically reduce its rate of capital expenditure? All that tax would become payable…

4. Accounting for pension obligations

4.1 Why is it important?

Anyone reading the financial press over the last few years cannot fail to have seen the various headlines about pension accounting. For many traditional industrial firms in sectors such as engineering, automotive and chemicals the provision of retirement benefits has been an important component of employee remuneration – and these companies have been highly labour intensive. Accounting for these pension benefits is complicated by the different types of pension, the uncertainty associated with asset returns as well as the complex interplay between domestic legislation and accounting concepts. Here we shall attempt to demystify some of the major areas of uncertainty as well as focusing on the financial analysis and modelling implications.

4.2 What is current GAAP under IFRS for pensions?

In relation to financial reporting there are two key issues: the income statement charge and the balance sheet asset/liability. Neither of these is straightforward. Before proceeding to these let us deal with a few of the fundamental aspects of pensions.

4.2.1 Forms of pension scheme:

Category 1: Defined contribution schemes

These schemes define the contributions that the employer will make to the fund on behalf of the employee. The contributions are typically expressed as a percentage of gross salary. Once the transfer is made by the employing company then no further obligations rest with the company. The residual risk remains with the employee.

Accounting for these schemes is very straightforward and simply involves charging the contributions as an operating expense. They are in effect extra salary. There would not normally be any balance sheet obligation save for some delay in making the contributions.

Category 2: Defined benefit

These schemes define the target benefits to be paid to employees on retirement in the future. Normally the target is expressed as a fraction of final salary (i.e salary on leaving the company or retiring). The fraction normally changes as extra years of service are completed. So a scheme might provide that an employee would generate an annual pension of 2 per cent of his final salary for each year of employment. So if he worked for 10 years then he would receive an annual pension of 20 per cent of his final salary.

We can see that as the company has made a promise to pay the risk resides with it. This risk is not easy to control as there are so many uncertainties associated with the ultimate outcome. For example, how long will the employee be in service? What will the final salary level be? How much should be invested now to meet the estimate of the obligation? It is these uncertainties that make the accounting complex.

4.2.2 Funded and unfunded schemes

A certain level of confusion also emanates from the fact that pension schemes may be funded or unfunded. In the US and the UK it is mandatory for defined benefit plans to be funded. This means that any contributions that the actuary determines are necessary must be made to a separate funding vehicle. Therefore a scheme will have both a fund (i.e. the equities, bonds and cash invested to satisfy future obligations) and an obligation (i.e. amounts to be paid to employees on retirement). The difference between the actuary's current estimation of the fund and obligation can either be a deficit or surplus. In other jurisdictions there is no funding requirement (e.g. Germany and Japan). Therefore, while there is an obligation with such schemes, the investment is effectively in the corporate's assets.

Economic status of the fund

The level of funding required for a defined benefits pension plan is determined by the actuary. The actuary will base his estimate on forecasts of various factors such as:

- salary levels;
- retirement age;
- life expectancy;
- employee turnover;
- investment performance of the fund's assets;
- level of benefits guaranteed.

Due to the difficulty of forecasting such variables, deficits (under funding) and surpluses (over funding), commonly arise on defined benefit plans.

For example, for a funded scheme the relevant deficit or surplus could be ascertained by comparing the current market value of the plan assets ('fair value') with the present value of the obligations. We shall explore this further below.

4.2.3 Pension Obligations

Types of Obligation

The level of salary at retirement has a significant impact on the ultimate defined benefit plan obligation. There are two alternative approaches to estimating this: Accumulated pension Obligation (ABO) and Projected Benefit Obligation (PBO). The fundamental aspects of these two calculations are the same. The only difference is that whilst the former ignores expected future increases in salary, the latter includes an estimate of such increases. It is the latter calculation that is required under IAS 19.

The calculation of the PBO is as follows:

	€
Opening PBO	**X**
+ Service cost	X
+ Interest on PBO	X
+/- Actuarial gains/losses	X
+ Prior service costs	X
Gross pension costs	X
- Benefits paid	(X)
Closing PBO balance	**X**

Notes

1. IAS 19 uses the term DBO (defined benefit obligation) but this is the same as the more widely used PBO.
2. ABO and PBO are identical in schemes not related to pay (flat benefit plans).
3. Both ABO and PBO are based on present values and hence each measure is very sensitive to the discount rate used. The required discount rate is that for a high quality corporate bond of equivalent maturity and currency. IAS 19 suggests a corporate bond with a AA (so called double 'A' rating).

4.2.4 Pension Plan Assets

This can be calculated as the assets at the start of the year plus returns and contributions less the payments to pensions. The assets (equities, bonds, real estate and cash instruments) are marked to market for the purposes of calculating the funded status of the scheme. Remember that if the scheme is unfunded then there will be no assets, just a PBO.

4.2.5 Accounting for Defined Benefit Plans

A defined benefit pension scheme will be reflected in the financials as follows:

Income Statement Charge

The actual cost of providing a defined benefit scheme in any year will be the increase in the obligation minus the increase in the fund assets. This concept is reflected in the income statement calculation below.

Income statement charge (expense)

	€
Service cost*	**X**
+ Interest on PBO*	X
- Expected return on fund assets**	X
+/- Amortisation of gains/losses**	X
Net pension cost	**X**

IAS 19 does not specify if these items should be presented as a single line or disaggregated as most analysts would want (see below).

Notes

*__Actual events__

These two events are simply a record of what has happened

** **Smoothed events**

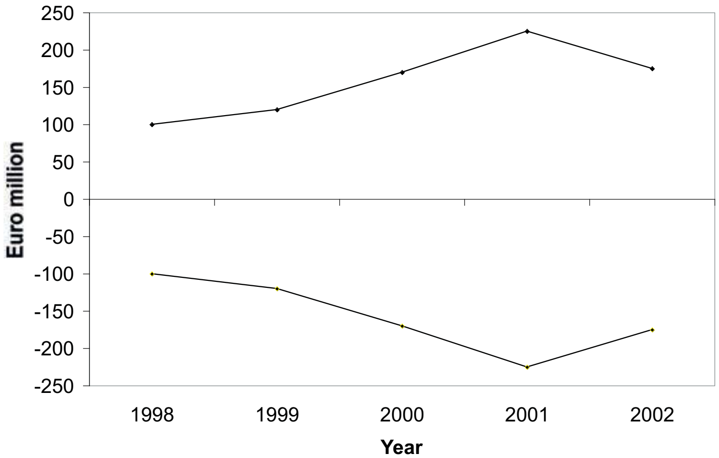
1. The expected ROA is based on an estimate of the long term rate of return. Pension cost includes this expected level rather than the actual return. Any difference is deferred and accumulated
2. The Amortisation of prior service cost is over the remaining service life of employees (rather than expensed as incurred). This might arise where the company's management will make a discretionary improvement to the pension provision for existing pensioners
3. The amortisation of gains/loss refers to, for example, changing assumptions and the difference between actual gains/losses and expected gain/losses

However, the impact of such gains/losses is generally not recognised in one particular period. Instead these items are smoothed. This is to avoid excessive volatility. IAS 19 uses a rather bizarre concept of a corridor to achieve this smoothing. An enterprise can smooth any gains/losses in excess of the greater of:

- 10% of the plan assets (@ fair value) and
- 10% of the present value of the projected benefit obligation.

Gains and losses within (i.e. less than) this 10 per cent corridor may be recognised but this is not required. The excess (i.e. the amount outside the corridor) is amortised over the average remaining service lives of employees. This can be illustrated in the following diagram (Exhibit 4.15). Assume the numbers correspond to the 10 per cent thresholds above.

Exhibit 4.15: The pension corridor



The exhibit shows that the corridor is 'gap' in the middle. Gains and losses falling within this gap are ignored; it is only those gains and losses falling outside the gap that are amortised.

Balance Sheet Asset/Liability

The balance sheet asset or liability is calculated thus:

PBO	X
-Fair value of plan assets	(X)
Deficit/(surplus)	X
+/-Unrecognised actuarial gains/losses	X
Balance sheet asset/liability	**X**

Thus the sole difference between the economic status of the fund and the balance sheet liability/asset is the unrecognised (smoothed) actuarial gains and losses.

Comprehensive Example

Lamy plc has the following disclosures in its notes regarding its pension fund on 1st January, 2005:

	€
Pension fund assets (@ fair value)	10,000,000
Pension fund liabilities (@ present value)	(10,400.000)
	(400,000)

There were no unrecognised gains and losses at the start of the year.

The following information relates to the year ended 31 December, 2005:

Current service cost	€800,000
Expected long term return on assets	5.1%
Contributions to the fund	€1,020,000
Pensions paid	€900,000
Actual return on assets	€400,000

The present value of liabilities at 31st December, 2005 is estimated to be €11,000,000. The relevant discount rate is 5%.

What would be the treatment under IAS 19?

Please note:

- Assume actuarial gains/losses are spread over a useful service life of 10 years.
- Experience losses arising from changing actuarial assumptions amount to €180,000. There were no carried forward experience gains/losses. In addition for simplicity assume that, in the past, actual and expected gains had always been identical.
- Ignore the corridor concept.

Solution

Income Statement

All included in Operating Costs €

Service cost		800,000
+ Interest cost		520,000
- Expected returns		(510,000)
- Actuarial gains/loss		
110,000/10 (W2)	11,000	
180,000/10	18,000	29,000
		839,000

Balance Sheet Liability

PV of future obligation	11,000,000
- FV of plan assets (W1)	(10,520,000)
+ Unrecognised actuarial losses	
[110,000 + 180,000] - [11,000 + 18,000]	(261,000)
	219,000

W1 Fund Assets

Opening balance	10,000,000
+Actual return	400,000
+Contributions paid	1,020,000
-Pensions paid	(900,000)
	10,520,000

W2 Actual return vs. expected return

Actual return	400,000
Expected return	(510,000)
Adverse variance	(110,000)

4.3 US GAAP Focus

The FASB issued FAS 158, *'Employers Accounting for Defined Benefit Pension and Other Postretirement Plans'* which brings accounting for pension schemes much closer to IFRS than under the older FAS 87 standard. In the short term the main difference is with regard to the valuation of assets, with IFRS requiring a valuation at the balance sheet date and US GAAP allowing some deviation from this. There are also presentational differences.

4.4 Case example

Pension liabilities are included in the provisions section of a balance sheet. The notes to the financials must be reviewed in order to make any sense of the numbers. Remember we are trying to deal with two aspects: the income statement charge and the balance sheet 'debt'. Typically information about both would be disclosed in the 'provisions' note, as in the case for BMW below (Exhibit 4.16).

The balance sheet disclosure for BMW shows a recognised liability of €2,394 million after smoothing. The smoothing is represented by the line 'unrecognised actuarial losses', in 2003 amounted to some €1,104 million. In our view the full economic status of the fund is the best picture of a scheme, i.e. the full deficit. Therefore in an enterprise value calculation we reverse out the effect of this smoothing. Where relevant the figure included in the valuation should be net of deferred tax as, unlike debt principal repayments, pension payments are typically tax deductible.

Exhibit 4.16: BMW pension provisions

In € million 31 December	Germany 2003	 2002	UK 2003	 2002	Other countries 2003	 2002	Total 2003	 2002
Present value of pension benefits covered by accounting provisions	2,513	2,186	–	–	91	73	2,604	2,259
Present value of funded pension benefits	–	–	5,564	5,329	222	209	5,786	5,538
Defined benefit obligations	**2,513**	**2,186**	**5,564**	**5,329**	**313**	**282**	**8,390**	**7,797**
Fair value of fund assets	–	–	4,744	4,722	156	144	4,900	4,866
Net obligation	**2,513**	**2,186**	**820**	**607**	**157**	**138**	**3,490**	**2,931**
Actuarial gains (+) and losses (–) not yet recognised	– 208	–69	–852	–617	–44	–52	–1,104	–738
Income (+) or expense (–) from past service cost not yet recognised	–	–	–	–	–2	–3	–2	–3
Amount not recognised as an asset because of the limit in IAS 19.58	–	–	–	– 1	0	23	10	23
Balance sheet amount at 31.12.	**2,305**	**2,117**	**– 32**	**– 10**	**121**	**106**	**2,394**	**2,213**
thereof pension provision	2,305	2,117	3	33	122	107	2,430	2,257
thereof pension asset (–)	–	–	–35	–43	–1	–1	–36	–44

Source: BMW Group Annual Report 2003

In € million	**Net present value of pension benefits**	**Fair value of fund**	**Net obligation assets**
1 January 2003	5,329	–4,722	607
Current service cost	48	–	48
Expenses from reversing the discounting of pension obligations	273	–	273
Expected return on plan assets (–)	–	–239	–239
Employer contributions	–	–111	–111
Benefits paid	–255	255	0
Actuarial gains (–) and losses (+)	441	–155	286
Translation differences and other changes	–272	228	–44
31 December 2003	**5,564**	**–4,744**	**820**

Source: BMW Group Annual Report 2003

The extract reproduced above shows the income statement charge. The crucial aspect is where each element has been included in the income statement. In our view it is only the service cost that should be included in the EBIT number. All other charges are financial in nature. The appropriate treatment of the amortisation of the actuarial gains/losses is arguable. One argument is that these are real costs they are simply being amortised. Another is that they represent cumulative changes in estimates and hold little economic value once the overall size of the deficit is appropriately recognised. We tend to favour the latter view and would rather see the total of actuarial gain/losses deducted from equity although we can see some validity in the other approach.

4.5 Implications for financial analysis

In an environment where there is a shortage of highly skilled and experienced staff, pension benefits can be used as a means of attracting employees. However, offering generous pension terms can be very expensive. Therefore, analysts will want to examine the underlying assumptions and status of the plan closely. Such analysis may well involve going beyond the financial statements data and adjusting the financials.

One of the key problems for analysts is the significant amount of 'netting off' that occurs under IAS 19. Given the smoothing nature of some of these numbers there is an argument that, if the numbers are significant, some level of disaggregation should be undertaken by the analyst. Typical adjustments that might be made would include:

- The only charge that should go into EBIT is the service cost. This is the true ongoing regular cost.

- IAS 19 does not specify where the various elements of the pension expense should go. Therefore it is important that the analyst understands where each item is prior to attempting to carry out reversals and other adjustments. IAS 19 requires the location of the various components to be disclosed but we have seen instances when this important disclosure has been omitted. In any event any other items that are included in EBIT should really be reversed out. Interest and return on assets are both financial items and the amortisation of actuarial gains and losses should not really be spread but instead should go to equity, in total, immediately.

4.6 Building valuation models: What to do

There are two distinct issues that need to be addressed. First is the treatment of the liability relating to years of service already worked. The second issue is the burden on the company in the future of offering 'new' pension benefits to employees as further years of service are undertaken.

In relation to the former, unfunded or under-funded pensions (measured using PBO) should be deducted from the value of the assets alongside debt. They represent a loan from employees to the company. If the pension is unfunded, then future profits will also incorporate a provision for future liabilities. This cannot be ignored in valuations and is also debt.

The valuation implications can be distilled into a number of points:

- **Unfunded schemes** – treat the projected benefit obligations (PBO) as debt. Under most GAAPs this is already recognised as a liability.
- **Funded schemes –** net off fair value of plan assets from the obligation to derive over-/under-funding. This is in effect the liability for a funded scheme. This is a debt number.

Free cash flow should be net of the pension charge, even though this will be shown in the accounts as a non-cash item. This is because it is a real cost. The alternative is to attempt to identify what cash flows would actually be paid out. This is often completely impractical. The alternative strategy is to assume that, in the long run, the service cost will approximate to the normalised contributions. Therefore we would suggest forecasting the service cost based on a percentage of staff costs and reflecting this in free cash flow. If this is done then the only value that is lost is the difference between the time value of when the service cost forecast goes through free cash flows and when it is actually contributed to the fund. This is something we can live with.

When constructing valuation models, it is not always easy to establish what the free cash flow net of service costs would be. For most practical purposes it is reasonable to assume that to the extent that forecast free cash flows include an element that contains provisions for pension obligations, we simply want to detach that amount from the cash flows that we are discounting, because it represents an accrual of a liability that is attributable to someone other than the shareholders (in this case, the employees). For the same reason, we should not add back the change in the provision for pension obligations into NOPAT when we calculate economic profit (see Chapter five on valuation), because although it is a non-cash item, it represents a real cost to the business. And when thinking about returns on capital employed, it is important to remember that pension obligations are part of the financial capital of the company, equivalent to debt.

5. Provisions

5.1 Why is it important?

Although the thesis of this book is that valuers, including those using discounted cash flow methodologies, need to carefully examine accounting earnings, we are not immune to some of the vagaries of accounting information. Provisioning is one area which historically has been troublesome for interpretation. The nature of provisions is such that they are subjective and non-cash. This means they are vulnerable to manipulation. If a user is to understand the operating performance of an entity and then to use this as a basis for valuation then a sound understanding of provisions is vital. More specific technical provisions in areas such as deferred taxation and pensions have been dealt with above.

5.2 What is current GAAP under IFRS for provisions?

IAS 37 defines a provision as simply a liability of uncertain timing or amount. So for example if a company is subject to a lawsuit, and it anticipates this loss in its financials, then this would be a provision. Given the estimation and uncertainty surrounding provisions it is little surprise that they can be used to manipulate earnings. The example overleaf seeks to illustrate this point.

Example

BuildX is a manufacturing company. A leakage occurred at a production facility that unfortunately has lead to a lawsuit for $10m. The legal counsel acting on the company's behalf believe that there is a probable chance of the lawsuit succeeding against the company. The various transactions and entries proceeded as follows.

- **Year 1** – record the lawsuit: increase provisions $10m, increase expenses $10m.
- **Year 2** – case has not yet been settled. Lawyers are now of the opinion that it will be a claim of $15m.

  Increase provisions $5m and increase expenses $5m.
- **Year 3** – new evidence has undermined the case against the company and the legal team now think a claim of only $12m will succeed.

  Decrease provisions $3m and decrease expenses $3m.

Note that it is the *decrease* in the provision that goes through the income statement as *income*.

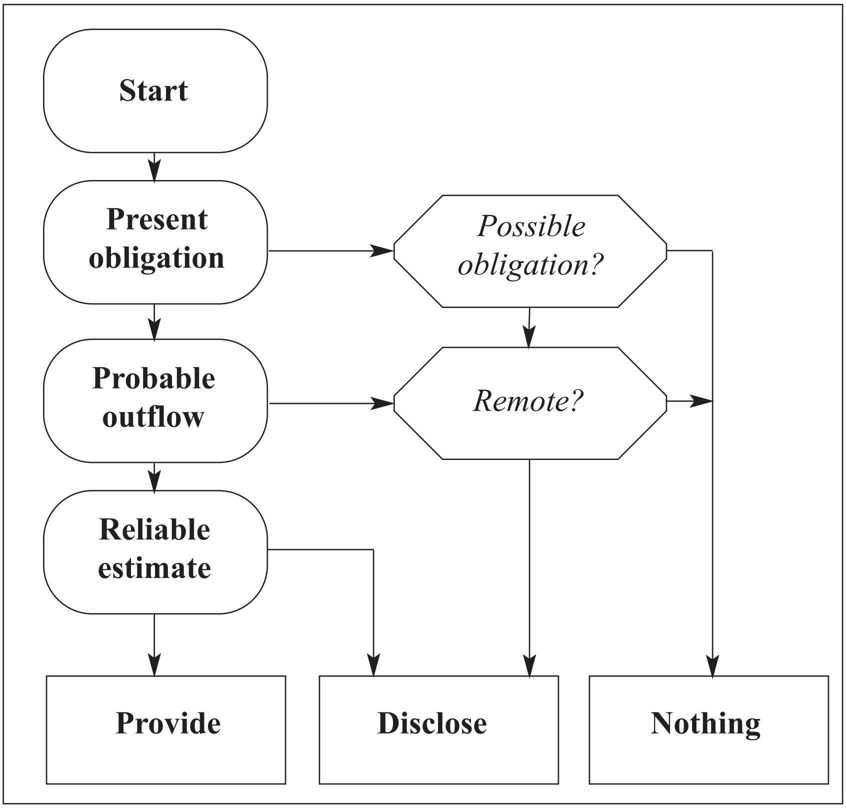
- **Year 4** – the case is settled for $9m.

  Decrease provisions $12m, decrease cash $9m, decrease expenses $3m.

Note that the cash movement only happens in year 4. All the other movements are purely bookkeeping adjustments leaving them highly susceptible to manipulation.

In an attempt to stop excessive provisioning being used as an income smoothing technique IAS 37 sets out strict criteria that must be satisfied prior to the recognition of a provision. A decision tree is provided in the appendix to the standard which we have reproduced here as Exhibit 4.17 together with some explanatory notes.

Exhibit 4.17: Provisions recognition decision tree



Explanatory notes

Note that in order to recognise a provision various criteria must be met:

- Present obligation i.e there must be an existing quasi legal liability
- Obligating event i.e the event leading to the liability must already have occurred
- It must be probable that the outflow will occur
- Measurability – the liability must be capable of expression in monetary units.

If any of these conditions are not met then no numbers will be recognised on the actual financial statements. Instead there is either disclosure or nothing. Disclosure will happen if there is a possible outflow. This is then termed a contingent liability. If the probability is remote then no action is required at all.

5.3 US GAAP focus

Very substantial overlap exists between the two standards. However, there are a few differences:

1. IAS 37 requires discounting if material whereas under US GAAP certain provisions are not discounted.
2. Reconstruction provisions can only be recognised under IAS 37 if a detailed formal plan is announced publicly or implementation has begun. The US GAAP is that such a provision is only recognised if a transaction occurs that leaves little or no discretion to avoid the future liability. A mere plan does not create a sufficient obligation.

5.4 Case example

The provisions note for Lufthansa is reproduced below in Exhibit 4.18. Note that it is dominated by the pension provision – a subject dealt with in section 4 above.

Exhibit 4.18: Lufthansa provisions note

Provisions and accruals

€m	31.12.2003	of which due in the following year	31.12.2002	of which due in the following year
Retirement benefit and similar obligations	4,327	129	4,020	126
Provisions for current income taxes	124	124	91	91
Provisions for deferred taxes	208	–	170	–
Provisions for other current taxes	22	22	35	35
Provisions for unearned transportation revenue	630	630	670	670
Outstanding invoices	928	905	869	844
Other accruals	1,814	1,489	1,941	1,542
	8,053	**3,299**	**7,796**	**3,308**

Source: Lufthansa Annual Report 2003

	2003 €m	2002 €m
Loss/profit before income taxes	-814	905
Depreciation of fixed assets (net of reversals)	2,080	1,251
Depreciation of repairable aircraft spare parts	53	48
Result from fixed asset disposal	-229	-495
Result from investments accounted for using the equity method	97	20
Net interest	341	415
Income taxes paid	-19	0*
Changes in inventories	-24	-14
Changes in receivables, other assets and prepaid expenses	314	204
Changes in provisions and accruals	112	759
Changes in liabilities (without borrowings)	-403	-574
Other	73	-207
Cash flows from operating activities	**1,581**	**2,312**

* below €1m

Source: Lufthansa Annual Report 2003

Some points to note:

1. The overall level of other provisions has increased during the year. This would therefore be an expense in the income statement. We would also expect to see this as an adjustment in the cashflow statement (see further extract above). We can see that in 2002 €759m of provisions went through earnings with €112m in 2003. These are reversed out in the cashflow statement as they are non-cash items.
2. The provision note is disaggregated into its various elements. Easily the largest is pensions which we have dealt with separately. We have also dealt with provisions for taxation and deferred taxation. Accruals and unpaid invoices will relate to costs that have been incurred but have yet to be paid. In the main these will relate to commonplace overhead (phone, electricity etc) in addition to more specialist items such as staff benefits.
3. Provisions are not especially complex in themselves. They are merely estimates of certain future costs. The problem for the analyst is to decide which of these are self-perpetuating (treat as equity), one-off (debt), continuing and will be paid (debt with annual charge).

The valuation treatment of provisions is considered further in the last part of this section.

5.5 Implications for financial analysis

There are two aspects to the analysis of pensions: identifying the existence or otherwise of income smoothing and the classification of provisions as debt or equity. We shall deal with the former here whilst the latter is dealt with in the valuation section below.

In order to be able to determine whether provisions have been used for the purpose of income smoothing a user must be able to identify what provisions have passed through the income statement. There are a number of ways to identify this:

- Examine the cash flow statement – what does the reconciliation of profit to cash flow show for provisions?
- Examine the increase/decrease in the provision numbers in the balance sheet. Remember it is the movement that goes through the income statement
- Examine the expenses notes and look for the existence of provisions either increasing or decreasing

The user must try to ascertain if the provision is genuine, or is instead an attempt to control the reporting of results. The use of excessive provisioning in good years and reversals in poor years is a classic form of income smoothing. The user may choose to reverse out those provisions which are 'unnecessary' and reverse out the reversals when they occur!

5.6 Building valuation models: What to do

In general terms, for valuation purposes, provisions in the balance sheet are either treated as quasi debt or quasi equity, and provisions in future cash flows are treated as if they were a cash cost, or as if they were profit. A balance sheet provision that is unlikely to be paid out in cash will be treated as equity whereas a provision, such as those for pensions, which will certainly be paid out in cash, will be classified as debt.

Looking at this in slightly more detail:

- **Provision is equity**

  As equity it is no longer being looked upon as a cost. Therefore it should be added back to both free cash flow and NOPAT. Examples of this might be deferred taxation provisions in a growing company.

- **Provision is debt – one-off**

  If we are dealing with a liability that will only crystallise once, for example a restructuring cost, then we should treat this as debt in our enterprise value calculation, unless the provision reverses during our forecast period.

- **Provision is debt – continuing**

  Pensions are a good example of this type of provision. Here we have two distinct problems. We have the existing obligation which, in a similar manner to the one above, should be treated as debt. Then we have the ongoing cost in our forecasts. As we saw in the discussion of pensions in section four above this is a real cost, and we must deduct it from both NOPAT and free cash flow. The question is how to forecast the actual cash cost. This is very tricky to do and the pensions section explored some compromise solutions to this.

6. Leasing

6.1 Why is it important?

Leases are a crucial form of finance for a wide range of corporates. They are of special interest to users of financial statements as the accounting for these agreements is far from straightforward. In addition there is ample evidence that companies take advantage of accounting definitions in order to understate the perceived leverage of the company. It is important that any user who wants to perform reasonably sophisticated analysis becomes familiar with the accounting rules underpinning these legal agreements.

6.2 What is current GAAP under IFRS for leasing?

There are two basic forms of leases, namely finance leases and operating leases, as illustrated below. The essence of the difference between the two is captured in Exhibit 4.19. However, accounting regulations typically avoid such an ephemeral approach to classification and so provide a list of criteria that determine the classification. As ever with prescriptive accounting this offers the opportunity for clever avoidance. The criteria under IAS 17 are overleaf.

Exhibit 4.19: IAS 17 leasing criteria

Criteria	Comment
Ownership is transferred at the end of the lease or	This would effectively be payment by instalments
There is a bargain purchase option	If the asset can be bought below its fair value then according to IAS 17 it is a bargain
Lease term is for the major part of the asset's economic life	Typically 75% of the asset's life is the benchmark.
Present value of minimum lease payments is substantially all of the fair value of the leased asset	Here, fair value can be read as cash price. Substantially all normally equates to c90%
Assets are of a specialised nature	If only the lessee can use them it's the lessee's asset
Residual value fluctuations belong to the lessee	This would be an indicator of where the economic risks and rewards lie
Lessee can extend the lease at a below market rental	The secondary period brings the lessee closer to economic ownership

These criteria are quite strict and therefore the accounting for most basic forms of leases will reflect the economics. This sounds great and you may wonder what the problem is. For that we need to understand the accounting treatment for each type of lease.

6.2.1 Example

As ever with many accounting issues the easiest way to understand the intricacies is to examine a numerical example. The following simple spreadsheet based examples show the main accounting entries if a lease is designated as finance or operating. Note that we have only used the 90 per cent cut-off rule, given the judgmental nature of the other criteria. Exhibit 4.20 illustrates a finance lease and Exhibit 4.21 an operating lease.

Exhibit 4.20: Finance lease illustration

Inputs

Fair value of asset	1,040,000
Annual rental	250,000
Interest rate	9%
Term (years)	5
PV of MLP	972,413
PV as % of fair value	94%

Finance lease

Period	Opening balance	Interest	Rental	Capital repaid	Closing balance
1	972,413	87,517	-250,000	-162,483	809,930
2	809,930	72,894	-250,000	-177,106	632,824
3	632,824	56,954	-250,000	-193,046	439,778
4	439,778	39,580	-250,000	-210,420	229,358
5	229,358	20,642	-250,000	-229,358	0

Notes

1. The initial entry is to capitalise the lease and the asset at the present value of the minimum lease payments, i.e. €972, 413.
2. The interest column goes to the income statement as the finance charge.
3. The principal will be depreciated, usually on a straight line basis in accordance with the usual treatment of depreciation of fixed assets, despite the fact that capital repayments are skewed towards the end of the lease.
4. The rental will go through the cash flow statement, normally divided between principal repayments (financing cash flow) and the interest paid (can be financing or operating or indeed investing under IFRS).
5. The closing balance is debt and will be time profiled between that which is due within one year and that which is due after that period.

If we change the details we can see that the rentals merely go through the income statement.

Exhibit 4.21: Operating lease illustration

Inputs	
Fair value of asset	1,040,000
Annual rental	210,000
Interest rate	9%
Term (years)	5
PV of MLP	816,827
PV as % of fair value	79%
Operating lease	
Income statement expense	
Year 1	210,000
Year 2	210,000
Year 3	210,000
Year 4	210,000
Year 5	210,000

Notes

1. There is no entry on signing an operating lease agreement. It is a rental agreement and so there is only recognition on a time basis i.e. as the benefits of the leased asset are enjoyed.
2. All of the lease payments are, unsurprisingly, classified as operating costs and are recognised in EBIT.
3. But, sometimes a lease can just qualify as an operating lease and yet the accounting is wholly different from the above, if the lease is complex (see below).

6.2.2 More complex forms of leasing

The leasing model that we have used for the purposes of explaining the fundamental accounting issues can be applied to a wide range of lease agreements but it should be remembered that leases often contain much more complex arrangements.

The most common form of added complexity is the addition of lease incentives. These can be in many forms. For example lower rentals in the earlier period, rebates or even rent free periods can be used to induce a lessee to take on a lease.

The question is how should such benefits be reflected in the financials. Merely accepting what is paid as the rental expense would expose income statements to tailor-made leasing products designed to manipulate earnings. Remember those analysing financials are interested in the future and so forecasting would be distorted by such incentives. SIC 15 outlines that such incentives are to be included in the calculation of the total lease payments and these payments should be allocated over the life of the lease. So if a lessee received year 1 of a five year lease free and the subsequent rentals were €125,000 pa then SIC 15 would simply take the total payments of €500,000 and allocate these over the lease term of five years resulting in an expense of €100,000 pa and hence avoiding the distortion of profit trends.

Another area of interest is the treatment of sale and leaseback transactions. The technical driver behind the accounting numbers is, again, the form of the lease. If the leaseback is a finance lease then the sale and leaseback is essentially ignored, and the transaction is treated as a secured loan. There is also an argument that the sale should be recognised but the gain/loss deferred although we strongly prefer the former treatment. On the other hand if the leaseback is operating, as would be most commonplace, then it is treated as a disposal of an asset and a separate operating lease. Assuming the gain/loss on disposal is on market terms then it can be recognised immediately. If the gain/loss is higher or lower than would be the case under normal commercial terms then it may indicate that future operating lease rentals may be higher or lower to compensate for this. If so some form of spreading of the 'super' gain /loss may be required.

6.3 US GAAP focus

As in other areas the differences tend to be in the detail rather than the underpinning principles which are in essence identical. Some of the key differences include the following:

1. For leveraged leases the tax consequences are reflected in the tax line under IFRS but in the lease accounting calculations under US GAAP.
2. The present value of lease payments is calculated using the incremental borrowing rate under US GAAP but the rate implicit in the lease under IFRS.
3. A leasehold interest in land (e.g. upfront balloon payment) is always treated as a prepayment under US GAAP. Under IFRS it could be accounted for as an investment interest. If this was the case IAS 40 would give the option to fair value it through the income statement.
4. In a sale and leaseback context, assuming an operating leaseback, any gain is recognised immediately under IAS 17 but is amortised over the lease term under US GAAP.

6.4 Case example

When looking at a set of financials for information on leasing a number of pieces of information may well be helpful:

- The **accounting policy statement** for leasing will immediately inform the user what type of leases the company uses. The vast majority of large corporations will use operating as well as finance leases. In addition sale and leaseback transactions may well be used for financial structuring.
- The **level of finance leases** can quickly be ascertained by looking at the debt note. The leases that have been capitalised (i.e finance/capital leases) will appear in long term and short term debt. Note that these liabilities are principal amounts only. The detailed note for Hilton showing a time profile split is reproduced below in Exhibits 4.22 and 4.23. The presentation employed by Hilton is to show the gross rentals, which would include interest, and then to reverse this out to leave the residual principal amounts.

Exhibit 4.22: Hilton note on leases (1)

Obligations under finance leases

The maturity of the Group's obligations is as follows:

	2003 £m	**2002 £m**
Amounts payable:		
– Within one year	18.4	4.4
– Within two to five years	14.9	26.6
– After more than five years	26.1	28.0
	59.4	59.0
Less: finance charges allocated to future periods	(5.4)	(7.5)
	54.0	**51.5**

Source: Hilton Group plc Annual Report 2003

- The **annual payments on finance and operating leases** go through the cashflow statement in very different ways. For finance leases, payments are split between interest elements (will typically go to operating cashflows under IFRS) and principal repayments which will be disclosed under financing cashflows. Operating leases will simply go through operating cashflows as revenue expenditure flows.

- The **level of operating leases** can be ascertained from the relevant 'future obligations' note, again reproduced below. A user will attempt to use this as the basis for capitalisation of these leases (if material). However, the actual length of each lease is not disclosed and so a certain amount of educated guessing is required.

Exhibit 4.23: Hilton note on leases (2)

Leasing commitments	**2003** **£m**	**2002** **£m**
Leases expiring:		
– Within one year	16.1	10.6
– Within two to five years	35.0	25.1
– After more than five years	94.6	86.2
	145.7	**121.9**

Source: Hilton Group plc Annual Report 2003

Off balance sheet finance (OBSF)

Although leasing is the most common form of off balance sheet finance (i.e. raising funds and enjoying resources with no balance sheet recognition), there are plenty of others. IFRS will attack many of these. The recognition and derecognition rules in IFRS are very principles based in nature and so it is virtually impossible to predict how specific schemes will be accounted for without access to specific documentation and expert auditor opinion. Two forms of common non-leasing OBSF are considered below:

Take or pay contracts

Companies often enter into very long term contracts to guarantee the supply of some raw material or supply line. For example a utility company may enter into a long-term contract for the supply of gas. As this is an obligation it could be construed to be a liability. The purchase must be made irrespective of whether there is a need. Furthermore, such contracts might have a fixed cost pricing clause. This would mean that the contract would become more or less attractive depending on the cash price of the underlying commodity at the time of mandatory purchase under the agreement. It is unlikely, even under IFRS, that take or pay contracts will be recognised on balance sheets as liabilities. The one exception would be if the characteristics of the contract became similar to a derivative in nature. In this latter case the contracts would have to be fair valued. There is a specific exemption in IAS 39 for contracts where the commodity is physically delivered and used by the company (so called ‘own-use’ exemption) thereby reducing the scope of contracts subject to the IFRS provisions. An investor or analyst may well take the view, as many credit agencies do, that these contracts are liabilities and assuming they are currently off balance sheet would seek to recognise some sort of obligation.

Securitisations

These come in many forms. An example would be a company securitising its receivables. This basically involves selling the receivables to a financial institution. Typically this is structured as a non-recourse loan that is repaid as the customers pay. The non-recourse element means if customers default the financial institution and not the originating company would suffer. The problem for analysis is whether to reinstate the asset (receivables) and recognise a loan. We would have a lot of sympathy for treating non-recourse finance as on-balance sheet loans.

6.5 Implications for financial analysis

Any user will need to understand the nature of an entity’s financing to understand its performance. A core part of this understanding will be the use and treatment of leases. For example, comparing two airlines, one that uses finance leases against one that predominantly uses operating leases, requires judicious adjustments for leasing contracts irrespective of the accounting treatment preferred under IFRS. These are discussed in the modelling section below.

Here we need to analyse the impact on profitability and ratios of using one lease type rather than another. For simplicity’s sake let us assume that we have an operating lease that is being renewed and we feel it will now be treated as a finance lease. Exhibit 4.24 describes the impact on some key measures.

Exhibit 4.24: Impact of capitalising lease

Issue	Impact	Comment
Net income	Lower (early years)	In contrast to the consistent nature of the net income charge under operating leases, finance leases make higher charges in the earlier years of a lease and as the 'principal' is repaid the charges comes down because the interest element of the charge falls.
EBIT	Higher	As a major part of the finance lease charge is interest then we would expect EBIT to be higher over all years. An exception to this might be if the lessee charged very high levels of accelerated depreciation but this would be very rare.
Debt:equity	Higher	We get extra debt on the balance sheet with finance leases.
Return on equity	Lower (early years)	Net income is lower early in the lease period and higher later in the lease period so this ratio will first fall and then increase.
Return on capital employed	?	Capital employed is higher but so is operating profit. Therefore the outcome here is a function of the relative change in the numerator and denominator.
EBIT/Interest	?	EBIT is higher but so is interest and they both change by different amounts so again we need to look at the numbers.

6.6 Building valuation models: What to do

All leases are a form of debt irrespective of the accounting treatment. Therefore if a lease is accounted for as a capital lease then we have few problems with this and no major adjustments are required, save for ensuring that the recognised leasing obligation is included in the debt numbers deducted from EV to find the equity value.

On the other hand, if operational lease accounting is used then important adjustments are required if we are to restate operating leases onto a similar basis as if the asset had either been acquired outright or leased under a finance lease:

- **Reverse out the existing rental from EBIT**
- **Capitalise both an obligation (debt) and an asset at the present value of the lease payments**. There are two alternative approaches to this:
    1. Apply a multiple of the annual committed rental. The market tends to use multiples of either 7x or 8x annual rentals.
    2. Estimate the length of the leases and discount at an appropriate incremental borrowing rate. The problem here is that existing disclosure tends to present a challenge to completing this exercise in a reasonably sophisticated manner, as the length of leases is not shown as such.
- **Charge interest on the debt** (at either a fraction of the multiplier or at the incremental borrowing rate depending on which approach has been used for the second step above)
- **Charge depreciation on the capitalised resource**. Assume this is straight line to a zero residual value for simplicity's sake.
- **Deduct the debt numbers from the EV** to arrive at the residual equity value.

In principal, if we are valuing a company that makes extensive use of operating leases, it should make little difference to our valuation whether we leave it with high cash lease payments as a deduction from EBIT, or whether we restate everything so that it is modelled as if it had entered into a finance lease or bought and borrowed. The net present value of the lease payments should, after all, be very similar to a one-off deduction of the equivalent amount of debt. The two options will probably not be identical, because of tax treatment, but this is probably hard to assess from outside the company.

The problem with this argument is that our projections of a company's profits and cash flows are likely to represent an extrapolation, albeit an intelligent extrapolation, of its past performance. If performance is being overstated through the use of operating leases then the risk is that we shall project overly optimistic returns on incremental capital, and underestimate the full amount of investment that is needed to fund the company's future growth. In addition, if we are to calculate the company's cost of capital correctly, we need to know what the full amount of debt finance is that it is utilising – however this is accounted for. So, on these two grounds – that we do not overestimate returns on capital and underestimate the extent to which the company is financed by what is effectively debt – we should always capitalise operating leases if their value is material to the company.

Operating leases can also cause complications when comparing companies, both in the application of performance benchmarks (profitability) and in the use of comparable company valuation multiples. The equity market does value companies with large operating leases as if these were debt, whether accounted for as such or not, and they will often look as if they are being rather undervalued if their market enterprise value is taken to be merely the sum of the market capitalisation of their equity and of their stated debt.

Finally, do not forget the importance of clean value accounting to intrinsic valuation models. If it is assumed that the figure represented by the capitalised operating leases will grow, then this adds to the capital charges in an economic profit model, and should be treated as a cash outflow (acquisition of fixed assets) in a DCF model, as if the capital investments had in fact been made.

7. Derivatives

7.1 Why is it important?

Derivatives have become an integral tool used by almost all companies of reasonable size. Their use varies but typically the vast majority of corporates use derivatives to hedge exposures. The exposures might be:

- **Future price of raw materials** (e.g. aviation kerosene for an airline, cocoa beans for a manufacturer)
- **Foreign currency** (e.g. customer balances in a foreign currency)
- **Interest rates** (e.g. protect against rising interest rates where the company has predominantly variable rate debt)

Analysts need to understand how these instruments are reflected in the financials. This is especially the case as the accounting issues are not straightforward. The investor needs to be in a position to appreciate the entries that are made for these items prior to considering a logical approach for analysis.

7.2 What is current GAAP under IFRS for derivatives?

7.2.1 Derivative refresher

Technically, a derivative is simply an asset whose value is dependent on the value of something else, an underlying asset. A forward contract to buy Euros to fund a summer holiday will, by the time the holiday arrives, have been either a winning or a losing bet. The value of the derivative, in that instance, is the gain or loss versus just buying the money when you needed it.

All derivatives are ultimately made up of four types of entity, or a combination of more than one of them.

1. **Forward contracts**
   These are the simplest, and take the form described above. They are not tradeable instruments, but an Over The Counter (OTC) contract between two parties.

2. **Futures contracts**
   Futures contracts are just forward contracts that are tradeable on regulated markets. The advantage is liquidity. The disadvantage is that the terms of the contracts have to be standardised.

3. **Swaps**
   Swaps are just portfolios of forward contracts. If a company swaps its fixed coupon debt into floating rate, with a bank as counterparty, what the bank has actually done is to sell a series of forward contracts on interest rates over the duration of the debt.

4. **Options**
   These represent the right, but not the obligation, to buy (call) or sell (put) an asset at a pre-arranged price. The option element makes them complicated, but just as an option is valued by analogy with a forward contract and debt, so a forward contract can be synthesised by the purchase of a call option and the sale of a put option.

So derivatives are interchangeable, and arbitrageable, with one another. The choice of instrument, and whether to deal on regulated exchanges or use OTC contracts, is one of convenience. All so-called ‘exotic derivatives’ are merely bundles of contracts of the type described above, though valuing them can be horribly complicated.

7.2.2 Accounting tutorial

IAS 39 *Financial instruments* is the core standard under IFRS for derivatives. It is a complex and somewhat controversial accounting standard that has been the subject of extensive debate.

Essentially IAS 39 is based on a simple premise – derivatives must be recognised on the balance sheet at fair value. Historically, under many national GAAPs, driven by a historical cost perspective, derivatives remained unrecognised as there is no initial cost, as in a swap, for example. The only recognition of their effect may be the matching of the relevant underlying with the derivative on settlement. Therefore a company could have an entire portfolio of derivatives at the year end with little or no recognition in the financials as there is no upfront cost as such. This position would continue to prevail until the relevant hedged transaction took place. The IASB viewed this ‘deferral and matching’ system as a privilege rather than a right and therefore tore up the book on how derivatives were accounted for. The simple step of insisting that derivatives be marked to market at fair value means that recognition is now mandatory.

In many ways it is the other entry that is of most interest – if an asset/liability is recognised by marking a derivative to market on the balance sheet does the change go to the income statement or equity? IAS 39 has devised a system to make this decision. The example below shows the three different classifications for derivatives. Some comments will help appreciate the nature of these categories:

1. **No hedge**
   This applies to derivatives not entered into for hedging purposes and, perhaps more importantly, those that fail to qualify for hedge accounting. In this case the change in value goes through the income statement.

2. **Fair value hedge**
   If the derivative does meet the definition of a hedge and there is an existing asset/liability then both are valued at fair value and gains/losses offset in the income statement thereby reflecting the economics of the situation.

3. **Cash flow hedge**
   Again this applies if the hedge criteria are satisfied but it is future cash flows that are being protected rather than the fair value of an existing asset/liability. In this case the derivative is still marked to market. However, as no underlying yet exists the movements in value go directly to equity. Once there the gains/losses await the underlying and when it happens they are 'recycled' to income (i.e. matched).

In practice these are quite complex entries so IAS 39 produces a range of examples with numbers. The following examples are based on the rules in IAS 39.

Example 1 – Fair Value Hedges

Six months before year end, a company issues a 3 year €10m fixed interest note at 7.5 per cent, with semi-annual interest payments. It also enters into an interest rate swap to pay LIBOR (London Interbank Offer Rate) and to receive 7.5 per cent semi-annually; swap terms include a €10m notional principal, 3 year term and semi-annual variable rate reset.

LIBOR for the first six month period is 6 per cent. By year end, interest rates have fallen and the fair value of the swap (after settlement) is €125,000 (asset).

What entries are required?

1. If traditional historic accounting is used.
2. IAS 39 with no hedge accounting.
3. IAS 39 with hedge accounting.

Solution

1. If traditional historic accounting is used

Borrowings

1. Loan is recognised at net proceeds

↑	Cash	€10,000,000
↑	Creditors	€10,000,000

2. Interest on loan for period

↓	P&L account - net interest payable	€375,000
↓	Cash	€375,000

Derivatives

1. Swap is recognised, measured at cost

↑	Financial asset - held for trading	€0
↓	Cash	€0

2. Settlement under swap in period

↑	Cash (€375,000-€300,000)	€75,000
↑	P&L account - gain on hedge	€75,000

2. IAS 39 with no hedge accounting

Borrowings

1. Loan is recognised at net proceeds

↑	Cash	€10,000,000
↑	Creditors	€10,000,000

2. Interest on loan for period

↓	P&L account - net interest payable	€375,000
↓	Cash	€375,000

Derivatives

1. Swap is recognised, measured initially at cost

↑	Financial asset - held for trading	€0
↓	Cash	€0

2. Settlement under swap in period

↑	Cash (€375,000-€300,000)	€75,000
↑	P&L account - gain on hedge	€75,000

3. Swap is subsequently remeasured to fair value

↑	Financial asset - held for trading	€125,000
↑	P&L account - gain on hedge	€125,000

3. IAS 39 with hedge accounting

1. Loan is recognised at net proceeds

↑	Cash	€10,000,000
↑	Creditors	€10,000,000

2. Interest on loan for period

↓	P&L account - net interest payable	€375,000
↓	Cash	€375,000

Derivatives

1. Swap is recognised, measured initially at cost

↑	Financial asset - held for trading	€0
↓	Cash	€0

2. Settlement under swap in period

↑	Cash	€75,000
↑	P&L account - gain on hedge	€75,000

3. Swap and loan are subsequently remeasured to fair value

↑	Financial asset - held for trading	€125,000
↑	Financial liability (loan)	€125,000

Example 2 – Cash Flow Hedges

Delta Limited has tendered for a contract. The price quoted is $10m. However, Delta's functional currency is the Euro. Therefore, as prices would be fixed Delta wishes to hedge this exposure. It enters into an FX future with a nominal value of $10m.

The treatments under various scenarios are summarised below:

1. **Traditional transaction approach**

   The hedge will be ignored until the contract flows occur at which point the gain/loss on the derivative would be recognised. If the contract tender is not successful, the derivative would be settled and reported in income.

2. **Hedge accounting conditions *not* met**

   The FX derivative is marked to market at period end through the income statement as it is classified as speculation per IAS 39.

3. **Hedge accounting conditions *are* met**

   Phase I: Derivative is marked to market on the balance sheet with gains/loss going to equity.

   Phase II: Once cash flows occur, the gain/loss on derivative is matched with the relevant portion of the hedged inflows.

7.3 US GAAP Focus

FAS 133 and its IASB equivalent are reasonably similar in terms of broad application. However, given that FAS 133 has extensive guidance and has evolved over a longer period it is no surprise that there are differences in the detail. Here are the key differences:

1. In the US available for sale unlisted investments are stated at cost whereas under IFRS they are recorded at fair value once a reasonably reliable measure can be established.
2. Both GAAPs punish companies that dispose of assets from their held to maturity portfolio classification. Under IFRS there is a ban from using the category for 2 years whereas there is no limit under US GAAP.
3. Offsetting assets and liabilities is generally more difficult under US GAAP
4. Under US GAAP certain SPEs (Special Purpose Entities) are deemed to be qualifying, i.e QSPEs.
5. Hedges of an underlying for part of its life are prohibited under US GAAP but allowed, once effective, under IFRS.
6. US GAAP allows a short-cut method for establishing hedge qualification whereas under IAS 39 all hedges must be tested for effectiveness if they are going to qualify for hedge accounting.
7. Macro hedge accounting is allowed in certain circumstances under IFRS but prohibited under US GAAP.

7.4 Financial analysis implications

There is no accepted systematic approach to dealing with derivative gains and losses. In addition to the general complexity surrounding some of the instruments, few companies have had to report them under local GAAPs outside the US. The transition to IFRS means that companies will in future report these numbers and as a result analysts will have to interpret them.

Perhaps the most straightforward approach to this issue is to consider a number of interpretation points that must be considered.

1. Simply reversing out gains/losses on derivatives is not an option. For example a gain/loss on a derivative that relates to a cash market transaction recognised in the financials is a real economic cost/income. Reversing out may, for example in the case of an interest rate hedge, mean the interest expense is under/overstated.

2. It is also difficult to see how analysts can deal with comparable analysis of companies where one qualifies for hedge accounting and another does not, yet both are economically similar. Our favoured approach is only to reverse any derivative gains/losses recognised in the income statement that relate to underlying transactions that are not recognised in the same income statement. Ineffective hedges should be treated as financial income/charges. It remains to be seen whether companies will provide the market with the information to undertake such analysis.
3. It should be borne in mind that for accurate forecasting a good appreciation of the hedges a company has in place is important. Therefore analysts and investors can utilise the information in the financials to derive this understanding. It should always be borne in mind that current hedging conditions are unlikely to persist beyond a certain time horizon. But, a company can always hedge if it is prepared to pay the price.

7.5 Case example

We have included two extracts from the financials of Commerzbank to illustrate certain points of interest on financial instruments. The first example in Exhibit 4.25 discloses the instruments that have been fair valued and included on the balance sheet. The fair values amount to some €2.5bn in 2003. Without the requirements of IAS 39 there would be no need to fair value these instruments. Note the classification into fair and cashflow hedges.

Exhibit 4.25: Commerzbank fair value hedges

	31.12.2003 €m	31.12.2002 €m	Change in %
Positive fair values from related effective fair value hedges	1,649	2,110	-21.8
Positive fair values from related effective cash flow hedges	903	1,021	-11.6
Total	**2,552**	**3,131**	**-18.5**

Source: Commerzbank annual report 2003

If a user wishes to identify what amount of derivative fair value differences has passed through the income statement then this will be disclosed in the cashflow statement. The cash to profit reconciliation is reproduced below in Exhibit 4.26. The gains on derivatives are a highly significant reconciling item. These are reversed out as they are non-cash losses and hence do not have an effect on cash.

Exhibit 4.26: Commerzbank cash to profit reconciliation

	2003 €m	2002 €m
Net profit	**-2,320**	**-298**
Non-cash positions in net profit and adjustments to reconcile net profit with net cash provided by operating activities:		
Write-downs, depreciation, adjustments, write-ups to fixed and other assets, changes in provisions and net changes due to hedge accounting	929	1,114
Change in other non-cash positions:		
Positive and negative fair values from derivative financial instruments (trading and hedging derivatives)	1,248	1,607
Profit from the sale of assests	-291	88
Profit from the sale of fixed assets	4	-12
Other adjustments (mainly net interest income)	-2,299	-4,000
Sub-total	**-2,729**	**-1,501**

Source: Commerzbank annual report 2003

7.6 Building valuation models: What to do

Taking the three categories of hedge separately, gains or losses on fair value hedges offset changes in value of the hedged entity, so there should be no impact on the profit or cash flow that is being discounted. However, when thinking about returns on capital employed, it is marked to market capital that we should ideally be using, so the net value of fair value derivatives should be included in the calculation.

With cash flow hedges, we only want to reflect the profit or cash effect of the hedge when the underlying transaction crystallises, which is as it will be reflected in the accounts. But, for the same reason, it would make sense to reverse gains and losses on cash flow hedges out of equity in calculations of return on equity or return on capital.

Unless it is known that a company is speculating (in which case the trading gain or loss is clearly a trading gain or loss!) it might seem sensible to reverse out the profit or loss from derivatives that are not classified as hedge transactions. The problem with this is that if the derivative is effectively hedging a future transaction then the gain or loss on the derivative will substantially offset a loss or gain on the transaction, and leaving it in would provide a clearer impression of the real economic position than leaving it out. If in doubt, it is probably better to leave it in.

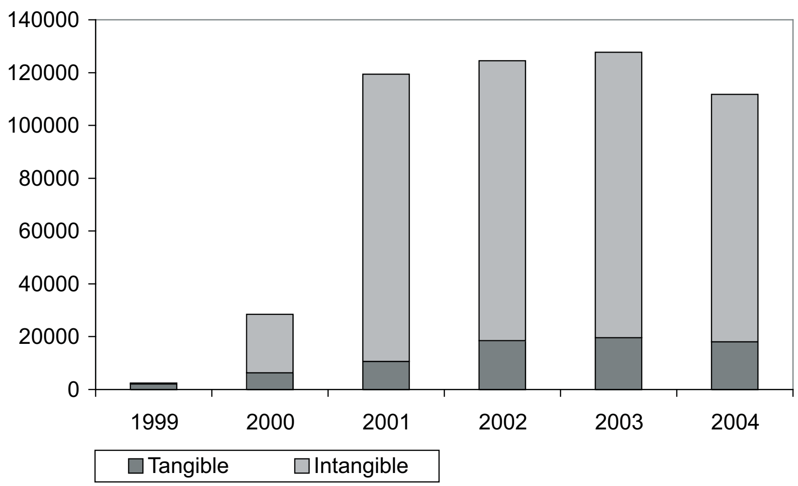
Most analysts do not model future gains and losses on derivatives. For most practical purposes, what is key is to remember that transaction hedges to protect the company against foreign exchange risk, for example, will run out typically after a year to eighteen months. So if there has been an adverse currency movement which has not yet been reflected in trading profits, it will be! Unless the exchange rate is expected to reverse, the risk is that a substantial impairment to the value of the business is ignored. The marking to market of cash flow hedges should at least alert analysts to this problem, which was often completely obscure in the past.

8. Fixed assets

8.1 Why is it important?

Much of the balance sheet of today's typical listed company is made up of intangible fixed assets i.e. those with no physical presence. Exhibit 4.27 shows the dominance of intangibles in the balance sheet of Vodafone, the telecoms company. Therefore in order to analyse a company's asset base appropriately and indeed its return on invested capital we must have a good understanding of how financial statements reflect this important asset group. In many ways the accounting appears to obfuscate and confuse rather than show the underlying economics of a company's dealings in intangibles if not interpreted carefully.Tangible fixed assets are also of importance although their accounting tends to be more straightforward.

Exhibit 4.27: Vodafone tangible and intangible fixed assets



Source: Vodafone published financials

8.2 What is current GAAP under IFRS for intangibles?

Before proceeding to focus on intangible fixed assets it is worth addressing briefly tangible fixed assets. The accounting for these assets is a much more straightforward task at one level – recognition does not tend to be a problem in most cases. The leasing section above will have addressed some of the issues about recognition of tangible assets where legal ownership and control of economic benefits diverge. Apart from this recognition is normally, although not always, straightforward.

There are a few aspects of IFRS tangible asset accounting that should be drawn to investors' attention:

- Under IFRS fixed assets can be revalued to market value, although this is not required. It is very unlikely that many intangibles would qualify for revaluation due to their bespoke nature and the fact that obtaining a market price would be highly problematic. Therefore the key asset we may see revalued will be the real estate assets of corporates. As this is a choice under IFRS it is likely that companies will carefully consider whether to take advantage of it. On the plus side if a company revalues its assets then their debt-equity and price to book measures would be lower. However against this earnings will be lower due to higher depreciation. Return on equity will suffer due to this earnings effect as well as the higher equity. When companies in the UK had this choice they tended to adopt a non-revaluation stance, especially given the rigorous rules regarding keeping the valuations up to date.
- Investment properties can be accounted for using either a cost or a mark to market (through income statement) model. If the choice is made to adopt a cost model then the fair value of these assets should still be disclosed (see the section on real estate companies in Chapter 6).

Both of these treatments could cause problems for our clean surplus assumption. Remember to achieve clean surplus accounting all gains/losses recognised during a period should go through the income number that is being used in the valuation. If a company revalues an asset and this change goes through equity then our 'clean' assumption is violated. This might encourage valuers to treat such gains and losses as income for valuation purposes (as against for performance analysis or comparables where these items should clearly be excluded). The same problem does not apply to property companies that adopt the fair value model as in this case clean surplus accounting is not violated as the fair value movements go through the income statement.

- Residual values used for depreciation calculations (intangibles rarely have residual values) must be based on updated information. In some countries residual values have historically been ignored for depreciation purposes so this may reduce depreciation charges. From an economic perspective it makes obvious sense to charge the real cost of an asset rather than ignoring the future residual value or using an out of date one.

The difficulty of accounting for intangible fixed assets lies in the difficulty of attaining an appropriate valuation. This is especially the case for assets that are not generic such as customer loyalty, brand recognition, trademarks, licences, franchises etc. Therefore the accounting rules reflect a high degree of conservatism when dealing with intangibles. The mantra appears to be of the 'if in doubt leave it out' school from academia. Its justification was perhaps most elegantly expressed by the first Lord Leverhulme (founder of Unilever) when he is alleged to have said, 'I know that half of the money that I spend on advertising is wasted, but unfortunately I don't know which half'.

IAS 38 *Intangible assets* only allows recognition of an intangible asset if it meets a challenging asset definition. An asset is defined as a resource which is controlled by an entity as a result of past events and from which future economic benefits are expected to flow to the entity. These two conditions (control and future benefits) often mean that potential intangibles do not meet the definition of an asset. For example advertising costs would not meet the definition as the benefits that may flow are in no way controlled by the enterprise. Therefore such costs are expensed.

Many of the accounting issues surrounding the recognition of intangible fixed assets can be distilled into one question: has the intangible been purchased or internally generated?

8.2.1 Purchased intangibles

By their nature a purchased intangible has a much better chance of recognition than internally developed. This is simply due to the fact that a company will normally only buy something over which it has control and from which they would expect to enjoy future economic benefits. If the purchase of the intangibles is in the context of a business combination then again recognition is highly likely. This recognition may well be in the form of a specific intangible (such as brands) or as part of the residual goodwill. The treatment of goodwill is considered in Chapter seven.

8.2.2 Internally developed intangibles

As stated above, most of these will not meet the recognition criteria. R&D, or more precisely 'D', is one notable exception. IAS 38 specifies two phases that an internal intangible passes through, the research phase and the development phase.

1. **Research phase**
   This is the original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge. All of the costs associated with this phase should be written off as incurred.

2. **Development phase**
   The application of research findings or other knowledge to improve or substantially develop company products, services or processes. Development costs that meet the following conditions *must* be capitalised otherwise they are written off as an expense.
   - The project is technically feasible
   - There is an intention to complete the intangible asset and use or sell it
   - The enterprise has the ability to use or sell the asset
   - It must be clear how the intangible can be used or how it could be sold
   - The company has adequate resources to complete the project
   - The expenditure associated with the intangible asset can be reliably measured

Once an intangible asset has been capitalised then it should be initially recognised at cost. Subsequent to initial measurement at cost the preferred IFRS treatment is to show the asset at cost net of accumulated amortisation and impairment charges. Theoretically IAS 38 does allow revaluations of intangibles but this is only where there is an active market in the intangible. Given the unique nature of many intangibles this is unlikely to be the case and so we very rarely see revaluations of intangibles.

The amortisation period is assumed to be less than 20 years. However, in certain industries a longer period may be acceptable. This might apply for example in the aerospace industry where expenditure might be expected to generate benefits over periods as long as 30 years although we doubt very much whether such amortisation periods would be used in practice. The normal approach to amortising an intangible is to use a straight-line depreciation method with a zero residual value.

8.3 US GAAP Focus

There are two key areas of divergence between US GAAP and IFRS on accounting for intangibles:

1. **Research and development expenditure** is generally expensed in the US, although certain software and technology costs may qualify for capitalisation. Under IFRS development must be capitalised
2. **Intangibles** can be revalued if they are traded in an active market (highly unlikely for most intangibles). This is prohibited under US GAAP.

8.4 Case examples

A typical accounting policy for a company that capitalises development costs is reproduced below in Exhibit 4.28. The last paragraph essentially reproduces the criteria required in IAS 38.

Exhibit 4.28: Capitalising development costs

Research and development costs

Research and development costs include costs, salaries and depreciation directly or indirectly attributable to corporate research and development activities.

Research costs are recognised in the profit and loss account in the year in which they are incurred.

Clearly defined and identifiable development projects in which the technical degree of exploitation, adequate resources and potential market or development possibility in the undertaking are recognisable, and where it is the intention to produce, market or execute the project, are capitalised when a correlation exists between the costs incurred and future earnings.

Source: Danisco Annual Report 2003

The second extract below (Exhibit 4.29) show the intangible assets note. In addition to development capitalisation, software costs and patents are also capitalised and amortised. Amortisation policies are very much at the discretion of the company and if we are to view these as real costs then some level of normalisation must be applied to the reported numbers. Danisco produce a useful summary of their various amortisation periods. Note that amortisation of intangibles is almost universally straight line. The numerical disclosures are in the normal format of cost plus additions less amortisation equals book value.

Exhibit 4.29: Danisco intangible assets

Goodwill	up to 20 years
Development projects,	3-5 years
patents, licences, trademarks	
and other intellectual property rights	up to 20 years
Software	up to 5 years

Source: Danisco Annual Report 2003

Intangible fixed assets

DKK million	Goodwill	Software	Patents and licenses	Product development	Prepayments and assets under construction	Other	Total
Cost at 1 May 2003	8,187	255	127	102	24	185	**8,880**
Exchange adjustment of opening value	-	(1)	(3)	-	(3)	(10)	**(17)**
Additions due to new activities	17	-	3	-	-	-	**20**
Additions during the year	29	25	6	46	39	8	**153**
Disposals during the year	(107)	(26)	(27)	-	(3)	-	**(163)**
Transferred to (from) other items	-	39	(9)	(21)	(16)	7	**-**
Total	**8,126**	**292**	**97**	**127**	**41**	**190**	**8,873**
Depreciation and writedowns at 1 May 2003	(1,997)	(128)	(59)	(14)	.	(119)	**(2,317)**
Exchange adjustment of opening value	(5)	-	1	-	.	8	**4**
Depreciation and amortisation of disposals during the year	107	26	26	-	.	-	**159**
Depreciation and amortisation for the year	(409)	(44)	(10)	(4)	.	(12)	**(479)**
Transferred (to) from other items	-	-	1	-	.	(1)	-
Total	**(2,304)**	**(146)**	**(41)**	**(18)**	**.**	**(124)**	**(2,633)**
Balance at 30 April 2004	**5,822**	**146**	**56**	**109**	**41**	**66**	**6,240**
Balance at 30 April 2003	**6,190**	**127**	**68**	**88**	**24**	**66**	**6,563**

Source: Danisco Annual Report 2003

8.5 Implications for financial analysis

This is a relatively simple issue in terms of accounting complexities. However, there are still important issues from an analytical perspective.

Firstly, accounting for intangibles does not typically reflect the underlying economics of these key assets. This is especially the case for internally developed intangibles which have almost universally been written off. These are real assets resulting from discretionary investments. Management must be held accountable for decisions relating to these. If we want to establish the real size of a balance sheet then we will need to capitalise and amortise intangible assets. This will directly affect our interpretation of profitability and returns on capital.

Secondly, intangibles offer room for manipulation. This is normally through the choice of a useful life. As this decision is highly subjective users need to be aware that profitability can vary substantially depending upon the life chosen. There are therefore two choices available to users: ignore the amortisation by using a profit number such as EBITA or normalise the amortisation charge across the sector under analysis. The decision taken will be a function of the objective of the analysis.

8.6 Building valuation models: What to do

We have seen in the earlier chapters of this book how valuation is ultimately dependent on expected returns on incremental capital. Chapter three dealt with the fact that straight line depreciation did not reflect impairment of value, and looked at alternative approaches. These would apply equally to the point relating to the manipulation of amortisation periods referred to above. But intangible assets represent a far more difficult problem for company valuation when they do not appear on the balance sheet at all, and that is the case for many companies, for the accounting reasons already explained.

Really, this leaves the modeller with two choices. There is the council of perfection, rarely if ever performed but sometimes possible. And there is the short cut, which is much more common.

The former is achievable when the company gives the necessary information to identify what its intangible investments actually are. For example, all of the research and development programme of a pharmaceuticals company is associated with what in economic terms is investment; none of it is expenditure required to generate this year's sales. And it is separately identified in the financial statements. If we make the assumption that we know what an appropriate amortisation period is there is no difficulty in going back through historical accounts, adding back the research cost, capitalising it and amortising it. Assuming that the appropriate amortisation period is ten years then we need to do this for nine years of history. The result will be an uncertain impact on profit, but a huge increase in capital employed, which should permit the calculation of what the actual, rather than accounting, returns on investment have been. (If the historical data is not available, it is possible to approximate these adjustments with an assumed historical growth formula, which we shall discuss in Chapter five in the section on modelling fixed assets.)

Unfortunately, it is often impossible to separate out the capital from the operating element of costs that create intangible assets. To revert to Lord Leverhulme, not only would he have difficulty in separating out the effective from the ineffective: he would also have trouble separating out the spending that was building sales for the future from the spending that was generating sales this year, yet we would need to do that to achieve a rigorous distinction between capital and operating costs. In this case probably the least bad solution is to capitalise all of it. But sometimes, the relevant information on the expenditure is simply not there at all, How does one estimate the proportion of the wage bill of a software company that is related to development of new products?

So we fall back on option two. This is to accept that for large parts of the equity market there will be no reversion of returns on capital into line with the cost of capital, however far forward we extrapolate. This is not a rejection of the basic economic principle that capital will flow to the areas in which it is best rewarded, thus reducing its returns. It is instead a recognition that the accounting returns will be overstated, and that they should therefore not be assumed to drop into line with economic reality.

9. Foreign exchange

9.1 Why is it important?

For most multinational companies the accounting treatment of foreign exchange items is a potentially significant item. Depending on the exact nature of the underlying foreign currency activity it can have implications for earnings, equity and debt numbers reported in the financial statements. Analysts must be in a position to deal with these important and complex numbers. Some of the major questions that arise are:

1. What is the difference between transaction and translation exchange gains and losses?
2. When do gains/losses go through income and when through equity directly?
3. What are the implications from an analysis and modelling perspective of these reported gains and losses?

9.2 What is current GAAP under IFRS for transactions in a foreign currency?

IAS 21 *The effect of changes in foreign exchange rates* addresses two crucial issues relating to foreign exchange transactions. First, it provides rules for translating individual transactions that are denominated in a foreign currency. Second, it addresses the issues relating to the translation of foreign entities into consolidated financial statements.

9.2.1 Issue 1 – Individual transactions

Here we will focus on the aspects of IAS 21 that relate to foreign currency transactions which would include:

1. buying or selling goods and services which are invoiced in a foreign currency,
2. borrowing or lending in a foreign currency, or
3. acquiring/disposing of assets/settlement of liabilities in a foreign currency.

Initial measurement

The fundamental rule is that a foreign currency transaction such as that mentioned above is initially translated at the spot rate on the date of the transaction. In practice a rate that approximates to that may well be acceptable such as a weekly or monthly average, assuming rates do not fluctuate significantly.

Example I

Rendle SA purchases a major piece of mechanical equipment from a UK supplier. The functional currency of Rendle SA is the Euro and the price of £10,000,000, is quoted, and must be paid in, sterling.

The exchange rate is 0.668.

Applying the fundamental rule would require the following entry:

Increase fixed assets [10,000,000/0.668]	€14,970,060
Increase creditors	€14,970,060

Subsequent valuation

The subsequent measurement of these items is based on the distinction between monetary and non-monetary items. Monetary items are those that involve the right to receive, or an obligation to deliver, units of a foreign currency. The obvious examples of these are payables, receivables and loans. Non-monetary assets lack this right to receive or pay monetary amounts and would include inter alia inventory and property and equipment. IAS 21 quite logically provides that monetary items will be translated using the closing rate (i.e. the rate on the balance sheet date) whereas non-monetary items will not be retranslated.

Example I continued

Suppose at the year end the £/€ exchange rate was 0.778, the entries would be:

Decrease creditors by	€2,116,590
Increase fx gain	€2,116,590

£10,000,000/0.778 = 12,853,470-14,970,060 = €2,116,590

Settlement

To finish the example assume that settlement took place when the £/€ = 0.745.

Decrease cash [10,000,000/0.745]	€13,422,819
Decrease creditors	€12,853,470
Increase fx loss	€569,349

Note that IAS 21 is silent on exactly where these gains and losses are recognised. However, it is reasonable to assume that fx gains and losses that relate to operations would be reported in operating profit whereas those relating to financing, would be reported as finance charges or income. The latter example might arise on the retranslation of a foreign currency loan.

9.2.2 Issue II – Consolidated financials

If a parent company has a number of independent subsidiaries then their financials are likely to be prepared in the functional currencies of these entities. The functional currency is the key operating currency of that entity. For example an independent subsidiary of a UK corporation operating in Germany will typically have its costs and revenues in Euro, and will prepare its financial statements in Euro as well. Therefore a set of rules is required to translate these amounts into the presentation currency, i.e. that used in the consolidated financial statements.

This is not as complex a topic as it might sound. All that is needed is a rate. IAS 21 requires most of the balance sheet to be translated at the closing rate and the income statement at the actual rate. In the latter case an average rate is often used for pragmatic reasons. For the purposes of this chapter it is important to note that the gains and losses on this translation exercise are recognised as a separate component of equity. This means that the gains and losses do not pass through the income statement. The rationale for this is that the exchange gains are not under managerial control, have little or nothing to do with performance and, in any event, have little discernible impact on present and future cash flows.

In many cases the foreign exchange movement on the translation of foreign subsidiaries is the major gain/loss that bypasses the income statement and is recognised directly in equity. Therefore it throws up valuation issues in that to ignore it would result in dirty-surplus accounting. This issue is discussed below.

9.3 US GAAP focus

There are no major differences between the GAAPs in this area.

9.4 Case example

The statement of total recognised gains and losses for Reckitt Benckiser plc is reproduced below in Exhibit 4.30. The exchange movements recognised must relate to either the retranslation exercise for subsidiaries or hedge of a foreign currency asset as they have been reported in equity rather than earnings. There would also be foreign exchange movements reported through earnings but these are not disclosed in this note.

Exhibit 4.30: Reckitt Benckiser total recognised gains and losses

Reconciliation of movements in total shareholders' funds

	Notes	2003 £m	2002 £m
Profit for the year		**489**	408
Dividends (including non-equity preference dividends)		**(198)**	(181)
Ordinary shares allotted on exercise of options and conversion of convertible capital bonds		**31**	15
Net exchange movements on foreign currency translation		**(47)**	(100)
Own shares repurchased		**(25)**	–
Unvested restricted shares	22	**19**	25
Net increase in shareholders' funds		**269**	167
Total shareholders' funds at beginning of year		**1,201**	1,034
Total shareholders' funds at end of year		**1,470**	1,201

There is £5m (2002 £5m) of non-equity shareholders' funds included within total shareholders' funds.

Source: Reckitt Benckiser Annual Report & Accounts 2003

9.5 Building valuation models: What to do

Transaction effects

Foreign exchange transaction effects would normally exemplify themselves in terms of a widening or narrowing of margins. If a company manufactures products in its home market, with a domestic cost base (not all imported raw materials) then a weakening of the domestic currency will result in higher revenues if it retains its price to customers in their local currency. The opposite, of course, occurs if the domestic currency strengthens.

Over time, this effect should probably unwind. For most economies, a fall in the exchange rate is likely to be associated with inflation, which will ultimately drive up domestic costs. But the time lags can be quite substantial, as the ballooning of earnings from the Russian oil companies after the Rouble collapse of 1998 illustrates. Their export revenues rose immediately, but the gain was only eroded gradually over a run of years (in this case the dollar price subsequently increased as well, but that is a separate issue).

So there should be an impact on forecasts resulting from recent foreign exchange movements if the company is a large exporter (or, on the other hand, importer).

The picture is complicated if the company operates a policy of transaction hedging, and this may extend for prolonged periods into the future (in which case it will probably not get hedge designation for its derivatives positions, which complicates things further). The impact on valuation is usually less acute than it is on specific annual forecasts of profit. Companies cannot hedge their sales forward for ever, and when the protection afforded by the hedges runs out, the full impact of the currency will be felt. Since even two or three years' worth of profits and cash flows have only a small impact on value, the main worry for the modeller is likely to be the accuracy of individual annual forecasts. Where hedges are not designated as cash flow hedges, this will also mean that large gains or losses will occur on the derivatives long before the transactions that are being hedged occur.

Translation effects

Where currencies are forecast to move against the reporting currency of the group, translation effects will ensue. Projecting the detailed impact on the balance sheet, as explained in the accounting discussion above, is very difficult from outside the company, because it is generally not possible to get enough information on the assets and liabilities concerned to re-translate the balance sheet at different rates. More common might be an approximate apportionment taken through the entire balance sheet with the adjustment to equity taken to other consolidated income. Companies generally borrow in the currency of the relevant subsidiary, so it is often (though not always) appropriate to assume that all of the balance sheet items can be apportioned more or less proportionately. It is clearly important to check this.

Also important is that, even though it may be non-recurring, a one-off fall in the exchange rate for an overseas subsidiary does represent a real fall in the value of the business to its shareholders. The future stream of cash flows and profits in the parent company has been impaired. In discounted cash flow terms, the stream of cash that we are discounting is reduced. In economic profit terms, we are now making the same return on a smaller balance sheet, with exactly the same negative impact on value.

A different problem arises where a group has operations in high inflation countries with endemically weak currencies. In that situation, we are not looking at a one-off event, but at a likely sequence of annual currency losses. In addition to the forecasting issues raised, this also involves a point with respect to discount rates. It is crucial that the profits or cash flows that are being discounted, and the rates that are used to discount them, are consistent with another. In general, the preferred approach is to use the discount rate that equates to the group's reporting currency, and then to make sure that the accounts are translated so that profits, balance sheets and cash flows are as they are projected to be represented in that currency. So a large Brazilian subsidiary may be growing fast, but when translated into Euros, the rate of growth will be reduced, and there will be negative translation effects on the balance sheet size, creating translation losses. Cash flow growth will be reduced in line with the impact on profits.

The point has already been made that it is a feature of economic profit models that they rely on clean value accounting: that all of the increase or decrease in shareholders' equity must be attributable to profits, dividends, share distributions and share buy-backs. If this is not the case then there will be a mismatch between what is happening to balance sheets and what is happening to profits, which will throw out the identity between cash flow valuation and economic profit valuation. So when we construct our economic profit models it is important that if translation gains or losses are being forecast then they must be included in the NOPAT that is used to derive the calculation of forecast economic profit.

Currency of debt

The point was made above that companies generally borrow in local currency as a natural fair value hedge. If the assets are in dollars and I borrow in dollars then I have to some degree hedged my dollar exposure. But what if I am a Norwegian oil producer, with most of my assets in Norway, but with cash flows that are largely (not entirely, if I am selling gas into continental Europe in Euros) denominated in dollars? This is the position in which Statoil, the Norwegian producer, has found itself for years. It has responded by denominating its borrowing almost exclusively in dollars. What happens to it when the dollar falls against the Krone?

First, it books a substantial unrealised profit on the retranslation of its dollar debt into fewer Krone. Second, its revenues in that year and in all subsequent years fall in Krone terms because the dollar stream converts into fewer Krone (unless oil and gas prices go up).

If one were modelling Statoil's assets, it would make sense to model them in dollars and to value them using a dollar discount rate. If one were modelling the company, then it would still probably be easier to model it in dollars, value it in dollars, and then convert the projected accounts into Krone.

Similar issues arise for mining companies and for oil companies. In the South East Asian currency crisis of 1998, the equity of Thai Air was almost eliminated by currency translation losses on its debt, which was almost all denominated in dollars, while its assets where denominated in Baht. There was nothing imprudent about its choice of borrowing currency. Its revenues were effectively denominated in dollars, too, since this is the currency in which it priced its flights, and in which it paid for its fuel.

The same comment cannot be made about a UK company which went spectacularly bankrupt during the 1980s, namely Polly Peck. This company had large financial assets and debts, with the assets mainly denominated in Turkish Lire, and its loans mainly denominated in Swiss francs. The result was large positive financial items in the profit and loss account, and large currency losses recorded as other gains and losses and taken straight to shareholders' funds. It was still looking quite profitable as it became insolvent.

There are two messages from this sad tale. Firstly, other consolidated gains and losses may or may not be ongoing, but they do count. Secondly, it should not be assumed that all debt is automatically borrowed in the functional currency of the company.

Chapter Five

Valuing a company

Pulling things together

It is time to pull together the theory from the early chapters of this book with the accounting issues raised in Chapter four. We are going to look at valuation models for a series of companies, selected to illustrate specific issues in forecasting and valuation. In all cases, whether or not there are difficult accounting issues involved, valuing a company comprises two elements: projecting its accounts for a specific period (often five years) and putting a value on what happens after the five years, often treated as a single, so-called 'terminal value'.

So we shall start with a fairly simple company and how to produce a five year forecast for its financials. We shall then calculate its cost of capital, for the purposes of producing a valuation. Once we know the appropriate discount rate, we need something to discount, so we shall calculate the free cash flow and the economic profit that we think the company will generate over the five years of our forecast. Initially, we shall use a single terminal value calculation to complete both the DCF and the economic profit valuation, and shall incidentally demonstrate that, as the theory in Chapter one implied, they do indeed produce the same answer.

Then it will be time to move on to some examples that illustrate some more of the problems that often arise in the real world that tend to be ignored by the textbooks. These break into several groups.

1. There are the companies that are hard to model and value because they exemplify the kinds of accounting issues raised in Chapter four. These points will be picked up throughout the examples below.
2. There are companies that are expected to have a dramatic change to their balance sheet structure, perhaps through a share buy-back. This is a pure valuation point.
3. There are highly cyclical companies, in which the key question often boils down to what is a normal year, for the purpose of long term extrapolation.
4. There are companies with a large component of intangible assets, frequently not capitalised, which raises the question of what their returns on capital actually are.
5. There are fast growing, and also often highly profitable, companies, where the issues are the rate at which both of these elements will fade to maturity.

Obviously, we are not going to be able to illustrate everything. But we hope to be able to show you enough to ensure that, whatever the problem, you have a systematic approach to dealing with it to produce realistic values. Most of the issues are generic to groups of industrial companies, often known as the 'cyclicals', the 'growth stocks' or whatever. There are some sectors that require very different treatment, and we shall defer consideration of these until the next chapter.

1. Building a forecast

One of the simplest sorts of company to forecast and value is a food retailer. Its accounts are usually fairly transparent. It conducts one business in one country, which means that different business streams do not have to be modelled individually and then consolidated, though we are going to do so here merely to illustrate the methodology. It operates in one currency. It is not cyclical and if it is a market leader it is unlikely to grow very fast, since its market is already mature. For this reason, we shall start with a food retailer, and partly because it had already accounted using IAS prior to the adoption of IFRS we shall take the German company, Metro.

The entire forecast is printed in Exhibit 5.1, and in the commentary that follows we shall refer to the different pages of the model: EBIT, fixed costs, profit and loss, balance sheet, cash flow, fixed assets, working capital, equity, debt and ratios. When referring back to the model it would be useful to bear in mind a couple of conventions that we have followed. Firstly, entered numbers (either from historical accounts or forecast drivers) are boxed. Secondly, all percentages, rather than numbers, are italicised.

Exhibit 5.1: Metro accounts forecasts

1. Metro operating profit (€ million)

Year	2002	2003	2004	2005	2006	2007	2008
Net sales							
Metro cash and carry	23,972	25,093	25,846	26,679	27,603	28,631	29,776
Real	8,198	8,205	8,287	8,396	8,542	8,736	8,998
Extra	2,835	2,773	2,801	2,838	2,887	2,953	3,041
Media Markt and Saturn	9,583	10,563	10,880	11,231	11,620	12,052	12,534
Praktiker	2,584	2,811	2,895	2,989	3,092	3,207	3,336
Kaufhof	3,900	3,819	3,857	3,908	3,976	4,066	4,188
Total sales	**51,072**	**53,264**	**54,566**	**56,040**	**57,719**	**59,645**	**61,873**
Other companies	454	331	334	338	341	344	348
Metro group	**51,526**	**53,595**	**54,900**	**56,378**	**58,060**	**59,990**	**62,221**
Growth in sales							
Metro cash and carry		*4.7%*	*3.0%*	*3.2%*	*3.5%*	*3.7%*	*4.0%*
Real		*0.1%*	*1.0%*	*1.3%*	*1.7%*	*2.3%*	*3.0%*
Extra		*(2.2%)*	*1.0%*	*1.3%*	*1.7%*	*2.3%*	*3.0%*
Media Markt and Saturn		*10.2%*	*3.0%*	*3.2%*	*3.5%*	*3.7%*	*4.0%*
Praktiker		*8.8%*	*3.0%*	*3.2%*	*3.5%*	*3.7%*	*4.0%*
Kaufhof		*(2.1%)*	*1.0%*	*1.3%*	*1.7%*	*2.3%*	*3.0%*
Total sales		***4.3%***	***2.4%***	***2.7%***	***3.0%***	***3.3%***	***3.7%***
Other companies		*(27.1%)*	*1.0%*	*1.0%*	*1.0%*	*1.0%*	*1.0%*
Metro group		***4.0%***	***2.4%***	***2.7%***	***3.0%***	***3.3%***	***3.7%***
EBIT							
Metro cash and carry	709.1	799.6	904.6	933.8	966.1	1,002.1	1,042.2
Real	147.0	160.5	165.7	185.8	209.2	236.8	269.9
Extra	(47.2)	(75.7)	28.0	33.7	40.8	49.7	60.8
Media Markt and Saturn	280.2	345.2	380.8	393.1	406.7	421.8	438.7
Praktiker	(41.6)	(13.8)	29.0	35.5	43.7	53.9	66.7
Kaufhof	131.4	94.1	96.4	102.3	108.9	116.6	125.6
Total EBIT	**1,178.9**	**1,309.9**	**1,604.5**	**1,684.2**	**1,775.5**	**1,880.9**	**2,004.0**
Other companies	(13.4)	8.2	8.4	8.4	8.5	8.6	8.7
Metro group	**1,165.5**	**1,318.1**	**1,612.9**	**1,692.7**	**1,784.0**	**1,889.5**	**2,012.7**
EBIT margin							
Metro cash and carry	*3.0%*	*3.2%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*
Real	*1.8%*	*2.0%*	*2.0%*	*2.2%*	*2.4%*	*2.7%*	*3.0%*
Extra	*(1.7%)*	*(2.7%)*	*1.0%*	*1.2%*	*1.4%*	*1.7%*	*2.0%*
Media Markt and Saturn	*2.9%*	*3.3%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*
Praktiker	*(1.6%)*	*(0.5%)*	*1.0%*	*1.2%*	*1.4%*	*1.7%*	*2.0%*
Kaufhof	*3.4%*	*2.5%*	*2.5%*	*2.6%*	*2.7%*	*2.9%*	*3.0%*
Total EBIT	***2.3%***	***2.5%***	***2.9%***	***3.0%***	***3.1%***	***3.2%***	***3.2%***
Other companies	*(3.0%)*	*2.5%*	*2.5%*	*2.5%*	*2.5%*	*2.5%*	*2.5%*
Metro group	***2.3%***	***2.5%***	***2.9%***	***3.0%***	***3.1%***	***3.1%***	***3.2%***
Other operating income	1,532	1,461	1,476	1,490	1,505	1,520	1,536
Annual growth		*(4.6%)*	*1.0%*	*1.0%*	*1.0%*	*1.0%*	*1.0%*

2. Metro fixed costs (€ million)

Year	2002	2003	2004	2005	2006	2007	2008
Selling expenses	(10,377)	(10,636)	(10,901)	(11,174)	(11,452)	(11,738)	(12,031)
Annual growth		*2.5%*	*2.5%*	*2.5%*	*2.5%*	*2.5%*	*2.5%*
General administrative expenses	(1,013)	(1,031)	(1,049)	(1,068)	(1,087)	(1,106)	(1,126)
Annual growth		*1.8%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*
Other operating expenses	(115)	(112)	(109)	(106)	(103)	(101)	(98)
Annual growth		*(2.6%)*	*(2.6%)*	*(2.6%)*	*(2.6%)*	*(2.6%)*	*(2.6%)*

3. Metro profit and loss account (€ million)

Year	2002	2003	2004	2005	2006	2007	2008
Net sales	**51,526**	**53,595**	**54,900**	**56,378**	**58,060**	**59,990**	**62,221**
Cost of sales	(40,126)	(41,687)	(42,431)	(43,556)	(44,866)	(46,403)	(48,217)
Gross profit	**11,400**	**11,908**	**12,469**	**12,822**	**13,194**	**13,586**	**14,004**
Gross profit margin	*22.1%*	*22.2%*	*22.7%*	*22.7%*	*22.7%*	*22.6%*	*22.5%*
Other operating income	1,532	1,461	1,476	1,490	1,505	1,520	1,536
Selling expenses	(10,377)	(10,636)	(10,901)	(11,174)	(11,452)	(11,738)	(12,031)
General administration expenses	(1,013)	(1,031)	(1,049)	(1,068)	(1,087)	(1,106)	(1,126)
Other operating expenses	(115)	(112)	(109)	(106)	(103)	(101)	(98)
EBITA	**1,427**	**1,590**	**1,885**	**1,965**	**2,056**	**2,161**	**2,285**
Amortisation of goodwill	(261)	(272)	(272)	(272)	(272)	(272)	(272)
EBIT	**1,166**	**1,318**	**1,613**	**1,693**	**1,784**	**1,889**	**2,013**
Investment income	38	(60)	(11)	(11)	(11)	(11)	(11)
Net interest	(378)	(425)	(477)	(431)	(385)	(338)	(290)
Other financial items	4	(16)	(6)	(6)	(6)	(6)	(6)
Net financial items	**(336)**	**(501)**	**(494)**	**(448)**	**(402)**	**(355)**	**(307)**
Earnings before tax	**830**	**817**	**1,119**	**1,245**	**1,382**	**1,534**	**1,705**
Income tax	(328)	(246)	(487)	(531)	(579)	(632)	(692)
Tax/Profit before amortisation	*39.5%*	*30.1%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*
Group net income	**502**	**571**	**632**	**714**	**803**	**902**	**1,013**
Minority interest	(59)	(75)	(83)	(94)	(106)	(118)	(133)
Minority/group net income	*11.8%*	*13.1%*	*13.1%*	*13.1%*	*13.1%*	*13.1%*	*13.1%*
Attributable net income	**443**	**496**	**549**	**620**	**698**	**784**	**880**
Dividend paid	(334)	(334)	(369)	(417)	(469)	(527)	(592)
Retained earnings	109	162	180	203	228	257	288
Common stock							
Weighted average shares (m)	324.1	324.1	324.1	324.1	324.1	324.1	324.1
Year end shares (m)	324.1	324.1	324.1	324.1	324.1	324.1	324.1
Preferred stock							
Weighted average shares (m)	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Year end shares (m)	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Shares outstanding							
Weighted average shares (m)	326.8	326.8	326.8	326.8	326.8	326.8	326.8
Year end shares (m)	326.8	326.8	326.8	326.8	326.8	326.8	326.8
Earnings per share (Euro)	1.36	1.52	1.68	1.90	2.14	2.40	2.69
Common stock dividend (Euro)	1.020	1.020	1.130	1.275	1.435	1.611	1.810
Preferred stock dividend (Euro)	1.122	1.122	1.243	1.403	1.578	1.772	1.991
Payout ratio (common stock)	*75.2%*	*67.2%*	*67.2%*	*67.2%*	*67.2%*	*67.2%*	*67.2%*
Preferred dividend /common dividend	*110.0%*	*110.0%*	*110.0%*	*110.0%*	*110.0%*	*110.0%*	*110.0%*

4. Metro balance sheet (€ million)

Year	2002	2003	2004	2005	2006	2007	2008
Fixed assets							
Goodwill	4,070	3,987	3,715	3,443	3,171	2,899	2,627
Other intangible assets	188	326	326	326	326	326	326
Tangible assets	7,201	10,490	10,741	11,062	11,447	11,891	12,389
Financial assets	229	238	238	238	238	238	238
Total fixed assets	**11,688**	**15,041**	**15,020**	**15,069**	**15,182**	**15,354**	**15,580**
Current assets							
Inventories	5,506	5,941	6,047	6,207	6,394	6,613	6,872
Trade receivables	369	339	347	357	367	379	394
Other receivables and other assets	2,857	2,061	2,111	2,168	2,233	2,307	2,393
Cash and cash equivalents	1,323	1,593	2,071	2,565	3,059	3,566	4,103
Total current assets	**10,055**	**9,934**	**10,576**	**11,297**	**12,053**	**12,866**	**13,760**
Deferred tax assets	1,084	1,456	1,456	1,456	1,456	1,456	1,456
Prepaid expenses and deferred charges	96	149	149	149	149	149	149
Total assets	**22,923**	**26,580**	**27,201**	**27,971**	**28,840**	**29,824**	**30,946**
Equity							
Capital stock	835	835	835	835	835	835	835
Additional paid-in capital	2,558	2,551	2,551	2,551	2,551	2,551	2,551
Reserves retained from earnings	305	279	441	621	824	1,053	1,309
Group net profit	443	496	549	620	698	784	880
Treasury stock	0	0	0	0	0	0	0
Total equity	**4,141**	**4,161**	**4,377**	**4,627**	**4,908**	**5,222**	**5,576**
Minorities	105	188	246	312	386	470	563
Provisions							
Pensions and similar commitments	960	1,012	1,132	1,259	1,396	1,542	1,699
Other provisions	725	758	758	758	758	758	758
Total provisions	**1,685**	**1,770**	**1,890**	**2,017**	**2,154**	**2,300**	**2,457**
Other liabilities							
Financial debts	5,587	7,802	7,802	7,802	7,802	7,802	7,802
Trade payables	9,119	9,907	10,084	10,351	10,663	11,028	11,459
Other liabilities	1,965	2,097	2,148	2,206	2,272	2,347	2,435
Total other liabilities	**16,671**	**19,806**	**20,034**	**20,359**	**20,736**	**21,177**	**21,695**
Deferred tax liabilities	196	526	526	526	526	526	526
Deferred income	125	129	129	129	129	129	129
Total equity and liabilities	**22,923**	**26,580**	**27,201**	**27,971**	**28,840**	**29,824**	**30,946**
Check	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Net debt	4,264	6,209	5,731	5,237	4,743	4,236	3,699
Operating capital (including goodwill)	9,107	11,140	11,055	11,006	11,003	11,040	11,107
Operating capital (excluding goodwill)	5,037	7,153	7,340	7,563	7,832	8,141	8,480

5. Metro cash flow (€ million)

Year	2002	2003	2004	2005	2006	2007	2008
EBIT			1,613	1,693	1,784	1,889	2,013
Depreciation and amortisation			1,521	1,551	1,587	1,628	1,674
Changes in pension provisions			60	61	63	64	66
Changes in other provisions			0	0	0	0	0
Changes in net working capital			63	99	115	135	160
Income taxes paid			(487)	(531)	(579)	(632)	(692)
Changes in deferred tax assets and liabilities			0	0	0	0	0
Changes in prepayments and deferred income			0	0	0	0	0
Cash flow from operating activities			**2,770**	**2,873**	**2,970**	**3,085**	**3,220**
Capital expenditure			(1,500)	(1,600)	(1,700)	(1,800)	(1,900)
Cash flow from investing activities			**(1,500)**	**(1,600)**	**(1,700)**	**(1,800)**	**(1,900)**
Dividends to Metro shareholders			(334)	(369)	(417)	(469)	(527)
Dividends to minority shareholders			(25)	(28)	(31)	(35)	(39)
Equity issued			0	0	0	0	0
Equity bought back			0	0	0	0	0
Change in debt			0	0	0	0	0
Net interest paid			(417)	(364)	(311)	(256)	(200)
Investment income			(11)	(11)	(11)	(11)	(11)
Other financial items			(6)	(6)	(6)	(6)	(6)
Cash flow from financing activities)			**(792)**	**(778)**	**(776)**	**(778)**	**(783**
Opening cash		1323	1,593	2,071	2,565	3,059	3,566
Change in cash		270	478	495	494	507	537
Closing cash		**1593**	**2,071**	**2,565**	**3,059**	**3,566**	**4,103**
Average cash		1,458	1,832	2,318	2,812	3,313	3,834
Interest received		158	199	251	305	359	416
Interest rate on cash		*10.8%*	*10.8%*	*10.8%*	*10.8%*	*10.8%*	*10.8%*

6. Metro fixed assets (€ million)

Year	2003	2004	2005	2006	2007	2008
Tangible fixed assets						
Opening gross value	**12,597**	**16,408**	**16,803**	**17,272**	**17,809**	**18,410**
Additions	1,421	1,500	1,600	1,700	1,800	1,900
Disposals and transfers	(499)	(1,105)	(1,131)	(1,163)	(1,199)	(1,239)
Other items	2,889	0	0	0	0	0
Closing gross value	**16,408**	**16,803**	**17,272**	**17,809**	**18,410**	**19,071**
Historical long term growth	2.0%					
Opening net value	**7,201**	**10,490**	**10,741**	**11,062**	**11,447**	**11,891**
Additions	1,421	1,500	1,600	1,700	1,800	1,900
Depreciation	(959)	(1,249)	(1,279)	(1,315)	(1,356)	(1,402)
Other items	2,827	0	0	0	0	0
Closing net value	**10,490**	**10,741**	**11,062**	**11,447**	**11,891**	**12,389**
Opening gross assets/depreciation	13.1					
Closing cumulative depreciation	5,918	6,063	6,211	6,363	6,520	6,682
Opening fixed asset turn	7.4	5.2	5.2	5.2	5.2	5.2

7. Metro working capital (€ million)

Year	2003	2004	2005	2006	2007	2008
Inventory days	52	52	52	52	52	52
Trade receivables days	2	2	2	2	2	2
Other receivables (% sales)	*3.8%*	*3.8%*	*3.8%*	*3.8%*	*3.8%*	*3.8%*
Trade payables days	87	87	87	87	87	87
Other liabilities (% sales)	*3.9%*	*3.9%*	*3.9%*	*3.9%*	*3.9%*	*3.9%*
Total non-cash working capital	(3,663)	(3,726)	(3,825)	(3,940)	(4,076)	(4,235)
Opening working capital turn	(23)	(15)	(15)	(15)	(15)	(15)

8. Metro equity (€ million)

Year	2003	2004	2005	2006	2007	2008
Share price (Euro)	36.76					
Par value (Euro)	2.56					
Equity issued		0	0	0	0	0
Equity bought back		0	0	0	0	0
Shares issued		0	0	0	0	0
Shares bought back		0	0	0	0	0

9. Metro debt (€ million)

Year	2003	2004	2005	2006	2007	2008
Opening financial debt	5587	7,802	7,802	7,802	7,802	7,802
Change in finance debt	2215	0	0	0	0	0
Closing finance debt	**7802**	**7,802**	**7,802**	**7,802**	**7,802**	**7,802**
Average finance debt	6,695	7,802	7,802	7,802	7,802	7,802
Interest paid	**(528)**	**(615)**	**(615)**	**(615)**	**(615)**	**(615)**
Interest rate on debt	*7.9%*	*7.9%*	*7.9%*	*7.9%*	*7.9%*	*7.9%*
Opening pension provision	960	1,012	1,132	1,259	1,396	1,542
Interest on pension provision	55	60	67	74	82	90
Changes in pension provisions	(3)	60	61	63	64	66
Closing pension provision	**1012**	**1,132**	**1,259**	**1,396**	**1,542**	**1,699**
Provision/fixed costs	*0.0%*	*0.5%*	*0.5%*	*0.5%*	*0.5%*	*0.5%*
Average pension provision	986	1,072	1,195	1,328	1,469	1,620
Interest on pension provision	(55)	(60)	(67)	(74)	(82)	(90)
Interest rate on pension	*5.6%*	*5.6%*	*5.6%*	*5.6%*	*5.6%*	*5.6%*

10. Metro ratios (€ million)

Year	2003	2004	2005	2006	2007	2008
Revenue growth	*4.0%*	*2.4%*	*2.7%*	*3.0%*	*3.3%*	*3.7%*
Dupont including goodwill						
Opening operating capital asset turn	5.9	4.9	5.1	5.3	5.5	5.6
Net operating margin	*1.6%*	*1.7%*	*1.8%*	*1.8%*	*1.9%*	*1.9%*
Return on opening operating capital	*9.2%*	*8.6%*	*9.1%*	*9.7%*	*10.3%*	*11.0%*
Opening net debt/ operating capital	*46.8%*	*55.7%*	*51.8%*	*47.6%*	*43.1%*	*38.4%*
Dupont excluding goodwill						
Opening operating capital asset turn	10.6	7.7	7.7	7.7	7.7	7.6
Net operating margin	*2.1%*	*2.2%*	*2.3%*	*2.3%*	*2.3%*	*2.4%*
Return on opening operating capital	*22.1%*	*17.1%*	*17.4%*	*17.7%*	*17.9%*	*18.2%*
Opening net debt/ operating capital	*84.7%*	*86.8%*	*78.1%*	*69.2%*	*60.6%*	*52.0%*

When forecasting, it may be desirable to rearrange the profit and loss account with the aim of achieving two objectives: separating out cash costs from non-cash costs, and where possible splitting cash costs between variable costs and fixed costs. Variable costs are those that move in line with units sold. Fixed costs do not. Often, the largest fixed cost is represented by employment, and it is often desirable to forecast this as a separate item. Non-cash costs comprise depreciation and amortisation. To make the Metro model as intelligible to readers as possible, we have almost completely followed the layout of the company's financial accounts, but if modelling a group of companies there is much to be said for imposing your own standardised formats.

A problem arises immediately for companies which do not undertake a single business in a single country. In this case information is often provided broken down either by business or by location (but never the full matrix), for sales and for EBIT. This leaves the modeller with a choice. Either the benefit of the operating split is retained, and the detail of the cost structure is lost, or the other way round. Unfortunately, this dilemma arises more often than not, and it arises in the case of Metro. We have opted here to break out the operating forecasts by business line, and to project revenue growth and margin for each business.

We have also projected fixed costs on page two of the model, escalating individual line items independently of volumes sole. But this means that when we get to the profit and loss account, the calculation runs upwards from EBIT, with the fixed costs added back to derive gross profit, and the cost of goods sold derived as the difference between revenues and gross profits. This is clearly the opposite of what one would like to do. It is also inevitable, given the way that the information is presented in their accounts, for many companies. The only solution is to watch movements in the gross margin very carefully, since it is a result that reflects assumptions made about revenue growth rates, EBIT margins and growth in fixed costs.

A second question is treatment of unusual items. Obviously, it is the underlying trends in revenues and costs that should inform our forecasts. While it is not always desirable to follow the company's guidance on what constitutes an unusual item (for some companies, if it is positive it is in the normal line of business and if it is negative then it is obviously an aberration to be ignored!), some decisions regarding what to leave in and what to remove are required. And sometimes it is not left clear by the accounts what the impact of unusual items has been on the taxation charge. As a broad rule of thumb, restructuring costs reduce tax charges because when actually incurred they will be allowable against taxable profit (but not in the year in which the provision is made, note). Impairments of goodwill are generally irrelevant to the tax charge since goodwill is not usually an allowable expense, but write-ups and write-downs of other fixed assets generally increase or decrease deferred tax liabilities. And gains and losses on disposals are hard to model as the cost allowable against tax and the book value are not necessarily the same nor is the rate of capital gains tax necessarily the same as the rate of corporation tax. But one must do one's best to guess. Where you do strip out items to get at an estimate of underlying net income, then it is important to show both the stated and the adjusted figures, especially in the forecasts, as will become clear when we move on to discussing the valuation.

Just as the profit and loss account needed to be rearranged, so, often, does the balance sheet. In general one wants to keep the number of line items to the list of elements that it makes sense to forecast independently. Thus, on the asset side of the balance sheet we shall want to separate the different elements of fixed assets, and to separate cash and cash equivalent, from debtors (receivables) and from other current assets. But it makes little sense in most cases to penetrate further than that, and published balance sheets will separate out cash from short term investments (a distinction that we can generally safely ignore) but may not separate out debtors and creditors (payables) from other current assets and other current liabilities, which we shall definitely want to do. Debtors and creditors are an important part of the capital employed in the business whereas, for example, other current liabilities are often dominated by tax liabilities that have accrued to be paid within the next twelve months.

(Notice that under IFRS accounting, which Metro adopts, shareholders' equity includes the earnings generated during the year but does not exclude the dividend announced with respect to the year. This is deducted from equity when it is paid, and the following year's earnings are added. So cash dividends and accrued dividends are aligned and there is no current liability relating to dividends announced but not yet paid.)

We would also often suggest lumping provisions (other long term liabilities) together in the printed balance sheet, though their component parts may well need to be modelled separately if they comprise, for example, deferred taxation, provisions for pension obligations and provisions to cover restructuring costs. But, as with the profit and loss account, we have kept the format of the Metro model as close to that of the company's accounts as possible.

1.1 Forecasting the business drivers

Whereas most of the components of a model of an industrial company are similar to one another, as we shall see shortly, the main differences relate to the drivers to revenue and cash operating costs. These are clearly industry specific. We are not going to be able to cover all eventualities, though, as already indicated, we shall try to give as many generic examples as possible. So, how are we going to forecast our food retailer?

One approach would be to start from the macro: estimate annual expenditure in food retailers in general, and then allocate an assumed market share to our company. The other is to start from the bottom up. How many square feet of space do we have, and what value of goods do we sell per square metre? The latter also relates to the specific retailing concept of 'like for like' sales: the value sold off the same space as the previous year, as opposed to increases (or decreases) due to changes in the size or number of stores. Clearly, the two should relate to one another.

As we are not trying to turn you into a food retail specialist, in our model we shall take the second approach and ignore the first, but if you are a food retail specialist it would be a good idea to add up all your revenue projections and see if they come to a sensible figure. In addition, we have stopped at the level of revenue growth forecasts by division, without relating them back to per square metre numbers, though this would not be difficult. What we shall be careful to do is to ensure that our forecasts of capital expenditure are consistent with our forecasts of revenue, a point to be returned to when modelling fixed assets.

1.2 Fixed assets, capital expenditure and depreciation

There are three sorts of company, when it comes to capital expenditure. The first is non-cyclical and has a large number of assets. Metro clearly falls within this category, and we shall defer discussion of the others for now, but will mention them here for completeness.

Some companies have very small numbers of large assets that need to be modelled specifically. Imagine a gas pipeline. It costs a large amount to build. It is generally built with a capacity that considerably exceeds its initial likely throughput. For some years, volumes might rise without any required capital investment. Then it reaches its capacity, so some incremental expenditure is required to add compression facilities to the pipe. Eventually, no further additions are possible. We need another pipe. Toll roads, bridges, airports, many utilities and others of the same kind come in this category.

Then there are the cyclicals. At the low point in the cycle a cement manufacturer is probably not operating plant at full capacity. As the upturn occurs, not only do prices recover but volumes may increase considerably without any attendant need for additional capacity. Clearly, as the economy continues to grow and demand increases, capacity will be stretched to the point at which additions are required.

A food retailer is not like either of these examples, nor would be a food manufacturer, or a pharmaceuticals company, or many others. In all of these cases it makes little sense to ask what the additional capital expenditure is that would be required to add 4 per cent to sales next year, except in the most general of senses. All other things being equal, it is probably reasonable to assume that the relationship between sales and fixed assets is a fairly constant one. In other words, if we can project depreciation then we can project the necessary capital expenditure to ensure that assets grow in line with expected sales. The ratio of sales to fixed assets is generally known as the 'fixed asset turn', and is a crucial, and often under-analysed, component of company forecasts. One of the more frequently encountered errors in company valuations results from models having perfectly reasonable projections of profit, but far too low a level of net investment (capital expenditure and increase in working capital minus depreciation) to fund the projected expansion in profit. Since free cash flow is the difference between two items, profit and net investment, the result is systematic overvaluation.

It is of course possible to make the capital expenditure dependent on an assumed fixed asset life, but that is probably a little too rigid. Companies often provide guidance regarding planned capital expenditures, and in any case investment flows are not even, but tend to move in waves with cycles in demand. We would therefore recommend inserting forecasts as independent variables, but checking the resulting capital turns for plausibility.

Turning to depreciation, this is difficult to forecast because in reality assets are depreciated individually, and we do not have enough information to do this. In addition, although models often relate depreciation to net fixed assets, this is in fact incorrect. As Exhibit 3.4 showed, if an asset is depreciated using the straight line method over a period of five years, then depreciation will be a fifth of its opening book value in the first year, but equivalent to one hundred per cent of it in the last year. It is true that a company with a portfolio of assets may approximate to the mid-point, at which depreciation will equal 33 per cent of opening net book value. But most companies are subject to waves of capital expenditure followed by periods in which it is lower. In this instance, the average remaining life of the company's assets will fluctuate.

Let us try an alternative approach. Depreciation may not be a fixed proportion of net assets, but it should be a fixed proportion of the gross cost of fixed assets, if it is calculated on a straight line basis. So dividing a company's opening gross fixed assets by its depreciation charge will give us the appropriate asset life by which to divide all future opening gross fixed assets to calculate annual depreciation, if we assume that it carries on investing in the same sort of assets.

How do we forecast gross assets? The additions are easy. They are annual capital expenditure figures. And the deductions? Assets get retired at the end of their life, so we need to project asset retirements. Obviously, one way to do this would be to go back through the relevant number of annual reports and accounts so if the asset life is 10 years, then we retire the capital expenditure that grew the gross fixed assets 10 years ago. This could get laborious, and assets may have been bought and sold in the meantime.

A simpler approach is formulaic. If we assume that we know roughly how fast the company has, on average, been growing, then we can work out what the capital expenditure should have been 10 years ago that, if grown each year at a constant rate, would have left us with the gross fixed assets that we have in the balance sheet now. The opening balance sheet value of our gross fixed assets must be the following, if capital expenditure has grown at a constant rate each year:

$$F = R*[1+(1+g)+(1+g)^2+\ldots(1+g)^{n-1}]$$

where F=opening gross fixed assets, R=this year's retirements, and n=asset life.

To see why, return to Exhibit 3.4 The asset that was bought at the end of year 0 is fully depreciated (and therefore retired) at the end of year 5. So what is in the balance sheet at the beginning of year 5 is the partially depreciated assets bought during years 0-4. At end year 5, the assets bought during year 0 are retired. Retirement in year 5 will thus be capital expenditure in year 0. Making retirements the subject of the equation gives:

$$R = F/[1+(1+g)+(1+g)^2+\ldots(1+g)^{n-1}]$$

This is another geometric expansion, rather like the perpetuity that gave us the Gordon Growth model in Chapter one. We shall as usual relegate the proof to the mathematical appendix, but the general solution is as follows:

$$R = F*g/[1-(1+g)^n]$$

We can forecast next year's retirements by taking closing gross fixed assets from the last report and accounts, calculating the asset life in years, and then applying a constant growth factor to retrospectively approximate the stream of capital expenditure that will be retired over forecast years. This version of the formula will give us a negative figure for R, the amount to deduct from fixed assets.

Clearly, if the asset life is low then it may be practicable to look the numbers up. And if our forecast period is longer than the asset life then we can start to use the capital expenditure numbers that we have in our model. So if the asset life is 5 years and we have a 10 year forecast, then retirements in year 6 should equal capital expenditure in year 1. In our example, the asset life is a lot more than 5 years, so we shall be entirely dependent on the formula for our forecasts of retirements.

To explain the detail of page six of the Metro model, additions to gross assets are projected capital expenditure, taken to the cash flow. In the absence of disposals, disposals and transfers represent the retirements forecast by formula as discussed above. Depreciation is derived by dividing opening gross assets by the gross asset life, and is also taken to the cash flow. Closing net assets are taken to the forecast balance sheets. Moving from one forecast to the next, it is the net between capital expenditure and depreciation that represents a cash outflow and an increase in net fixed assets.

We have not discussed acquisition or disposal of fixed assets, but it is not uncommon to know that a company has a policy of trading assets (perhaps the tail of its portfolio), and to need to model this. In the case of disposals, it will be necessary to estimate the gross asset value as well as knowing the net book value. Companies will often announce both the consideration and the profit associated with a sale, but will not generally state the gross value of the assets sold. Unless advised otherwise, there is little choice but to assume that the asset is of the same age as the average of the group's assets, so the ratio of gross to net is just assumed to be the average for the group.

1.3 Amortisation of intangible assets

The accounting treatment of goodwill is discussed in Chapter seven. Acquisition of new goodwill will have to await Chapter seven, and discussion of mergers and acquisitions. For the time being, we are merely concerned with building intangible assets into our accounting forecasts of a going concern. It follows that there can be no acquisition of new goodwill in the model. We either amortise what is in the balance sheet or we do not. As discussed in Chapter four, under IFRS rules there is no amortisation of goodwill after 2004. Notice that historically amortised goodwill will not be added back into balance sheets, so the figure that will continue to be carried is the partly amortised amount.

Other intangible assets may be capitalised for one of two reasons. They may be created as part of the writing up and down to fair value of assets assumed as part of an acquisition. In this case, they may be amortised over their useful lives, or may be deemed to not to have a determinable life and be carried unamortised. Alternatively, the company may capitalise some of its expenditure on the creation of patents or brands, in which case they will both be amortised and added to by future investments, and will be systematically retired.

Intangible assets of the second kind should be modelled in exactly the same fashion as tangible assets, with amortisation run off gross fixed assets and an asset life. And it is reasonable to assume retirements in the same way as we did for tangible fixed assets.

1.4 Changes in working capital

It is most convenient to separate operational from financial items when modelling companies. We shall therefore treat working capital as comprising inventory, trade debtors (trade receivables) and other non-cash current assets, minus trade creditors (trade payables) and other non-cash current liabilities. Cash and short term debt will be modelled separately as part of financing (though in Metro's case the balance sheet shows total debt and we have left this unallocated). This should not be taken to imply, however, that all cash should automatically be netted off against debt when valuing the equity in a company. That would be fine if it were really practical to run a company with no cash whatsoever in its balance sheet, clearly an impossibility. So, when we model the company's finances, we shall take minimum operating cash requirements into account. But we shall treat them as part of the cash and debt calculation, and keep them separate from non-cash items.

Working capital used to be referred to by classical economists as 'circulating capital', and this is a useful way to conceptualise it. At any one time our company will have a given stock of goods on its shelves. It will owe its suppliers for that which has been delivered to it during the credit period under which it buys, and it will be owed small amounts, mainly relating to the fact that some customers use credit cards, with the result that there is a small interval between the purchase and receipt of payment.

All of this is best handled in terms of days of purchases or sales. Inventory clearly relates to purchases (cost of goods sold). If inventory in the balance sheet represents one twelfth of annual COGS, then it is reasonable to assume that a normal stock turn is one month. Similarly, if the company makes its purchases under credit terms averaging between 30 days and 60 days, then trade creditors might represent some 45 days worth of annual COGS. In the case of this company, it would be surprising if debtors represented more than a very small number of days of sales (because people usually pay cash in supermarkets), but it is to sales that they relate, not to COGS.

For a non-cyclical business, it is reasonable to assume that the resulting figures are likely to remain stable in forecast years. This is clearly not the case for cyclical companies (imagine what happens to the stock turn of an auto manufacturer in a recession) but we can probably hold the numbers of days flat in the case of a food retailer, unless there was a clear industry trend towards tighter stock management, or different credit periods for purchases.

When we turn to the other components of non-cash working capital, life becomes more difficult. Other current assets may largely comprise prepayments. Other current liabilities, whatever else it contains, is likely to have as one of its larger items the tax that has accrued for the year but which had not, as at the year end, been paid.

It makes little sense to regard either other current assets or other current liabilities in terms of days of anything. Accrued tax may in some cases be modellable but the current liability is generally less important to model than possible long term assets or liabilities created as a result of deferred tax. We discussed the accounting treatment of deferred taxation, and ways in which it could possibly be modelled, in Chapter four.

To keep the model comprehensible, we have simply escalated other current assets and liabilities in line with sales, but it is important to be aware that if this is unacceptably simplistic additional line items can be split out and forecast separately. We are forecasting the three main components (inventory, debtors and creditors) and lumping other items together. Although we forecast the line items with respect to sales or costs depending on whether they relate to one or the other, it is useful to take the resulting net non-cash working capital figure and relate it to sales. In the same way that we did for fixed assets, we are answering the question of how much capital we need to tie up to produce one unit of sales. It is a ‘working capital turn’ which can be related to the ‘fixed asset turn’ to derive an overall ‘capital turn’. In Metro’s case the negative figure implies that its trade creditor item so exceeds inventory and debtor items that the overall balance is a negative non-cash working capital.

To elaborate the mechanics of page seven of the model, the historical numbers for days of sales of receivables, payables, etc are calculated from the balance sheet items, as is the working capital and the opening working capital turn. The forecast drivers are shown, and the results of those drivers are taken to the forecast balance sheet items. These are then aggregated to show total non-cash working capital in the tab, and the movements in the total non-cash working capital are then taken to the cash flow statement. So the balance sheet forecasts are driving the forecast cash flows.

1.5 Unleveraged profits

With revenues, margins, fixed assets and working capital all modelled, we have essentially finished with the operating assets of the company. What still needs to be dealt with, apart from minorities and associates, is how the assets are financed: the balance between equity, debt and provisions. There is nothing to prevent us from completing our profit and loss account, other than the fact that we shall not know, until we have completed the model, what the movements in cash and debt are going to be, and therefore what to assume for interest received and charged. At this point, we complete the profit and loss account, leaving the interest items blank. (Obviously, Exhibit 5.1 is complete, and has the interest line items in, but for reasons that will become apparent later in the text, it is necessary to leave hooking up the interest lines in the profit and loss account until the model is in all other respects built.)

For reasons that will become apparent when we turn to valuation, we should always strike EBIT to exclude profits from joint ventures and associates, whether or not the company includes them in operating profit. What we want is the operating profit that is generated by the operating assets of the business that we are trying to model and value. Profits from associates are returns on financial assets, and where they are material the associates need to be forecast and valued separately.

Although we are not populating the rows represented by interest charges, it is important to separate out what the company will usually show as one net line into three components: interest received, interest paid and other financial items. The point is that we shall forecast the first two as a function of average cash and average debt balances for the year. The third may or may not be predictable. Dividends received are. Gains and losses incurred on swaps contracts are not. Metro shows a single item for net interest in its profit and loss account, and we have again followed its format, though it would be usual in models to show the two items separately, and they are forecast separately in our model as we shall see.

As we have no interest calculations in the model yet our pre-tax profits will be simply EBIT plus profits from associates, and are therefore higher than they will be when the model is complete. In fact, what we are projecting is unleveraged profits, a concept to which we shall return when we move on to valuation issues.

Taxation is a complex subject which we have already met in Chapter four. It is best to keep separate two questions: What is the tax charge in the profit and loss account going to be? And what is the tax paid going to be? At this point we are merely concerned with the tax charged to the profit and loss account.

In principle, one would expect a tax charge to be the pre-tax profit times a statutory tax rate. In practice, there are a variety of reasons why it might not be: goodwill impairment, profits from associates, international operations, tax losses brought forward, consolidation effects, gains or losses on disposals, and so on. The two that are likely to be present systematically in many models are goodwill impairment and profits from associates, and they are easy to accommodate.

Goodwill impairment is not generally recoverable against tax. So when calculating taxable profit, it should simply be added back to pre-tax profit. Profits from associates are generally consolidated net of taxation, and if they are then clearly they will have no impact on the group tax charge. So they should be subtracted from pre-tax profit to arrive at taxable profit. This point will remain important even after adoption of the new IFRS treatment of goodwill impairment because it will remain necessary to interpret historical marginal rates of taxation.

When it comes to the other items, a more subjective approach is often required. For example, if the model works on business, rather than geographical, lines, then a geographical shift in profits will have to be dealt with by an intuitive adjustment to the effective rate of taxation. We have discussed tax losses in Chapter four, but would merely make the point here that if a company has accounted for the loss by creating a deferred tax credit then the tax loss will not have any impact on the tax charge in future years, because in terms of the profit and loss account, the credit was recorded in the year in which the loss was incurred. But if the loss was merely noted in the accounts but no deferred tax asset was created then the taxable profit will be reduced to the extent of the tax loss carried forward.

Consolidation effects occur if a group has subsidiaries, some of which are loss-making and do not create deferred tax assets. In this case the marginal rate of tax in the consolidated profit and loss account will look very high, as losses reduce pre-tax profits but not the tax charge. Clearly this would reverse if the loss-making subsidiary returns to profit and incurs a reduced tax charge.

Finally, it is very hard to model the impact of disposals on tax. Capital gains are not necessarily taxed at the statutory rate of corporation tax, and the book value of the asset may be very different from the cost that is allowed when selling it for the purpose of calculating taxable gains. The default assumption is that book profit equals taxable profit, and that the corporation tax rate equals the tax rate on the disposal profit, but this is all highly unlikely to be correct. In the absence of better information, however, it is what has to be assumed.

Below the tax line on page three of the model there are two lines for potential deductions before we get to profit attributable to ordinary shareholders. The first is the deduction for minority shareholders' interests in group profits. The second is for the deduction of dividends payable to preference shareholders.

Whereas profits from associates accrue from businesses outside the group, and should be forecast independently, profits attributable to minorities are clearly a part of profits generated by group companies. There is an important distinction here, between groups in which the minorities represent third party interests in large numbers of subsidiaries, and groups in which there are a few large third party interests in a few large subsidiaries. In the former case it is clearly sensible to escalate the profit from minority interests in line with group profit before minorities, assuming a constant proportion of group profit is attributable to third parties. In the second case the issue is one of materiality. If the minorities matter and the number of subsidiaries is small, then it may be worth trying to model them separately. We shall adopt the constant percentage interest approach here.

The dividends on preference shares are usually fixed as a percentage of par value, though this may not be in the currency of the company, so there may be some translation effects in the reporting currency of the group. German companies represent an exception, in that preference shares often receive a variable dividend in excess of the dividend to ordinary shares, and this is the situation with Metro.

Finally, we come to the calculation of the per share statistics. Earnings per share are calculated using the weighted average number of shares issued and outstanding (net of treasury stock) during the year, whereas the dividend will be paid to the shares outstanding on a specific date. We have handled this by forecasting the number of shares in issue at the year end (to be discussed below) and then using the average of the opening and closing shares in issue to derive a weighted average. For most companies, the relevant earnings figure would be after preference dividends, which are treated as being akin to interest. Because Metro's preference shares receive variable dividends, they are treated as akin to equity, and the earnings per share calculation is based on income after minority interests and the weighted average total number of shares (preferred and ordinary) that are outstanding for the year.

Finally, we have to forecast the dividend per share. For a non-cyclical company, a constant payout ratio may be appropriate. For a cyclical it would not be, as the company would be forever halving and doubling its dividends, which few companies set out to do. In our case we shall set what looks like a sensible payout ratio and then use share issues and buy-backs to manage the balance sheet structure, which is exactly what most companies are now doing. We have maintained a constant premium of preference over ordinary dividends in our forecasts.

1.6 Provisions

Provisions represent charges to the profit and loss account which reflect costs that have accrued, but have not yet been paid. Examples are provisions for restructuring (we are going to make lots of severance payments associated with a redundancy programme that we have now announced, but we have not made them yet), provisions for deferred taxation, and provisions for underfunded or unfunded pension liabilities.

Although it is often easiest to aggregate provisions in the cash flow statement and balance sheet, to make the model more compact and easy to read, we usually need to forecast provisions separately, generally in the three categories: pension provisions, deferred tax provisions and restructuring provisions. Accounting issues relating to all of these items have been discussed in Chapter four. What we are concerned with here is the application of the accounting rules to models of future corporate accounts. Often the most important provision to model carefully is the pension provision, and in the Metro model this is the line-item on which we have concentrated (see page nine of the model). Other provisions, which are relatively small, have been held constant in the forecast balance sheet on page four of the model.

The key to modelling pension provisions is to separate out three elements of pension costs. The service cost is the only part of pension costs that applies to operating costs, and should be modelled as part of employment costs. The interest on the PBO and the expected return on plan assets (see Chapter four on pensions) should be allocated to financial items. Since unexpected returns and actuarial adjustments are probably unpredictable, these are the only items that it is probably prudent to forecast. We shall deal with historical accrued surpluses or deficits, whether already recognised in the balance sheet or not, as a deduction or addition to net debt when we value the company. In other words, we shall treat a company with an underfunded pension scheme as if it immediately borrowed the money to fund it, with the payments into the scheme precisely matching its accrued obligations in all future years. This is clearly not what would be reflected in the accounts of a company which had a large unrecognised deficit in its scheme, which would then be amortised through its profit and loss account in future years, and ultimately reflect in larger contributions by the firm to its pension scheme. We are picking up the liability as if it crystallised now, which should be approximately equivalent in terms of impact on value.

For companies with unfunded pension schemes, we shall also treat the outstanding provision as akin to debt, but we cannot assume a future matching between contributions to the scheme and accrued liabilities, as there is no scheme. Pensioners are paid directly by the company. The service cost of the pension should be part of employment costs. The interest charge should be part of financial items. The accrued provision in the balance sheet should be treated as debt. But there will also be an annual provision contribution to forecast cash flow, which reflects the difference between the accrued liability for the year and the payments that the company has made to retired employees during the year. This is clearly an item for which we are not going to want to pay, when we value the shares in the company. It is analogous to the provisions for decommissioning costs that we discussed in chapter one. The cash stream ultimately reflects a liability that will ultimately be reflected in pensions paid to our employees. So why should we pay for it when we buy the shares?

In the debt page of the Metro model (page nine), there is a set of calculations that relate to the modelling of the pension liabilities. The interest charge is not a cash payment, but an unwinding of a discount rate. For this reason, it is included in the financial items in the profit and loss account, but then backed out of the cash interest paid in the cash flow statement, because it does not represent actual cash paid. Instead, it accrues as part of the addition to the pension provision each year. So the pension provision in the balance sheet expands both with the increase in the provision for the year (notionally, the service charge, in our forecasts) and with the interest charge.

From outside a company it is highly unlikely to be possible to establish the differences between the book value of assets for tax purposes and for reporting purposes. One is generally left with the rather cruder option of looking at the history of its tax paid as a percentage of tax charges, and should generally assume that if the company continues to grow then its cash flows will continue to benefit from continued deferred tax provisions, and that the provision in the balance sheet will never crystallise. This happy assumption has several dangers attached to it. The first is that since tax is collected at the level of the operating company, it is quite possible that a group could continue to grow, but would be unable to offset capital allowances created in one business against tax liabilities that have accrued in another. The second is that the rate of growth of the business may slow, in which case it will not continue to create new capital allowances at the pace necessary to continue to defer a constant proportion of its tax charge.

When assessing acquisition targets this last point may be particularly important if the strategic intention is to redirect the cash flows of the target to fund more attractive investment opportunities in the portfolio of the acquirer.

In Metro's case, the balance sheet on page four of the model shows that the company has net deferred tax assets. These are generally created by losses brought forward and while it is reasonable to assume that they will eventually be utilised, the timing of this is often uncertain.

Finally, we have the one-off provisions, most commonly exemplified by restructuring costs. These may generally be expected to reverse within the forecasting period of the model, so the main point to remember is that if provisions have been taken through the profit and loss account but the money has not yet been spent then future cash flows should suffer from the cash outflow and the reversal of the provision.

1.7 Shareholders' funds

If we ignore items that are taken straight to shareholders funds but which have not been reflected in the profit and loss account (such as unrealised gains or losses on currency translation, gains or losses on cash flow hedges that have not yet been recycled, and so on) then the annual movement in shareholders' equity is simply explained by retained net income and any increase or decrease in equity through the issuance, or buy-back, of shares.

For now, we are not going to project other consolidated gains or losses which go straight to shareholders' equity but do not go through the profit and loss account. As we have seen in Chapter one, it is vital to economic profit valuations that clean surplus accounting is used, so that the profit used to derive economic profit is consistent with the increases or decreases in equity from year to year. We discussed this point with respect to both derivatives and foreign exchange in Chapter four. In this model, we are not assuming any other consolidated income, so clean value accounting applies.

Rather than having a single line item for shareholders' equity, it is not difficult to project the components separately, divided between paid up capital, share premium account, retained earnings and the profits generated during the past year. Other items, such as revaluation reserves, may arise from time to time but are unlikely to be forecast.

In its basic state, the model has no share issues or buy-backs built into it, so we shall discuss the modelling of simple accrual of earnings first, and then revert to how to model changes in capital.

In this case there is no change either to capital stock or additional paid in capital during the forecast years. The two relevant line items on page four of the model are thus reserves retained from earnings and group net profit. To understand how they work, let us take the estimates for 2004. Starting with the profit and loss account, the company is forecast to make attributable net income of €549 million (see page three of the model). This figure is added to its equity on page four, because the 2004 dividend, of €1.13 and €1.243 per share for ordinary and preference shares, respectively, will not be paid in cash until 2005. What is paid during 2004 is the dividends that were announced for 2003, which represent a total of €334 million (see the cash flow statement on page five). In the end 2003 shareholders' funds on page four of the model, the figure of €496 million of attributable earnings was included. This drops out of the equity in 2004, replaced by an addition to retained earnings of €162 million from page three of the model. In 2005, the figure of €549 will disappear from shareholders' funds on page four of the model, to be replaced by additional retained earnings of €180 million (because the 2004 dividend of €369 million will have been paid), and 2005 attributable earnings of €620 million will be added to the total. And so on.

As this is the logical place to go regarding modelling, we shall address the mechanics of share issues or buy-backs here. They represent the first of our special cases to be discussed in the later sections of this chapter, after the basic model is completed, so we shall return to them, and illustrate the text with an example, when we get there.

If you are in a company planning a schedule of share buy-backs, of course you would want to be accurate about the implications. From the outside, the main use to which we shall put this facility is to realise (when the model is complete) that we are projecting wildly improbable balance sheets and to conclude that over the next few years the company is likely either to issue or to buy back a large amount of equity. The detail of the timing is unknowable, so the best that we can generally do is to forecast the year end number of shares outstanding and assume that the weighted average is equal to the arithmetic average of the opening and closing number. If you know that the company is going to have a large issued on 30th September, then it would clearly be more sensible to weight the weighted average number of shares accordingly.

Another important question regarding share issues or buy-backs is the price at which the share transactions are assumed to happen. All other things being equal, share prices are expected to rise over time. So using the current share price is presumably pessimistic if we are issuing new shares to raise new equity in five years' time, and optimistic if the idea is that we shall buy back equity. Here, a more sophisticated approach than just using the current share price is to use the cost of equity (see Chapter two for a definition) and the Gordon Growth model (from Chapter one) to derive an expected annual share price appreciation. If the company has a cost of equity of 7 per cent and a dividend yield of 3 per cent then presumably its shares are expected to rise in value at 4 per cent a year.

We shall encounter items taken straight to shareholders' funds in some of our discussions of more complicated companies than Metro, so that discussion is deferred for the time-being. These items contravene the principle of 'clean value' accounting, in that they create inconsistency between balance sheet figures for equity and profits taken through the profit and loss account, so they need to be thought through quite carefully both from the point of view of the modelling and of the implications for value. They represent accrued gains or losses that can easily be missed by either DCF or economic profit models.

In the absence of these refinements, we have shareholder's funds rising with retained earnings unless we assume a share issue or buy-back. In this case, we calculate the number of shares bought or sold by using the forecast share price. This number must then be carried back to the year end shares in issue on the profit and loss account tab, so that each year's shares outstanding is equal to the number outstanding in the previous year, plus or minus the new shares issued or bought back. The resulting changes in shares issued must be carried back to the profit and loss account for the purpose of calculating earnings per share and dividends.

One consequence of an earlier decision should be noted. Because we set the payout ratio as the basis for determining the dividend per share, earnings accretion or dilution resulting from share buy-backs or issues will automatically be compensated for in higher or lower dividend payments per share. When modelling cyclical companies, for which a fixed payout ratio is not suitable, it is likely to be necessary to reconsider the dividend stream in the light of expected issues or buy-backs of equity.

A final point is the allocation of the funds raised or spent between the various categories of shareholders' equity. If the change is a new issue, then the par value of the new shares is added to paid up capital, and the surplus over par value is added to the share premium account, or, as Metro describes it, additional paid in capital. In the event of a buy-back, the full value of the distribution represents a negative item in shareholders' funds, namely, treasury stock.

1.8 Minority interests

Both associates and minorities are consolidated into group accounts with line items for earnings, dividends and shareholders' equity, but no further information. The accounting treatment for minorities is that their interest in group profit is shown as a charge to the profit and loss account. It is a part of cash flow from operations, but the dividend paid by the relevant subsidiaries to the third party shareholders (who lie outside the group) is shown in the cash flow statement as an item of cash flow to and from finance. And the difference between the two, which represents the accrual of retained income that is attributable to third party shareholders, accumulates as third party interest in group equity in the balance sheet.

In our discussions of the relationship between growth, return on equity and payout ratios in Chapter one we made the observation that if two of these are set independently, then the third is a dependent variable. This is as true on an annual basis as it is in a constant growth model. Setting the earnings growth rate and the payout leaves return on equity and shareholders' funds as results. Setting the earnings growth rate and the return on equity (which implies a figure for equity) determines the dividend and therefore the payout ratio.

In this model we have let the earnings grow with those of the group as a whole and we have set the dividend stream to grow with those of the group as a whole, with the future level of return on equity to associates as an implicit result. Naturally, whichever way round the forecast is constructed, it will be important to ensure that all three figures and ratios seem reasonable.

As we shall see when we turn to valuation, the value of the minority interests will be included in the value that is put on the operations of the group by both DCF and economic profit models. This implies that it has to be independently calculated and deducted from the value of the group, alongside debt and other liabilities, before ascribing a value to the equity of group shareholders.

1.9 Associates

The accounting treatment for associates is for the profit attributable to the group to be shown as a separate line item in the profit and loss account. Since the cash flow statement begins with an income figure that includes all profit consolidated from associates, an adjustment item subtracts the difference between the profit consolidated from associates and the dividends received from associates, so that the figure for cash flow from operations merely reflects the dividend stream. The difference between the profit consolidated from associates and the dividend received from associates comprises the group's retained profits in its associated companies. Investments in associates are shown in the balance sheet under financial assets (a part of fixed assets), and it is the group's net interest in the shareholders' funds of the associates that is displayed. So the item in the balance sheet grows each year to the extent of its interest in the retained earnings of the associated companies.

As Metro does not have significant equity associates, let us take a simple example. Suppose that group A has a 40 per cent interest in associated company B. If B makes $100 of net income, A will book $40 of profit from associates. Suppose that B pays out 25 per cent of its profits and retains 75 per cent. Then A will receive $10 in dividend from B. A's cash flow statement will include the $10, and there will be a line item which attributes the figure of minus $30 to the difference between profit booked from associates and dividend received from associates. The $30 will accrue to the financial assets in A's balance sheet as retained net income in associates. Overall, we are adding $40 to A's equity, $10 to A's cash, and $30 to A's fixed assets, so everything balances.

There is one point that should be noted here, to which we shall return in Chapter seven. In the case of there being goodwill associated with the acquisition of an interest in an associate, the goodwill is booked along with the net interest in the associate, as part of the financial assets of the group. And profits from associates are shown net of impairment of goodwill (if it is impaired). The goodwill is not separately shown as part of group goodwill either in the balance sheet or as part of the amortisation charge, because the associate is not part of the group. It really is a case of 'two line accounting'.

By contrast to the situation regarding minority interests, associated lie outside the group, and it makes little sense to forecast their contribution as a fixed proportion of group profits. It probably makes more sense to make independent estimates of growth in earning and either return on equity or payout ratios, and then to check the results for realism.

1.10 The cash flow statement

While it may be useful for presentational reasons, or to draw conclusions from historical trends, it is not essential to enter historical cash flows into our model.

We do need a historical profit and loss account and balance sheet from which to build our forecasts. We do not need a cash flow statement. Moreover, for many companies it is highly unlikely that it will be possible fully to reconcile historical cash flows with movements in balance sheet items. An important reason for this is that foreign assets and liabilities are generally translated at closing exchange rates, while revenue accounts are translated at average exchange rates, with the difference going straight to equity as a gain or loss on translation of foreign activities.

Whether or not history is being shown in the model, we recommend using a structure of the cash flow that facilitates modelling. This implies breaking it into three components: cash flow from operations, cash flow to and from investment, and cash flow to and from finance. The intuition is that the former shows what our business is expected to generate. The second shows what our business is expected to absorb by way of new investment. And the balance between the two is a measure of cash flow available to or required from finance, which will be distributed to or required from the providers of capital. Companies have discretion to arrange their cash flows either starting with net income or with EBIT. In the latter case there will be a line item for taxed paid, in the former a possible adjustment for deferred taxation. In the Metro model we have assumed that tax paid for the year equals tax charged. If deferred taxation is being assumed then the cash tax would be lower, offset by the creation of a deferred tax provision.

Although we shall obviously retain the right to revisit the question of equity issues or buy-backs when we have seen the resulting forecast balance sheets, if we simply take the figures as we have them, most of the forecast cash flows can be completed. We have profit, depreciation and amortisation, provisions and changes in working capital, which together comprise cash flow from operations. We have capital expenditure, which is our cash flow to and from investments unless we start to model asset acquisitions and disposals. And we have line-items for equity issued or bought back, dividends paid to our shareholders, and dividends paid to minority shareholders. All that is left is the allocation of the remaining elements of cash to and from finance: changes in short term debt, changes in long term debt, and changes in cash and cash equivalent.

Before we move on the treatment of the components of net debt, we should return briefly to the treatment of disposals of fixed assets, because this is not treated in the Metro model, though we shall return to it in Chapter seven. If an asset is sold for a sum of £150 million, with a book value of £100 million, a profit of £50 million will result. This will be subject to a tax charge which may or may not be that of the group, and may be levied on something other than £50 million, depending on the tax carrying value of the asset. But from outside if the marginal rate of corporating tax is 30 per cent then we probably have little option other than to assume that the resulting tax charge will be £15 million.

How does all this appear in the accounts? The profit and loss account would show a pre-tax exceptional gain of £50 million, with the tax charge rising by £15 million, implying that the net of tax impact on earnings is £35 million. The line-item in the cash flow for net profit on disposals will contain the figure of minus £35 million, so that the figure for cash flow from operations does not contain anything for the disposal. When we get to the movements to and from investments, the net proceeds from the disposal have to be included in the cash flow. What are they? Not £150 million, clearly, since we have paid some tax. The net receipt is £150 million minus tax of £15 million, which equals £135 million.

Thinking in terms of the impact of all of this on the balance sheet, equity has risen by £35 million (the net profit on the disposal). Fixed assets have fallen by £100 million (the book value of the assets). And cash has risen by £135 million (net cash receipts). Both sides of the balance sheet have expanded by £35 million.

> As a general point about modelling, it is worth thinking through all of the implications of an event for the profit and loss, the cash flow statement and the balance sheet before you start to insert numbers into your spreadsheet. If you can see how the changes to assets and liabilities will balance, the probability of success is high!

1.11 Net debt

Many models simply stop at forecasting net debt as a single line item. This is rather unsophisticated and has a number of disadvantages. It obviously cannot reflect different interest rates applying to cash, short term debt and long term debt. It looks ugly if the company turns net cash positive because one is left with a negative net debt item on the liability side of the balance sheet. And it eliminates from analysis the whole question of a company's future funding requirements which, depending on the use to which the model may be being put, may or may not be half of the point of building the model.

Equally, if you are in the Treasury department of a company, or in a bank advising the Treasury department of a company, then you are going to want to model the debt tranche by tranche, and to be much more specific about the composition of short term debt, and of cash and cash equivalents. What we are going to produce is of intermediate detail, but it should provide an adequate indication of how one could go further.

As Metro's balance sheet shows total debt as a single item, this is how we have modelled it, but we describe below an approach that can be used to separate out forecasts of long term debt and short term debt.

The general approach is to model long term debt as the independent variable. Reports and accounts will let us know the maturities of the group's debt, so we can enter that into our model. We can also enter discretionary changes in long term debt as a separate entry for each year. Clearly, it will only make sense to do this when we have seen the projected balance sheets, and know what the financial structure of the company would be in the absence of voluntary issuance or retirement of debt.

Cash and short term debt will be the dependent variable, with a simple rule to allocate between them. We shall decide what the minimum operating cash requirement for the company is, and any surplus cash over and above that will be used to pay down short term debt. Clearly, it is not possible to pay off short term debt below zero, so in the event of our forecasting the elimination of short term debt then any additional cash piles up over and above the minimum operating requirements.

In the event of a shortfall, then the logic for the model is as follows. You did not have an equity issue. You did not have a bond issue. We need a certain minimum level of cash, so there is nowhere to go to find it other than from additional short term debt. So short term debt rises to ensure that cash levels are not lower than the minimum operating level.

There is one small point implicit in all this that should be highlighted in passing. The short term debt is being treated as a ‘revolver’ in that rather than forecasting the movement in short term debt we are effectively assuming that it is all paid off and that new short term debt is assumed each year, as required. Or none is borrowed if none is required.

Reverting to the treatment of long term debt, the reality is that when this becomes due for payment in less than one year it moves out of long term debt into short term debt, and is then paid 12 months later. We therefore want to pick up as short term debt in the balance sheet the sum of the balance under the revolver and the repayment of long term debt that falls due in the following year, and to pick up as long term debt in the balance sheet the total long term debt liability minus the portion that falls due in the following year.

Our Metro model is less sophisticated than that, following the company’s balance sheet format. On the debt tab we have as a default assumption that there is no increase or decrease in debt. This will be reviewed once we are able to assess the full forecast. The pension provision, which is the only provision to be modelled, is on the debt tab, as it contributes to interest charges and will be treated as debt in our valuation. The change in debt, or absence of it, is reflected in the relevant line of the cash flow forecast, and is one of the drivers to movements in cash balances.

1.12 The balance sheet

In much the same way that double entry book keeping had as one of its objectives the ability to check records for consistency, so our projected balance sheets should permit us to ensure that all of the calculations that we have done so far are consistent with one another.

> For this to work it is essential that each item in the balance sheet is separately estimated, and that assets and liabilities are separately summed and checked against one another. As soon as one item in the balance sheet is introduced as a 'fudge factor' (all the assets minus the other liabilities, or whatever), it will stop fulfilling its function as a check on our model.

The corollary to this is that if the balance sheet does balance unaided, then it is almost impossible that the rest of the model is not hooked up correctly. Individual estimates for certain line items may be crazy, but they are at least consistent. We shall worry about how to avoid silly, rather than inconsistent, forecasts later.

It will be remembered that we are still forecasting with no interest in the profit and loss account at this stage. To spare the reader two lots of balance sheet to look at, we shall make the point here that connecting up the balance sheet should be done first, and that the interest charges from the debt calculation should then, and only then, be inserted into the profit and loss account. The reason is that (whatever the software package that is being used) insertion of the interest charge creates a circularity in the model. Interest is a function of average debt. Average debt is a function of year end debt. And year end debt is a function of interest. Packages such as Microsoft Excel can cope with circularities, but they make the models harder to audit. So it is worth getting the balance sheet to balance first, and inserting the interest into the profit and loss account afterwards. Exhibit 5.1 above illustrates restated profit and loss account, balance sheet, and cash flow statement, all with interest charges already connected into the profit and loss account.

2. Ratios and scenarios

An understandable mistake that is often made by those who have limited experience of modelling and valuing companies is to imagine that if they make sensible estimates for the key inputs to a model then this implies that the outputs will also be sensible. Sadly, this is not the case. The reason is that for any input there is a range of plausible numbers that could be used. But certain combinations of plausible inputs will themselves produce implausible outputs.

A simple example relates to growth and capital expenditure. The two are clearly related. A sensible range could be applied to both. But if we take the most optimistic plausible growth rate for revenue, and the lowest plausible value for capital expenditure over the next 5 years, we shall end up with some highly implausible forecasts.

This was a simple case, but there are others that are more complicated. Suppose that you are analysing an industry that is highly cyclical, with the driver to the economic cycle being the impact of fluctuations in Gross Domestic Product (GDP) on demand. Analysis of the company's history might suggest that there are two main drivers to profitability: sales and margin. But it will almost certainly turn out that there is a close relationship between periods of high sales growth and periods of high margins (because capacity is being fully utilised), and between periods of weak or negative sales growth and of low margins (because of low capacity utilisation). Where there seemed to be two variables determining profit there is in reality only one (sales), with the other (margin) a dependent variable. Spotting these connections is not always easy, but is the key to producing intelligent forecasts.

Although not all of this can be automated, and there is a skill to understanding the relationships that apply to particular industries, you can help yourself by always concentrating on a single output tab, combining all the key ratios that are implied by your model. These should be broken into the following categories: growth rates, margins, capital turns, returns on capital and financial leverage.

Taking the ratios by group, the annual growth figures are fairly self-explanatory. Both they and the margin figures should be separated between what they are telling you about the operations (everything down to EBIT) and what they are telling you about financing, because from pre-tax profit downwards the figures are affected by the amount of interest that is forecast to be paid or received.

We have addressed the question of capital turn as we proceeded through the construction of the model. At the time we made the point that the fixed asset turn and the working capital turn should be monitored for realism. They have an additional importance in that margins and capital turns in combination determine return on capital employed, as shown in the following formula:

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R=P/CE=P/S*S/CE
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where R is return on capital, P is net operating profit after tax (NOPAT), CE is capital employed, and S is sales.

We do not need a mathematical appendix for this, since it is obvious that in the final version the figures for sales just cancel out to give us profit over capital.

The point of the expansion is that the ratio of profit over sales is a margin, and the figure for sales over capital is a capital turn. The latter may be split out again to separate capital between fixed and working capital. So we can break out our assumptions for future returns on capital employed into their business drivers: margin and capital turn. If we wish, we can also break these factors down further.

Before we proceed further, it will be remembered that in our discussion of valuation in Chapter one, we made the point that a constant growth company could be valued from just three inputs: growth rate, return on capital and weighted average cost of capital. And the equity in a company can be valued from growth rate, return on equity and cost of equity. What our present analysis does is to allow us to break down the crucial return element of the equation into its determinants. This is why it is often referred to as the 'value driver' approach to valuation. Instead of just discounting a stream of cash, we can break the determinants of the stream down into margins and capital turns, and then subdivide those further if required.

The principles underlying this analysis are known as 'DuPont Analysis', and in their full form are aimed at extending down to the return on equity. This can be represented in a number of ways, but given where we have started with gross margins and capital turn giving us a return on capital, the natural extension is to leverage up the return on capital to a return on equity. This is done using the following formula:

r=Y/E=R+(R-I)*D/E

where r is return on equity, Y is net income, I is net cost of interest, D is debt and E is equity.

Again, the proof is in the mathematical appendix, but the intuitive explanation is that our return on equity is the same as the return on capital, plus an additional spread that we earn on the portion of our assets that are funded by debt. The spread is the return on capital minus the cost of debt. Returns and interest rates are all net of tax in this formula, though they could clearly be grossed up by dividing by one minus the tax rate.

So the margins and capital turns define our return on capital (feel free to check this!) and when we forecast the long term future offer us a way to project long term returns on capital employed as a result, rather than as an input. If we progress to thinking about returns to equity we have three drivers: margin, capital turn and leverage.

In practice, extending the analysis down to a return on equity is often complicated by the facts that there are non-operating assets in the balance sheet, and that liabilities comprise not just debt on which a spread is being earned but also various different sorts of provisions and minority interests. Our pragmatic recommendation, when it comes to the valuation of industrial companies (but not banks and insurance companies) is to concentrate on valuing the operating capital, and then derive a value of the equity by adding the market value of non-operating assets and subtracting the market value of financial liabilities, and for this reason our DuPont analysis on the ratios page of the Metro model stops at capital and merely illustrated the capital gearing (including only finance debt as debt, not, for example, the pension provision, as we shall do in our valuation).

Given the importance of return on capital employed to the interpretation of history, the construction of forecasts and the derivation of a terminal value (see below), we should linger briefly on what we mean by it. We are looking at the operating profit generated by the operating assets of the business, so the profit excludes both financial items and profits from associates, and the denominator represents only the fixed and working capital that is deployed in the business. It excludes financial investments, associates, and so on.

There are two specific points to be made to avoid confusion. The first is that the returns in this table have been calculated by dividing taxed operating profit for the year (NOPAT) by opening capital employed, not average capital employed. The reason for this will become apparent when we get to economic profit valuation below.

The second point is that while companies often refer to capital employed as meaning debt and equity (ours and third party), our definition includes all provisions as part of the capital base. Some modellers use the phrase ‘invested capital’ to mean the total and ‘capital employed’ to mean merely finance capital. Our reasons for rejecting the distinction are simple. Firstly, if we are looking at the operations of a company we want to know how well it is doing with its assets, irrespective of how they are financed. Finance is a separate question. Secondly, when we come to value a company we cannot ignore provisions. In the last analysis they are either a liability or they are not, in which case they are effectively equity, in economic terms. Metro’s opening 2004 capital employed, for example, included €1,012 million of pension provisions on which it is accruing interest and which is clearly debt. It also includes €758 million of other provisions that will either crystallise or they will not. If so they are a financial liability to be netted off the value of the equity (unless they will reverse within our forecast) or they are effectively part of equity.

Returning to Exhibit 5.1, the last block of ratios relate to balance sheet leverage, and will drive our choice of decisions regarding share issues and buybacks and bond issues on the equity and debt tabs, since it is leaving us with a balance sheet structure that dramatically reduces financial leverage during our forecast period.

We shall defer a detailed discussion of goodwill until Chapter seven, but would make a few quick points here.

- Firstly, when a company makes an acquisition it must ultimately justify the goodwill that it paid.
- Secondly, this does not imply that it must earn more than its cost of capital on the capital base including goodwill in the early years after the acquisition. This depends on whether long term investment opportunities comprised a large part of the value.
- Thirdly, it does not really matter whether economic profit models are set up to include or exclude goodwill in the calculation (because what I gain in book value by including it is knocked off again in capital charges), but *what*

> *is absolutely crucial is that when companies are forecast the return that they are expected to make on incremental capital investments should relate to the returns that they are making excluding goodwill. When a company builds a new asset it does not put a pile of goodwill on top of it.*

When using a model, rather than building it, there is a correct order in which it makes sense to approach the assumptions which drive it. We should start with the determinants of sales growth, and then work through the drivers to variable and fixed margins. Capital investment and changes in working capital follow. This fixes the operating cash flows of the business. We should then move on to the balance between debt and equity, and finish (if we progress this far) with the balance between long and short term debt. It is evident that if the forecasts are approached in the other direction, you are likely to chase yourself around it several times, as later changes make earlier ones look unrealistic.

We have now built and discussed at some length a detailed model of a fairly simple company. Our strategy now will be to add a valuation procedure to it, and then to devote the remainder of the chapter to considering some of the more common cases in which the standard approach is inadequate. Be warned that we shall not display the full construction of the models in each case, only the deviations from what we are doing with Metro. So now is the time to ensure that you are happy with what we have done so far.

3. Building a valuation

When we value a company we need to do two things. The first is to decide what we are going to discount, and the second is to decide the rate at which we are going to discount it. We had an extensive discussion of the cost of equity and cost of capital in Chapter two, and in Chapter one we proved that if models are applied consistently then there are four approaches at arriving at the same answer: to value capital or equity, and to value it by discounting cash or by discounting economic profit. We are not going to use all four models for each company we analyse, and in any case as the projected market gearing for most companies alters throughout the forecast period it is a complicated matter to reconcile the results in practice, rather than in the theoretical world of constant growth models. It can be done, but we would need to recalculate all of the components of the cost of capital by annual iteration (time varying WACC) to do it. We shall look at this technique later in the chapter when we turn to difficult situations that need special treatment, but many companies do have fairly stable balance sheets, which means that this refinement is often unnecessary. Put brutally, errors in the forecasts will considerably exceed errors in the discount rate so there is no point worrying too much about the impact of small changes in balance sheet structure.

This also militates in favour of discounting economic profits and cash flows to capital, rather than to equity, as within a wide range (a cash pile at one end and imminent financial collapse at the other), changes in financial gearing are largely mutually offsetting as far as WACC is concerned. As leverage rises, so do both tax shelters and default risks. They largely cancel one another out. This is not true of the cost of equity, where quite small changes in gearing can have a quite large impact on the appropriate discount rate.

So we shall calculate one WACC for our company, and carry it through the forecast years. Our problem now switches back to the first question. What are we supposed to be discounting? Since there is no difficulty in reconciling DCF with economic profit we shall calculate both valuations, and would strongly recommend that you do so in your models. They slice the value in different ways, and this can be highly illuminating. If forced to come off the fence, we would prefer economic profit to DCF, because it conveys more information about how the valuation is derived, and because it is easier to avoid losing accruals in valuation methodology that goes with the grain of accrual accounting, rather than butchering the accounts to get at the operating cash flows.

3.1 Defining free cash flow

In the section of the note that follows we shall be commenting at length on the valuation routine attached to the basic Metro model, which derives a WACC and intrinsic values for the company both using the DCF and the economic profit methodology. As with the previous section, we reproduce the full printout of the two pages below, in Exhibit 5.2, and shall then refer back to them in what follows.

Exhibit 5.2: Metro valuation

11. Metro cost of capital		
Risk free rate	*4.02%*	
Equity risk premium	*4.00%*	
Beta	0.83	
Cost of equity	*7.3%*	
Risk free rate	*4.02%*	
Debt premium	*1.50%*	
Gross cost of debt	*5.52%*	
Tax rate	*35.00%*	
Net cost of debt	*3.59%*	
Share price	36.76	
Shares issued (m)	324	
Market capitalisation	11,914	*65.7%*
Net debt (book)	6,209	*34.3%*
Enterprise value	18,123	*100.0%*
WACC	***6.05%***	

12. Metro DCF/EP valuation (€ million)

Year	2004	2005	2006	2007	2008	Terminus
WACC	*6.1%*					
Incremental ROCE	*9.0%*					
Long term growth	*2.0%*					
EBIT	1,613	1,693	1,784	1,889	2,013	
Notional taxation on EBITA	(660)	(688)	(720)	(757)	(800)	
NOPAT	**953**	**1,005**	**1,064**	**1,133**	**1,213**	**1,237**
Depreciation & amortisation	1,521	1,551	1,587	1,628	1,674	
Capital expenditure	(1,500)	(1,600)	(1,700)	(1,800)	(1,900)	
Change in working capital	63	99	115	135	160	
Free cash flow	**1,038**	**1,055**	**1,067**	**1,096**	**1,147**	**962**
Opening capital employed	**11,140**	**11,055**	**11,006**	**11,003**	**11,040**	**11,107**
Earnings growth	*13.6%*	*5.4%*	*5.9%*	*6.4%*	*7.1%*	*2.0%*
Return on opening capital employed	*8.6%*	*9.1%*	*9.7%*	*10.3%*	*11.0%*	*9.0%*
Cost of capital	*6.05%*	*6.05%*	*6.05%*	*6.05%*	*6.05%*	*6.05%*
Investment spread	*2.5%*	*3.0%*	*3.6%*	*4.2%*	*4.9%*	*2.9%*
Economic profit	**279**	**336**	**398**	**467**	**545**	**565**
DCF valuation						
+ PV 5 year cash flow	4,531	*20.4%*				
+ PV terminal value	17,691	*79.6%*				
= Enterprise value	**22,222**	***100.0%***				
+Financial assets	238					
-Minority interests	(188)					
-Pension provisions	(1,012)					
- Net debt	(6,209)					
= Equity value	**15,051**					
Value per share	46.06					
Economic profit valuation						
+ Opening balance sheet (excl. financial assets)	11,140	*50.1%*				
+ PV 5 year economic profit	1,670	*7.5%*				
+ PV terminal value (ex incremental investment)	6,953	*31.3%*				
+ PV terminal value (incremental investments)	2,459	*11.1%*				
= Enterprise value	**22,222**	***100.0%***				
+Financial assets	238					
-Minority interests	(188)					
-Pension provisions	(1,012)					
- Net debt	(6,209)					
= Equity value	**15,051**					
Value per share	46.06					

In our discussion of discount rates in Chapter two we devoted considerable space to the question of whether tax shelters should be discounted at the unleveraged cost of equity or at the gross cost of debt, and concluded that (whatever the lack of guidance from the theoreticians) it made more sense to discount them at the unleveraged cost of equity. This choice also had implications for the formula that we use for leveraging and deleveraging Betas.

Whichever choice we make about how to treat tax shelters, however, there is no doubt that since we are treating the tax shelter as an item to be adjusted for in the discount rate (via a net of tax cost of debt), we should not also be taking it into account in the cash flows that we discount. To do so would clearly be double-counting. So when we calculate free cash flow we do so by restating the cash flows as if the company had no debt in its balance sheet. We discount deleveraged free cash flow. This is true whether we apply a single WACC, or whether we value the unleveraged assets and the tax shelter separately, as in an APV analysis.

Turning to the forecasts of economic profit and cash flow, notice a number of points relating to the calculation.

- The first is that, because we want unleveraged free cash flows, we start not with pre-tax profits but with EBIT.
- Secondly, the calculation of tax is a notional one. It is what the tax would have been in the event that we were not in fact going to be creating tax shelters through the payment of interest. Tax in our forecast profit and loss account is in fact lower than the tax shown here, and the difference is the tax shelter that the company will create if it carries the levels of debt that we are projecting. As with our actual forecast, we add back amortisation of goodwill into taxable profit, so the notional tax charge is arrived at by multiplying EBITA by the marginal rate of taxation.
- Thirdly, we would include as part of our NOPAT those provisions for which we want to pay (deferred taxation, for example), because we do not believe that they represent a real accrual of liability. The reason for including them in the NOPAT, rather than putting them alongside depreciation will become apparent when we move on the discussing the economic profit calculation of value. Clearly, where we put them in a DCF calculation will make no difference to the calculation of free cash flow.
- Fourthly, the remaining items (comprising depreciation and amortisation, capital expenditure and change in non-cash working capital) can conveniently be netted off against one another to derive a figure for net investment. This is the extent to which the company grows its balance sheet size from one period to the next.

So free cash flow can either be thought of as unleveraged cash flow from operations less investment, or, much more usefully, as NOPAT minus net investments: profit less the proportion of profit that we have to plough back into the business to fund future growth. The reason why this is a much better way to look at the problem is that we have a formula for retentions, which we discussed in Chapter one. It is that retentions must equal projected growth divided by projected returns on incremental capital.

3.2 Terminal value calculations

It is clearly very easy to discount back 5 figures for free cash flow to derive a present value. But it will also not get us very far towards the valuation of the company, since the larger part of the value will be attributable to the stream of cash that Metro is expected to generate after the end of the forecast period. Since it is not practical to forecast to infinity, the most common approach to what happens after the forecast period is to apply a terminal value formula, using the Gordon Growth model that we discussed in Chapter one. This implies our knowing two things: what free cash flow will be in the first year after the forecast period (the Terminus), and knowing what growth rate to apply to it.

In Chapter one we discussed the connection between growth, retentions and return, so here we shall merely refer back to that discussion and make the point that, for most companies, the best approach to calculating free cash flow in the terminus is to apply the formula:

$$FCF_{t+1}=NOPAT_t*(1+g)*[1-g/ROCE_i]$$

where t+1 is the Terminus and i refers to incremental capital.

This is often referred to as the 'value driver' formula for terminal value, since it uses the retentions approach to work out what proportion of profit needs to be reinvested to derive the projected growth, and then derives free cash flow as profit minus required retentions. As we discussed earlier in this chapter, the DuPont approach can then be used to disaggregate the expected return on incremental investment into a margin and a capital turn. The capital turn can be split between fixed assets and working capital. And if required the margins could be split between gross (before fixed costs), operating (after fixed costs) and net (after tax), so it is possible to make the terminal value the result of a detailed breakdown of value drivers.

We shall keep the model simple and just run the Terminus off two assumptions: earnings growth and return on incremental capital. But it is important to note how flexible this approach can be made to be.

If we add together the net present value of the free cash flows in Exhibit 5.2, and the value that derives from applying the Gordon Growth model to the free cash flow in the terminus, then we can add them together to derive a value for the operating assets of the company.

Before we move on there is one frequent error that must be avoided at all costs.

Remember that the Gordon Growth model applied to the free cash flow in the Terminus will derive a value as at the end of the forecast period (a future value of the terminal value). For our purposes we want a present value of the terminal value, so the formula for the terminal value that we want in our valuation is as follows:

$$TV_0=FCF_{t+1}/(WACC-g)/(1+WACC)^t$$

This gives us the terminal value at the end of year zero (the last financial year) based on free cash flow in the first year after our explicit forecast period (the Terminus year), capitalised as a growth perpetuity (by the Gordon Growth model) and discounted back for the length of the forecast period. In the case of our model the discounting of the terminal value will be over 5 years, even though the terminal value relates to cash flow in year 6. Do not forget that the Gordon Growth model capitalises a growing perpetuity which starts with a payment in a year's time, so a stream starting at end year 6 is valued at end year 5, and then brought back for 5 years to end year zero.

Exhibit 5.2 shows the breakdown of the value that we are putting on the operating assets of the company, comprising two present values, one for the forecast free cash flows, and one for the terminal value.

3.3 Non-operational items

If we want to put a value on the equity of the company, we need to adjust the value of the operating assets. In the simplest case, this simply involves making a deduction for debt. But in almost all real examples, there are a number of adjustments to be made for three other categories of item: accrued provisions that we regard as representing real liabilities, non-operational assets, and the element of our derived value for operational assets that is attributable to third party, minority shareholders.

The key point relating to all of these items is that what we want is their market value, but what we see in the balance sheet is a book value. A judgement about materiality is required. If it matters, because the debt is trading at 30p in the pound, or because the minorities are worth 5 times book value, then make an adjustment. In particular, the P/B and P/E formulae that we derived in Chapter one can be used to derive fair value multiples for associates and minorities, to be respectively added to and subtracted from the basic valuation of the operating assets. To make the connection with the Metro's report and accounts as transparent as possible (for anyone who wants to look) we shall work with book values, but it would be a fairly simple matter to make them better approximations to market value.

3.4 Economic profit valuation

As we say in Chapter one there is no difference between an economic profit valuation and a discounted cash flow valuation, and the Mathematical Appendix has a proof that for an all-equity company residual income and dividend discounting always result in the same value. But they do allocate the value in very different ways. The insight offered by DCF has to do with duration. If I buy the company, how much of the value is returned over the first five years and how much after that? The insight offered by economic profit valuation is that the company may be seen as being worth the book value of it assets plus a premium, to reflect its success in earning a return on capital employed which is above the cost of the capital employed.

Deriving economic profit for one year is not hard, and can be achieved in either of two ways. We can calculated the spread between the return on capital and the cost of capital as a percentage spread, and then multiply it by the opening capital to arrive at a figure. Or we can calculate a capital charge by multiplying the opening capital by the cost of capital and deducting the result from NOPAT.

Imagine a company that starts the year with capital of $1,000. It earns NOPAT of $120 during the year, a return on capital employed of 12 per cent. Its cost of capital is 10 per cent. Our first approach would be to say that 12 per cent less 10 per cent is 2 per cent, so the company is earning an investment spread of 2 per cent. On capital of $1,000, this implies economic profit of $20. Our second approach would be to say that the cost of $1,000 capital at 10 per cent is $100, and we made NOPAT of $120, so the economic profit was $20. In both cases, we are deducting from the company's profits not just an interest charge but a full cost of capital, so any resulting surplus or deficit comprises value added or subtracted.

Before we reproduce these calculations for Metro, let us pause over one point. We are using the opening amount of capital in this calculation, not the average, which would be the more usual number to quote. The reason is this. Just as in a DCF model we treat cash flow as if it all arrives on the last day of each year, discounting the first year for one year and the second for two, and so on, we do the same with an economic profit model. We assume that the year one profits arrive all at the end of the year, and represent a return on the capital that was invested at the beginning of the year. The resulting economic profit is discounted for one year at the WACC. For year two, the same applies, but the resulting economic profit is then discounted for two years. Handling the numbers this way guarantees that the results of the two analyses will be identical, and it is not generally worth the effort involved in adjusting either valuation to a mid-year discounting convention.

As with the DCF valuation, we shall simply discount the five years' economic profit at the WACC to derive a present value of the forecast economic profit.

3.5 Terminal values in economic profit

When we were discussing valuation methodologies in Chapter one we made the point that the two key drivers were assumed growth rate and assumed return on incremental capital. This is not necessarily the same as the return on historical, already installed capital. To see why not, consider a company that is currently earning £100 a year of NOPAT. If the company is to grow its profits at 4 per cent annually and will make a 10 per cent return on incremental capital then it needs to reinvest 4/10 of its profit, a total of £40, and it can distribute 6/10 of its profit, a total of £60. We met these calculations both in Chapter one and in the discussion of the value driver terminal value for DCFs earlier in this chapter. But stop a moment and consider what is happening here. We need to reinvest £40 in new capital because at a 10 per cent return this will give us the required additional £4 of profit. If we did not want to grow our profit, then we could happily distribute all of our profit and leave the balance sheet size unchanged.

> There is no reason at all to assume that the existing capital is earning the same rate of return as that which we want to assume for the Terminus. In both the DCF and the economic profit model, we assume that the capital that is already installed at the end of the forecast period is capable of generating the same returns, and the same stream of profit, for ever. The growth and retentions formula relates merely to the amount of new capital that we shall need to generate new streams of profit in future years.

We shall consider later the question of what to do in the event that we do not believe that existing capital will continue to generate stable returns into the long term future. For the time being let us just remain with, and understand, the convention that once a pound of capital is invested it earns the same return in perpetuity. Now, if we have a company that is projected to earn a high return on capital by the end of the forecast period, several per cent above the WACC, for example, we are free to make whatever assumption that we want to about the return that will be made on new capital invested after the forecast period. Since new capital may generate a different return from existing capital, the blended return may be different every year, as the balance between old and new capital changes.

Although we did not worry about it at the time, this is happening in our DCF model as well. There is was implicit, since we were valuing the stream of cash that the company pays out, and were only using the assumed return on incremental capital to derive the stream. Here, the distinction between treatment of old capital and new capital (at the Terminus) will have to be explicit, as otherwise we shall be trying to model a company that is earning a differing return on capital, and therefore a different investment spread, each year.

The solution is simple. We start with the economic profit that is generated in the Terminus. This is easy for us to calculate, because we know the opening capital (it is the closing capital at the end of our forecast period), and we know the NOPAT (as in the DCF it is NOPAT in year t bumped up for one year's growth). If the company were never to make another investment, and the lump of capital earned the same return for ever, then the value that results is just a no-growth perpetuity:

$$PV_t = EP_{t+1}/WACC$$

where PV_t is the present value at the end of the forecast period of the perpetuity represented by the economic profit from the Terminus held flat to infinity. Of course, as with the terminal value in the DCF, this has to be discounted back to a present value in year zero, so its contribution to the firm's value is:

$$PV_0=PV_t/(1+WACC)^t$$

but we are assuming that the company will grow by reinvesting some of its profit in year t+1 and beyond. So we need another calculation to derive the incremental value that will be created by the incremental investments that the company makes after the forecast period. We do this by calculating how much it will invest in the first year, then by calculating how much value this investment will create, and finally be applying the Gordon Growth model to result, because each following year's investment will be bigger by the growth rate than the one before. Because all new investments are assumed to earn the same return on capital, the application of a constant growth formula here will work.

To calculate the investment made in year t+1 we use:

$$I_{t+1}=NOPAT_{t+1}*g/ROCE_i$$

which is essentially the same formula that we used to calculate free cash flow in the DCF model but spun round to calculate retentions.

We then calculate the value added by this one year's investment by calculating the investment spread that it achieves, and valuing it as a flat perpetuity:

$$PV_{i,\ t+1}=I_{t+1}*(ROCE_i-WACC)/WACC$$

where $PV_{i,t+1}$ is the present value of an infinite flat stream of economic profit derived by multiplying the net investment made in year t+1 by the investment spread that it generates.

But we shall invest more in year t+2, and more again in year t+3, with a constant growth rate of g, so we can now derive the value of the whole investment programme to infinity as:

$$PV_t=NOPAT_{t+1}*g/ROCE_i*(ROCE_i-WACC)/[WACC*(WACC-g)]$$

even those readers that have understandably shunned the Mathematical Appendix will need to grasp this unpleasant looking formula if they are to use economic profit models. Intuitively, the first part of it calculates the investment that will be made in year t+1, as a function of growth and incremental return. The second part converts this into a stream of economic profit by multiplying by an investment spread. And the third part contains two capitalisations. The first capitalised the stream represented by the t+1 year investment. The second applies the Gordon Growth model to it to calculate the present value of an infinite stream, with each year's investment being bigger by (1+g). Do not forget that, as ever, this is a value at the end of our forecast period, and will need to be brought back to a current value:

$$PV_0=PV_t/(1+WACC)^t$$

before we go ahead and enter these two components of the terminal value into our model, let us just linger a moment on what the PV_t formula above is telling us. It is giving us the present value of a stream of investments that will be made to infinity, starting in one year's time, by capitalising the value that each annual investment will create. This has an application that goes well beyond the construction of economic profit models.

> The economic profit terminal value formula is applicable to all sectors of industry in which it is practical to value the existing assets of the company and separately to put a value on the future investment stream. This permits complete emancipation from accounting entities if the assets (franchises, properties, oil fields, drug patents) can be valued directly, and then an additional component of value be put on the firm's incremental investment opportunities.

So we now have two components to our economic profit terminal value.

The first represents the present value of a flat stream of economic profit generated by the assets as at the end of the forecasting period, valued as a flat perpetuity, and then brought back to year zero.

The second represents the value that will be added by incremental net investments made after the forecasting period, derived from the same retention formula that we used in the DCF model. The value added by the first year's investment is then calculated and extrapolated as a constant growth series of additions to value. We are not valuing an annual cash flow here. We are valuing an annual accrual of additional value to the company.

So, does it give us the same answer as the DCF? Exhibit 5.2 illustrates the complete economic profit valuation of Metro, with the same balance sheet adjustments that we used for the DCF valuation. And, yes, it gives us the same answer.

What is very different about this analysis is its attribution of that value, which is sliced four ways: the current balance sheet, the economic profit that is expected to be generated over the next 5 years, the economic profit that would be generated after 5 years if no additional investments were undertaken, and the value that we are putting on the investment programme after the forecast period.

In our discussion of the DCF valuation, we did not concentrate on the assumptions made to derive the terminal value, so let us do so here, as we are now in possession of far more insight into what they mean. The growth figure is generally uncontentious. If a company grows faster than nominal GDP for ever then it will end up taking over the world, which has yet to happen. In reality, mature companies grow less fast than nominal GDP, so the growth rate used in terminal values should be around 3-4 per cent as a maximum.

What about the return on incremental investment? In theory, this should drop into line with the cost of capital with the result that economic profit erodes away and there is no need to put a value on incremental investments. In practice, as we shall discuss later, balance sheets for many companies do not fully reflect the investments made to establish the brand, develop the drug, and so on. We then have two choices: we can rebuild the balance sheet as if large amounts of operating cost had been capitalised, or we can just accept that it is unrealistic to assume that incremental returns, as shown in the published accounts, will not be higher than the WACC. In the latter case we are explicitly assuming a positive investment spread to correct for the inadequacy of published accounts to meet our requirements.

This is why it is common for valuations to assume that incremental returns will be lower than that achieved at the end of the forecast period, but higher than the WACC. One of the advantages of the economic profit approach is that it makes explicit in the print-out of the valuation how much value is dependent on this assumption.

3.6 Sensitivities

What we have discounted is cash flows and economic profits derived from a base case assumption. True, we have used a discount rate that has some risk premium built into it, but so long as we remain within the CAPM framework this merely reflects market risk, and ignores specific risk. What this means is that the onus is on the modeller, when a base case has been generated, to put high and low cases round it, typically by flexing the assumptions for growth rates, margins and capital requirements during the forecast period, and for growth and return on incremental capital after the forecast period. Experimenting with this will quickly establish where the really important assumptions lie, and also how sensitive the resulting valuation is to each of the individual variables. It will also establish the extent to which valuations are skewed, as upward or downward changes in assumed margins, for example, will probably not have symmetrical effects on the derived valuation.

If it is possible to ascribe probabilities to the different input assumptions, then the resulting values can be probability weighted, to produce a possibly more meaningful number than the base case value. Pushing this analysis to its logical conclusion results in so-called Monte-Carlo analysis, which requires as inputs probability distributions for the drivers to value, and which produces a probability distribution of resulting values for the asset or company.

4. Frequent problems

This completes our discussion of basic DCF and economic profit valuation, and we repeat our warning from the end of the section related to forecasting. Although we shall devote some time to discussion of issues in which the basic approach does not work well, we shall not again reproduce an entire model and both valuations with full explanations of how they were derived. So be sure that you are comfortable with what we have done before moving on through this book.

We began this chapter by saying that in addition to explaining a basic model, we would also move on to discussion of some commonly encountered problems. The first of these, the accounting issues discussed in Chapter four, pepper the book. The explicitly modelling issues that remain are four:

1. Varying balance sheets
2. Cyclical companies
3. 'Asset light' companies
4. Growth companies

They all require very different treatment, and we address them one by one below.

4.1 Changing balance sheet structures

It is not unusual to find yourself analysing a company in which the balance sheet structure is projected to change quite dramatically. This may arise because the company has been forecasted without any specific projections for share issues or buy-backs, or because it is clear that the company can and should change its balance sheet structure. In the first case, it is probably sensible to address the problem by building share issues or buy-backs into the model, so that the balance sheet structure remains stable. On this basis, it is not unreasonable to use a single discount rate throughout the forecasts, as we did for Metro above.

But there are other cases where this will not do. Suppose that you are modelling a biotechnology company, which is currently financed entirely with equity, not least because it has unpredictable cash flows and few separable assets. The company may fail, but if it succeeds, then it will probably become, as it matures, a large, stable, cash generative entity, which can support a reasonable amount of debt, and should do so to benefit from the resulting tax shelter. In this case it is absolutely unacceptable to use a single discount rate through time. In addition, as we discussed in Chapter two, there is also a real question as to whether its cost of capital should not be reduced on the grounds of liquidity and general stability, whether or not this is in accordance with the principles of the CAPM. Before we turn to growth companies, which we shall address below, there is a simpler case in which varying discount rates are required. This is where the company is already mature and stable. Nothing is going to happen to the riskiness of the existing business. But the company may have indicated that it was its intention to substitute debt for equity simply in an attempt to reduce its cost of capital.

As we saw in Chapter two, increasing the proportion of debt in a balance sheet does two things. It increases the size of the tax shelter, and it increases the risk to both the debt and the equity. There is dispute about both the appropriate treatment of the tax shelter and the treatment of the risk premium on the debt. We shall take the simplest (and, we believe, probably the best, approach) here. We shall discount the tax shelter at the unleveraged cost of equity, and we shall assume that 100 per cent of the risk premium on debt is default risk, and that debt has a zero beta. We explored the implications of these conclusions in chapter two and will merely assume them here.

Whatever the stand that we take on theoretical questions, there is also a practical issue as to which of the two methodologies to adopt: adjusted present value (APV), which we discussed in Chapter two, or time-varying WACC (TVW). The former works by valuing the assets and the tax shelter as separate components. The latter works by iterating a different annual solution for WACC each year. We shall use TVW as our methodology for this exercise, for two reasons. The first is that whereas APV is intuitively easy to understand, TVW requires some explanation if it is to be replicated. The second is that TVW is in many ways more flexible, because it is possible to build default risk into the cost of debt. As we saw in Chapter two, APV cannot handle default risk, which has to be derived by running a WACC calculation to derive a value that can be compared with an APV, with the difference attributable to default risk.

We shall continue to use Metro as our example. It is a perfectly reasonable candidate for a share buy-back, and using it will have the additional benefit that we can illustrate to readers the mechanism modelled on the equity tab, and the impact of the buy-back on a valuation that has already been established using a constant discount rate.

Before we do this exercise, look again at Metro's ratios of debt to capital in the model reproduced above. Debt is falling steadily. In the event that this really happened, the company's cost of capital would rise steadily, making our valuation above over-optimistic. So there are two possibilities: either that the forecast above is right, and that the valuation above is too high, or that the company will maintain a more leveraged balance sheet, perhaps through buy-backs, in which case the valuation above could be more or less correct. Let us test these hypotheses.

In Exhibit 5.3 overleaf, we reproduce the three main financial statements, the equity tab, and two new valuation tabs for Metro (pages 13 and 14). It is the same model, with a €1 billion share buy-back built into it in 2007, and a somewhat different valuation routine to cope with TVW. The other parts of the model are not reproduced since all the operating figures are assumed to be the same as in Exhibit 5.1 above.

Exhibit 5.3: Metro valuation with buy-back

3. Metro profit and loss account (€ million)

Year	2002	2003	2004	2005	2006	2007	2008
Net sales	**51,526**	**53,595**	**54,900**	**56,378**	**58,060**	**59,990**	**62,221**
Cost of sales	(40,126)	(41,687)	(42,431)	(43,556)	(44,866)	(46,403)	(48,217)
Gross profit	**11,400**	**11,908**	**12,469**	**12,822**	**13,194**	**13,586**	**14,004**
Gross profit margin	*22.1%*	*22.2%*	*22.7%*	*22.7%*	*22.7%*	*22.6%*	*22.5%*
Other operating income	1,532	1,461	1,476	1,490	1,505	1,520	1,536
Selling expenses	(10,377)	(10,636)	(10,901)	(11,174)	(11,452)	(11,738)	(12,031)
General administration expenses	(1,013)	(1,031)	(1,049)	(1,068)	(1,087)	(1,106)	(1,126)
Other operating expenses	(115)	(112)	(109)	(106)	(103)	(101)	(98)
EBITA	**1,427**	**1,590**	**1,885**	**1,965**	**2,056**	**2,161**	**2,285**
Amortisation of goodwill	(261)	(272)	(272)	(272)	(272)	(272)	(272)
EBIT	**1,166**	**1,318**	**1,613**	**1,693**	**1,784**	**1,889**	**2,013**
Investment income	38	(60)	(11)	(11)	(11)	(11)	(11)
Net interest	(378)	(425)	(477)	(431)	(385)	(394)	(404)
Other financial items	4	(16)	(6)	(6)	(6)	(6)	(6)
Net financial items	**(336)**	**(501)**	**(494)**	**(448)**	**(402)**	**(411)**	**(421)**
Earnings before tax	**830**	**817**	**1,119**	**1,245**	**1,382**	**1,478**	**1,592**
Income tax	(328)	(246)	(487)	(531)	(579)	(612)	(652)
Tax/Profit before amortisation	*39.5%*	*30.1%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*
Group net income	**502**	**571**	**632**	**714**	**803**	**865**	**939**
Minority interest	(59)	(75)	(83)	(94)	(106)	(114)	(123)
Minority/group net income	*11.8%*	*13.1%*	*13.1%*	*13.1%*	*13.1%*	*13.1%*	*13.1%*
Attributable net income	**443**	**496**	**549**	**620**	**698**	**752**	**816**
Dividend paid	(334)	(334)	(369)	(417)	(469)	(484)	(549)
Retained earnings	109	162	180	203	228	268	267
Common stock							
Weighted average shares (m)	324.1	324.1	324.1	324.1	324.1	310.5	296.9
Year end shares (m)	324.1	324.1	324.1	324.1	324.1	296.9	296.9
Preferred stock							
Weighted average shares (m)	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Year end shares (m)	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Shares outstanding							
Weighted average shares (m)	326.8	326.8	326.8	326.8	326.8	313.2	299.6
Year end shares (m)	326.8	326.8	326.8	326.8	326.8	299.6	299.6
Earnings per share (Euro)	1.36	1.52	1.68	1.90	2.14	2.40	2.72
Common stock dividend (Euro)	1.020	1.020	1.130	1.275	1.435	1.613	1.830
Preferred stock dividend (Euro)	1.122	1.122	1.243	1.403	1.578	1.775	2.013
Payout ratio (common stock)	*75.2%*	*67.2%*	*67.2%*	*67.2%*	*67.2%*	*67.2%*	*67.2%*
Preferred dividend/ common dividend	*110.0%*	*110.0%*	*110.0%*	*110.0%*	*110.0%*	*110.0%*	*110.0%*

4. Metro balance sheet (€ million)

Year	2002	2003	2004	2005	2006	2007	2008
Fixed assets							
Goodwill	4,070	3,987	3,715	3,443	3,171	2,899	2,627
Other intangible assets	188	326	326	326	326	326	326
Tangible assets	7,201	10,490	10,741	11,062	11,447	11,891	12,389
Financial assets	229	238	238	238	238	238	238
Total fixed assets	**11,688**	**15,041**	**15,020**	**15,069**	**15,182**	**15,354**	**15,580**
Current assets							
Inventories	5,506	5,941	6,047	6,207	6,394	6,613	6,872
Trade receivables	369	339	347	357	367	379	394
Other receivables and other assets	2,857	2,061	2,111	2,168	2,233	2,307	2,393
Cash and cash equivalents	1,323	1,593	2,071	2,565	3,059	2,530	3,039
Total current assets	**10,055**	**9,934**	**10,576**	**11,297**	**12,053**	**11,829**	**12,696**
Deferred tax assets	1,084	1,456	1,456	1,456	1,456	1,456	1,456
Prepaid expenses and deferred charges	96	149	149	149	149	149	149
Total assets	22,923	26,580	27,201	27,971	28,840	28,788	29,882
Equity							
Capital stock	835	835	835	835	835	835	835
Additional paid-in capital	2,558	2,551	2,551	2,551	2,551	2,551	2,551
Reserves retained from earnings	305	279	441	621	824	1,053	1,321
Group net profit	443	496	549	620	698	752	816
Treasury stock	0	0	0	0	0	(1,000)	(1,000)
Total equity	**4,141**	**4,161**	**4,377**	**4,627**	**4,908**	**4,191**	**4,523**
Minorities	105	188	246	312	386	465	552
Provisions							
Pensions and similar commitments	960	1,012	1,132	1,259	1,396	1,542	1,699
Other provisions	725	758	758	758	758	758	758
Total provisions	**1,685**	**1,770**	**1,890**	**2,017**	**2,154**	**2,300**	**2,457**
Other liabilities							
Financial debts	5,587	7,802	7,802	7,802	7,802	7,802	7,802
Trade payables	9,119	9,907	10,084	10,351	10,663	11,028	11,459
Other liabilities	1,965	2,097	2,148	2,206	2,272	2,347	2,435
Total other liabilities	**16,671**	**19,806**	**20,034**	**20,359**	**20,736**	**21,177**	**21,695**
Deferred tax liabilities	196	526	526	526	526	526	526
Deferred income	125	129	129	129	129	129	129
Total equity and liabilities	**22,923**	**26,580**	**27,201**	**27,971**	**28,840**	**28,788**	**29,882**
Check	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Net debt	4,264	6,209	5,731	5,237	4,743	5,272	4,763
Operating capital (including goodwill)	9,107	11,140	11,055	11,006	11,003	11,040	11,107
Operating capital (excluding goodwill)	5,037	7,153	7,340	7,563	7,832	8,141	8,480

5. Metro cash flow (€ million)						
Year	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
EBIT		1,613	1,693	1,784	1,889	2,013
Depreciation and amortisation		1,521	1,551	1,587	1,628	1,674
Changes in pension provisions		60	61	63	64	66
Changes in other provisions		0	0	0	0	0
Changes in net working capital		63	99	115	135	160
Income taxes paid		(487)	(531)	(579)	(612)	(652)
Changes in deferred tax assets and liabilities		0	0	0	0	0
Changes in prepayments and deferred income		0	0	0	0	0
Cash flow from operating activities		**2,770**	**2,873**	**2,970**	**3,104**	**3,260**
Capital expenditure		(1,500)	(1,600)	(1,700)	(1,800)	(1,900)
Cash flow from investing activities		**(1,500)**	**(1,600)**	**(1,700)**	**(1,800)**	**(1,900)**
Dividends to Metro shareholders		(334)	(369)	(417)	(469)	(484)
Dividends to minority shareholders		(25)	(28)	(31)	(35)	(36)
Equity issued		0	0	0	0	0
Equity bought back		0	0	0	(1,000)	0
Change in debt		0	0	0	0	0
Net interest paid		(417)	(364)	(311)	(313)	(314)
Investment income		(11)	(11)	(11)	(11)	(11)
Other financial items		(6)	(6)	(6)	(6)	(6)
Cash flow from financing activities		**(792)**	**(778)**	**(776)**	**(1,834)**	**(851)**
Opening cash	1323	1,593	2,071	2,565	3,059	2,530
Change in cash	270	478	495	494	(530)	509
Closing cash	**1593**	**2,071**	**2,565**	**3,059**	**2,530**	**3,039**
Average cash	1,458	1,832	2,318	2,812	2,794	2,784
Interest received	158	199	251	305	303	302
Interest rate on cash	*10.8%*	*10.8%*	*10.8%*	*10.8%*	*10.8%*	*10.8%*

8. Metro equity (€ million)						
Year	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Share price (Euro)	36.76					
Par value (Euro)	2.56					
Equity issued		0	0	0	0	0
Equity bought back		0	0	0	(1,000)	0
Shares issued		0	0	0	0	0
Shares bought back		0	0	0	(27)	0

13. Metro unleveraged cost of equity

Risk free rate	*4.70%*	
Equity risk premium	*4.00%*	
Beta	1.00	
Cost of equity	*8.7%*	
Share price	36.76	
Shares issued (m)	324	
Market capitalisation	11,914	*65.7%*
Net debt (book)	6,209	*34.3%*
Enterprise value	18,123	*100.0%*
Market debt/equity	*52.1%*	
Deleveraged Beta	0.66	
Deleveraged cost of equity	*7.33%*	

14. Metro time varying WACC valuation (€ million)

Year	2004	2005	2006	2007	2008	Terminus
WACC	*6.1%*					
Incremental ROCE	*9.0%*					
Long term growth	*2.0%*					
NOPAT	953	1,005	1,064	1,133	1,213	1,237
Free cash flow	1,038	1,055	1,067	1,096	1,147	962
Opening capital employed	11,140	11,055	11,006	11,003	11,040	11,107
Opening net debt	6,209	5,731	5,237	4,743	5,272	4,763
PV of future cash flows	**17,999**	**18,212**	**18,428**	**18,654**	**18,872**	**19,051**
Return on opening capital employed	*8.6%*	*9.1%*	*9.7%*	*10.3%*	*11.0%*	*9.0%*
Time varying cost of capital	*6.95%*	*6.98%*	*7.01%*	*7.05%*	*7.02%*	*7.05%*
Investment spread	*1.6%*	*2.1%*	*2.7%*	*3.2%*	*4.0%*	*1.9%*
Economic profit	**179**	**233**	**292**	**358**	**438**	**454**
PV of future economic profit	6,859	7,156	7,422	7,651	7,832	7,944
DCF valuation						
= Enterprise value	**17,999**					
+ Financial assets	238					
- Minority interests	(188)					
-Pension provisions	(1,012)					
- Net debt	(6,209)					
= Equity value	**10,828**					
Value per share	33.14					
Economic profit valuation						
+ Opening balance sheet (excl. financial assets)	11,140	*61.9%*				
+ PV economic profit	6,859	*38.1%*				
= Enterprise value	**17,999**	***100.0%***				
+Financial assets	238					
-Minority interests	(188)					
-Pension provisions	(1,012)					
- Net debt	(6,209)					
= Equity value	**10,828**					
Value per share	33.14					

Starting with the equity page, we have assumed that the company buys back 27 million shares at €36.76 a share, with a total cost of €1 billion. This is a relatively large buy-back, but still leaves the company with adequate shareholders funds to maintain its dividend policy. If you turn to the balance sheet you will see the impact of the buy-back on the equity of the company and on its retained earnings. In the profit and loss account, the impact of lower interest receipts fewer shares and higher earnings per share are all visible.

To construct a TVW model, we need two additions to the methodology used in the last section. Firstly, we need to deleverage the company's Beta, so that it can be releveraged each year to reflect different market gearing. Secondly, we need to rearrange the valuation model so that it applies each annual discount rate successively to the stream of cash flow or profits. Let us start with the discount rate. The deleverage page of the model contains some of the information previously provided on the discount rate page (we have excluded the debt calculations as they remain unchanged), but shows the figures used to deleverage Metro's Beta and to derive a deleveraged cost of equity. This cost of equity will be releveraged each year as part of an annual WACC calculation.

On the valuation page, there are two important differences between the calculations as done here, and as done above. As with the discount rate, some of the information on the previous calculation has been left out, so that we can concentrate on the new elements.

First, rather than each item of cash flow or economic profit being discounted once if it occurs in year one, twice if it occurs in year two, and so on, here we have to work backwards from the end. So the terminal value is discounted at its own discount rate. Then, it and the cash flow or economic profit for year five are both discounted back for one year at the discount rate for year five. In year four, the start year five value and year four cash flow or economic profit is discounted at the unique rate for year four, and so on back to year one. The effect of this is that an item that relates to the terminal value is discounted at six different rates as it migrates back to start 2004.

This would be a pointless restatement of what happens in a normal model (you can restate any model to work this way) unless it were coupled with an individual reworking of the discount rate each year. The insight here, explained in Chapter two, is that there is only one combination of value for equity, ratio of market values of debt to equity, and discount rate, that leaves them all compatible with one another. So each year gets its own discount rate, and changing the level of projected debt by repurchasing shares alters the rate for that year and for subsequent years. In terms of the model reproduced above, the net debt number is that forecast in the company's projected accounts, but the enterprise value is a function of the TVW, and the TVW is a function of the enterprise value.

We should note that the leveraging and deleveraging uses the formula that assumes that the tax shelter is discounted at the unleveraged cost of equity, so that:

$$B_L = B_A * (1+D/E)$$

(See Chapter two for discussion and definitions.)

We have not altered the assumed cost of debt to the company, partly for the sake of transparency and partly because the impact of the buyback on Metro's coverage and gearing ratios is not huge. In fact, as we shall discuss in a moment, the buy-back merely stabilises a balance sheet that was otherwise becoming less efficient.

Looking at the results, it may at first be surprising that the value derived is lower than that in the simple single discount rate model. But look at the annual WACCs. They are actually rising, as the company's market leverage is falling, despite the buy-back. For comparison, we reproduce below this valuation page for the company based on the assumption (used in Exhibit 5.1) that it does not buy back shares. The discount rate rises faster and the derived value is lower again.

14. Metro time varying WACC valuation (€ million)

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**Terminus**
WACC	*6.1%*					
Incremental ROCE	*9.0%*					
Long term growth	*2.0%*					
NOPAT	953	1,005	1,064	1,133	1,213	1,237
Free cash flow	1,038	1,055	1,067	1,096	1,147	962
Opening capital employed	11,140	11,055	11,006	11,003	11,040	11,107
Opening net debt	6,209	5,731	5,237	4,743	5,236	3,699
PV of future cash flows	**17,835**	**18,036**	**18,239**	**18,451**	**18,655**	**18,829**
Return on opening capital employed	*8.6%*	*9.1%*	*9.7%*	*10.3%*	*11.0%*	*9.0%*
Time varying cost of capital	*6.94%*	*6.98%*	*7.01%*	*7.04%*	*7.08%*	*7.11%*
Investment spread	*1.6%*	*2.1%*	*2.7%*	*3.3%*	*3.9%*	*1.9%*
Economic profit	**180**	**234**	**293**	**358**	**432**	**447**
PV of future economic profit	6,695	6.980	7,234	7,448	7,614	7,722
DCF valuation						
= Enterprise value	**17,835**					
+ Financial assets	238					
- Minority interests	(188)					
- Pension provisions	(1,012)					
- Net debt	(6,209)					
= Equity value	**10,664**					
Value per share	32.63					
Economic profit valuation						
+ Opening balance sheet (excl. financial assets)	11,140	*62.5%*				
+ PV economic profit	6,695	*37.5%*				
= Enterprise value	**17,835**	***100.0%***				
+Financial assets	238					
- Minority interests	(188)					
- Pension provisions	(1,012)					
- Net debt	(6,209)					
= Equity value	**10,664**					
Value per share	32.63					

This tells us several things about balance sheet structures and capital efficiency, as well as about valuation modelling.

1. The first is that the impact of share buy-backs of a practicable size (we cannot buy back all our equity!) on value is generally fairly small. Getting the operations right matters much more than getting the balance sheet right.
2. The second is that balance sheets that 'drop out' of forecasts without active financial management being assumed often drift in the direction of piling up surplus cash. In this case, assuming a flat discount rate is wrong: it would rise unless something is done about it.
3. There are generally limits to the extent of a company's practical ability to leverage up. Most buy-backs are exercises in returning surplus cash to avoid balance sheet deterioration, not fundamental transformations of the financial structure of the company.

It is notable, incidentally, that our two latest valuations both bring us much closer to the actual share price of the company at the time of writing (€36.76) than the assumption of a flat discount rate.

4.2 Cyclical companies

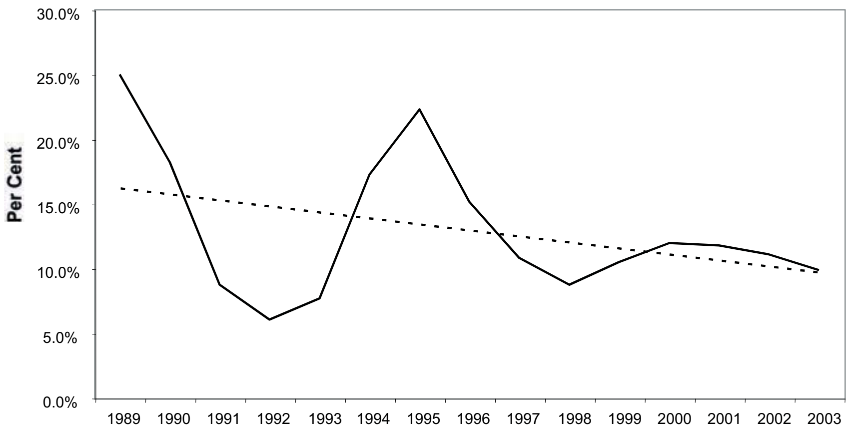
The problems associated with cyclical companies are not that they require a different type of model from the one we applied to Metro, but that it is much harder to work out what to put into it. What is generally required is not more sophisticated modelling but a more sophisticated understanding of history. The reason is that across the cycle, their profitability tends to vary dramatically, and we need to be sure that our forecasts get us back to a 'mid-cycle' set of figures, at least before we arrive at the terminus.

Remember that cyclical companies will tend to be high-Beta. This means that they will have a high calculated cost of capital. We do not, therefore, need to build the risks from cyclicality into our forecasts. They are already built into our discount rate. This is why, in practice, five year forecast periods are common for mature companies. If they are mature, but cyclical, it is long enough to make it plausible that we have moved from the current state of boom or bust back to a normal year. The issues then becomes what a normal year actually looks like, and clearly this requires an interpretation of history.

There is clearly a trade-off involved in the length of time period that one uses for analysing the history. A decade is necessary to pick up a sense of full cycles, and it could be argued that longer would be better. As against that, over ten years a company will probably change its business mix. There may be secular changes in the margin structure and capital requirements. And inflation, interest and returns may all rise or fall. So it is important not merely to look at averages but also at the slope of trend lines, and we shall do both in the analysis below.

Rather than build a model of a cyclical company, which would look exactly like Metro but with more volatile inputs, we are instead going to analyse historical accounts for a cyclical engineering company, the Swedish group, Sandvik, over the 15 year period since 1989. We begin, in Exhibit 5.4, with its history of return on capital employed.

Exhibit 5.4: Sandvik ROCE

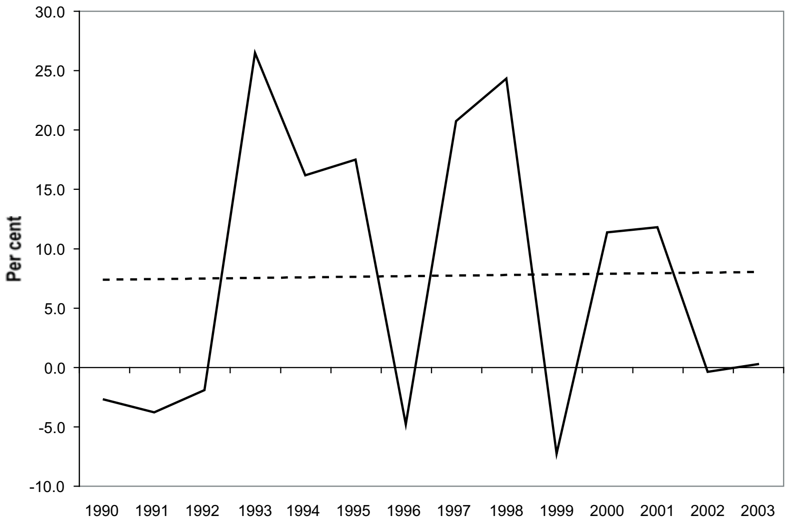


The recession of the early 1990s and the Asian crisis of 1997/8 are clearly visible, as is the period of boom in 1989 and the years of the middle 1990s. There is a further trend, it would appear, towards lower volatility and to lower overall returns on capital employed. These are in part attributable to business mix, and in part to changes in the Swedish economy related to convergence to rates of inflation and growth of other European Union economies.

Return on capital is a result, not a driver. The drivers are sales growth, operating margins and capital turns, which can be split between working capital requirements and fixed asset requirements. It therefore makes sense, when forecasting these items, to look at their histories in turn.

Exhibit 5.5 shows the history for annual sales growth for the Sandvik group as a whole. Clearly, a more detailed approach would be to model the separate businesses independently, but even the consolidated figures tell a story.

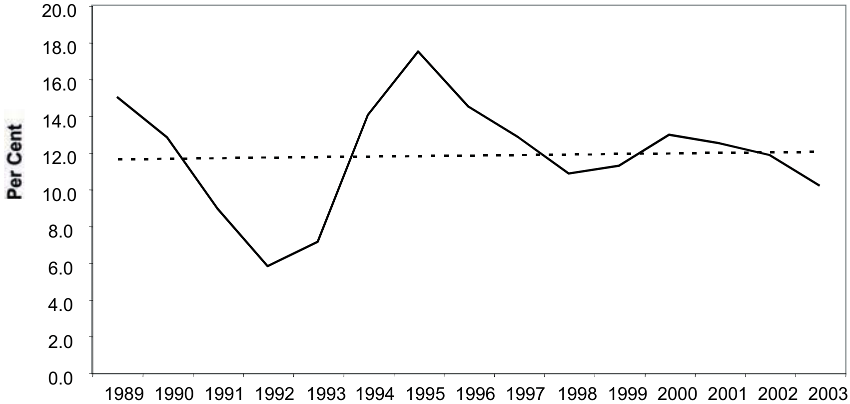
Exhibit 5.5: Sandvik sales growth



Movements in sales growth have to be interpreted carefully. In addition to economic cycles, consolidated sales for an international business will also reflect movements in currencies, and may also be affected by acquisitions and disposals. A more detailed analysis would clearly permit these items to be separated out from one another. Here, we merely note that the recessions of the early 1990s and the past two years are clearly visible, but with a rather more volatile pattern in between than would be explained merely by the economic cycle. The underlying trend in growth in sales is very stable, which should permit a reasonable sense of long term growth rates.

Turning to margins, these can of course be split between gross trading margins and the impact of fixed costs. Exhibit 5.6 below merely concentrates on the consolidated operating margin over the period.

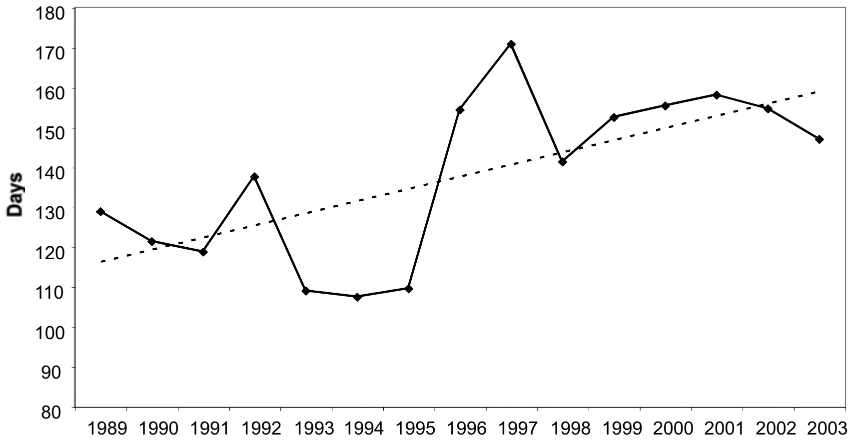
Exhibit 5.6: Sandvik EBIT margin



Less distorted by acquisitions, disposals and currency, this very much follows the pattern that we might expect, with a boom in the late 1980s, a severe recession in the early 1990s, a falling away with the Asian economic crisis of 1997/8, and a very bad year in 2003. It also shows that the underlying trend in operating margin is almost completely stable, which should again make it reasonable to use this as a basis for extrapolation.

Remember that it is not only sales and margins that are cyclical. There tends to be a build-up of inventory as companies enter recession, and a working off of the surplus as they move out of it again. This basic cycle can be broken by price discounting, changes in credit terms to customers, and other business responses, or even changes in revenue recognition (see Chapter four) so a perfect correlation with economic activity is unlikely. And, again, there is a question of trend. Exhibit 5.7 shows inventory days for Sandvik, expressing inventory in terms of cost of goods sold.

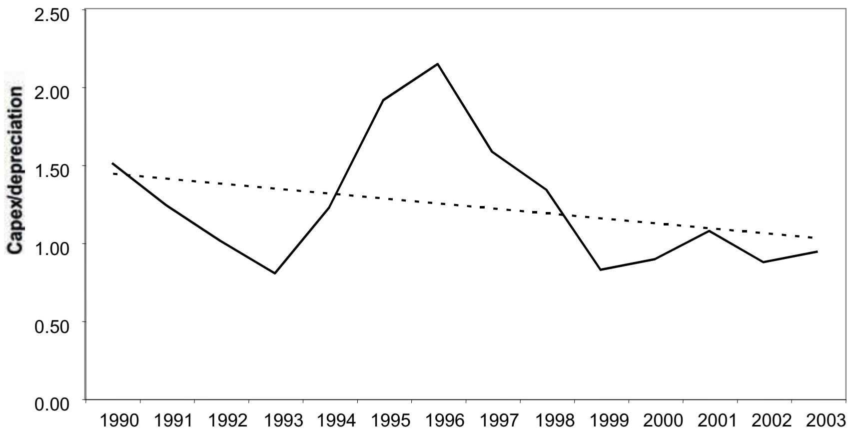
Exhibit 5.7: Sandvik inventory days



The most notable factors in this chart are the lack of a simple correlation with economic cycles, though inventory days were low between 1993 and 1995, and inflected dramatically in 1997, and, even more strikingly, the surprisingly upward-sloping line, implying that the underlying inventory requirements of the business have increased quite considerably. This is an area in which anyone trying to model the company would clearly have to do some work to identify whether the trend is likely to be maintained, or even what the best reasonable assumption about the underlying mid-cycle level of inventory days actually is.

Fixed assets can be thought of, as we have seen, in terms of fixed asset turn: the amount of sales generated for a unit of fixed assets. Trends through time may also be usefully presented in terms of the ratio of capital expenditure to depreciation. Clearly, for any growing company this ratio should average at more than one. Exhibit 5.8 shows the history for Sandvik.

Exhibit 5.8: Sandvik capex/depreciation



In this case the cycle matches our expectation reasonably well. Capital expenditure was slashed during the early 1990s, and only began to rise in a lagged response to demand in the mid-90s. It fell away after the Asian crisis, and has remained rather low ever since.

But the trend is again interesting. The ratio has fallen from about 1.5 in 1990. It was below 1.0 in 2003. Of course the former year reflected the high demand of the late 1980s, after which it was cut, and the latter reflects the poor environment of the new millenium. But still, the figures would deserve investigation.

To conclude, the drivers to a cyclical company are the same as those to Metro, but are likely to oscillate more wildly. We build the forecasts in the same way as we built Metro's, but the inputs for growth, margin and capital requirements need rather more careful thought, and an analysis of historical trends.

In the case of Sandvik, historical analysis might leave us fairly happy with our sense of underlying growth and of mid-cycle margins, but might leave us less happy with what we expect regarding capital requirements, and with whether or not the capital expenditures that we are seeing are consistent with the trend growth rate that we might expect. Whatever the outcome regarding working capital it is probably safe to conclude that either growth is going to slow considerably or capital expenditures will have to rise considerably.

4.3 'Asset light' companies

Companies that have small balance sheets and that appear to earn exceptionally high returns on equity and on capital are often referred to as being 'asset light'. This is in many ways a deeply misleading description, as it implies that they do indeed have very few assets and that they are extraordinarily profitable, neither of which are generally true of the larger ones. As with all companies, as they become large and mature their economic returns drop towards their cost of capital.

So how do we reconcile the paradox? Companies such as Unilever, Novartis or Colgate Palmolive all look very profitable and look as if they do not employ very many assets, yet we are arguing that this cannot be true. It is not. The explanation is that for all of these companies their main assets are not capitalised, but this does not mean that they did not invest large sums to acquire them, or that the returns that they are making on these investments are particularly high.

The point is that, despite a shift towards valuing assets and liabilities at more realistic levels on balance sheets, it will still remain true for the foreseeable future that most of the intangible assets represented by brands, drug patents, television franchises, and other intangibles will only be recognised on balance sheets at fair value if they are acquired. The cost of building them, mainly R&D and marketing costs, has historically been almost all charged to the profit and loss account, and will continue to be except to the extent of development costs.

This is awkward for valuation, because as we have seen it is only practical to value companies, whatever the methodology used, if a sensible economic value can be put on their balance sheet assets and liabilities so that some reasonable measure can be made of what their returns on capital really are. Fortunately, many companies provide enough information about their costs incurred for it to be possible to derive a sensible guess as to what they have really invested to achieve their current position, and to estimate the return that they are really earning on it.

Before progressing to an example, let us consider one common objection to this line of argument. It runs as follows. Most of the money spent on R&D or marketing is wasted, therefore it should all be written off as it is imprudent to do anything else. This confuses two points. Firstly, it is true that most of the money spent on these activities is unsuccessful. Secondly, the successful bit has to carry the rest. It is no good a company saying that it spent €100 million on R&D, and that it has made a great return on the €10 million that it capitalised. It has to make an acceptable return on the lot.

So, having dismissed the objection, let us return to the more practical question of how we arrive at a fair measure of both the capital and the return on capital of 'asset light' companies.

We are going to use as an example the French company, Danone, whose main businesses are the manufacture of yoghurts, mineral water and biscuits. Before we dive into its figures, we need to establish one point. In addition to its capitalised and uncapitalised intangible assets, Danone also has a substantial amount of goodwill on its balance sheet. Goodwill is a very different type of intangible asset from a brand or a drug patent. In fact, one of the reasons that the goodwill paid in 'asset light' industries is so high is precisely that most of the assets are not on the balance sheet. If they were, the premium paid over the fair value of the net assets of the target company would be a fair reflection of the present value of its growth prospects, and would be a lot lower. We shall discuss goodwill at length in Chapter seven, and will therefore defer further discussion of it here. Suffice it to say that here we shall strip the goodwill out of Danone's balance sheet and ignore it, as if the company had grown organically.

Exhibit 5.9 comprises three pages. The first is a simplified extract of figures from Danone's 2003 report and accounts. The second is a set of four very different calculations of the company's capital employed, NOPAT and ROCE. The third is an exercise in rebuilding the company's balance sheet and amortisation charges as if it had capitalised its historical marketing and R&D costs. We shall explain them in turn.

Exhibit 5.9: Danone ROCE calculations

Danone accounting items 2003	**€ Million**
NOPAT calculation	
EBIT	1,604
Of which goodwill amortisation	84
EBITA	1,688
Tax rate	*35%*
Tax on EBITA	(591)
NOPAT (EBIT-tax)	**1,013**
NOPAT before goodwill amortisation	**1,097**
Opening operating capital employed including goodwill	
Net property, plant and equipment	2,992
Brand names	1,259
Other intangible assets	234
Goodwill	2,734
Fixed assets excluding financial assets	**7,219**
Inventories	592
Trade accounts and notes receivable	820
Other accounts receivable and prepaid expenses	775
Short term loans	128
Current assets excluding cash and marketable investments	2,315
Trade accounts and notes payable	(1,516)
Accrued expenses and other current liabilities	(1,541)
Current liabilities excluding short term debt	(3,057)
Non-cash working capital	**(742)**
Opening operating capital employed including goodwill	**6,477**
Opening operating capital employed excluding goodwill	**3,743**

Danone return on capital employed 2003	**€ Million**
Calc one:	
NOPAT after goodwill amortisation	1,013
Opening capital employed including goodwill	6,477
ROCE (stated accounts)	***16%***
Calc two:	
NOPAT before goodwill amortisation	1,097
Opening capital employed including goodwill	6,477
ROCE (excluding goodwill amortisation)	***17%***
Calc three:	
NOPAT before goodwill amortisation	1,097
Opening capital employed excluding goodwill	3,743
ROCE (ex-goodwill returns)	***29%***
Calc four:	
NOPAT before goodwill amortisation	1,097
Addition of annual spend on intangibles	1,013
Amortisation of capitalised intangibles	(775)
Adjusted NOPAT	**1,336**
Opening capital employed excluding goodwill	3,743
Capitalised intangibles costs	5,044
Adjusted operating capital	**8,787**
ROCE (economic return)	***15%***

Danone intangible assets (€ Million)

	1994	**1995**	**1996**	**1997**	**1998**
Advertising costs	659	678	699	720	741
R&D costs	102	106	109	112	115
Capitalised costs	761	784	807	832	857
Gross capitalised costs	**761**	**1,545**	**2,352**	**3,184**	**4,041**
Amortisation charge	0	(76)	(154)	(235)	(318)
Net capitalised costs	**761**	**1,469**	**2,122**	**2,718**	**3,256**

	1999	**2000**	**2001**	**2002**	**2003**
Advertising costs	764	786	810	845	883
R&D costs	119	122	126	133	130
Gross intangibles ex-goodwill	882	909	936	978	1,013
Gross capitalised costs	**4,923**	**5,832**	**6,768**	**7,746**	**8,759**
Amortisation charge	(404)	(492)	(583)	(677)	(775)
Net intangibles ex-goodwill	**3,735**	**4,151**	**4,504**	**4,805**	**5,044**

The page containing accounting items should be fairly self-explanatory. The obvious and dramatic point is that capital employed excluding goodwill is less than 60 per cent of capital employed including goodwill. If we are going to take seriously our own view that goodwill is irrelevant to the underlying profitability of the operations, then this is going to make the operations look very profitable.

Now turn to the second page, with the four calculations of NOPAT, capital employed and profit. It is notable that the effect of ceasing from amortising goodwill, the forthcoming change to IFRS accounting, is not very material. What is material is that if we cut goodwill out of the balance sheet, its value falls by over 40 per cent and the return on capital correspondingly rises by about 75 per cent to what looks like an unsustainable number. It is unsustainable. In fact, it has never been sustained. To understand why, we need to turn to the next page, on Danone's intangible assets.

The third page above shows a simple set of accounting adjustments. We need to start by assuming an amortisation period for the costs that we are going to capitalise. We use 10 years. A longer period, which may be justifiable, would increase the impact. As we saw in our discussion of retirements of fixed assets earlier in this chapter, after 10 years any new asset will have been retired out of gross assets and will have been fully depreciated out of net assets, so if we capitalise the run from 1994 to 2003 we have everything that we need.

The 2003 form 20F for Danone gives its expenses on marketing and R&D for the three years 2001-2003. Prior to that we have simply assumed a trend growth of 3 per cent annually, which is unlikely to be fatally wrong. Amortisation each year is set at 10 per cent of opening gross costs and net intangibles grow with expenditure and fall with amortisation. The point of the series is merely to derive reasonable estimates for 2003. If we wanted reasonable estimates for previous years, we should have to go back further so that there was a 10 year run into the first figures that we wanted to use.

In the fourth calculation of Danone's NOPAT, capital employed and return on capital employed in the third page above we have used the capitalisation schedule to make the following adjustments.

1. We have added back into its profit Danone's 2003 spend on marketing and R&D as if it had been capitalised.
2. We have subtracted out of its profit Danone's 2003 amortisation of intangibles as if they had been capitalised and amortised.
3. We have added the net historical intangibles back into Danone's capital employed.

The result is striking. First, Danone emerges as making a return on capital of 15 per cent, slightly less than the apparent return, but about half of the apparent return on capital excluding goodwill. The addition to income almost compensates for a near doubling of the balance sheet size, versus the simple calculation in version two.

But if the measure of profitability is the same, the implications for valuation are definitely not. A return on capital of 15 per cent is probably slightly less than twice Danone's cost of capital. If we take the capital base to be the figure in calculation four, including the capitalised intangibles, then this would justify an enterprise value of about €18 billion for Danone. At time of writing its enterprise value was €21 billion. This would imply a low value value being placed on its reinvestment opportunities, and perhaps concern over possible erosion of the profitability of its existing ones. Both of these would be consistent with worries at the time about the sustainability of profits from consumer companies owing to pressure from hypermarkets.

If we did the same exercise for calculation three, we would conclude that the company was indeed worth a big premium over the value of its tangible assets, but no amount of manipulation of the numbers would get us to a value of €18 billion. This would require a fairly high value to be put on the value expected to be added from incremental investments, at a time when most industry experts do not believe this to be likely. The food manufacturing industry is mature. It is difficult to see why companies in this sector should have a high proportion of their value attributed to future investments. The same applies to pharmaceutical companies, and other mature 'asset light' industries.

> Practical proof is hard in the world of investment. We shall rest our case on a simple point. For many 'asset light' companies, it is relatively easy to justify their valuations and their profitability if we capitalise intangible assets, and it is almost impossible to do either if we do not.

4.4 Growth companies

Whereas the key to understanding cyclical companies lies in their past performance, the opposite is the case for growth companies. They often have no past and rather little to go on in the present. They are usually highly risky, equity financed, and will look very different if and when they become mature. Meanwhile, any sensible valuation will recognise the fact that their existing investors, who are generally venture capitalists, will require a very high return on their successful investments to carry the unsuccessful ones. CAPM and Betas are strictly for the mature. In addition, they are often in industries that are 'asset light', so they combine most of the issues that we have already addressed, and some more of their own.

We shall take as our example a small UK-listed company biotechnology company for which one of the authors provided some consultancy work and which we shall examine under the name, Skylark.

Perhaps the best introduction would be to point out that end 2003 shareholders' equity comprised £6.7 million of subscribed capital, £5.5 million of accumulated losses and net shareholders' funds of £1.2 million. The company had only begun to generate sales in 2001, and was hoping to break even for the first time in 2005. A further remove from the companies that we have looked at so far in this chapter it would be hard to imagine.

The business of Skylark was to act as a sub-contractor to much larger companies, and its service comprised screening of products in a research and development pipeline. The assets of the company were almost entirely intellectual property, with no balance sheet value.

In 2004, the company was still very closely held, essentially by venture capitalists, whose evident ambition was that it should be grown rapidly, and who expected to achieve high returns on equity during the intervening period, to compensate them for illiquidity and high risk of failure.

In practical terms, the difficulty with modelling the company was lack of transparency to future sales growth. Most costs were fixed, related to employee costs. In addition, after a long period in which it had been unable to borrow or to afford any significant capital expenditure, both items were changing. The company planned to borrow to buy the freehold of its head office, and it was beginning to spend again, mainly on information technology.

In modelling terms, the challenges included the fact that the company was carrying forward substantial tax losses, and had been applying for cash tax credits, rather than rolling forward the tax losses. In addition, as with Danone, the company was 'asset light', and while its long term returns on capital (essentially R&D) was likely to be high (in the event of success) it still required capitalising of intangibles if it was to be even remotely realistic or useable.

We reproduce the full detail of a model and valuation of Skylark below as Exhibit 5.10. It is not our intention to describe it line by line, as we did with Metro. This should not be necessary. Instead, we shall concentrate on the features of the model that are importantly different, and relate to its then status as a very small growth stock. We have retained the same conventions as with Metro. Inputs are boxed and percentages are italicised.

One difference is entirely cosmetic. In this model the equity is valued by adding the present value of forecast economic profit to shareholders' funds, rather than adding it to capital and then subtracting debt. The result is clearly identical.

Exhibit 5.10: Growth company model

Profit and loss account (£)

	2001	2002	2003	2004	2005	2006	2007	2008
US sales growth					*10.0%*	*10.0%*	*10.0%*	*10.0%*
Average $/£ rate				*1.80*	*1.80*	*1.80*	*1.80*	*1.80*
UK sales growth		*556.9%*	*62.6%*	*80.5%*	*110.0%*	*30.0%*	*20.0%*	*10.0%*
Gross margin	*95.9%*	*90.3%*	*76.3%*	*84.0%*	*84.0%*	*84.0%*	*84.0%*	*84.0%*
R&D growth		*833.4%*	*5.3%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
R&D/sales	*80.4%*	*114.3%*	*74.0%*	*41.0%*	*19.5%*	*15.0%*	*12.5%*	*11.4%*
Other admin growth		*650.1%*	*-31.0%*	*15.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*
Other admin/sales	*403.3%*	*460.6%*	*195.5%*	*124.6%*	*62.3%*	*50.3%*	*44.0%*	*42.0%*
Statutory tax rate	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*
Effective tax rate	*0.0%*	*4.4%*	*9.2%*	*10.1%*	*0.0%*	*0.0%*	*0.0%*	*1.4%*
US sales ($)				100	110	121	133	146
US sales				56	61	67	74	81
UK sales	98,614	647,770	1,052,953	1,900,000	3,990,000	5,187,000	6,224,400	6,846,840
Turnover	98,614	647,770	1,052,953	1,900,056	3,990,061	5,187,067	6,224,474	6,846,921
Cost of sales	(4,029)	(62,836)	(249,852)	(304,009)	(638,410)	(829,931)	(995,916)	(1,095,507)
Gross profit	**94,585**	**584,934**	**803,101**	**1,596,047**	**3,351,651**	**4,357,136**	**5,228,558**	**5,751,414**
Research and development	(79,290)	(740,104)	(779,366)	(779,366)	(779,366)	(779,366)	(779,366)	(779,366)
Other administrative expenses	(397,723)	(2,983,325)	(2,058,857)	(2,367,686)	(2,486,070)	(2,610,373)	(2,740,892)	(2,877,937)
Exceptional admin exp	0	(425,712)	0	0	0	0	0	0
Total admin exp	(477,013)	(4,149,141)	(2,838,223)	(3,147,052)	(3,265,436)	(3,389,739)	(3,520,258)	(3,657,303)
Operating profit/(loss)	**(382,428)**	**(3,564,207)**	**(2,035,122)**	**(1,551,005)**	**86,216**	**967,397**	**1,708,300**	**2,094,111**
Interest receivable	146	111,522	38,875	89,192	83,982	97,780	155,436	238,504
Interest payable	(4,470)	(57,842)	(53,154)	(28,251)	(56,000)	(56,000)	(56,000)	(56,000)
Pre-tax profit	**(386,752)**	**(3,510,527)**	**(2,049,401)**	**(1,490,064)**	**114,198**	**1,009,177**	**1,807,736**	**2,276,616**
Taxation charge	0	153,345	189,256	150,000	0	0	0	(32,616)
Net profit	(386,752)	(3,357,182)	(1,860,145)	(1,340,064)	114,198	1,009,177	1,807,736	2,244,000
Dividends	0	0	0	0	0	0	0	0
EPS (p)	(0.83)	(3.96)	(2.05)	(1.07)	0.09	0.81	1.45	1.80
DPS (p)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Payout ratio	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Average shares	46,696,000	84,836,652	90,623,382	124,913,793	124,913,793	124,913,793	124,913,793	124,913,793
End period shares		90,413,793	94,913,793	124,913,793	124,913,793	124,913,793	124,913,793	124,913,793
Net profit	(386,752)	(3,357,182)	(1,860,145)	(1,340,064)	114,198	1,009,177	1,807,736	2,244,000
FX gains/(losses)		6,898	52,649	0	0	0	0	0
Total recognised gains/(losses)	(386,752)	(3,350,284)	(1,807,496)	(1,340,064)	114,198	1,009,177	1,807,736	2,244,000
Tax losses brought forward				3,758,944	5,099,008	4,984,810	3,975,633	2,167,896
Pre-tax profit/(loss) for year				(1,490,064)	114,198	1,009,177	1,807,736	2,276,616
Tax charge				150,000	0	0	0	(32,616)
Cash tax credit			189,256	150,000	0	0	0	0
Tax loss brought forward				5,099,008	4,984,810	3,975,633	2,167,896	0

Balance sheet (£)

	2001	2002	2003	2004	2005	2006	2007	2008
Inventory days	*1129*	*344*	*99*	*99*	*99*	*99*	*99*	*99*
Debtor days	*198*	*266*	*141*	*141*	*141*	*141*	*141*	*141*
Trade creditor days	*3666*	*2209*	*40*	*40*	*40*	*40*	*40*	*40*
Other creditor/sales	*105.8%*	*2.7%*	*1.4%*	*1.4%*	*1.4%*	*1.4%*	*1.4%*	*1.4%*
Accruals/sales	*91.4%*	*55.4%*	*29.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*	*30.0%*
Fixed assets (tangible)	**326,889**	**1,099,591**	**661,557**	**1,300,611**	**1,580,906**	**1,373,619**	**1,148,816**	**1,113,224**
Stocks	21,250	50,783	67,766	82,455	173,152	225,098	270,117	297,129
Debtors	91,089	403,949	407,837	696,687	1,395,458	2,009,091	2,410,906	2,651,997
Cash	0	2,263,176	491,230	2,229,795	1,969,326	2,919,676	4,852,131	7,073,088
Current assets	**112,339**	**2,717,908**	**966,833**	**3,008,936**	**3,537,937**	**5,153,864**	**7,533,154**	**10,022,213**
Total assets	**439,228**	**3,817,499**	**1,628,390**	**4,309,547**	**5,118,842**	**6,527,483**	**8,681,971**	**11,135,437**
Trade creditors	69,021	325,893	27,429	33,374	70,085	91,111	109,333	120,266
Other creditors	177,999	14,848	14,375	25,940	54,473	70,814	84,977	93,475
Tax and social security	65,858	44,067	49,601	57,041	59,893	62,888	66,032	69,334
Deferrals & accruals	153,780	307,545	305,386	570,017	1,197,018	1,556,120	1,867,342	2,054,076
Short term debt	76,298	271,866	8,360	0	0	0	0	0
Current liabilities	**542,956**	**964,219**	**405,151**	**686,372**	**1,381,469**	**1,780,933**	**2,127,684**	**2,337,151**
Long term debt	86,954	392,045	0	800,000	800,000	800,000	800,000	800,000
Deferred tax	0	0	0	0	0	0	0	0
Other provisions	0	200,000	0	0	0	0	0	0
Long term liabilities	**86,954**	**592,045**	**0**	**800,000**	**800,000**	**800,000**	**800,000**	**800,000**
Share capital	68,000	90,414	94,914	124,914	124,914	124,914	124,914	124,914
Share premium account	0	5,779,787	6,544,787	9,454,787	9,454,787	9,454,787	9,454,787	9,454,787
Merger reserve	128,070	128,070	128,070	128,070	128,070	128,070	128,070	128,070
Profit and loss account	(386,752)	(3,737,036)	(5,544,532)	(6,884,596)	(6,770,398)	(5,761,221)	(3,953,484)	(1,709,485)
Shareholders' equity	**(190,682)**	**2,261,235**	**1,223,239**	**2,823,175**	**2,937,373**	**3,946,550**	**5,754,287**	**7,998,286**
Liabilitites and equity	**439,228**	**3,817,499**	**1,628,390**	**4,309,547**	**5,118,842**	**6,527,483**	**8,681,971**	**11,135,437**
Check	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Capital employed	(27,430)	861,970	740,369	1,393,380	1,768,047	1,826,875	1,702,155	1,725,198
Net debt/(cash)	163,252	(1,599,265)	(482,870)	(1,429,795)	(1,169,326)	(2,119,676)	(4,052,131)	(6,273,088)
Net debt/equity	*(85.6)%*	*(70.7)%*	*(39.5)%*	*(50.6)%*	*(39.8)%*	*(53.7)%*	*(70.4)%*	*(78.4)%*

Cash flow (£) **Year**	**2004**	**2005**	**2006**	**2007**	**2008**
Operating profit/(loss)	(1,551,005)	86,216	967,397	1,708,300	2,094,111
Depreciation	210,946	219,705	307,287	324,803	135,592
(Gain)/loss on disposal	0	0	0	0	0
Change in inventory	(14,689)	(90,698)	(51,945)	(45,019)	(27,012)
Change in debtors	(288,850)	(698,771)	(613,633)	(401,816)	(241,091)
Change in trade creditors	5,945	36,711	21,025	18,222	10,933
Change in other creditors	11,565	28,533	16,342	14,163	8,498
Change in tax and social security payable	7,440	2,852	2,995	3,144	3,302
Change in deferrals and accruals	264,631	627,002	359,102	311,222	186,734
Deferred taxation	0	0	0	0	0
Other provisions	0	0	0	0	0
Exchange rate differences	0	0	0	0	0
Cash flow from operations	**(1,354,016)**	**211,549**	**1,008,569**	**1,933,020**	**2,171,068**
Interest received	89,192	83,982	97,780	155,436	238,504
Interest paid	(28,251)	(56,000)	(56,000)	(56,000)	(56,000)
Net interest	*60,941*	*27,982*	*41,780*	*99,436*	*182,504*
Tax paid	**150,000**	**0**	**0**	**0**	**(32,616)**
Capital expenditure	(50,000)	(500,000)	(100,000)	(100,000)	(100,000)
Acquisition of building	(800,000)	0	0	0	0
Disposals	0	0	0	0	0
Cash flow to/from investments	**(850,000)**	**(500,000)**	**(100,000)**	**(100,000)**	**(100,000)**
Cash flow before financing	**(1,993,075)**	**(260,469)**	**950,349**	**1,932,456**	**2,220,957**
Dividends	0	0	0	0	0
Issue/buyback of equity	2,940,000	0	0	0	0
Change in short term debt	(8,360)	0	0	0	0
Change in long term debt	800,000	0	0	0	0
Cash flow to/from financing	**3,731,640**	**0**	**0**	**0**	**0**
Opening cash	491,230	2,229,795	1,969,326	2,919,676	4,852,131
Change in cash	1,738,565	(260,469)	950,349	1,932,456	2,220,957
Closing cash	**2,229,795**	**1,969,326**	**2,919,676**	**4,852,131**	**7,073,088**

Fixed assets (£)	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Fixed asset life	*0.9*	*5.7*	*5.7*	*5.7*	*5.7*	*5.7*	*5.7*
Fixed asset turn	*1.5*	*1.0*	*3.3*	*6.2*	*7.7*	*13.5*	*20.7*
Opening gross fixed assets	**359,017**	**1,540,180**	**1,204,280**	**1,254,280**	**1,754,280**	**1,854,280**	**774,088**
Additions	1,180,192	3,812	50,000	500,000	100,000	100,000	100,000
Retirements	0	0	0	0	0	(1,180,192)	(3,812)
Disposals	(14,690)	(367,449)	0	0	0	0	0
FX impact	15,661	27,737	0	0	0	0	0
Closing gross fixed assets	**1,540,180**	**1,204,280**	**1,254,280**	**1,754,280**	**1,854,280**	**774,088**	**870,276**
Opening cumulative depreciation	**32,128**	**440,589**	**542,723**	**753,669**	**973,374**	**1,280,661**	**425,272**
Depreciation	413,664	269,784	210,946	219,705	307,287	324,803	135,592
Retirements	0	0	0	0	0	(1,180,192)	(3,812)
Disposals	(6,701)	(153,929)	0	0	0	0	0
FX impact	1,498	(13,721)	0	0	0	0	0
Closing cumulative depreciation	**440,589**	**542,723**	**753,669**	**973,374**	**1,280,661**	**425,272**	**557,052**
Opening net fixed assets	326,889	1,099,591	661,557	500,611	780,906	573,619	348,816
Closing net fixed assets	**1,099,591**	**661,557**	**500,611**	**780,906**	**573,619**	**348,816**	**313,224**
Property			**800,000**	**800,000**	**800,000**	**800,000**	**800,000**

Share issues/(buybacks)

	2002	2003	2004	2005	2006	2007	2008
Par value per share	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Share price			9.8	13.0	13.0	13.0	13.0
Share premium	-0.1	-0.1	9.7	12.9	12.9	12.9	12.9
Share issue (£)			2,940,000	0	0	0	0
Shares issued			30,000,000	0	0	0	0
Share buyback (£)			0	0	0	0	0
Shares bought			0	0	0	0	0

Debt and cash (£)

	2001	2002	2003	2004	2005	2006	2007	2008
Opening long term debt				**0**	**800,000**	**800,000**	**800,000**	**800,000**
Mandatory repayments				0	0	0	0	0
Discretionary issues/ repayments				800,000	0	0	0	0
Closing long term debt	**86,954**	**392,045**	**0**	**800,000**	**800,000**	**800,000**	**800,000**	**800,000**
LTD/Operating capital	*-317.0%*	*45.5%*	*0.0%*	*57.4%*	*45.2%*	*43.8%*	*47.0%*	*46.4%*
Interest rate			*7.0%*	*7.0%*	*7.0%*	*7.0%*	*7.0%*	*7.0%*
Interest paid			0	28,000	56,000	56,000	56,000	56,000
Opening short term debt				**8,360**	**0**	**0**	**0**	**0**
Change in short term debt				(8,360)	0	0	0	0
Closing short term debt	**76,298**	**271,866**	**8,360**	**0**	**0**	**0**	**0**	**0**
STD/Operating capital	*-278.2%*	*31.5%*	*1.1%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Interest rate			*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*
Interest paid			251	251	0	0	0	0
Opening cash				**491,230**	**2,229,795**	**1,969,326**	**2,919,676**	**4,852,131**
Change in cash				1,738,565	(260,469)	950,349	1,932,456	2,220,957
Closing cash	**0**	**2,263,176**	**491,230**	**2,229,795**	**1,969,326**	**2,919,676**	**4,852,131**	**7,073,088**
Interest rate				*4.0%*	*4.0%*	*4.0%*	*4.0%*	*4.0%*
Interest received				89,192	83,982	97,780	155,436	238,504
Net interest				60,941	27,982	41,780	99,436	182,504
Net debt				(482,870)	(1,429,795)	(1,169,326)	(2,119,676)	(4,052,131)
Interest rate (opening balance)				*12.6%*	*2.0%*	*3.6%*	*4.7%*	*4.5%*

Capitalisation routine (£)

	2001	2002	2003	2004	2005	2006	2007	2008
Amortisation period	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Opening gross intangibles	**0**	**79,290**	**819,394**	**1,598,760**	**2,378,126**	**3,078,202**	**3,117,464**	**3,117,464**
R&D spend	79,290	740,104	779,366	779,366	779,366	779,366	779,366	779,366
Retirement	0	0	0	0	(79,290)	(740,104)	(779,366)	(779,366)
Closing gross intangibles	**79,290**	**819,394**	**1,598,760**	**2,378,126**	**3,078,202**	**3,117,464**	**3,117,464**	**3,117,464**
Amortisation	0	15,858	163,879	319,752	475,625	615,640	623,493	623,493
Retirement	0	0	0	0	(79,290)	(740,104)	(779,366)	(779,366)
Cumulative amortisation	**0**	**15,858**	**179,737**	**499,489**	**895,824**	**771,360**	**615,487**	**459,614**
Closing net intangibles	**79,290**	**803,536**	**1,419,023**	**1,878,637**	**2,182,378**	**2,346,104**	**2,501,977**	**2,657,850**

Return on capital (£)

Year	2003	2004	2005	2006	2007	2008
Stated operating profit	**(2,035,122)**	**(1,551,005)**	**86,216**	**967,397**	**1,708,300**	**2,094,111**
Plus R&D spend	779,366	779,366	779,366	779,366	779,366	779,366
Minus amortisation of R&D	(163,879)	(319,752)	(475,625)	(615,640)	(623,493)	(623,493)
Adjusted operating profit	**(1,419,635)**	**(1,091,391)**	**389,956**	**1,131,123**	**1,864,173**	**2,249,985**
Notional tax charge	0	150,000	0	0	0	0
Net operating profit after tax	**(1,419,635)**	**(941,391)**	**389,956**	**1,131,123**	**1,864,173**	**2,249,985**
Opening capital employed	**861,970**	**740,369**	**1,393,380**	**1,768,047**	**1,826,875**	**1,702,155**
Plus capitalised R&D	803,536	1,419,023	1,878,637	2,182,378	2,346,104	2,501,977
Adjusted opening capital employed	**1,665,506**	**2,159,392**	**3,272,017**	**3,950,425**	**4,172,978**	**4,204,132**
Adjusted ROCE	(85.2)%	(43.6)%	11.9%	28.6%	44.7%	53.5%
Tax losses brought forward		3,758,944	5,159,949	5,073,733	4,106,336	2,398,036
Stated operating profit		(1,551,005)	86,216	967,397	1,708,300	2,094,111
Tax charge		150,000	0	0	0	0
Cash tax credit		150,000	0	0	0	0
Tax loss brought forward		5,159,949	5,073,733	4,106,336	2,398,036	303,925

Economic profit valuation (£)

	2004	2005	2006	2007	2008	Terminus
Long term profit growth rate:	*3.0%*					
Return on incremental capital:	*52.9%*					
Net operating profit after tax	(941,391)	389,956	1,131,123	1,864,173	2,249,985	2,317,484
Adjusted opening capital employed	2,159,392	3,272,017	3,950,425	4,172,978	4,204,132	4,383,048
ROCE	*-43.6%*	*11.9%*	*28.6%*	*44.7%*	*53.5%*	*52.9%*
Cost of operating capital	*25.0%*	*19.9%*	*15.8%*	*12.6%*	*10.0%*	*8.0%*
Economic profit	(1,481,239)	(261,350)	505,023	1,337,579	1,827,572	1,966,840
PV economic profit	18,744,331	24,911,652	30,131,756	34,402,295	37,405,992	39,336,804
Stated shareholder's equity	1,223,239					
Net intangibles	1,419,023					
PV economic profit	18,744,331					
Market value	**21,386,593**					
Shares issued	124,913,793					
Value per share (p)	**17.1**					

The difficulties of forecasting sales in this situation are very obvious, and since there is a negligible cost of sales, operational gearing is very high (lots of fixed costs and very little variable costs, so the impact of a small change in sales is large). In modelling terms, the most difficult thing about the profit and loss account was the tax charge. It is usual that tax losses would roll forward to be utilised against future taxable profits. In this case, an additional line item was required, to model the cash tax credits.

Working capital items are forecast directly on the balance sheet page, with the differences from on year to the next carried to the cash flow. The other items on the balance sheet are derived from later pages of the model. The capital employed calculation includes provisions, as it effectively did for Metro, though in that case it was derived from the asset side of the balance sheet. Here we have aggregated shareholders' equity, net debt and provisions.

There is nothing notable to say about the cash flow page other than that the forecast items reflect a pick-up in capital expenditure and the purchase of the freehold referred to above.

On the fixed asset tab, the asset life sets the depreciation rate as a proportion of gross fixed assets as for Metro. It is low because the assets are largely related to laboratory equipment. More information is provided regarding the history, but forecasts are constructed in the same way as for Metro. Property is excluded from the main calculation as it is not depreciated or retired.

The shares page shows the calculations surrounding the early 2004 rights issue. There is nothing very notable about the debt page other than that forecast long term debt entirely comprises the mortgage.

The intangibles page represents an attempt to capitalise assets that would otherwise be written off through the profit and loss account as R&D expenses, and works in the same fashion as for Danone, except that here we can go back to inception, so all the historical numbers are an attempt at reality.

Most of the return on capital page will again be familiar from the Danone calculations above. The tax calculations have to be redone, as a deleveraged company would utilise its tax losses less fast than one that receives interest. Our forecasts have a large cash accumulation by the end of the forecast period.

This leads to one of the interesting issues in the valuation calculation. Firstly, there was obviously the question about whether the forecast revenues would be achieved. Secondly, there was the question of what to do about discount rates. And, thirdly, there was the question of what to think about leverage. The forecasts seemed reasonable at the time. Let us take the other two separately.

As at the time of the valuation, the company's shares represented venture capital. But, clearly if it hit its targets, this would not be true in five years' time. The way to treat this is the same as the treatment for TVW where the variation come from balance sheet structure, except that here there is no need for iteration. We just assume that we want 25 per cent now and shall only want a normal 8 per cent when the company is mature.

But this is a capital based valuation. It takes operating capital and the NOPAT that it is expected to generate. To make the capital base and the returns more reasonable, though they are still very extreme, because of the nature of the business, it capitalises intangibles, but it ignores the question of surplus cash altogether.

Go back and look at the projected 2008 balance sheet. It largely comprises cash! The problem with trying to distribute the cash is that there are no distributable retained earnings in shareholders' funds. This is why the tax burden falls faster in the forecast profit and loss account than in the restated ROCE calculation. Companies can usually find ways to reconstruct themselves so that surplus cash can be distributed. In practice, for this company, its ambitions were such that, at the time that the model was constructed, it seemed highly unlikely that the cash would not have been spent on some or other corporate deal, if all went well. So the question of the appropriate treatment of the inefficient projected balance sheet gearing, and the alternative of how the cash might be returned to the shareholder seemed rather academic. But readers are entitled to an explanation as to why we have not followed any of our own advice regarding the implications of leverage, and it was one of the many vulnerable points in the valuation. A proper valuation based on the assumption of the accumulation of a large pile of the cash in the company would have increased the discount rate (assuming that the base case was reasonable) and would have made a significant deduction from the value of the equity.

5. Three period models

In our discussions of terminal values we promised a comment on what to do in the event that we do not believe that existing capital will continue to generate stable returns into the long-term future. Moreover, Skylark, our growth company example, was assumed to mature within a five year forecast. What should we do if we want to assume either that growth fades over a longish period, or that it is optimistic to assume even that existing installed capital can continue to generate its existing returns for ever, or both? After all, a more realistic assumption in many cases might be that both growth and profitability fall with maturity, and that the profitability of existing products as well as new ones might be reduced. The solution is a three period model.

In this section, we briefly discuss what a three period model is and how to create one, and then apply this to our valuation of Metro.

5.1 Fades

What we want is a series of individual annual forecasts for a period that exceeds our ability to extend the full detail of our company model sensibly. So instead we reduce the company to just a very few lines, at a minimum just net operating profit after tax (NOPAT), capital employed and free cash flow, and then run our valuations as usual. But the forecast period will now comprise our original estimates (in our case for five years), and an intermediate fade period, which can be as long as we like, which will then be followed by a terminal value, which works precisely as in our existing Metro valuation above.

The simplest form of fade gradually reduces growth in NOPAT year by year during the fade period. The slowdown may be linear, or may be compound (i.e. we reduce growth at a rate that over the fade period will take it down from its rate at the end of the forecast period to its rate in the terminus). We also reduce the company's return on capital employed (ROCE) annually over the same period, again using whatever system we find most realistic. For each year, if we know NOPAT and we know ROCE then the required capital drops out as a result. And if we know profit for a year and the opening and closing capital, then we know net investment and thereby free cash flow.

This argument should be familiar both from our discussion of growth and retentions in Chapter 1 and of the value driver formula for terminal values above. It is yet another application of the principle that only two of growth, profitability and distribution can be independent. Set two and the third follows. This point implies that, if we wanted to, we could derive fades in a number of ways, not merely by changing the way in which annual rates fade, but by changing the lines of causation between the forecast items. So, for example, we could fade profit growth and payout, and derive capital. Or, and this is more common, we could apply growth to the capital base and use the returns to derive profit. We shall return to the implications of these choices when we have worked through a basic example.

5.1.1 Constructing a fade

The valuation routine of a three period model will tend to be cumbersomely long, since if there are five years of explicit forecast, followed by a twenty year fade, followed by a terminal value, the whole thing will extend to twenty-six columns. Fortunately, these need never be presented in any detail. All that is required is a specification of what is being faded, how, and to what rate. In Exhibit 5.11 we have cut out a series which starts with the last forecast year and ends with the terminus, with only a four year intermediate, fade period. This should make the following explanation reasonably easy to understand. Having worked through this artificial example we shall then consider the application of a more realistic model to Metro.

Exhibit 5.11: Fade routine

Fade routine (£ million)

Year	**Final Forecast**	**1**	**2**	**3**	**4**	**Terminus**
NOPAT	100	106	111	115	118	122
Opening capital	1,000	1,050	1,185	1,327	1,476	1,520
NOPAT growth	*7.0%*	*5.7%*	*4.6%*	*3.7%*	*3.0%*	*3.0%*
ROCE	*10.0%*	*10.1%*	*9.3%*	*8.6%*	*8.0%*	*8.0%*
Free cash flow	50	-30	-31	-34	74	76

The boxed entries for the final forecast year reflect that these numbers are derived from our existing forecast. The boxed entries for growth and ROCE in the terminus are inputs, as they were in our earlier, two phase model. In between, NOPAT grows at an annual growth rate which varies year by year. ROCE trends down to its long-term rate. Opening capital is derived by dividing NOPAT for the year by the ROCE for the year. And free cash flow is NOPAT less the increase in capital during the year. It should be noted that opening capital in the first year of the fade is already known. It is ending capital at the close of the last forecast year. So, in this example, we have four years in which to fade our earnings growth, but only three years in which to fade our ROCE, since year one ROCE is set by NOPAT and opening capital. It is only in years two, three and four that ROCE is the driver and opening capital the result. Since we are using compound fade rates, each year's growth (and ROCE) is derived by multiplying the previous one by a factor. Taking growth for an example, the formula for the annual factor is as follows:

```
Factor = (gl/gf)^(1/t)
```

Where gl is long-term growth, gf is growth in the last forecast year, and t is the number of years in the fade.

5.1.2 Types of fade

We mentioned above that as well as having a choice about the derivation of the annual fade rate (for example, linear or compound, as above), there is also choice as to what to grow and what to derive. One option would be to grow revenue, and then use the DuPont drivers of margin and capital turn to derive NOPAT, capital and thereby free cash flow. Another, which is quite common, is to apply the growth term to the capital, rather than to the profit, and to derive profit by applying ROCE to capital. It is important to realise that ostensibly the same long-term assumptions regarding growth rate and profitability may result in considerably different forecasts and valuations, depending on which choice gets taken regarding the construction of the fade routine, even if the number of years that the intermediate period extends over is fixed. This will be clearer if we take our Metro example and put a fade routine on it.

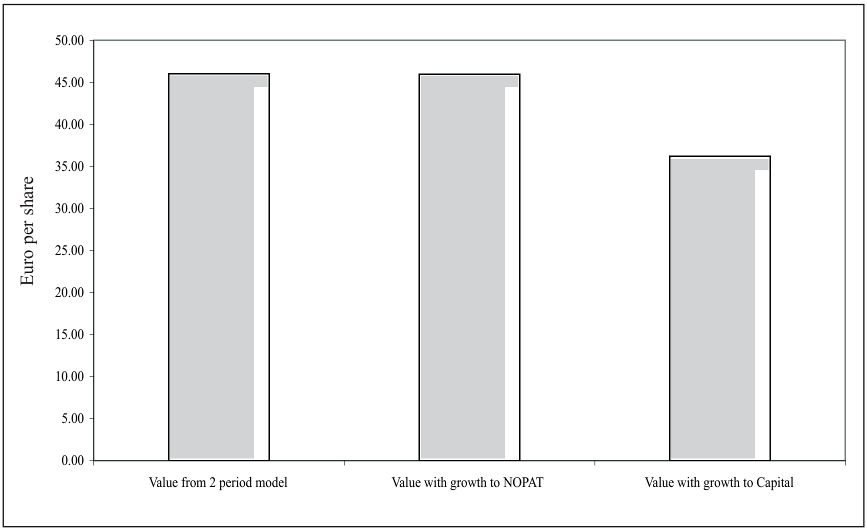
5.2 Three period Metro valuation model

Look back to page twelve of our Metro model, above. It comprised five years of forecast and a terminal value. We shall examine what happens to the value if we make exactly the same assumptions about the long term, incremental ROCE of 9 per cent and growth of 2 per cent, but instead of assuming that the Euro 11,107 million that is installed at end 2008 carries on producing a profit of Euro 1,237 million for ever (with only incremental capital earning the lower return of 9 per cent) we instead assume that the return on all capital fades over a ten year intermediate period, to 9 per cent. Moreover, we shall fade annual growth during the intermediate period gradually down to 2 per cent. But there will be two valuations using the three period model. The first will apply growth to NOPAT, and the second will apply growth to the capital base.

Before we look at the results, let us just consider, on the basis of the numbers on page twelve of the model, what one might expect to happen. In our two period base case from page twelve of the model, earnings growth slows from over 7 per cent per annum in 2008, to 2 per cent thereafter, a sharp drop. In the first fade, earnings growth fades slowly towards the 2 per cent rate, which it hits in 2018. The company makes an 11 per cent return on capital employed in 2008, almost 5 per cent above its cost of capital. In the base case, incremental investment in the terminus only earns 9 per cent, a reduction in the investment spread of some 40 per cent, but the existing installed capital continues to earn its 11 per cent rate. In the first fade, on the other hand, returns on all capital, including already installed capital, fades from 2008 onwards, and is 9 per cent by 2018. There is clearly a trade-off here. Compared with the base case, the first fade valuation will benefit from a longer period of higher earnings growth, but will suffer from a faster decline in overall return on capital.

Turing to the second fade, growth will here be applied to the capital base, and, again, return on overall capital will fade down to 9 per cent. But if you look back at page twelve of the model, Metro's capital base shrinks through our forecasts, and only grows slightly during 2011, which is the base for our fade. So, decline in ROCE is not going to be offset by a longer period of higher growth, since growth starts at less than 2 per cent, and slowly rises through our fade period. So we would expect our second fade valuation to be materially lower than the first. Let us look at the results in Exhibit 5.12.

Exhibit 5.12: Three values for Metro



As expected, the value from the first fade routine is very similar to the value we derived from our base case, two period model. The second routine produces a valuation which is some 10 Euros per share lower. This is a massive difference, and is entirely attributable to the fact that returns on capital that is installed by the end of the forecast period are projected to fall over the following decade, whereas in the two phase model it is explicitly assumed that profit is ongoing, and only new capital earns at a lower rate. Our first fade made the same assumption about ROCE, but offset it with relatively higher earnings growth throughout the ten year fade period.

So which is right? As a very general rule we would be inclined to suggest that there are relatively few businesses in which it is sensible to assume that the capital that is installed in five years time (or whenever) will continue to generate the same profit for ever, and only incremental capital will earn less. The principles underlying a fade seem more likely to be right for more businesses than those underlying a two phase model.

But when it comes to what to fade, how, and over what period, the choices are considerable, and it is important to realise how much they may matter. After all, we are making the same assumption about Metro's long-term growth rate and profitability in both fade routines, and one gives 46 and the other 36 Euros as a target price. In this particular case it seems to us more logical to assume that growth should apply to earnings. This is a consumer goods company, in which profit growth is driven by revenue expansion, and in which balance sheets follow, as the necessary capacity is installed. The opposite might apply to a mineral resources company, in which reserves and fixed assets are closely related, and, for any given price assumption, profit and revenue is a function of installed capacity, not the other way round.

So, as so often, we would recommend making the decision on company or industry specific grounds, rather than universally applying a single approach to any of the key questions. Two period models or three period models? How long should the fade be? Will growth or profitability fall at a fixed rate per year or at a compound rate of deceleration? And, last but very much not least, does the growth apply to profit, to capital, or even to revenue?

5.3 Three period models in general

Since a three period model merely comprises a longer explicit forecast period, of which part is based on our full accounting model, and a longer fade period is based on only a few line items, followed by a terminal value as usual, it can be combined with all the other approaches to valuation that we have discussed above or in earlier chapters. So, the adjusted present value approach that we discussed in Chapter 2 can also be used here, though we would need an assumed leverage and debt for each of the years in the fade period, and the same also applies to the time-varying WACC discussed above.

6. Conclusions regarding basic industrials

No company is that basic. Even Metro got us into difficulties regarding balance sheets and discount rates. But if the analysis above has any clear messages, we hope that they have come across as follows:

1. It is absolutely essential to understand the business that you are modelling. This often means pulling around the accounts, as for Danone or Skylark, especially for ‘asset light’ companies.
2. Understanding cyclicals is largely a matter of close interpretation of history. Whereas growth stocks are gambles on the future, the efficient analysis of cyclical companies is crucially dependent on understanding when and why their volumes, margins and working capital behave as they do.
3. Although discount rates may represent the most intellectually challenging subject for investment analysts, they are unlikely to be the most rewarding. Simple, common-sense treatment is often better than arcane calculations based on an unlikely and unpredictable future.

Chapter Six

The awkward squad

What makes them different?

The previous chapter showed how to apply investment theory and accounting practice to the building of forecasting models and the derivation of values. We also addressed some issues that arise frequently, such as companies with changing balance sheets, cyclical companies, growth companies, and 'asset light' companies. None of these required knowledge of additional accounting techniques, merely variants on our basic practice. This chapter addresses five types of company for which completely different accounting, modelling and valuation issues apply: regulated utilities, resource extraction companies, banks and insurance companies and lastly property companies. In each case, the differences start with the fundamental economics of the business, extend through the accounting for and modelling of the business, and have implications for the valuation techniques used. We shall therefore be required to mix discussion of accounting issues with discussion of modelling and valuation issues on a case by case basis as we proceed.

The interested reader should gain a reasonable understanding of the accounting, fiscal, valuation and (where relevant) regulatory issues needed to model and value companies in these sectors. But depending on his or her interest and needs, further specialist reading is likely to be required on whichever of the businesses the reader wishes to specialise. We include some recommendations, under 'Further Reading', at the end of this book.

1. Utilities

1.1 What makes utilities difficult?

One might have thought that regulated utilities would be simple to model on the basis that demand is usually fairly predictable, and that the fact that they are regulated should mean that the same applies to their cash flows and values, other than at times of regulatory uncertainty. In a way, they are, but complications arise for three main reasons, even in the case of companies that are 100 per cent regulated monopolies.

- Firstly, their regulatory balance sheets are not necessarily the same as their accounting balance sheets.
- Secondly, regulation does not guarantee a specific outcome if it takes the form of, for example, price caps.

- Thirdly, in Europe (though not in the USA), most regulation applied to current cost accounts, rather than to historical cost accounts.

Where groups comprise a mix of regulated and unregulated businesses, there is the usual issue as to whether or not disclosure is adequate to permit separate modelling. If companies have assets that are either dedicated to unregulated businesses, or have been disallowed by the regulator on the ground that they should not be included in the base for calculations of permitted tariffs, then this may or may not be transparent. And it is clearly a matter of judgement whether or not a company will exceed or fail to match the regulator's expectations regarding, for example, achievable reductions in unit costs. All of these things inevitably have to be assessed on a case by case basis.

We shall concentrate on the third point, since if the connections between current cost accounting and historical cost accounting, and the issues that the former poses for valuation, are not understood then no amount of understanding of the business issues will result in accurate valuations.

1.2 'The past is another country' (L.P. Hartley)

In this chapter, we are going to refer to historical cost accounting (what we have been using so far) as HCA and to current cost accounting (which adjusts for inflation) as CCA. Readers should be aware that there are two possible approaches to CCA accounting.

The simplest, but one which is not use by utilities, is to adjust all historical figures upwards to bring them into line with current purchasing power. It is the equivalent of using year end exchange rates for translation of foreign balance sheets. In the same way that hyperinflation grows the accounts of a subsidiary in the relevant country, and they then shrink back again when we apply the new exchange rate, so apparently high growth rates shrink if we inflate historical numbers to reflect their then purchasing power. This approach is referred to, appropriately enough, as current purchasing power (CPP) accounting.

The alternative, which is much more complicated, but which is generally used by European utilities, is to adjust accounting items into line with estimated replacement cost. Under replacement cost accounting (RCA), fixed assets are carried at a value that reflects their depreciated replacement cost. In practice, it is the valuation and depreciation of the fixed assets that represent the main adjustment to replacement cost accounting, though there are two others. Firstly, the components of working capital should also be revalued at current cost. Other than at times of hyperinflation, the effect is likely to be small. Secondly, to the extent that the company has debt in its balance sheet, the real value of this is eroded by inflation, resulting in a profit.

In our discussion of CCA accounts we shall, for simplicity, concentrate only on fixed assets, and we shall ignore leverage and model a dummy company on an unleveraged basis. For real companies with complex balance sheets the reader would probably find our discussion hard to follow, though all of the same points would apply. Given the simplification, we shall refer to the increase in the replacement cost of fixed assets as ‘inflation’, though the reader should be aware that it need not equate to changes in the retail price index.

1.2.1 Why use CCA accounts?

Given that the EU member states, the USA and Japan at least have now enjoyed low levels of inflation (or, in the case of Japan, deflation) for many years, it is legitimate to ask why utilities are generally regulated using a real, rather than nominal, approach. The reason is that the fixed asset life of the relevant assets often extends to decades. Even at a rate of inflation of only two or three per cent, the difference between the purchase cost and the eventual replacement cost of a gas pipeline with a life of perhaps thirty years is extremely high. It would be palpably unfair to shareholders to only permit them a fair return on the former, if they are to be expected to finance maintenance of the business out of internally generated funds. So, whatever the mode of regulation adopted, European regulators almost always structure their regulation with respect to a real, rather than a nominal, assumed cost of capital, and with regard to projected current cost, rather than historical cost, accounts.

1.3 How does regulation work?

In addition to the use of real or nominal returns, European and US regulators also differ in the model of regulation that they tend to adopt. In both cases, the modern convention is to attempt to separate what used to be vertically integrated monopolies between the elements that can be exposed to competition and those that cannot. So, in the power industry, generation of electricity is a business in which it is reasonable to attempt to establish competition and then to let market mechanisms determine prices, whereas the transmission and distribution of power comprises a series of natural monopolies, which will need to be regulated if they are not to exploit their pricing power.

We are really concerned here with the natural monopolists, the owners of wires, pipes and telephone lines, whose businesses are and are likely to remain monopolies, subject to price regulation. They may or may not be owned by groups that also operate in the competitive parts of the chain. In some cases this is precluded by regulation. In others, arm’s length transactions within a vertically structured group are permitted.

Where the transatlantic difference comes is that in the USA regulatory boards have tended to specify a permitted return on the companies, whereas in Europe regulators have tended to adopt a price-cap of the form ‘RPI-x’. The former explicitly determines profitability. The latter does not, in that if the company exceeds or fails to achieve expected operating costs, then it will earn more or less than the targeted return on capital.

There is a case to be made either way, but it is not one that we shall address in this book. Our model will jump straight to profits and cash flows, and will ignore revenues and operating costs, but it should be borne in mind when modelling that if a given price formula has been set with the intention of permitting a given target return on capital then the regulator is assuming that the combination of the price cap, expected volumes and expected cash operating costs will result in cash flows from operations and profits that will be consistent with the target return. The price has been set by starting at the bottom, with the implied level of profit, and then adding back assumed costs (which may require the company to restructure if they are to be achieved) to derive an implied revenue stream, which in turn determines the price cap.

1.4 Implications for models

In Chapter three we addressed the difference between an accounting return on capital employed (ROCE) and an economic internal rate of return (IRR). We made the point that they will tend to be greatest for companies with assets that have a long life and a steadily rising stream of income through the asset life. We also pointed out that for many companies it is more or less acceptable to assume that with a portfolio of assets of varying age then the overall company ROCE more or less approximates to the IRR of its assets.

Unfortunately, utilities represent exactly the sort of company for which this assumption is least true. In addition, the relationship between accounting and economic returns may look rather different, depending on whether we are looking at nominal or real (HCA or CCA) numbers. Finally, given that they are stable and regulated industries it is important for us to be precise in exactly the area where up to now we have been content to accept some inconsistencies. So the rest of this section on utilities is aimed at ensuring that you are confident with the connection between HCA and CCA accounts, and that you know how to translate both into values.

1.4.1 Assets and cash flows

As with the discussion of the Metro model in the previous chapter, we reproduce altogether the full model that we shall be discussing, and then refer back to its individual pages in the text that follows. As with Metro, in Exhibit 6.1 we have followed the convention of boxing the figures that are inputs, and of using italics for percentages. Key lines and totals have been emboldened.

Exhibit 6.1: Current cost accounts model

1. HCA accounts

Inflation	5.00%
Asset life (years)	3.0
Real cash on cash return	39.71%

Year	**0**	**1**	**2**	**3**	**4**	
Cash flows						
Capital expenditure	(100.00)	(105.00)	(110.25)	(115.76)	(121.55)	*5.0%*
Cash flow from Year 0 capex	0.00	41.69	43.78	45.97	0.00	*-100.0%*
Cash flow from Year 1 capex	0.00	0.00	43.78	45.97	48.27	*5.0%*
Cash flow from Year 2 capex	0.00	0.00	0.00	45.97	48.27	*5.0%*
Cash flow from Year 3 capex	0.00	0.00	0.00	0.00	48.27	*na*
Total cash flow from operations	**0.00**	**41.69**	**87.56**	**137.90**	**144.80**	***5.0%***
Net cash flow	(100.00)	(63.31)	(22.69)	22.14	23.25	*5.0%*
HCA gross balance sheet						
Opening gross capital	0.00	100.00	205.00	315.25	331.01	*5.0%*
Capital expenditure	100.00	105.00	110.25	115.76	121.55	*5.0%*
Retirements	0.00	0.00	0.00	(100.00)	(105.00)	*5.0%*
Closing gross capital	**100.00**	**205.00**	**315.25**	**331.01**	**347.56**	***5.0%***
Cumulative depreciation	0.00	33.33	101.67	106.75	112.09	*5.0%*
Cum depr/gross closing capital	*0.00%*	*16.26%*	*32.25%*	*32.25%*	*32.25%*	
HCA net balance sheet						
Opening net capital	0.00	100.00	171.67	213.58	224.26	*5.0%*
Capital expenditure	100.00	105.00	110.25	115.76	121.55	*5.0%*
Depreciation	0.00	(33.33)	(68.33)	(105.08)	(110.34)	*5.0%*
Closing net capital	**100.00**	**171.67**	**213.58**	**224.26**	**235.48**	***5.0%***
HCA profit and loss account						
Cash flow from operations	0.00	41.69	87.56	137.90	144.80	*5.0%*
Depreciation	0.00	(33.33)	(68.33)	(105.08)	(110.34)	*5.0%*
Profit	**0.00**	**8.36**	**19.22**	**32.82**	**34.46**	***5.0%***
HCA ROCE						
Profit	0.00	8.36	19.22	32.82	34.46	*5.0%*
Opening capital	0.00	100.00	171.67	213.58	224.26	*5.0%*
ROCE	***0.00%***	***8.36%***	***11.20%***	***15.37%***	***15.37%***	

2. CCA accounts

Inflation	2.50%
Asset life (years)	3.0
Real cash on cash return	39.71%

Year	**0**	**1**	**2**	**3**	**4**	
CCA gross balance sheet						
Opening gross capital	0.00	100.00	210.00	330.75	347.29	*5.0%*
Capital expenditure	100.00	105.00	110.25	115.76	121.55	*5.0%*
Retirements	0.00	0.00	0.00	(115.76)	(121.55)	*5.0%*
Cl gross cap before inflation adj	100.00	205.00	320.25	330.75	347.29	*5.0%*
Inflation adjustment	0.00	5.00	10.50	16.54	17.36	*5.0%*
Closing gross capital	**100.00**	**210.00**	**330.75**	**347.29**	**364.65**	***5.0%***
Cumulative depreciation	0.00	34.15	106.67	112.00	117.60	*5.0%*
Cum depr/gross closing capital	*0.00%*	*16.26%*	*32.25%*	*32.25%*	*32.25%*	
CCA net balance sheet						
Opening net capital	0.00	100.00	175.85	224.08	235.29	*5.0%*
Capital expenditure	100.00	105.00	110.25	115.76	121.55	*5.0%*
Depreciation	0.00	(34.15)	(72.52)	(121.10)	(127.15)	*5.0%*
Inflation adjustment	0.00	5.00	10.50	16.54	17.36	*5.0%*
Closing net capital	**100.00**	**175.85**	**224.08**	**235.29**	**247.05**	***5.0%***
CCA profit and loss account						
Cash flow from operations	0.00	41.69	87.56	137.90	144.80	*5.0%*
Depreciation	0.00	(34.15)	(72.52)	(121.10)	(127.15)	*5.0%*
Profit	**0.00**	**7.55**	**15.04**	**16.81**	**17.65**	***5.0%***
CCA ROCE						
Profit	0.00	7.55	15.04	16.81	17.65	*5.0%*
Opening capital	0.00	100.00	175.85	224.08	235.29	*5.0%*
ROCE	***0.00%***	***7.55%***	***8.55%***	***7.50%***	***7.50%***	
Reconciliation						
CCA profit	0.00	7.55	15.04	16.81	17.65	*5.0%*
Supplementary depreciation	0.00	0.81	4.19	16.01	16.81	*5.0%*
HCA profit	0.00	8.36	19.22	32.82	34.46	*5.0%*

3. Nominal cash flows

Year	0	1	2	3	4	5	6	7
Nominal								
Year 0 capex cash flows	(100.00)	41.69	43.78	45.97				
Opening NPV		100.00	73.06	40.06				
Closing NPV	100.00	73.06	40.06	0.00				
Impairment		(26.94)	(33.00)	(40.06)				
Profit		14.75	10.78	5.91				
Nominal IRR	***14.75%***	***14.75%***	***14.75%***	***14.75%***				
Year 1 capex cash flows		(105.00)	43.78	45.97	48.27			
Opening NPV			105.00	76.71	42.06			
Closing NPV		105.00	76.71	42.06	0.00			
Impairment			(28.29)	(34.65)	(42.06)			
Profit			15.49	11.32	6.20			
Nominal IRR		***14.75%***	***14.75%***	***14.75%***	***14.75%***			
Year 2 capex cash flows			(110.25)	45.97	48.27	50.68		
Opening NPV				110.25	80.55	44.16		
Closing NPV			110.25	80.55	44.16	0.00		
Impairment				(29.70)	(36.38)	(44.16)		
Profit				16.26	11.88	6.52		
Nominal IRR			***14.75%***	***14.75%***	***14.75%***	***14.75%***		
Year 3 capex cash flows				(115.76)	48.27	50.68	53.21	
Opening NPV					115.76	84.57	46.37	
Closing NPV				115.76	84.57	46.37	0.00	
Impairment					(31.19)	(38.20)	(46.37)	
Profit					17.08	12.48	6.84	
Nominal IRR				***14.75%***	***14.75%***	***14.75%***	***14.75%***	
Year 4 capex cash flows					(121.55)	50.68	53.21	55.87
Opening NPV						121.55	88.80	48.69
Closing NPV					121.55	88.80	48.69	0.00
Impairment						(32.75)	(40.11)	(48.69)
Profit						17.93	13.10	7.18
Nominal IRR					***14.75%***	***14.75%***	***14.75%***	***14.75%***

4. Adjusted HCA accounts

Year	0	1	2	3	4
Adjusted balance sheet					
Opening net capital	0.00	100.00	178.06	227.02	238.37
Capital expenditure	100.00	105.00	110.25	115.76	121.55
Impairment	0.00	(26.94)	(61.29)	(104.41)	(109.63)
Closing net capital	**100.00**	**178.06**	**227.02**	**238.37**	**250.29**
Cash flow from operations		41.69	87.56	137.90	144.80
Adjusted profit		14.75	26.27	33.49	35.17
Return on opening capital employed		***14.75%***	***14.75%***	***14.75%***	***14.75%***

5. Nominal valuation

					Terminus
Year	**1**	**2**	**3**	**4**	**5**
Profit	8.36	19.22	32.82	34.46	36.18
Opening capital	100.00	171.67	213.58	224.26	235.48
Net cash flow	**(63.31)**	**(22.69)**	**22.14**	**23.25**	**24.41**
ROCE	*8.36%*	*11.20%*	*15.37%*	*15.37%*	*15.37%*
Discount rate	*14.75%*	*14.75%*	*14.75%*	*14.75%*	*14.75%*
Economic profit	**(6.39)**	**(6.10)**	**1.31**	**1.38**	**1.44**
DCF valuation					
4 year net cash flow	(44.34)				
Terminal value	144.34				
Enterprise value	**100.00**				
Economic profit valuation					
Opening capital	100.00				
4 year economic profit	(8.54)				
Terminal value	8.54				
Enterprise value	**100.00**				

6. Real cash flows (Year 0 money)

Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Year 0 capex cash flows	(100.00)	39.71	39.71	39.71				
Opening NPV		100.00	69.58	36.33				
Closing NPV	100.00	69.58	36.33	0.00				
Impairment		(30.42)	(33.25)	(36.33)				
Profit		9.29	6.46	3.37				
Nominal IRR	***9.29%***	***9.29%***	***9.29%***	***9.29%***				
Year 1 capex cash flows		(100.00)	39.71	39.71	39.71			
Opening NPV			100.00	69.58	36.33			
Closing NPV		100.00	69.58	36.33	0.00			
Impairment			(30.42)	(33.25)	(36.33)			
Profit			9.29	6.46	3.37			
Nominal IRR		***9.29%***	***9.29%***	***9.29%***	***9.29%***			
Year 2 capex cash flows			(100.00)	39.71	39.71	39.71		
Opening NPV				100.00	69.58	36.33		
Closing NPV			100.00	69.58	36.33	0.00		
Impairment				(30.42)	(33.25)	(36.33)		
Profit				9.29	6.46	3.37		
Nominal IRR			***9.29%***	***9.29%***	***9.29%***	***9.29%***		
Year 3 capex cash flows				(100.00)	39.71	39.71	39.71	
Opening NPV					100.00	69.58	36.33	
Closing NPV				100.00	69.58	36.33	0.00	
Impairment					(30.42)	(33.25)	(36.33)	
Profit					9.29	6.46	3.37	
Nominal IRR				***9.29%***	***9.29%***	***9.29%***	***9.29%***	
Year 4 capex cash flows					(100.00)	39.71	39.71	39.71
Opening NPV						100.00	69.58	36.33
Closing NPV					100.00	69.58	36.33	0.00
Impairment						(30.42)	(33.25)	(36.33)
Profit						9.29	6.46	3.37
Nominal IRR					***9.29%***	***9.29%***	***9.29%***	***9.29%***

7. Adjusted CCA accounts (Year 0 money)

Year	0	1	2	3	4
Adjusted balance sheet					
Opening net capital	0.00	100.00	169.58	205.91	205.91
Capital expenditure	100.00	100.00	100.00	100.00	100.00
Impairment	0.00	(30.42)	(63.67)	(100.00)	(100.00)
Closing net capital	**100.00**	**169.58**	**205.91**	**205.91**	**205.91**
Adjusted profit					
Cash flow from operations		39.71	79.42	119.13	119.13
Profit		9.29	15.75	19.13	19.13
Return on opening capital employed		***9.29%***	***9.29%***	***9.29%***	***9.29%***
Reconciliation					
Real IRR	*9.29%*				
Nominal IRR	*14.75%*				
Implied inflation	*5.00%*				

8. Real valuation

Year	1	2	3	4	Terminus 5
CCA profit	7.55	15.04	16.81	17.65	18.53
CCA inflation adjustment	5.00	10.50	16.54	17.36	18.23
CCA profit plus inflation adjustment	12.55	25.54	33.34	35.01	36.76
Opening capital	100.00	175.85	224.08	235.29	247.05
Net cash flow	**(63.31)**	**(22.69)**	**22.14**	**23.25**	**24.41**
ROCE	*12.55%*	*14.52%*	*14.88%*	*14.88%*	*14.88%*
Nominal discount rate	*14.75%*	*14.75%*	*14.75%*	*14.75%*	*14.75%*
Economic profit	**(2.20)**	**(0.40)**	**0.29**	**0.30**	**0.32**
DCF valuation					
4 year net cash flow	(44.34)				
Terminal value	144.34				
Enterprise value	**100.00**				
Economic profit valuation					
Opening capital	100.00				
4 year economic profit	(1.87)				
Terminal value	1.87				
Enterprise value	**100.00**				

The first page of this model derives projected historical cost accounts for a company which plans to make an investment of 100 at the end of Year 0, and whose investments grow at 5 per cent annually thereafter, this merely representing the inflation rate. So once the company is mature it will not grow but will merely maintain itself. To keep the spreadsheet manageable, the asset life is set at three years (it could be ten times that in reality), so by Year 4 we have a mature company, which should simply be growing in line with inflation.

Each annual investment is permitted by the regulator to generate a stream of cash which begins at 39.71 per cent of the original investment (we shall explain this odd figure below), and which grows annually with inflation. So the initial 100 investment in Year 0 generates 39.71 * 1.05 = 41.69 in Year 1, and 5 per cent more in each subsequent year of its life. It is retired at the end of Year 3. The cash flow calculations culminate with a calculation of cash flow from operations and of net cash flow (cash flow from operations minus capital expenditure). By Year 4, the company is mature, and both are growing at 5 per cent annually.

1.4.2 HCA accounts

Now, we need to convert these cash flows into balance sheets and profit and loss accounts. Starting with gross assets, these grow each year with capital expenditure, but in Year 3, that year's expenditure is offset by the retirement of the investment made in Year 0. So, by Year 4, gross assets are also expanding at 5 per cent annually, as one third of the balance sheet is uplifted by 15 per cent (three years' worth of inflation). Net assets in the balance sheet also grow with capital expenditure, but are reduced by an annual depreciation charge, which is the opening gross asset figure, divided by the asset life, in this case by three. The cumulative depreciation charge is the difference between closing gross assets and closing net assets, and grows each year by the difference between depreciation and retirements (when an asset is retired it drops out of gross assets and cumulative depreciation). With a three year asset life, after two years the proportion of gross assets that have been depreciated is a stable number. There will always be two partly depreciated assets and one un-depreciated asset in the balance sheet at the end of each future year.

Profit is simply cash flow from operations minus depreciation, and return on opening capital is profit divided by opening capital (which, in this model, merely comprises fixed assets as there is no working capital).

1.4.3 CCA accounts

The second page of Exhibit 6.1 takes the same cash flows and converts them into current cost account. As with the HCA numbers, we capitalise capital expenditure. But when we calculate the closing balance sheet figure for gross fixed assets, we include an adjustment for inflation, to increase the opening figure by the rate of inflation. Then, when we retire assets, we retire them at the current equivalent of their purchase cost, so the 100 that we spent in Year 0 is retired as $100*1.05^3 = 115.76$ when it drops out of the gross assets in Year 3.

The net assets in CCA accounts are derived by looking at the ratio of net to gross assets in the HCA accounts and applying it to the gross replacement cost assets. Then since we know the opening value, the closing value and the capital expenditure, we can derive depreciation as a result. So, at end Year 2, cumulative depreciation (from the HCA accounts) comprises 32.25 per cent of gross assets, so in the CCA accounts if gross assets comprise 330.75 then cumulative depreciation must be 106.67. Closing net assets must be 330.75 - 106.67 = 224.08. Now, if we know that opening net assets were 175.85, closing net assets were 224.08 and capital expenditure was 110.25, then by deduction the annual depreciation charge for the year is 72.52.

As with HCA accounts, CCA profit is cash flow minus CCA depreciation and return on opening capital is CCA profit divided by opening CCA capital. Notice that the return on capital employed stabilises at exactly 7.5 per cent. That is where our rather eccentric looking ‘real cash on cash return’ number comes from. It is the figure for real cash return on cash investment that would provide the company with a 7.5 per cent CCA return on capital assuming a three year asset life. In reality, the regulator would not set the cash flow directly, as we have discussed, but would set a price cap such as to generate expected cash flows that are consistent with the target return.

The reconciliation between the HCA and the CCA profit numbers is the difference between the two depreciation charges, the ‘supplementary depreciation’ in the CCA accounts. But there is an important difference between the two accounts to which we shall return. For the HCA accounts, clean value accounting holds. So, for example, in Year 1, capital grows from 100.00 to 171.67, and the net investment of 71.67 equals capital expenditure of 105.00 minus depreciation of 33.33 (net investment), which in turn equals profit of 8.36 plus negative net cash flow (new capital) of 63.31. But these relationships do not hold in CCA accounts. The reason is the inflation adjustment.

> Capital grows each year by more than net investment or the sum of profit and negative cash flow. Clean value accounting does not hold. This will have strong implications for how our valuation methodology will have to work, if we are running off CCA accounts.

1.4.4 Economics HCA-style

The third page of Exhibit 6.1 illustrates the individual cash flows generated by each of the four years’ of capital expenditure in our forecasts. This exercise has two purposes. The first is to demonstrate what the economic rate of return is. The

IRR of 14.75 per cent compares with an apparent return of 15.37 per cent from the first page. The second purpose is to work out what the impairment of value of the company's assets is each year. If we do this and aggregate the figures for each year, then we get a set of numbers that we can substitute for depreciation, to derive a more meaningful set of accounts. This is done on page four of the model.

In this calculation, adjusted net capital grows with investment and shrinks with impairment of value. Adjusted profit is cash flow from operations less impairment of value. Return on capital every year is 14.75 per cent, so if we were to value this company using 14.75 per cent as a discount rate it would generate zero economic profit each year, and be worth its opening balance sheet value of 100. As clean value accounting holds, a DCF would also arrive at the same result.

1.4.5 Valuing the HCA accounts

Suppose that we had only the consolidated HCA accounts to work from, and could not reconstruct individual cash flows by asset or by annual investment (which one would not normally be able to do from outside a company). Then we should be working from the consolidated cash flows, profits and balance sheets from page one in Exhibit 6.1. Let us start with the cash flows. If we know that the company will be mature after four years and will then just grow its net cash flow in line with inflation of 5 per cent annually, we have a simple stream of cash flow to discount.

Turning to the profits and balance sheets, we know that if clean value accounting applies, then we know from Chapter one that we must always get the same answer out of an economic profit model and a DCF model, so a valuation based on the stated profits and balance sheets must yield the right same answer as the DCF.

Let us try it. On page five of Exhibit 6.1 we have extracted the profits, balance sheets and net cash flows from page one. To begin with, let us assume that we knew that the IRR that the company was really making on its projects was 14.75 per cent, as opposed to the 15.37 per cent ROCE, and use 14.75 as the discount rate. The DCF value at start Year 1 comes out at precisely 100, which is what one would expect if the company earns precisely its cost of capital. New investments do not add value and we are worth the 100 that we have already spent. The figures in the terminus are just the Year 4 figures grown for inflation.

Let us try to value the company again using the economic profit model. The terminal value in the economic profit model can be calculated as just the economic profit from the terminus divided by 14.75% - 5.00% (WACC minus growth, the Gordon Growth model) as we are assuming that returns on new capital will be the same as that on old capital (see Chapter five on terminal values in economic profit models). There is no question of earning different returns on incremental capital. As with the DCF, the model has correctly derived a fair value of 100, and by implication it has correctly put a value of zero on the stream of future economic profit. All that is happening is that returns are underestimated in the first two years and overestimated after that. The two effects cancel out.

But the crucial point here was that we knew that the appropriate discount rate was 14.75 per cent. Suppose instead that we were valuing a US utility where the regulator was using accounting returns as a proxy for economic returns (which it probably would) so that we were all using the assumption that the company was generating returns of 15.37 per cent on its assets.

Substituting this discount rate results in a valuation of 88.50 (again, for both methodologies). The valuation is being understated if the valuer follows the regulator in taking the ROCE to be a proxy for the IRR. The valuation shows the company to be worth less than its regulatory asset base (the 100 of sunk investment at end Year 0), which would be perverse, if it were being permitted to earn its cost of capital.

1.4.6 Economics CCA-style

The easiest way to model real projected cash flows is to convert them all into Year 0 money, so that the Year 1 numbers are discounted for one year's worth of inflation, Year 2 for two years' worth, and so on.

Page six of the model does this and allows us to make the same calculations as we did in page three for the nominal figures. Firstly, the calculations show us that the real IRR on our investments is 9.29 per cent, which compares with the 7.5 per cent real ROCE that we see in the CCA accounts. Thus in this case the accounts are seriously understating the actual profitability that we are achieving, rather than overstating it as in the HCA calculations.

Secondly, if we are prepared to stay in Year 0 money then we can produce adjusted profits and balance sheets CCA, as we did on page four for the HCA accounts. These are shown on page seven of Exhibit 6.1, and they illustrate the following points. Firstly, as with the HCA equivalents, the calculated CCA ROCE each year is 9.29 per cent, which we know to be the correct IRR. Secondly, an economic profit model would therefore value the company at 100 as at start Year 1. Thirdly, as clean value accounting applies, a DCF model would necessarily do the same.

Incidentally, to understand the reconciliation between the real and the nominal returns, you need to remember that returns compound, so that 1.0929 (real IRR) times 1.05 (inflation) equals 1.1475 (nominal IRR).

1.4.7 Valuing the CCA accounts

Now suppose that you are valuing a company for which the published accounts are the consolidated CCA figures from page two of Exhibit 6.1. There are a couple of seductive but horribly wrong things that you could do, and we look first at the wrong and then at the right approaches below.

1. An obvious mistake would be to take the net cash flows, grow them in the terminus at 5 per cent annually, and then discount them at a real discount rate. If we use the 7.5 per cent target CCA return on capital we get a value for the enterprise of 687.77, which has the merit of being very obviously wrong!
2. Since how the company accounts cannot alter its cash flows, it follows that if we are going to value the company by discounting its net cash flows the discount rate that we should use is the nominal rate of 14.75 per cent, even if we are applying it to cash flows derived from a CCA model in which the forecasts have been obtained by assuming a real rate of return on replacement cost assets.
3. Another superficially attractive way to value the company would be to use an economic profits model and to use a real discount rate. Unfortunately, as we have seen in page two, the projected returns on capital are in all years lower than the real discount rate of 9.29 per cent. In fact, running an economic profit valuation on this basis gives a negative intrinsic value for the enterprise of -41.11, which again has the sole merit of being obviously wrong! The culprit is the breakdown in clean value accounting.

Clean value accounting implies that balance sheet growth must equal net investment, which must equal profit plus negative net cash flow (new capital). So we have to add back the inflation adjustment, which of course means that the returns on capital that we derive are again now nominal. Look at page eight. We are correctly deriving a value of 100 by applying a nominal discount rate of 14.75 per cent to returns that include the inflation adjustment. The pattern of economic profit is, however, different from that calculated in page five, because the inflation adjustments are providing a better picture of value creation than the HCA accounts did, with their straight line depreciation. However, it is still not perfect. We still have a small negative value creation in the first four years perfectly offset by a positive terminal value of 1.87. To apply economic profit to CCA accounts you must include the inflation adjustment in the calculation of NOPAT, and then discount the resulting economic profit at the nominal cost of capital.

1.5 Conclusions for modelling utilities

To explain the accounting and modelling points that relate to CCA accounts, which are not intuitively obvious, we have had to take recourse to a rather simple company. It has no working capital and is entirely funded by equity. Its asset life is three years. It does not grow. And we were able to construct its accounts from underlying cash flows based on discrete annual investments, to ensure that we had the proper discount rate. We have ignored tax. None of this is likely to apply when you find yourself modelling a real utility.

But the principles are the same. If the company is regulated on the basis of a target real return on replacement cost capital, then it makes sense to model its forecast accounts on that basis, driving the forecasts off that accounting return, or something slightly higher or lower in the event that you believe the company can beat, or will not achieve, the required cost cutting. This will end up producing a set of forecast CCA accounts.

Your can then, as usual, either value the company by discounting its cash flow or by discounting its economic profit. The counterintuitive fact here is that either way you must use a nominal, not a real, discount rate. For an economic profit model the inflation adjustment (or adjustments, if there are working capital and gearing adjustments as well as inflation of the fixed assets) must be included in the NOPAT and ROCE calculations.

1.6 What discount rate to use?

Most regulation does not work on the basis of IRRs. Regulators estimate the real cost of capital (or nominal in the USA) and apply it as a target ROCE, even if this is in theory not quite right. Look back to page eight. If we use a real 7.5 per cent and then convert that to a nominal return of 1.075 * 1.05 = 1.12875, and then plug 12.875 per cent into our valuation model, the resulting enterprise value is 146.77. This would be the correct valuation for the enterprise if we agreed with the regulator that its real cost of capital is 7.5 per cent. We would go from the CCA forecasts on page two to the valuation including inflation adjustments on page eight, with a discount rate of 12.875 per cent, instead of a discount rate of 14.75 per cent. The company would be worth a 46 per cent premium over its asset base because its IRRs would represent a substantial spread over its WACC, even if this was not evident in its ROCE.

In practice, most utilities are valued using forecasting models that run off the regulatory regime and assumptions about volumes, cost-cutting, etc, but the valuation routines used generally derive their WACC from application of the standard CAPM methodology with measured Betas and an assumed equity risk premium. There is no obligation on the valuer to agree with the regulator's estimate of the cost of capital. And, ironically, one of the risks to a regulated utility is that the calculations on which its regulation is based will go out of date during the period of perhaps five years that the regulatory regime runs before a subsequent review. So, in practice, we should certainly not use a discount rate of 12.875 per cent, but it is quite unlikely that we would use 14.75 per cent either. A real company earns different and changing returns on different assets, so no attempt to calculate a corporate IRR (or, CFROI) will be perfect. And even if we knew the number there is no reason to assume that this is the discount rate that investors actually require as a cost of capital.

As a final note on regulators and costs of capital, we would also point out that European regulators tend to target a real, pre-tax return on capital. They derive a real, pre-tax cost of capital by calculating the nominal cost of debt and equity in the normal way, and then convert this to a real number. As usual, this is an after corporation tax figure, so it has to be 'grossed up' to derive a pre-tax number. But the marginal rate of tax does not in fact apply to current cost profits. It applies to taxable profits based on historical cost accounts. And, as we have seen in our discussions of deferred taxation, the economic tax wedge is usually quite different (often lower) from the statutory rate of corporation tax. This all means that the regulators' calculations of the real cost of capital are highly questionable, even before we get to the fact that targeting ROCEs is not the same as targeting IRRs.

1.7 IFRS and the utilities industry

The transition to IFRS will have important implications for the regulated utilities sector. For the first time government based accounting will have to be supplanted with investor friendly GAAP. We have outlined below some of the areas of importance:

1.7.1 Asset capitalisation

The assets of a utility may be owned by the government or directly owned by the utility company for a period of time prior to being returned to the government. The recognition (or not) of these assets will reflect the detailed substance of the agreement between the government and the service provider. For example, if the asset is merely used by the utility company and the key risks rest with the government then it would appear highly likely that the asset would not be recognised on the company's balance sheet. If an asset were to be recognised then the depreciation period would be a function of the period over which the utility company is expected to use the asset.

1.7.2 Licences

If a utility corporation purchases the right to use the asset from the government then it will be recognised as an intangible asset.

1.7.3 Decommissioning costs

One of the key challenges for companies in these industries is to deal with future 'dismantling' costs. These costs are difficult to identify and are not required to be paid for a very long period. Under IFRS, the best estimate of the cost of decommissioning is added to the cost of the asset. The other entry is to establish a provision. The provision is thus established but not yet expensed. Instead the 'expense' is achieved by virtue of higher depreciation on the higher cost. The provision estimate is also discounted to present value. This is unsurprising given that IFRS do tend to require discounting of long-term provisions (e.g. decommissioning costs) as it is in these cases where it is material.

In summary the entries that will flow through the financials will be:

- Estimate a provision for future asset retirement obligations and;
    1. increase the cost of fixed assets by the present value of this estimate;
    2. record the provision at the same amount.
- Depreciate the asset (including the decommissioning cost component) as normal over its useful life.
- Accrete the provision over its 'life' to the undiscounted amount. This is achieved by charging an annual interest cost.

1.7.4 Concession accounting

There is no extant IFRS on concession accounting, yet this is a crucial issue in a sector that obtains its permission to operate (the concession to operate) from the government. The IASB is currently debating this issue. The following are the key questions that are being debated:

- Who owns the fixed asset (building on the comments above)?
- If not ownership what is the nature of the relationship?
- How can concession contracts be separated? (They contain hugely complex and divergent clauses.)
- Which model of accounting should drive the treatment?
    1. Model 1: Intangible asset mode – concession is treated as an intangible.
    2. Model 2: Receivable model – operator recognises the construction revenues as the asset is built and remaining revenues as earned. No fixed asset is recognised.
    3. Model 3: Physical asset model – recognise the constructed asset on balance sheet.

1.7.5 Emission rights

Utility companies are often allocated (e.g. by a government) emission rights. These rights come with a target level (so called 'cap') and companies are allowed to trade the rights attached. (The schemes are often referred to as 'cap and trade'). Some of the key issues are:

- **Should an asset be recognised?**
  An asset should be recognised when the rights were received, and it should be classified as an intangible asset.
- **What value should be ascribed to the asset?**
  The asset should initially be recognised at cost where there was a cost or at fair value where there was no initial cost.
- **Should the asset be revalued?**
  Initially the IASB's thinking was that the asset should not be subsequently remeasured at fair value; however they noted the staff's concerns around potential mismatches between recording the asset at cost and remeasuring to fair value at each reporting date any emission liabilities recognised under IAS 37; in early 2004 the IASB's IFRIC committee decided that emission rights and liabilities should be measured at fair value, with changes in value recognised in profit and loss.
- **If an asset is recorded what would the other entry be?**
  When an asset is recognised, a liability should be recognised in the amount of the minimum obligation assumed by accepting the asset.
- **Will such a value always be the same as the asset value above?**
  If not how will it balance? These two amounts (from last point above) would differ in each situation, and consequently the asset and liability would not necessarily be recognised initially at the same value. To the extent the initial values of the asset and liability differed, IFRIC believed the remaining credit should be treated as deferred income under IAS 20, *Accounting for Government Grants and Disclosure of Government Assistance* (i.e. treated as a government grant).

2. Resource extraction companies

2.1 Selling fixed assets: creative destruction

Although we are going to concentrate on oil, all resource extraction companies present the same accounting and valuation challenges. To be accurate, it is the upstream, exploration and production, end of oil companies that represent the challenges. The downstream, refining and marketing, businesses are very similar to other cyclical companies, so we shall ignore them here, and concentrate on an exploration and production company.

Put in a nutshell, what is odd about resource extraction companies is that they sell their fixed assets. Most companies do not. They employ fixed assets to add value to raw materials, and what is sold is a finished product or service. But what a resource extraction company sells is barrels of oil, millions of cubic feet of gas, or tonnes of coal or some metal. It is therefore constantly liquidating itself, and in the absence of development of additional reserves would simply liquidate itself into a large pile of cash. On the other hand, it will tend to be extremely cash generative, the question being how much of the cash flow from operations is really free and how much needs to be ploughed back to maintain the resource base.

Accounting for resource extraction companies explicitly reflects their oddity, in that they do not depreciate their reserves. They deplete them. The difference is that instead of applying straight line depreciation, reserves are depleted on a unit of production basis. The rate applied per unit is the total relevant capitalised cost divided by the recoverable reserve, and it may be calculated by asset or using wider cost-pools.

Because the asset life of a company's reserves may be large (10 to 15 years for oil companies, 20 to 30 years for mineral and mining companies are not uncommon), the accrued profit during a single year is a more than usually useless figure. Imagine a company that produced lots during the year but that found and developed no new reserves. It would look very profitable, but would merely have converted what started the year as a reserve base into an amount of cash. The profit would have been offset by a fall in the value of its remaining reserves. If one were to calculate value added as profit minus the fall in the value of the reserves then the resulting figure would merely reflect the unwinding of the discount rate for one year, not an impressive result.

On the other hand, suppose that a resource extraction company made a significant discovery of new reserves during a particular year. Development lead times are such that it would have no positive impact on the profit and loss account for several years after the discovery was made. But the value would have been added at the point of the discovery.

This second feature of resource extraction companies has strong implications for how we should measure their performance, and how we should value them. The difference between internal rates of return and accounting returns on capital is going to be particularly acute, and over quite long periods of time there may be little connection between accounting and actual profitability. In addition, the wasting value of the resource base may mean that it makes more sense to value them in terms of a division between the present value of their existing assets and the potential upside from exploration, than to run a 'going concern' value of the kind that we built for Metro in Chapter five.

2.2 Oil company accounting: counting barrels

The first time that an oil company will know with absolute certainty how much oil it will extract from a field will be when it shuts the field down and abandons it. Up to that point, all reserve numbers are probabilistic. The absolute volume of reserves in place is generally known fairly accurately. The question is how much of it will be recoverable, using current technology and predicted oil prices. Higher prices permit the application of enhanced oil recovery techniques that increase recovery factors. So reserve estimates are not merely technical calculations. They are also commercial.

In fact, the current convention is to divide reserves into three categories. The first is commercial reserves. The second is technical reserves: those that could be recovered, but not commercially. And the third comprises the upside from exploration or appraisal drilling.

The probability distribution for commercial reserves is conventionally cut at three points: that which is 90 per cent likely to be exceeded (proven), that which is 50 per cent likely to be exceeded (proven and probable); and that which is only 10 per cent likely to be exceeded (proven, probable and possible).

When companies make investment decisions or buy reserves they will put a value on all three categories, and would typically value commercial reserves using proven and probable volumes. When companies account, they use proven reserves only in the calculation of fixed assets per barrel, and in the calculation of depletion charges.

The rumpus that surrounded Shell's downgrading of its reserves by some 25 per cent in early 2004 highlighted another feature of reserve accounting. The industry standard had for many years been the requirements set by the US Securities and Exchange Commission (SEC) but these permitted only the use of information drawn from exploration wells, not from interpretation of seismic data. But since the 1980s, seismic data had been much more reliable, and would generally be regarded as an acceptable basis for reserve estimation by companies when making investment decisions. So at time of writing a large discrepancy has emerged between industry practice and the relevant accounting standards, which is in urgent need of resolution.

However it is resolved, certain issues will not change. It will still be necessary to have reserve estimates if depletion charges are to be calculated. And there will remain at least two ways to arrange the calculations. The first is 'successful efforts' accounting. Under successful efforts, each oilfield is treated as a separate asset, and is capitalised and depleted accordingly. The second is 'full cost' accounting. Under this method, costs are capitalised in geographical pools and depleted against production from the pool.

The former method involves the writing off of unsuccessful exploration expenditure as the company incurs it. The latter will involve the capitalisation of all expenditure so long as the overall cost pool is not impaired. The difference, in practical terms, is akin to a company capitalising or expensing most of its marketing costs, or its R&D costs. As we have seen, in our valuations we would do better to calculate returns on capital and invested capital using the full cost method. Most large companies use successful efforts, so there is some adjusting to do, in the same way that we capitalised Danone's historical marketing costs in Chapter five.

2.3 Oil company tax: Productions Sharing Agreements

Only in a relatively small number of countries do oil companies have title to the oil that they produce, paying tax on the profit from extraction. These include the USA, Canada, the UK, Australia, New Zealand and Norway, but they remain a minority. Most oil production occurs under so-called production sharing agreements (PSAs) or production sharing contracts (PSCs).

Under these agreements, the oil company has a contract entitling it to develop the field. Early cash flows are used to reimburse its capital expenses (cost oil) and the balance is split between the host state oil company and a smaller proportion that accrues to it (profit oil). There are large numbers of variations on this basic theme.

Accounting for PSAs is complex. The company will book as its equity reserves the proportion of the gross recoverable barrels that it expects to accrue to it as cost or profit oil. Its turnover and profit will be high early in the life of the field, but once payback has been reached, both will drop into line with its percentage entitlement to profit oil, which will be much lower. Changes in oil prices will have the perverse effect of changing depletion charges because a higher price reduces the proportion of the oil that will accrue to the oil company as cost oil, increasing its depletion charge per barrel.

Measures of company reserves and of its replacement cost of reserves must therefore be constructed carefully to ensure that it is net entitlement barrels that are counted in both cases. Tax rates will look very odd, since most of the state tax-take is removed before the revenue line in the profit and loss account.

2.4 Oil company accounts: interpretation and modelling

For this section of the book we are going to break with our usual concentration on IFRS accounting, and will model an operation that reports under US GAAP. This is because all of the large international oil companies have their shares listed on the New York stock market. They all file form 20Fs every year. And it is to the form 20F that anyone who is interested in modelling them will go for detailed information on their upstream (exploration and production) businesses. We will however, refer to some IFRS driven accounting changes later in the chapter.

As discussed earlier, we shall concentrate merely on upstream operations, since the downstream is similar to any capital intensive, cyclical industry. The US GAAP requires that companies with upstream activities account for them separately, and provide the following information: a profit and loss account, a statement of capitalised costs, information about costs incurred during the year, a statement of reserves with the components of movements in reserves, a discounted net present value of the year end reserves, and a statement showing the drivers to annual change in the discounted net present value of the year end reserves.

This all sounds too good to be true, and it almost is. The reserves are proven, commercial only, and are subject to the dispute mentioned above regarding what can and what cannot be booked. The discounted present values must use prices and costs at the year end (however extreme), do not allow for inflation, and are discounted at a high (because it is effectively real) rate of 10 per cent. The net effect is to understate reserves, and to understate values. In addition, additions to both are recorded rather later than they would be on a looser definition. But it is a start, and is a much better indicator of value creation than unadjusted accounts, as we shall see.

Since upstream operations are separately accounted for it makes no difference whether we use as an example an independent company or the upstream business of an oil major. The latter is probably more indicative of industry trends, so we have taken the largest company in the industry, ExxonMobil, as our case study.

Exhibit 6.2 shows Exxon's upstream business modelled in three pages, and then a calculation of its ROCE and adjusted ROCE for 2003 (the last reported financial year) on page four.

Exhibit 6.2: Exxon exploration and production model

1. Exxon upstream financials ($ million)

Year	2001	2002	2003	2004	2005	2006	2007	2008
Profit and loss account								
Revenue	31,844	30,341	38,641	55,399	47,960	48,440	48,924	49,413
Production costs	(5,200)	(5,464)	(6,218)	(6,922)	(7,705)	(8,577)	(9,547)	(10,628)
Exploration expenses	(1,191)	(957)	(1,033)	(1,472)	(1,487)	(1,502)	(1,517)	(1,532)
Depreciation and depletion	(4,983)	(5,434)	(5,763)	(7,174)	(7,650)	(8,082)	(8,476)	(8,837)
Taxes other than income	(3,033)	(2,781)	(3,913)	(5,610)	(4,857)	(4,905)	(4,954)	(5,004)
Related income tax	(7,651)	(6,745)	(9,512)	(14,991)	(11,504)	(11,115)	(10,701)	(10,256)
Results of producing activities	**9,786**	**8,960**	**12,202**	**19,230**	**14,757**	**14,258**	**13,728**	**13,157**
Other earnings	950	638	2,300	3,625	2,782	2,688	2,588	2,480
Total earnings	**10,736**	**9,598**	**14,502**	**22,855**	**17,539**	**16,946**	**16,315**	**15,636**
Tax % of results before income tax	*44%*	*43%*	*44%*	*44%*	*44%*	*44%*	*44%*	*44%*
Costs incurred								
Acquisition	124	187	45	0	0	0	0	0
Exploration	1,560	1,163	1,181	1,795	1,813	1,831	1,849	1,868
Development	6,119	7,805	9,421	11,147	11,259	11,371	11,485	11,600
Total	**7,803**	**9,155**	**10,647**	**12,942**	**13,071**	**13,202**	**13,334**	**13,468**
Exploration success	*24%*	*18%*	*13%*	*18%*	*18%*	*18%*	*18%*	*18%*
Capitalised costs								
Opening net capitalised costs		**44,733**	**49,764**	**59,875**	**63,848**	**67,457**	**70,746**	**73,755**
Development costs incurred		7,805	9,421	11,147	11,259	11,371	11,485	11,600
Depreciation and depletion		(5,434)	(5,763)	(7,174)	(7,650)	(8,082)	(8,476)	(8,837)
Accounting change/other		2,660	6,453	0	0	0	0	0
Closing net capitalised costs	**44,733**	**49,764**	**59,875**	**63,848**	**67,457**	**70,746**	**73,755**	**76,518**

2. Exxon oil and gas reserves

Year	2001	2002	2003	2004	2005	2006	2007	2008
Oil reserves (million barrels)								
Opening	**11,561**	**11,491**	**11,823**					
Revisions	264	355	375					
Purchases	0	0	1					
Sales	(9)	(13)	(16)					
Improved recovery	121	94	111					
Extensions and discoveries	453	777	674					
Production	(899)	(881)	(893)					
Closing	**11,491**	**11,823**	**12,075**					
Of which developed	7,212	7,200	7,172					
Of which undeveloped	4,279	4,623	4,903					
Gas reserves (billion cubic feet)								
Opening	**55,866**	**55,946**	**55,718**					
Revisions	836	1,447	1,462					
Purchases	1	2	10					
Sales	(69)	(43)	(120)					
Improved recovery	39	4	25					
Extensions and discoveries	3,431	2,597	1,719					
Production	(4,158)	(4,235)	(4,045)					
Closing	**55,946**	**55,718**	**54,769**					
Of which developed	36,022	34,743	36,234					
Of which undeveloped	19,924	20,975	18,535					
Oil equivalent reserves (mmboe)								
Opening	**20,872**	**20,815**	**21,109**	**21,203**	**21,415**	**21,629**	**21,846**	**22,064**
Revisions	403	596	619	655	662	669	675	682
Purchases	0	0	3	0	0	0	0	0
Sales	(21)	(20)	(36)	0	0	0	0	0
Improved recovery	128	95	115	122	123	124	126	127
Extensions and discoveries	1,025	1,210	961	1,017	1,028	1,038	1,048	1,059
Production	(1,592)	(1,587)	(1,567)	(1,583)	(1,599)	(1,615)	(1,631)	(1,647)
Closing	**20,815**	**21,109**	**21,203**	**21,415**	**21,629**	**21,846**	**22,064**	**22,285**
Of which developed	13,216	12,991	13,211	13,343	13,477	13,611	13,747	13,885
Of which undeveloped	7,600	8,119	7,992	8,072	8,153	8,234	8,317	8,400
Developed percentage	*63%*	*62%*	*62%*	*62%*	*62%*	*62%*	*62%*	*62%*

3. Exxon upstream performance

Year	2001	2002	2003	2004	2005	2006	2007	2008
Reserve replacement								
Production volume growth		*(0%)*	*(1%)*	*1%*	*1%*	*1%*	*1%*	*1%*
Reserve replacement ratio	*100%*	*101%*	*100%*	*101%*	*101%*	*101%*	*101%*	*101%*
Finding cost per barrel	1.00	0.61	0.70	1.00	1.00	1.00	1.00	1.00
Development cost per barrel		5.73	5.27	6.50	6.50	6.50	6.50	6.50
Opening reserve/production ratio	13.1	13.1	13.5	13.4	13.4	13.4	13.4	13.4
Per barrel numbers								
Revenue	20.00	19.12	24.66	35.00	30.00	30.00	30.00	30.00
Production costs	3.27	3.44	3.97	4.37	4.82	5.31	5.85	6.45
Depreciation and depletion	3.13	3.42	3.68	4.53	4.79	5.01	5.20	5.37
Taxes other than income	1.91	1.75	2.50	3.54	3.04	3.04	3.04	3.04
Taxes other than income/revenue	*10%*	*9%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
Capitalised costs per developed barrel	3.38	3.83	4.53	4.79	5.01	5.20	5.37	5.51
Depletion/opening capitalised costs		*101%*	*96%*	*100%*	*100%*	*100%*	*100%*	*100%*

4. ROCE ($ million)

Year	2003
Accounting ROCE	
Stated income	14,502
Opening capitalised costs	49,764
ROCE	***29%***
Capitalised costs per boe	2.35
NPV adjustments	
Opening NPV of reserves	96,599
Closing NPV of reserves	99,246
Change in NPV of reserves	2,647
Capitalised costs	(9,614)
Unrealised profit	**(6,967)**
Closing NPV of reserves/boe	4.68
Adjusted ROCE	
Stated income	14,502
Unrealised profit	(6,967)
Adjusted income	**7,535**
Opening NPV of reserves	96,599
Adjusted ROCE	**7.8%**

We have followed our customary convention of boxing the input numbers and of showing percentage movements in italics. The entries for page one are the components of the historical profit and loss accounts, the history of costs incurred in exploration and production, and the closing 2001 net capitalised costs. Notice that there are two tax lines. The first relates to specifically upstream taxes that we shall discuss later. The second relates to income tax, and is calculated as a proportion of profit before income tax.

Exxon is a successful efforts accounter. Each year, it writes off as an operating cost a proportion of its exploration expenditure: that which is not successful. The model calculates the proportion that has been successful for each of the last three years and carries the average forward as an assumption. The forecasts of future profits and of future expenditures will require us to look at the later pages in the model.

Page two of the model shows the history of Exxon's upstream business in terms of opening and closing volumes, and the movements for the year split between categories. We need a single composite for oil and gas, so the third block of numbers converts gas to oil at 6,000 cubic feet of gas = 1 barrel of oil. For the forecasts we shall need the next page but while on page two just notice that the company provided information as to the amount of its reserves that are developed. Clearly, it is developed reserves that are produced and depleted. In effect, fixed assets comprises two pools: one of developed reserves, and one of undeveloped reserves (capitalised exploration). As most exploration costs are written off, the second pool is very small so most of Exxon's capitalised costs are represented by the 62 per cent of the barrels that are developed. And as it is a mature company it may be reasonable to assume that the ratio of developed to total reserves will remain stable. There should always be a 'pipeline' of projects under appraisal or development.

Page three of the model shows the drivers to our forecasts. Clearly, it is possible to set two out of three of volume growth, reserve replacement and reserve to production ratio, as any two will derive the third. We have set volume growth and reserve life as the inputs, and the reserve replacement ratio drops out as a result. Simply put, if we want to grow at 1 per cent annually and maintain a constant reserve life then this is the amount of oil that we need to discover. Converting barrels of oil equivalent to financials, requires two further assumptions: finding costs per barrel and development costs per barrel.

Turning to the second block on page three, we are explicitly forecasting oil prices and production costs per barrel (in this case maintaining the two year trend for the latter). Upstream taxes are forecast as a constant proportion of revenue, but depletion per barrel is more complicated.

Depletion is calculated on a field by field basis, which we cannot reproduce. In addition, it comprised depletion of reserves but also straight line depreciation of some other assets. So it is not going to be amenable to perfect modelling. Approximation will have to do. A starting point is to take the capitalised costs from page one and the developed reserves from page two, and calculate a cost per developed barrel. This can be compared with the depletion charge per barrel produced for the subsequent year, and should be very similar. Here, it is very similar, so similar that assuming that one will equal the other in future years seems reasonable. So our depletion and depreciation charge per barrel is simply forecast as the opening capitalised cost per developed barrel.

Returning to page two, since we now know what our reserve replacement ratio has to be we can forecast reserve additions. Clearly, production is driven off the assumed production growth, also from page three. Additions are split between discoveries, revisions and enhanced oil recovery for purely presentational reasons, using the allocation from 2003. Lumping them all together would make no difference to the model. Finally, once we have closing reserves for each year, we can calculate an assumed amount that is developed, so that we have a number to use to derive future depletion charges.

Finally, we can return to page one. Revenues, operating costs and depreciation and depletion are calculated as barrels times the figure from page three, as is upstream tax. Income tax is at the rate shown, held at the 2003 rate. We have grown other earnings with the overall business. These comprise the activities that Exxon treats as upstream but that are excluded from the SEC calculation (pipes, liquefied natural gas facilities, etc).

Costs incurred are a multiple of barrels replaced and assumed finding and development costs. Assets grow with expenditure and fall with depreciation and depletion. This closes the model since the ending net capitalised costs, divided by developed reserves, provide the figure for the following year's depletion charge.

Modelling reserve extraction companies is hard. This is because physical and financial entities have to be more closely related than for other industrial companies. It can get worse, since if the company is immature it stops being reasonable to assume that the proportion of reserves that are developed is a constant, in which case the transfer of reserves from undeveloped to developed, and the capitalisation of exploration and development, has to be modelled slightly more carefully. We assumed that the same volumes of oil would be found and developed each year, and this assumption may be unreasonable in some cases.

Remember also that it is a matter of taste, or of what the modeller can best estimate, which items to forecast out of production growth, reserve life, and reserve replacement. It may sometimes be sensible to forecast the latter two and let the production volumes drop out as a result.

2.5 Valuing upstream oil companies

Although the SEC values for discounted cash flows from reserves are artificial, they are clearly better than nothing, and if one is not in a position to value the assets oneself (hardly likely given the size of Exxon, but very practicable for a smaller company with fewer assets) then the figure should be used and not ignored, as it frequently is.

Page four in the model calculates the company's ROCE in two ways. The first is simply to take net income (which excludes financial items) for 2003, and to divide by opening net capitalised costs. We find $50 billion of capital earning a 29 per cent return, albeit with an oil price of $25 a barrel.

The problem with this is that the figure of $50 billion is simply the partially depleted cost that Exxon incurred in developing its oilfields, some of which will have been developed before the first oil crisis of 1973. And even those that were developed in an era of more expensive oil, to the extent that they are largely depleted, will look very profitable. See our discussion of ROCE versus IRR in Chapter three. The effect is very marked for oil companies, and they often refer to assets that are almost depreciated as 'legacy assets'.

If the denominator is not much use, sadly the same can be said for the numerator. If we produce lots of oil but do not find any then the profit we generate should be offset by a decline in the remaining value of the business. Netting off the profit with the fall in the value of the reserves should just leave us unwinding the discount rate and earning a 10 per cent return on capital. (This effect is similar to the interest charge that attaches to the PBO of a pension scheme, discussed in Chapter four, or the movement in the embedded value of a life insurance company, to be discussed in a later section of this chapter.)

The solution is to adjust both numbers. We want our profit to reflect not merely that which has been realised but also the movement in the value of our reserves, adjusted for costs capitalised during the year. These comprise costs incurred minus exploration costs expensed directly. And we want our return to be calculated by dividing profit by the opportunity cost of our reserves at the start of the year, for which we shall take the SEC discounted value as a proxy. The point is that we could in theory sell our reserves at this value. If we keep them and run the company as a going concern, then it is presumably because we can earn an acceptable return on the fair value of the capital.

The adjustments are shown on page four, and the result is that our capital is now valued at $99 billion, and that the return made during 2003 on the opening figure of $97 billion drops to 7.8 per cent. In fairness, this was after an unrealised loss of $7 billion, because capitalised costs exceeded increase in the value of the reserves by $7 billion. Movements in reserve values are very volatile, and it is probably not realistic to assume that a well-managed company will continue on average to generate negative net present values when it invests.

Pursuing this analysis would require us to take a longer term view of Exxon's historical performance and to make explicit assumptions about future value added that go beyond the space that we can allocate here. For the reasons discussed earlier, the SEC valuation of Exxon's reserves will be substantially below a fair market value, because of the restrictiveness of the reserve definition, and the high discount rate applied to forecast cash flows. Suffice it to say that analysing Exxon's upstream assets with a base assumption that they are worth some $100 billion, plus whatever adjustment for conservatism is deemed reasonable, but that the company earns close to its cost of capital on its incremental investments, is a much better set of working assumptions than that its assets are worth only $50 billion and that it is generating almost 30 per cent returns on incremental capital. If the latter were the case then its slow growth and large returns of capital to its investors would be unintelligible. They are not.

2.6 Some further thoughts on accounting issues in extractive and energy sectors

The advent of IFRS has produced significant interest in accounting issues for a variety of sectors, including oil, gas and mining. Interestingly there is a large IASB project in progress on this industry. In general terms the project group has made it clear that:

1. The primary financial statements of an extractive industries enterprise should be based on historical costs, not on estimated reserve values.

2. The Steering Committee favours adoption of a cost-based method more consistent with the traditional successful efforts concept than with other concepts such as full costing. [Note that full costing involves broader capitalisation of exploration and related costs.]
3. All members of the Steering Committee favour disclosure of reserve quantities. The project committee is divided regarding disclosure of reserve values.
4. Disclose proved and probable reserves separately, and within proved disclose proved developed and proved undeveloped reserves separately.

Some of the other areas of accounting of interest are discussed below.

- **Decommissioning costs**
  In a similar vein to utilities, one of the key challenges for companies in these industries is to deal with future 'dismantling' costs. Over and above the points raised in the discussion of utilities, above, the situation is often complicated for oil companies by the substantial tax credits that can be created through abandonment. In the UK, for example, fields that have been paying Petroleum Revenue Tax will be eligible for tax relief at a rate of almost 70 per cent for the costs to the companies of abandonment.
- **Joint ventures**
  IAS 31 benchmarks proportional consolidation as the preferred treatment for jointly controlled entities. This would require line by line consolidation of a share of the JV's assets, liabilities, revenues, expenses and cashflows. The use of the equity method (so called 'single line' consolidation) is also ermitted under IAS 31.
- **Oil reserve disclosure requirements**
  Unlike the US, there are no oil reserve disclosure requirements under IFRS. However, in adopting a more comprehensive standard for extractive industries the IASB has stated its support for reserve disclosure.
- **Capitalising costs**
  Decisions about capitalisation tend to be based on general principles. However, the IASB wishes to introduce some more specificity into this process for companies operating in extractive industries. Exhibit 6.3 illustrates their current thinking.

Exhibit 6.3: IASB proposals regarding upstream oil activities

Proposals on costs incurred in various phases of upstream activities	
Pre-acquisition prospecting, appraisal, and exploration costs	Charge to expense when incurred
Direct and incidental property acquisition costs	Recognise as an asset
Post-acquisition exploration and appraisal costs	Initially recognise as an asset pending the determination of whether commercially recoverable reserves have been found. Some 'ceiling' should be imposed.
Development costs	Recognise as an asset
Construction costs that relate to a single mineral cost centre	Capitalise as part of the costs of that cost centre
Construction costs that relate to more than one mineral cost centre	Account for them in the same way as other property, plant, and equipment under IAS 16
Post-production exploration and development costs	Treat the same as any other exploration or development costs

Source: Deloitte

3. Banks

3.1 Why do we analyse banks separately from industrial corporations?

Banks and related financial institutions form a large part of any index of equity prices. They tend to be large, complex organisations. But let us be more precise about what makes banks significantly different from other large organisations:

3.1.1 Banking business is very different

Banks are involved in taking a spread from the differential in interest rates that are charged to borrowers and paid to depositors. Therefore banks have no involvement in traditional operating activities such as the acquisition of inventory, equipment and fixed assets and production activities related to same. In addition banks have extended their core 'traditional' activities to encompass areas such as:

- Investment banking
- Structuring derivatives
- Trading financial instruments
- Undertaking financial research

For these reasons banks are very different operationally from typical industrial corporations.

3.1.2 Financial items and operating items are not distinguishable

One of the fundamentals of valuation is that we often attempt to separate operating items and financial items. This allows us to focus on the operations as distinct from how they are financed. This is a continuation of the classical finance approach that views operating decisions as distinct from the financial decision. If financing items cannot be distinguished then our focus is on measures to equity rather than to the broader concept of capital. For example we talk of free cash flow to equity not free cash flow to the firm. This core element of bank valuation is covered later in the chapter.

3.1.3 Regulation of banks is very different

Given their pre-eminent role at the centre of the financial system, it is no surprise that banks are subject to much more stringent regulation than industrial corporations. This regulation can have a significant impact on financial analysis. In particular the concept of regulatory capital is important. This is based on minimum levels of capital required by regulators that act as a protector of investors and depositors. Some further details regarding regulatory capital are provided below.

3.2 Accounting issues when examining banks

3.2.1 The balance sheet

The first thing to remember is that the shape of the balance sheet is very different as can be seen in Exhibit 6.4 below.

Exhibit 6.4: Bank balance sheet

Assets	Liabilities
	Customer deposits
Loans advanced to customers	Provisions for losses on loans (reserves)
Investments in securities (equities, bonds and cash instruments)	Minority interests
Cash	Equity

The rules governing bank accounting are arcane and detailed. In many cases the precise rules are a function of precise nature of the transactions and it can be difficult to make generalisations. However, some of the key technical areas would include the fair valuing of investments, fair valuing of derivatives and provisioning. All of these are addressed in a general way in Chapter four. Some further thoughts are included below about some of the key assets and liabilities of a bank.

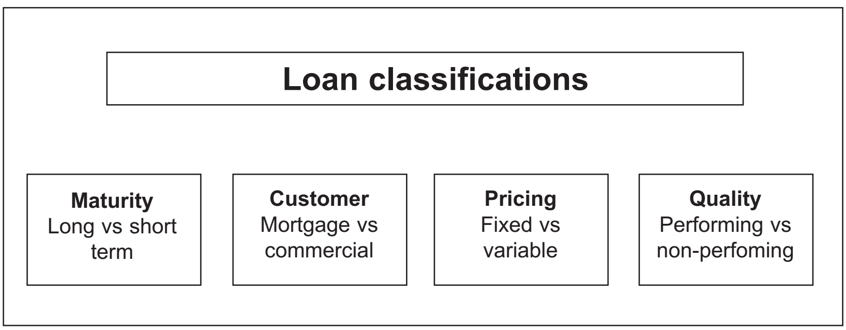
Loans advanced to customers

Naturally a significant asset of any bank will be its loan book. The book is typically recoded at amortised cost, which is consistent with the amount that is recognised by the borrower. This is generally calculated as:

Principal of the loan	X
+ Accrued interest	X
- Payments	(X)
- Write-offs	(X)
Loan on balance sheet	**X**

1. The term amortised cost refers to the amortisation of discounts/premiums on issue if the coupon is below/above the market rate respectively. Therefore the accrued interest will be based on the internal rate of return on the transaction (i.e the market rate) at inception of the loan. It will not change except in the case of variable loans.
2. Loans can be classified in many ways, as illustrated in Exhibit 6.5 below. A key accounting classification is between those loans that are performing and those that are non-performing. The crucial aspect here is provisioning. Under many local GAAPs the provision has two components: historic focus element and forward looking element. The historic element will involve making a provision based on the historic payment (or non-payment) experience. The forward looking component will be based on a statistical procedure designed to pre-empt losses that are highly likely to arise. These will be much more difficult to recognise under IFRS which places a much more 'backward' emphasis on provisioning (see Chapter four – one of the recognition criteria is a 'past event').
3. The initial principal recognised is based on the original outstanding amount. If there is any objective evidence of impairment then the loan must be stated at the present value of future cash flows. For this purpose the interest rate at the inception of the loan is used and not the current interest rate.

Exhibit 6.5: Classification of bank loans



Investments in securities

This was fully addressed in Chapter four.

Customer deposits

The major liability for many banks will be the deposits from customers. Accounting complications are rare for deposits as the coupon and effective yield will be the same and hence no discount or premium complication arises. Deposits are carried at their nominal value less any transaction costs. The only area of complexity that can arise is where banks enter into derivatives to hedge their exposure to interest rate fluctuations on deposits. Issues surrounding hedge accounting qualification can become very important in this regard.

3.2.2 The income statement

The core principles of income statement construction continue to apply. However, a few specific items deserve attention. Exhibit 6.6 below illustrates some of the key elements of a bank income statement.

Exhibit 6.6: Bank income statement

Revenues	Expenditure
Net interest income	Administration costs
Net fees and commissions	Losses on securities trading
Gains on securities trading	Loan loss provision increases
Loan loss provision decreases	

Net interest income

This is the difference between interest income on loans and fixed interest securities and interest expense on deposits and fixed interest securities. Interest income is accounted for on the traditional accruals system; i.e. interest is accounted for when earned irrespective of whether it had been received or not. Typically the effective yield approach is used which entails not only accounting for the coupon on a debt security but also for the unwinding discounts or premiums. For example revenue would be recorded on a zero coupon bond as it approaches maturity even though no coupon has yet been received. (Alternatively you can put interest expense as a main expense item.)

Net fees and commissions

This is again the difference between fee and commission income and fee and commission expenses. Net fees and commissions are another important source of banking revenues. There is scope for a bank to recognise certain components of this category upfront (e.g. arrangement fee for a loan). However, the application of IAS 39 will increase the likelihood that almost all of these sources of income will be accrued on a time basis. (Alternatively you can put fee and commission expenses as another expense item.)

Securities trading

In comparison to industrial companies banks are likely to have significant securities classified as trading. In this case the fair value movements of these items will pass through the income statement. A sizeable component of this may well be unrealised resulting in a divergence between earnings and cash flow.

Loan loss provisions

As provisions are such an important aspect of the balance sheet it is no surprise that they are a core expense in the income statement. Normal rules apply regarding the income statement recognition of movements in provisions as items of income and expense.

When analysing the operations of banks different terminology typically applies to margin calculations. For example the first margin calculated will typically be the interest margin calculated as:

Net interest / interest earning assets

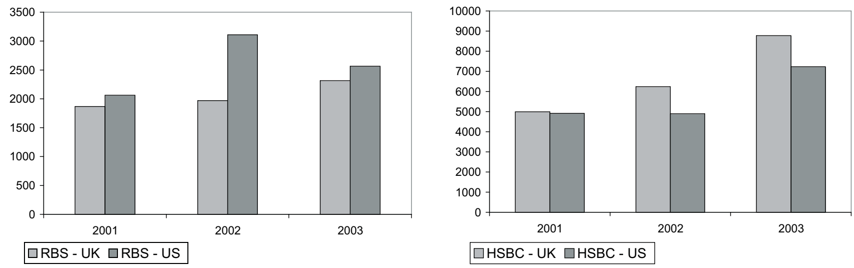
whereas an operating margin would be based on:

Operating profit / net banking revenues*

*(defined as net interest income + net fee and commission income + net trading gains)

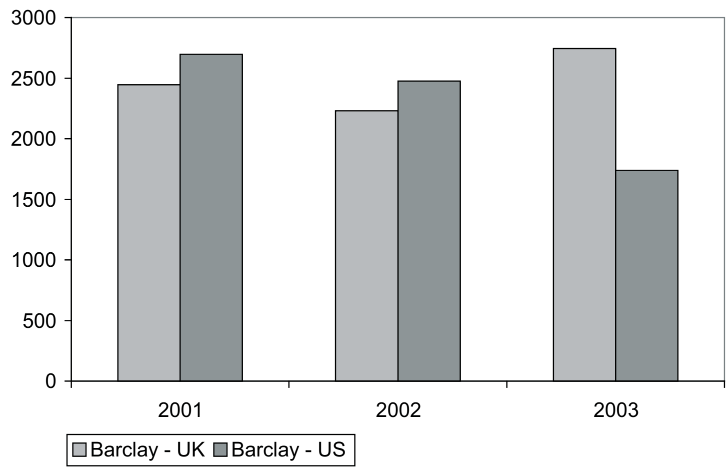
The above commentary covers some of the differences between banking financials and those of more traditional corporates. However, it should be appreciated that the activities of banks tend to be very complex which ultimately can manifest itself in issues such as accounting for securitisations and derivatives (see Chapter four) thereby complicating the picture regarding what is actually recognised in the financials. Furthermore, there is much disagreement about the methodologies that should be employed in order to reflect many of these numbers in the financials. For example, look at Exhibit 6.7 showing graphs of the net income under UK GAAP and US GAAP for two major UK banks.

Exhibit 6.7: UK GAAP and US GAAP bank net income



As can be seen the RBS earnings are consistently higher under US GAAP whereas the opposite is true for HSBC. Furthermore if we include Barclays (see Exhibit 6.8) then the US GAAP numbers are initially higher but end of dramatically lower. All this goes to show is that bank accounting is a complex area and there is little consensus regarding the appropriate treatment in areas such as securitisations, derivatives and provisioning.

Exhibit 6.8: Barclays US and UK GAAP net income



3.3 Regulatory issues

As mentioned before regulatory issues are extremely important in a banking context due to the size of the sector and its importance to the entire financial system. The list below summarises some of the key regulatory concepts.

Regulatory issues for banks

Banks are subject to strict requirements with regards to their capital position.

There are several reasons why banks require adequate capital ratios:

- To get regulatory approval and a banking license when they are set up.
- To absorb financial and operating losses resulting from the risks inherent in banking activities, namely:

1. Credit risk, i.e. risk of loss on loans or similar activities due to counterparty default. Credit risk increases in periods of economic downturns, making banking a highly cyclical business.
2. Market risk, i.e. risk of loss on investments and trading activities due to adverse changes in financial asset prices. It can be further split into interest rate risk and foreign exchange risk.
3. Operational risk, i.e. risk of loss due to quality control failures and simple human error.
4. To maintain depositors' and creditors' confidence in the bank, by protecting their savings and interests from risks above.
5. To support growth of banking activities. Regulators require bank capital to increase in line with risky assets.
6. To achieve desired credit rating from rating agencies and thus keep their cost of funding on capital markets under control.

Regulatory framework for European banks

Bank regulation has traditionally been the remit of national governing authorities. However, growing internationalisation of financial markets has increased the risk that the impact of a major bank failure spreads beyond the national banking system. In addition, regulators have become increasingly keen to prevent banks moving to less prudent jurisdictions to reduce their cost of maintaining minimum capital ratios.

These factors contributed to a trend towards increasing standardisation of capital regulations.

In 1975, the Basle Committee on Banking Regulations and Supervisory Practices ('The Basle Committee') was established to create a unified approach to capital regulation. In July 1988, the Basle Committee published the 'International Convergence of Capital Measurement and Capital Standards' ('The Basle Capital Accord' or 'Basle I'), which provided a definition of capital (Tier I and Tier II) and minimum capital requirements in particular in relation to credit risk (measured rather crudely by risk weighted assets, see below). In January 2001, the Basle Committee proposed a new Basle Capital Accord ('Basle II') recognising the effectiveness of sophisticated internal risk models developed by large banks to assess capital adequacy, and also exploring further capital requirements related to operational risk.

The Basle Committee comprises representatives from each of the G-10 countries but has no binding regulatory authority. However, the regulators of all the G-10 countries have enforced its provisions in their respective banking systems.

In addition, the European Commission has formulated capital regulations parallel and similar in content to those published by the Basle Committee, in a series of Directives including the Solvency Ratio for Credit Institutions Directive (89/647/EEC), the Own Funds Directive (89/299/EEC) and the Capital Adequacy Directive (93/6/EEC). The latter, which came into effect in 1996, sets out the minimum requirements for banks' capital (or 'own funds') and introduces the concept of Tier III capital to cover market risk affecting the trading book (see below). The European Directives have been adopted by most European regulators.

Definition of Regulatory Capital

Capital essentially represents the funds contributed to the business by its shareholders in the form of stock, reserves and retained earnings. However, there is a continuum of hybrid capital instruments, between debt and equity, some of which are able to absorb banking losses and preserve creditors' and depositors' interests. For this reason, regulators have decided to define capital according to a tier structure, recognising that there might be different layers of capital ranging from higher quality (Tier 1, essentially pure shareholders' equity) to poorer quality (Tier 2, hybrid instruments).

Tier 1

Tier 1 is calculated as:

+ Permanent shareholders capital, including:

  Fully paid common stock

  All disclosed reserves created by cumulated retained earnings

+ Perpetual non-cumulative preferred stock

+ Minority interests arising on consolidation of subsidiaries

+ Externally audited interim profits

- Goodwill and other intangible assets

- Current year's unpublished losses

= Tier 1

Disclosed reserves from cumulated retained earnings are part of Tier 1, whereas revaluation reserves arising from revaluation of fixed tangible and financial assets are explicitly excluded, though they are part of shareholders' funds. Revaluation reserves qualify as Upper Tier 2 (see overleaf).

Perpetual non-cumulative preferred stock qualifies as Tier 1 because it is permanent capital which does not guarantee a certain return to investors. In the case of cumulative preferred stock, if dividends are not paid, they accumulate and must be paid before any ordinary dividends can be paid. However, in the case of non-cumulative preferred stock, un-paid dividends are lost for good.

Including minority interests in Tier 1 recognises that minority interests represent equity invested by third parties in subsidiaries belonging to the group which can absorb part of the losses.

On the other hand, deducting goodwill (and other intangibles) reflects the fact that goodwill does not represent a separable asset which could be easily liquidated in case of losses and therefore does not help to protect depositors and creditors.

As capital adequacy must be maintained throughout the financial year and not checked just at year-end, Tier 1 capital needs to be up-dated. However, the application of the principle of prudence allows banks to include externally audited interim profits and requires them to include any current unpublished losses (not current internally audited profits, which can qualify as Upper Tier 2).

Tier 2

Tier 2 is divided into Upper (higher quality) and Lower (lower quality) Tier 2. It is calculated as follows:

+ Revaluation reserves
+ Hidden (or undisclosed) reserves
+ Internally audited current year profits
+ Generic reserves (against possible or unidentified losses)
+ Reserve for general banking risk
+ Perpetual, cumulative preferred stock (potentially convertible into shares)
+ Perpetual subordinated debt (potentially convertible into shares)
= Upper Tier 2
+ Dated preferred shares
+ Dated subordinated debt (minimum 5 years maturity)
= Lower Tier 2

Unless reserves have been created to cover specific risks, they can be used to absorb general operating losses. This is the case for four types of reserves:
(i) revaluation reserves, arising from an upward adjustment of fixed, tangible or

financial assets to their net realisable value; (ii) hidden reserves, created when loans or investment securities are written down without specific reasons or risks; (iii) generic reserves for possible loan losses or for latent losses which have not yet been identified; and (iv) reserve for general banking risk, created explicitly to protect against the cyclicality of the banking business.

Some hybrid instruments (preferred shares and subordinated debt) can qualify as Upper Tier 2 under specific conditions. Banks are continuously developing new financing instruments which might simultaneously satisfy investors' interests and regulators' requirements. Therefore, it is not possible to compile an exhaustive list of qualifying instruments, which is applicable across different countries. However, to contribute to Upper Tier 2 such instruments must have certain features:

- They must be unsecured, subordinated and fully paid-up.
- They must be perpetual, or, at least, not redeemable at the investor's discretion.
- Default on interest/dividend payments does not automatically oblige the bank to stop trading, i.e. the instruments must be available to participate in losses.

Total capital

Total capital is calculated simply as the sum of Tier 1 and Tier 2 (Upper and Lower), less a deduction for investments in unconsolidated banking associates. This deduction is not an explicit requirement of the Basle Accord, although it is implemented by most national regulators to avoid double-counting of capital across the financial system. Basle II has recently proposed a more stringent requirement relating to the deduction of unconsolidated insurance associates from consolidated capital.

Banks are obliged to publish their Tier 1, Tier 2 and Total Capital but they do not have to disclose a reconciliation of their calculation with the information contained in the balance sheet. However, many banks show a break-down of the calculation of capital in the directors' report.

Total capital is aimed at covering credit risk in the bank's so-called 'banking book', essentially the loan portfolio, measured by risk weighted assets (see below).

Tier 3

Total capital does not provide cover for market risk which affects the value and profits of the bank's trading securities, i.e. the so-called 'trading book'. Cover for market risk has been introduced in the form of Tier 3 capital by the Capital Adequacy Directive of the European Commission.

Tier 3 capital includes subordinated debt which has the following features:

- Unsecured, subordinated and fully paid-up.
- Minimum 2 years original maturity.
- "Lock in clause": if the bank's capital falls below minimum ratio, the regulator must be notified and may require the bank to suspend interest and/or principal repayments.
- Repayment prior to maturity must be approved by regulator.
- The capital treatment of the debt will not be amortised over its life.

Risk weighted assets

Risk weighted assets measure credit risk in the bank's banking book (on-balance sheet and off-balance sheet). The banking book comprises all of the banks' assets, with an appropriate risk weighting ranging from 0 per cent for risk free assets (such as cash) to 100 per cent for risky assets (such as loans to private sector companies). The calculation of risk weighted assets according to the crude weights set in Basle I, has been revised by Basle II: banks will have the option to apply either of the following approaches:

- A new Standardised Approach, with risk weights relating not only to the type of asset but also to the credit rating of the counter party. A loan to an AAA corporate will receive only 20 per cent risk weight under Basle II, instead of 100% under current Basle I requirements;
- An Internal Ratings Based Approach, with risk weights calculated internally on the basis of statistical parameters such as loss given default, probability of default and exposure at default. Only banks with adequate risk management systems will qualify to apply this approach.
- Off-balance sheet items, such as guarantees on third party loans or outstanding positions in derivative instruments are first converted into on-balance sheet exposures by multiplying them by a credit conversion factor ranging from 0 per cent to 100 per cent.

Regulatory capital and IFRS

The adoption of IFRS for the first time by many European banks may have a significant affect on banks regulatory capital. However, it is likely that some of the changes, such as cash flow hedging, will have no affect (as per recommendation of Basle Committee). However changes to pension accounting, revenue recognition and provisions may well affect regulatory capital.

The above section on regulatory matters is mainly adapted from Chapter 18 of *Accounting for Investment Analysts: An International Perspective*, Kenneth Lee, 3rd Edition, 2004, BG publications. Thanks to Annalisa Caresena, the BG financial services specialist, for writing the original piece from which this is adapted.

3.4 Economic capital

Many major European companies provide interesting and detailed disclosures regarding their risk management activities. Most of this information is driven by the regulations outlined above. We stated earlier that the objective of these rules is to provide protection in the financial system given the hugely important role played by financial institutions generally and large banks in particular.

In addition to meeting the 'external' regulatory requirements many financial institutions will have their own internal checks, for example internal mechanisms for allocating capital. Capital allocation decisions are important – the higher the allocated capital the higher the buffer provided against any deterioration in the business. Of course banks will also want to allocate capital as efficiently as possible because there is a cost attached to it. Given that much of the discussion in this text has surrounded economic capital approaches to valuation and analysis it will not surprise you to find that it can also have a role here.

Management of a financial institution would first define and model a measure of economic capital that is relevant for their business. Typically this would take the form of 'invested capital' subject to the various adjustments to reported accounting information that are normally required for the calculation of invested capital. Then the allocation decision is made taking into account the various risks of the business units (credit, market, operational, insurance etc). The performance of these businesses can then be measured by using economic profit rather than accounting profit. Remember the crucial difference between the two is that economic profit includes a charge for capital, something that is absent from its accounting equivalent. In an industry where capital is a scarce resource this charge is of crucial importance. The charge tends to focus and mould the minds of management when making decisions about where these limited resources should go.

Barclays includes a very useful table of their economic capital allocation by business (see Exhibit 6.9).

Exhibit 6.9: Barclays bank economic capital

	2003	%	2002	%
Personal financial services	2,400	*22%*	2,100	*21%*
Barclays private				
- ongoing	700	*6%*	550	*5%*
- closed life assurance activities	200	*2%*	300	*3%*
Barclaycard	1800	*17%*	1,500	*15%*
Business banking	2,850	*26%*	2,750	*27%*
Barclays Africa	200	*2%*	200	*2%*
Barclays capital	2,100	*19%*	2,050	*20%*
Barclays Global Investors	150	*1%*	200	*2%*
Other operations	500	*5%*	550	*5%*
Average economic capital	10,900	*100%*	10,200	*100%*

The figure indicates the amount of capital that has been allocated to specific activities in Barclays. Given the pressures for efficiency, management are likely to try to minimise the amount of economic capital that is allocated to specific businesses because of the cost of capital. This decision will be within the in-house risk limits that have been established by Barclays. Some interesting observations can be made:

1. Personal financial services, business banking and Barclays capital account for just under 70 per cent of the total economic capital.
2. Each year risk models are used to assess the level of economic capital required given the various risks faced by each business activity.
3. The allocation from year to year on a relative basis is very consistent with only one business showing a change of over 1 per cent (Barclaycard, but it is still only 2 per cent).
4. The consistency in the share of economic capital allocated to each business despite ongoing review of risk assessment methodologies and risks might confirm that there are very real differences between the risk characteristics of the different businesses.

The upshot of this is that the allocation of capital is a crucial risk management and economic decision. Because of this it is an important aspect for analysis and valuation.

3.5 Start with the balance sheet

When modelling an industrial company it is almost always sensible to start with the profit and loss account, then project investments in fixed assets and working capital, and then derive the resulting balance sheets. The financing decisions such as whether or not to issue or buy-back equity capital come last, and financial leverage may quite reasonably be assumed to vary considerably as the company matures or goes through economic cycles.

All of this is reversed with financial companies. The starting point is the balance sheet. Changes in the level of demand for a bank's services are exemplified by an increase or a decrease in the volume of its loans outstanding or its customer deposits. If we imagine a very simple bank, with no activities other than the extension of loans and mortgages, and the taking of deposits, then its loan portfolio will generate interest income, and its customer deposits will pay some interest, and will also incur the bank in the costs associated with the provision of cheque clearing and other banking services. Margins relate to the spread between interest received on loans and interest paid on deposits, and to the proportion of income that is absorbed by operating costs. Forecasting the profit and loss account is therefore best done by starting with the balance sheet and then estimating interest rates and operating costs.

There are clearly operations on both sides of a bank's balance sheet. On the asset side, loans are extended at rates that are higher than the risk free rate (and that should be higher than the risk adjusted cost of capital), and on the liabilities side interest costs and operating expenses are incurred to raise capital more cheaply than could be achieved by issuing bonds. The interface between the two sides of a bank is its treasury, and the management of the bank will regard the three functions as being separate profit centres, with transfer prices between them and capital allocated to each activity. But from outside the bank it is usually impossible to be so sophisticated, and we are left modelling a stream of returns to equity capital.

Banks are very highly leveraged, though the concept of leverage is clearly different from that of an industrial company. Assets are not mainly financed by equity and debt that the bank has issued. They are mainly financed by customer deposits, with capital representing a fairly small proportion of the total balance sheet (subject to the Basle minimum of 8 per cent). The Basle requirements for capital adequacy, discussed earlier, imply that something akin to equity capital (Tier I capital) can be leveraged by 25 times, this being the inverse of (1 divided by) a 4 per cent capital requirement. Small changes in capital ratios are therefore important to the risk and return characteristics of the equity of a bank, as we shall see shortly.

There is no equivalent, for a bank, to the acquisition of fixed assets and their depreciation, which plays such a large part in the cash flow of industrial companies. Instead, cash flows result from profit and the increase or decrease in loans and deposits. Since we are in any case starting with projected balance sheets, most external models of banks therefore do not model cash flows, but simply project the balance sheet and the profit and loss account.

Bank valuation models use the same techniques of discounted cash flow and discounted economic profit that we used for industrial companies, but it is cash flow to equity and residual income to equity that are discounted, and the discount rate is therefore a cost of equity, and not a cost of capital. It should be noted that none of this is true if one is able to model the separate operations of the bank independently of one another.

3.5.1 Duration and derivatives

Remaining with our simple bank for a moment, it is evident that there is likely to be a mismatch between the duration of the loan portfolio and the duration of customer deposits. Mortgages and commercial loans have durations that run to many years. Many deposits are overnight, and terms are often between one month and one year. Therefore one of the functions of the bank's treasury is to manage the duration risk associated with a business that would otherwise be acutely vulnerable to changes in the shape of the yield curve. It is possible for a bank to look very profitable by lending long and borrowing short, but as we move forward through time if annual rates rise to the levels implied by the initial yield curve then the high profits of the yearly years will be offset by some horrible losses later on! Clearly, this would be no way to run a highly leveraged business.

The implication of all this is that banks must be avid consumers of derivative products, because these offer the simplest way to hedge what would otherwise be a highly asymmetrical exposure to interest rate risks. This is another important element of a bank that it is unlikely to be possible to value correctly from outside. A clue to how effectively a bank is hedged against duration risk should be offered by the robustness of its historical performance to past shifts in the yield curve (and net interest margins have proven rather stable over time), but in the real world it is likely to be very hard to establish this given other drivers to bank profitability through economic cycles, and given that in reality banks have other businesses, such as investment banking and asset management, that cannot hedge their exposure to asset prices.

3.5.2 Provisions and loan losses

The purpose of bank regulation is to ensure the continued solvency of banks. One item that we ignored in the discussion of our simple bank was the fact that some of its customers will default and fail to service and repay their loans. As we have seen, this is what drives the capital adequacy requirements discussed earlier, since each asset is risk weighted to derive the total of risk weighted assets (RWA) to which the minimum capital ratios are applied. The corollary to a high credit risk, and a high risk weighting, is likely to be a high interest margin and a high loan loss provision. In addition, like demand for loans and deposits, and the structure of interest rates, loan losses will tend to be cyclical.

3.5.3 Drivers to profitability and value

The drivers to profitability are therefore complex, even for a simple bank. Margin structures have to been seen in terms of yield curves, not just spot rates. Operational gearing is high, since operating costs often represent a large proportion of net interest income (the cost/income ratio). And superimposed on all this is the cycle of loan losses. In general, it could be said that the ideal environment for a bank is one of a high level of economic activity, because of demand and low loan losses, and a flattening yield curve, because in practice across all of their businesses they tend to be net holders of long duration financial assets, despite hedging. But this is a generalisation, will vary between banks, and is extremely hard to model from the outside.

Bank shares tend to be high Beta for two reasons. The first is the cyclicality of the business, as already described. The second is just a function of leverage. However well hedged, any business whose assets represent a multiple of 20-25 times its equity is likely to be high Beta. One complication with banks is that there is no real equivalent to an unleveraged cost of equity for the business, as there is for an industrial company. The business is inherently highly leveraged, before we start to consider the allocation of capital between equity, preference shares, subordinated debt, and so on.

This creates a valuation conundrum to which we shall return. What do we do with a bank that has a significant surplus of capital over and above its regulatory requirements, or even that of its peers? One answer is to assume that it is distributed, and value the stream of cash flow to equity including these distributions. But, surely, if the balance sheet of the bank is materially altered by large buy-backs then this would result in an increase in its cost of equity? We shall return to this question after looking at a model of a real bank.

3.6 Commerzbank model and valuation

We have taken the German bank, Commerzbank, as the case study for two reasons. Firstly, it followed IFRS accounting standards in its 2003 accounts, which we used as the basis for the model. Secondly, it was a sufficiently simple bank for it to be reasonable to try to model it as a consolidated entity without worrying too much about modelling its individual businesses.

As with other models of companies, we reproduce in Exhibit 6.10 below the full ten pages of the model, and shall then talk through them in the paragraphs that follow. The ten pages comprise the balance sheet, profit and loss account, drivers to forecast balance sheets, drivers to forecast profit and loss accounts, analysis of economic capital, capital ratio analysis, modelling of equity, performance analysis, calculation of discount rate and valuation tabs. As usual, the figures that have been input are boxed, and all percentages, whether drivers or results, are italicised.

Exhibit 6.10: Commerzbank accounting and valuation model

1. Commerzbank Balance Sheet (€ million)

	2002	2003	2004	2005	2006	2007	2008
Assets							
Cash reserve	8,466	7,429	7,652	7,881	8,118	8,361	8,612
Claims on banks	54,343	51,657	53,723	55,872	58,107	60,431	62,849
Claims on customers	148,514	138,438	144,668	151,901	159,496	167,471	175,845
Provisions for loan losses	(5,376)	(5,510)	(4,960)	(5,194)	(5,440)	(5,698)	(5,967)
Positive fair values from derivative hedging instruments	3,131	2,552	2,667	2,800	2,940	3,087	3,242
Assets held for dealing purposes	117,192	87,628	87,628	87,628	87,628	87,628	87,628
Investments and securities portfolio	84,558	87,842	87,842	87,842	87,842	87,842	87,842
Goodwill	1,040	690	580	470	360	250	140
Other intangible assets	111	112	112	112	112	112	112
Fixed assets	2,505	2,063	2,063	2,063	2,063	2,063	2,063
Tax assets	5,995	6,038	6,038	6,038	6,038	6,038	6,038
Other assets	1,655	2,646	857	1,392	1,820	2,133	2,320
Total assets	**422,134**	**381,585**	**388,869**	**398,805**	**409,085**	**419,719**	**430,722**
Liabilities							
Liabilities to banks	114,984	95,249	98,106	101,050	104,081	107,204	110,420
Liabilities to customers	95,700	100,000	103,000	106,090	109,273	112,551	115,927
Securitised liabilities	92,732	83,992	87,352	90,846	94,480	98,259	102,189
Negative fair values from derivative hedging instruments	5,696	5,932	6,199	6,509	6,834	7,176	7,535
Liabilities from dealing activities	83,238	67,017	67,017	67,017	67,017	67,017	67,017
Provisions	3,528	3,307	3,307	3,307	3,307	3,307	3,307
Tax liabilities	3,664	4,495	4,495	4,495	4,495	4,495	4,495
Other liabilities	3,285	2,911	2,911	2,911	2,911	2,911	2,911
Subordinated capital	9,237	8,381	8,381	8,381	8,381	8,381	8,381
Minority interests	1,262	1,213	1,300	1,437	1,603	1,810	2,073
Total liabilities	**413,326**	**372,497**	**382,069**	**392,042**	**402,382**	**413,110**	**424,255**
Subscribed capital	1,378	1,545	1,545	1,545	1,545	1,545	1,545
Capital reserve	6,131	4,475	4,475	4,475	4,475	4,475	4,475
Retained earnings	3,268	3,286	3,286	3,456	3,629	3,814	4,011
Revaluation reserve	(769)	1,240	1,240	1,240	1,240	1,240	1,240
Measurement of cash flow hedges	(1,248)	(1,236)	(1,236)	(1,236)	(1,236)	(1,236)	(1,236)
Reserve from currency translation	(6)	(219)	(219)	(219)	(219)	(219)	(219)
Consolidated profit/loss	54	0	568	576	616	658	698
Treasury stock	0	0	(2,858)	(3,074)	(3,347)	(3,668)	(4,047)
Shareholders funds	**8,808**	**9,091**	**6,801**	**6,763**	**6,703**	**6,609**	**6,467**
Total liabilities and shareholders funds	**422,134**	**381,588**	**388,869**	**398,805**	**409,085**	**419,719**	**430,722**
Bad debt provisions							
Opening provision for loan losses		5,376	5,510	4,960	5,194	5,440	5,698
Provision for year		1,084	1,131	1,185	1,241	1,300	1,361
Amounts utilised and other changes		(950)	(1,785)	(1,068)	(1,118)	(1,171)	(1,226)
Closing provision for loan losses	**5,376**	**5,510**	**4,856**	**5,077**	**5,317**	**5,569**	**5,832**
Provisions/claims on banks and customers (%)	*2.65%*	*2.90%*	*2.50%*	*2.50%*	*2.50%*	*2.50%*	*2.50%*
Annual provision/claims on banks and customers (%)	*0.65%*	*0.57%*	*0.57%*	*0.57%*	*0.57%*	*0.57%*	*0.57%*

2. Commerzbank Profit and Loss Account (€ million)

	2002	2003	2004	2005	2006	2007	2008
Interest received	18,032	11,767	11,672	12,339	13,049	13,795	14,578
Interest paid	(14,899)	(8,991)	(8,607)	(8,832)	(9,064)	(9,304)	(9,552)
Net interest income	**3,133**	**2,776**	**3,065**	**3,507**	**3,985**	**4,491**	**5,027**
Provisions for possible loan losses	(1,321)	(1,084)	(1,131)	(1,185)	(1,241)	(1,300)	(1,361)
Net interest income after provisioning	**1,812**	**1,692**	**1,933**	**2,322**	**2,744**	**3,191**	**3,665**
Commissions received	2,416	2,505	2,580	2,658	2,737	2,819	2,904
Commissions paid	(296)	(369)	(380)	(391)	(403)	(415)	(428)
Net commission income	**2,120**	**2,136**	**2,200**	**2,266**	**2,334**	**2,404**	**2,476**
Net result on hedge accounting	(56)	40	0	0	0	0	0
Trading profit	544	737	737	737	737	737	737
Net result on available for sale investments	(11)	291	297	297	297	297	297
Operating expenses	**(5,155)**	**(4,511)**	**(4,133)**	**(4,496)**	**(4,875)**	**(5,260)**	**(5,650)**
Other operating result	938	174	167	171	175	179	184
Operating profit	192	559	1,200	1,296	1,412	1,549	1,709
Amortization of goodwill	(108)	(110)	(110)	(110)	(110)	(110)	(110)
Profit before exceptional items	**84**	**449**	**1,090**	**1,186**	**1,302**	**1,439**	**1,599**
Exceptional items	(247)	(2,325)	0	0	0	0	0
Restructuring expenses	(209)	(104)	0	0	0	0	0
Profit before taxation	**(372)**	**(1,980)**	**1,090**	**1,186**	**1,302**	**1,439**	**1,599**
Taxation	103	(249)	(435)	(473)	(519)	(574)	(638)
Taxation rate (%)	*27.7%*	*-12.6%*	*39.9%*	*39.9%*	*39.9%*	*39.9%*	*39.9%*
Profit after taxation	**(269)**	**(2,229)**	**655**	**713**	**782**	**865**	**961**
Minority interest in profit	(29)	(91)	(87)	(136)	(166)	(207)	(263)
Profit attributable to ordinary shares	**(298)**	**(2,320)**	**568**	**576**	**616**	**658**	**698**
Transfer from capital reserve	352	2,320	0	0	0	0	0
Consolidated profit/loss	**54**	**0**	**568**	**576**	**616**	**658**	**698**
Ordinary dividends payable	0	0	(398)	(403)	(431)	(461)	(489)
Retained profit/loss	54	0	170	173	185	197	209
Payout ratio	*0.0%*	*0.0%*	*70.0%*	*70.0%*	*70.0%*	*70.0%*	*70.0%*
Year end shares outstanding	529.9	594.4	407.8	393.7	375.9	355.0	330.2
Weighted average shares outstanding	533.6	544.2	501.1	400.8	384.8	365.4	342.6
Earnings per share	-0.56	-4.26	1.13	1.44	1.60	1.80	2.04
Dividends per share	0.00	0.00	0.97	1.02	1.15	1.30	1.48

3. Commerzbank Balance Sheet Drivers

	2002	2003	2004	2005	2006	2007	2008
Assets							
Cash reserve		-12.2%	3.0%	3.0%	3.0%	3.0%	3.0%
Claims on banks		-4.9%	4.0%	4.0%	4.0%	4.0%	4.0%
Claims on customers		-6.8%	4.5%	5.0%	5.0%	5.0%	5.0%
Provisions for loan losses		2.5%	-10.0%	4.7%	4.7%	4.7%	4.7%
Positive fair values from derivative hedging instruments		-18.5%	4.5%	5.0%	5.0%	5.0%	5.0%
Assets held for dealing purposes		-25.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Investments and securities portfolio		3.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Goodwill		-33.7%	-15.9%	-19.0%	-23.4%	-30.6%	-44.0%
Other intangible assets		0.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Fixed assets		-17.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Tax assets		0.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Other assets		59.9%	-67.6%	62.5%	30.8%	17.2%	8.7%
Total assets		***-9.6%***	***1.9%***	***2.6%***	***2.6%***	***2.6%***	***2.6%***
Liabilities							
Liabilities to banks		-17.2%	3.00%	3.00%	3.00%	3.00%	3.00%
Liabilities to customers		4.5%	3.00%	3.00%	3.00%	3.00%	3.00%
Securitised liabilities		-9.4%	4.00%	4.00%	4.00%	4.00%	4.00%
Negative fair values from derivative hedging instruments		4.1%	4.50%	5.00%	5.00%	5.00%	5.00%
Liabilities from dealing activities		-19.5%	0.0%	0.00%	0.00%	0.00%	0.00%
Provisions		-6.3%	0.0%	0.00%	0.00%	0.00%	0.00%
Tax liabilities		22.7%	0.0%	0.00%	0.00%	0.00%	0.00%
Other liabilities		-11.4%	0.0%	0.00%	0.00%	0.00%	0.00%
Subordinated capital		-9.3%	0.0%	0.00%	0.00%	0.00%	0.00%
Minority interests		-3.9%	7.2%	10.5%	11.6%	12.9%	14.5%
Total liabilities		***-9.9%***	***2.6%***	***2.6%***	***2.6%***	***2.7%***	***2.7%***
Subscribed capital		12.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Capital reserve		-27.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Retained earnings		0.6%	0.0%	5.2%	5.0%	5.1%	5.2%
Revaluation reserve		-261.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Measurement of cash flow hedges		-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Reserve from currency translation		3550.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Consolidated profit/loss		na	na	1.5%	6.9%	6.8%	6.1%
Treasury stock		na	na	7.6%	8.9%	9.6%	10.3%
Shareholders funds		***3.2%***	***-25.2%***	***-0.6%***	***-0.9%***	***-1.4%***	***-2.2%***
Total liabilities and shareholders funds		***-9.6%***	***1.9%***	***2.6%***	***2.6%***	***2.6%***	***2.6%***

4. Commerzbank Profit and Loss Drivers

	2002	2003	2004	2005	2006	2007	2008
Interest received/average earning assets		*2.99%*	*3.09%*	*3.19%*	*3.29%*	*3.39%*	*3.49%*
Interest paid/average interest-bearing liabilities		*1.20%*	*1.20%*	*1.20%*	*1.20%*	*1.20%*	*1.20%*
Growth in commissions received		*3.68%*	*3.00%*	*3.00%*	*3.00%*	*3.00%*	*3.00%*
Growth in commissions paid		*24.66%*	*3.00%*	*3.00%*	*3.00%*	*3.00%*	*3.00%*
Growth in trading profit		*35.48%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
Profit on investments/investments		*0.34%*	*0.34%*	*0.34%*	*0.34%*	*0.34%*	*0.34%*
Operating expenses/interest and commission income		*117.84%*	*100.00%*	*98.00%*	*96.00%*	*94.00%*	*92.00%*
Other operating result/total assets		*0.04%*	*0.04%*	*0.04%*	*0.04%*	*0.04%*	*0.04%*
Minority interest in profit		*4.08%*	*13.34%*	*19.12%*	*21.24%*	*23.91%*	*27.38%*

5. Commerzbank end 2003 economic capital (€ billion)

	2003
RWA	**140.8**
Market risk (trading book)	0.8
Market risk (banking book)	0.7
Market risk (equity holdings)	2.9
Credit risk	4.3
Operational risk	0.9
Business risk	0.5
Total	**10.1**
Diversification effects	-2.2
Economic capital after diversification effects	**7.9**
Tier I capital	10.3
Implied surplus	**2.4**
Economic capital/RWA (%)	*5.61%*

6. Commerzbank Regulatory Risk Weighted Assets and Capital Ratios (€ million)

	2002	2003	2004	2005	2006	2007	2008
Total book assets	422,134	381,585	388,869	398,805	409,085	419,719	430,722
Risk weighted assets (RWA)	**160,190**	**140,829**	**145,542**	**149,261**	**153,108**	**157,088**	**161,206**
Risk weighted assets/total assets	*37.95%*	*36.91%*	*37.43%*	*37.43%*	*37.43%*	*37.43%*	*37.43%*
Minimum Tier 1 ratio (%)	*4.00%*	*4.00%*	*4.00%*	*4.00%*	*4.00%*	*4.00%*	*4.00%*
Regulatory minimum total capital ratio (%)	*8.00%*	*8.00%*	*8.00%*	*8.00%*	*8.00%*	*8.00%*	*8.00%*
Core capital							
Equity capital in balance sheet	8,808	9,091	6,801	6,763	6,703	6,609	6,467
Minority interests	1,262	1,213	1,300	1,437	1,603	1,810	2,073
Goodwill	(1,040)	(690)	(580)	(470)	(360)	(250)	(140)
Adjustments	2,661	643	643	643	643	643	643
Tier I capital	**11,691**	**10,257**	**8,164**	**8,373**	**8,589**	**8,812**	**9,043**
Core capital ratio	*7.30%*	*7.28%*	*5.61%*	*5.61%*	*5.61%*	*5.61%*	*5.61%*
Target capital ratio		5.61%	5.61%	5.61%	5.61%	5.61%	5.61%
Target capital		7,900	8,164	8,373	8,589	8,812	9,043
Surplus capital		2,357	0	0	0	0	0
Supplementary capital							
Core capital	11,691	10,257	8,164	8,373	8,589	8,812	9,043
Subordinated capital	9,237	8,381	8,381	8,381	8,381	8,381	8,381
Adjustments	(1,475)	(513)	(513)	(513)	(513)	(513)	(513)
Tier II capital	19,453	18,125	16,032	16,241	16,457	16,680	16,911
Tier III capital	209	125	125	125	125	125	125
Total capital	**19,662**	**18,250**	**16,157**	**16,366**	**16,582**	**16,805**	**17,036**
Total capital ratio	*12.27%*	*12.96%*	*11.10%*	*10.96%*	*10.83%*	*10.70%*	*10.57%*

7. Commerzbank Equity (€ million)

	2002	2003	2004	2005	2006	2007	2008
Share price (Euro)		15.32					
Par value (Euro)		2.60					
Equity issued			0	0	0	0	0
Equity bought back			(2,858)	(217)	(273)	(320)	(379)
Shares issued			0	0	0	0	0
Shares bought back			(187)	(14)	(18)	(21)	(25)

8. Commerzbank Performance Ratios

	2002	2003	2004	2005	2006	2007	2008
Income margin	*-5.67%*	*-47.23%*	*10.79%*	*9.98%*	*9.75%*	*9.54%*	*9.30%*
Income/opening total assets		*1.16%*	*1.38%*	*1.48%*	*1.58%*	*1.69%*	*1.79%*
Return on opening total assets		***-0.55%***	***0.15%***	***0.15%***	***0.15%***	***0.16%***	***0.17%***
Opening shareholders' funds/total assets		*2.09%*	*2.38%*	*1.75%*	*1.70%*	*1.64%*	*1.57%*
Return on equity		***-26.34%***	***6.25%***	***8.48%***	***9.11%***	***9.82%***	***10.56%***
Cost/income ratio	***98.13%***	***91.84%***	***78.51%***	***77.89%***	***77.15%***	***76.28%***	***75.31%***

9. Commerzbank cost of equity

Current cost of equity:

Risk free rate	*4.02%*	
Equity risk premium	*4.00%*	
Beta	1.17	
Current cost of equity	***8.70%***	
Market capitalisation	9,106	
Surplus capital	(2,357)	*-25.88%*
Target capitalisation	6,749	*74.12%*
Proforma Beta	1.58	
Proforma cost of equity	***10.33%***	

10. Commerzbank Valuation (€ million)

	2004	2005	2006	2007	2008	Terminus
Terminus assumptions:						
Assumed long term growth rate	*2.00%*					
Assumed long term ROE	*10.33%*					
Inputs from forecasts:						
Profit after taxation	568	576	616	658	698	712
Cash flow to/(from) equity	**2,858**	**614**	**676**	**751**	**840**	**574**
Retained earnings	(2,290)	(38)	(60)	(93)	(142)	
Opening shareholders' funds	9,091	6,801	6,763	6,703	6,609	6,467
Return on opening shareholders' funds	*6.25%*	*8.48%*	*9.11%*	*9.82%*	*10.56%*	*10.33%*
Cost of equity	*10.33%*	*10.33%*	*10.33%*	*10.33%*	*10.33%*	*10.33%*
Implied residual income	**(372)**	**(126)**	**(83)**	**(35)**	**15**	**43**
Discounted cash to equity value:						
NPV five year free cash flow	4,619	*52.3%*				
NPV terminal value	4,212	*47.7%*				
Value of shareholders' funds	**8,831**	*100.0%*				
Shares issued (million)	594					
Value per share (Eur)	**14.86**					
Share price	15.32					
Premium/(discount)	*-3.01%*					
Residual income valuation:						
Opening shareholders' funds	9,091	*102.9%*				
PV five year residual income	(517)	*-5.9%*				
PV terminal value (ex incremental investment)	257	*2.9%*				
PV terminal value (incremental investment)	0	*0.0%*				
Value of shareholders' funds	**8,831**	*100.0%*				
Shares issued (million)	594					
Value per share (Eur)	**14.86**					
Share price	15.32					
Premium/(discount)	*-3.01%*					

3.6.1 Historical balance sheet

The historical balance sheet items are fairly self-explanatory, and we shall restrict our comments to the treatment of derivatives. Notice that fair value hedges are carried at fair value, and the assets and liabilities that are created closely match increases and decreases in the values of the underlying, which are also marked to market. (They do not match precisely, which is why there is a small gain or loss on derivatives used for hedging in the profit and loss account.) Derivatives also feature in the calculation of equity, where losses on cash flow hedges are being held prior to release when they can offset gains on the underlying transaction. We shall discuss the analysis of provisions for loan loss and the forecasts below.

3.6.2 Historical income statement

Turning to the income statement, it is evident that even for Commerzbank, which has relatively small investment management and asset management businesses, its net commission income is a large proportion of the total of net interest income and net commission income (the total income of the bank, prior to hedging, trading and investment activities). In 2003, net interest income prior to provisions for possible losses was €2,776 million, and net commission income was €2,136 million, which represented 43 per cent of total income of €4,912 million. It is notable that Commerzbank had a very high cost/income ratio, with operating expenses of €4,511 million representing 92 per cent of income.

Because Commerzbank follows IFRS, not only do we see the results on hedge accounting as already discussed but also the full impact of fair value reporting of available for sale investments as part of the net result on investments and securities portfolio.

There were large exceptional items in both 2002 and 2003, involving both restructuring charges and other exceptional items. In 2003 the largest of these comprised a write-down of investment assets following an impairment test, and this explains why the company had a tax charge despite generating a large loss. Asset write-downs are not deductible against taxation.

3.6.3 Forecast balance sheets

Turning to the forecasts, page three shows the balance sheet drivers, i.e. balance sheet items growth rates. They are all being forecast independently, other than loan loss provisions, to which we shall return, other assets, which are used as the balancing item, and therefore need to be watched carefully as a sanity check, and the components of equity, including minority interests. The main drivers to the balance sheet are the claims on banks and customers and the liabilities to banks and customers, and it seems reasonable to suppose that hedges and securitised liabilities will grow with the business. Most other items, such as provisions and tax assets and liabilities, have been assumed to remain unchanged, though in some cases it may be possible to model them more accurately.

Turning back to the analysis of provisioning on page two, banks carry provisions against the possibility of non-recovery of loans. Each year they make additional provisions, and each year they utilise some of the provisions, when writing off unpaid debts. We have forecast the balance sheet provision as a percentage of year end loans outstanding and the annual provision as a percentage of the average loans outstanding, which leaves the write-offs backed out as a result. Clearly, it is only possible to forecast two of these three items, and the third is an implied result.

3.6.4 Forecast profit and loss account

The key drivers to the profit and loss account are the interest rate received on loans and the rate paid on liabilities, the rate of growth in commission income, and the forecast of operating expenses to net interest and net commission income (the cost/income ratio). Note that we have modelled the minority by assuming that its share of net profit will be commensurate with its share of net assets, and have assumed that all of the profit attributable to minorities accrues to the balance sheet (no dividends to minorities).

3.6.5 Economic capital

Banks manage their businesses with reference to the economic capital that is required to support each business. This can be seen as the necessary cushion of equity (or quasi-equity) required to ensure the bank against failure under all but the most severe circumstances. It is derived by applying Value at Risk (VAR) analyses to the assets of the business, and determining the maximum extent of probable losses with a very high level of statistical confidence. Many banks show this calculation by business, and this permits the independent valuation of each operation with respect to its risk adjusted return on economic capital, with any surplus capital backed out as a residual. We are not trying to model Commerzbank on a business by business basis, but we can still use the bank's calculations of economic capital to determine the extent of its surplus capital, as shown on page five.

3.6.6 Capital ratios

Page six shows the analysis of and forecasts for Commerzbank's capital ratios. The report and accounts for most banks show an allocation of their book assets by category, and the weightings used to derive the risk weighted assets (RWA). If we assume that the nature of the business will not change materially, then holding an overall factor to derive the forecast RWA figure is reasonable. If not then the asset allocation should be forecast first, then the relevant weights should be applied, and the group RWA will drop out as a result.

It is clear that Commerzbank has significant surplus capital. But it is also notable that the bank's estimate of its economic capital at end 2003 was significantly higher than the minimum Tier I capital ratio permitted by the Basle agreement. Our approach is to assume that the bank distributes its surplus capital over and above its estimate of its economic capital, and that this can be forecast by assuming that its target Tier I capital ratio remains constant to the latest economic capital/RWA ratio. Clearly, if the business risk is expected to change dramatically in future then just as RWAs should be modelled by business then so should economic capital. In case the bank modelled does not disclose its economic capital, the target Tier I ratio might be assumed to be a multiple of the minimum regulatory requirement, to reflect the fact that rating agencies and sector analysts would downgrade a bank operating on a minimum regulatory capital level.

3.6.7 Equity issues and buy-backs

There is no difference between the accounting treatment of equity issues and buy-backs in the Commerzbank model, starting on page seven and then playing back into the forecasts of balance sheets and shares outstanding, and the same treatment in the Metro model in Chapter five. The modelling difference is that here we have calculated the size of the buy-backs in page seven as that which will result in the target Tier I capital ratios from page six. So the desired balance sheet explicitly determines the size of the buy-backs (or issues, in the opposite case of a bank whose projected capital was inadequate).

3.6.8 Performance ratios

Page eight of our model shows the simplest useful analysis of performance ratios for a bank. The first is a measure of income margin, taking net attributable income and dividing it by the sum of net interest and commission income. The second relates income to total assets. Clearly, multiplying the two together gives a return on total assets, in the same way that a margin and a capital turn provide a return on capital figure for an industrial company. The third component of the analysis is the percentage of assets that are represented by equity. If we multiply return on assets by the reciprocal of this figure then we get the return on equity. (If equity represents 2 per cent of assets then return on equity is 50 times return on assets.)

As with a standard DuPont analysis, it is possible to disaggregate this analysis into each of its components. A key driver to the income margin is the cost/income ratio, and we show that separately. The three most widely quoted performance measures for banks are return on assets, return on equity and cost/income ratio.

Our combination of some increase in forecast interest rates received and large reductions in cost/income ratios are combining to increase significantly the return on assets, and the buy-backs also leverage up the return on equity, but it should be remembered that this also has implications for the cost of equity.

3.6.9 Discount rates

We mentioned above that banks are inherently leveraged. Even a bank whose capital entirely comprised equity would have a balance sheet for which the larger part of the liabilities represented creditors representing customer deposits. The corollary is that assets will never be fully backed by equity capital, as can happen for industrial companies. We have seen that one approach is to estimate the amount of economic capital (risk capital is a more easily interpreted definition) that the bank needs, and to assume that it distributes any surplus over and above that amount. But distributing a surplus has the effect of increasing the cost of equity.

Our recommended approach to this is to assume that the Tier I capital in a bank can be valued as having two components. The first is the economic capital of the bank. The second is the surplus capital of the bank. The cost of capital to the latter is the risk free rate, since it is not being allocated as risk capital, and the cost of capital to the former can be derived by adjusting the measured Beta, in exactly the same way that one would deleverage the Beta of an industrial company with net cash in its balance sheet. Instead of the leveraged Beta being divided by (1+D/E) to derive an unleveraged Beta it is divided by (1-Cash/Equity), to derive an unleveraged Beta. In our case we are just treating surplus capital as if it were cash.

3.6.10 Valuation

Our valuation on page seven is an absolutely standard DCF/residual income to equity model, and should require no explanation, since it is structurally identical to the model used for Metro in Chapter five, other than that it values equity directly, rather than debt.

As usual, most of the DCF value lies in the terminus, which represents about 80 per cent of the value derived. Much more interesting is the allocation of value in the residual income model. Even assuming that incremental investments after 2008 earn exactly their cost of capital, and add or subtract nothing from the value of the business, it turns out that the current book value represents more than the appraised value of the equity. Forecast residual income is negative throughout the projected period and into the long term future with respect to capital that is already installed by end 2008.

3.6.11 Sum-of-parts and economic capital employed

Where adequate information is provided it may be possible to value the bank business by business. In that instance we would again recommend modelling returns (cash flow or profit) to projections of economic capital, and then adding on the value of the surplus capital as a separate item. In this instance, the discount rates used would be determined separately on a business by business basis, and would again apply only to risk capital, with surplus capital treated as risk free cash.

4. Insurance companies

Introduction

In a similar vein to banks, insurance companies are very different from industrial concerns. In many ways they share significant characteristics with banks in that they are subject to strict regulatory control, they are sophisticated managers of risk and they are heavily involved in investment and trading of securities. Indeed given these similarities many banks have insurance businesses leading to the term ‘bancassurers’.

However, even given this overlap between the business of insurance companies and that of banks it is important to note that insurance companies are really quite specialised in what they do – providing life and non-life insurance cover. Therefore although certain aspects of financial accounting are very similar, there are many quite complex and specific issues that only apply to insurance company financials.

4.1 Insurance company accounting

Insurance accounting has developed over the years in a sporadic way. It is a mixture of non-specific GAAP (e.g. on pensions), specific rules relating to insurance companies and accepted practice. This has resulted in a patchwork quilt of an accounting framework. In the IASB’s view, as they seek a coherent framework for accounting generally, this is unacceptable. Furthermore insurance companies have tended to be excluded from the scope of many accounting standards. In all, therefore, insurance accounting has been a bit of a mess. As a result of this cross border comparison of insurance company financials has been fraught with difficulty.

As a result of this the IASB embarked on an ambitious project to develop a co-ordinated suite of standards that would supplement existing (general) GAAP. Due to the complexity of some of the issues involved it was decided to divide the project into two phases. Phase I is manifest in IFRS 4 - *Insurance contracts*. Phase II is still under discussion at this stage. Many of the controversial issues, such as the role of embedded value accounting in any future accounting model, have been deferred to this second phase. A summary of the key points in IFRS 4 is included later in this chapter.

4.1.1 Fundamental aspects of insurance company accounting.

Essentially insurance companies receive policyholder funds in advance of providing the risk coverage. Therefore it is obvious that premium recognition will be a major accounting issue, even if not especially complex. In order to obtain this business insurance companies incur quite substantial costs. Therefore the recognition of these costs is a substantial issue. Once the monies have been received the insurance company will invest these so the treatment of investment income is significant. Finally the insurance company will have to estimate the amount of claims. It will often develop sophisticated systems for establishing provisions. Therefore provisioning is a major component of insurance company accounting.

In summary therefore the key accounting issues can be distilled into four areas:

1. **Premium recognition**: at what point can premium income received from clients be recognised?
2. **Customer acquisition costs**: at what point are these expensed? Can they be capitalised? If capitalised they are referred to as deferred acquisition costs.
3. **Investments**: How are they valued and when does investment income flow through the income statement?
4. **Provisions**: How are provisions estimated and recognised in an insurance context?

4.1.2 Insurance accounting terminology

Many insurance accounting terms do not integrate or fit with current accounting terminology. Exhibit 6.11 explains some of the key terms used.

Exhibit 6.11: Accounting terms for insurance

Term	Meaning
Reserves	Simply means provisions. Remember that these are non-cash. So if a company has a reserve, in the technical accounting sense of the word, they have merely anticipated a future liability. There is not (necessarily) cash somewhere specifically for this.
Technical Vs non-technical	These terms are sometimes used to distinguish between those activities that are related to core insurance activities, so called technical account, and those relating to other activities called the non-technical account.
Equalisation (catastrophe) reserves	Provisions that are established with no specific liability in mind. Insurance companies have used these to smooth earnings (as the name implies). The argument is that a catastrophe will happen from time to time and so a gradual model of recognition is more prudent.
Deferred acquisition costs (DAC)	If an insurance company incurs costs to acquire customers then these have often been capitalised and amortised over the time.
IBNR	The initials stand for 'incurred but not reported'. It refers to those claims that have not yet been reported by policyholders but the 'insured event' has already happened
Reinsurance	Insurers typically wish to spread some of the risk inherent in the business that they have underwritten. Therefore they will often 'cede' some of the risks to another insurance company. This passing of insurance using other insurance contracts is referred to as reinsurance.

4.1.3 Insurance company financial statements – the fundamentals

We outlined the four key core accounting issues in insurance accounting above. We shall now address each of these core issues before moving on to some of the additional detail that will help in analysing insurance companies.

A typical income statement and balance sheet for an insurance company is shown in Exhibit 6.12 below.

Exhibit 6.12: Accounts for typical insurance company

Income statement of typical insurance company	€
Net earned premiums	100
Claims incurred	(75)
Commissions	(12)
Operating expenses	(14)
Technical result	(1)
Investment income	6
Pre-tax profit	**5**

Balance sheet of typical insurance company	€
Intangible assets	400
Investments	200
PP&E	120
Other assets	50
Provisions (technical reserves)	(450)
Other liabilities	(20)
=Equity	**300**

Issue 1 – Premium income recognition (net earned premiums)

As we stated above premium recognition is a core issue for insurance company accounting. We must also bear in mind that under general accounting principles revenue can only be recognised if two conditions are met. First, the revenue is realisable, and second, it has been earned. In the case of an insurance company receiving a premium up front it is obviously realised. It will only be earned if the risk coverage period has elapsed. Therefore an insurance company will have a mix of premium sources; some older premiums now earned and recognised as well as the non-recognition of newer premiums not yet earned.

A standard working is used to illustrate this.

Exhibit 6.13: Calculation of net earned premiums

Calculation of net earned premiums	**€**
Gross written premiums	250
- Reinsured premiums	(120)
= Net written premiums	130
- Change in provision for unearned premiums	(30)
Net earned premiums	**100**

Gross written premiums are the actual funds received from policy holders in the period. Much of the risk that will have to be covered as a consequence of these receipts will relate to future periods. Therefore quite obviously it does not qualify for recognition under the earned basis.

In order to manage this risk the ceding company will often offload or pass on some of the risk to other insurance entities. As a result of this some of the premium is also passed onto other insurance companies. Naturally this has not been earned so must be deducted from gross written business to calculate the net written premiums.

Net written premiums represent the revenues for the net retained level of risk. The duration of insurance policies differs depending on their source. For example non-life insurance policies normally average about 2-3 years. Even if all the net written premiums lasted for one year only the premiums written on 1st January could actually be recognised.

Unearned premiums are similar in nature to deferred income – monies received from customers that have not yet been earned. These are a liability as the insurance company ‘owes’ the coverage to the customer. This liability will sit on the balance sheet as part of technical reserves. Therefore when premiums are received and the year end financials are being prepared the insurance company must decide what proportion related to the future and what amount has been earned. For example a premium of €2,400 received on 1 October (assume calendar year end) would be divided up into a recognised portion (3/12 X 2,400) €600 and an unrecognised portion €1,800. This €1,800 would be included in provisions called ‘provision for unearned premiums’. Each year the movement in the provision is netted against the written premiums to calculate those earned.

Issue 2: Claims and provisions

There are a number of different components to this line in the income statement:

- **Claims paid**
  This represents all of the claims settled during the period. It includes all related expenses (e.g. legal costs). Naturally if any of the risk on a policy has been ceded the claims paid by the reinsurance company shall be netted against the expense.
- **Claims incurred**
  An insurance company cannot wait for claims to be paid prior to recognition. This would mean that real liabilities and costs were not included in the income statement. An insurance company will be well aware of claims that have been made but not yet actually settled. In this case a provision, or reserve as insurance professionals tend to call it, is established. Like all provisions it is movement in the reserve that goes through the income statement. The balance of the claim will be recognised in the balance sheet. It is worth noting that insurance companies also provide for those claims that have not yet been reported but have been incurred. These are often referred to as 'IBNR' as described above.

It will only be the balance of claims made, and not settled, in addition to IBNR that will be recognised on the balance sheet. Provisions for catastrophes have been prohibited by IFRS 4 and therefore will no longer be allowed. The prevalence of these provisions had started to fade over the years and so it was no surprise that they were eventually eliminated. The main rationale for not recognising such provisions is that they did not satisfy the recognition criteria in IAS 37 *Provisions* as there was no past event – these provisions were established for future unknown events.

Issue 3: Commissions

As mentioned above insurance companies often incur substantial costs upfront in order to acquire customers. If we apply the matching system then there is an argument for deferring some of these costs as the benefit will also be recognised (earned premiums) in future years. Therefore, if such an approach were to be followed the 'DAC' or deferred acquisition costs would be capitalised as an intangible asset and amortised over the duration of the policy.

Accounting standards have tried to standardise this practice as there were widely divergent approaches in the industry. Both US GAAP and IFRS (via IFRS 4 *Insurance Contracts*) provide that DAC can only be capitalised if:

1. They are costs that relate directly to the acquisition of insurance premiums, such as commissions to agents and brokers, are deferred and amortised over the related policy period, generally one year

2. If the future policy revenues on existing policies are not sufficient to cover the DAC, then the costs are written off to earnings
3. Investment income is NOT considered in determining whether such a deficiency does exist.

DAC will be an intangible asset on the balance sheet. The amortisation period will be disclosed in the financials.

Issue 4: Investments

Under IFRS and US GAAP there are three classifications; available for sale, held to maturity and trading. In the balance sheet only held to maturity are not marked to market. The difference between trading and available for sale is that for trading, movements in value are recognised in the income statement whereas for available for sale such movements in value go to equity.

4.1.4 Life insurance contracts

Life insurance contracts tend to be more complex than general insurance contracts. This is also reflected in the accounting. The two main areas that require further commentary are establishing the technical reserve for life insurance and premium recognition for life insurers.

Technical reserves for life insurance:

These reserves are derived from two distinct sources;

1. **Reserves for claims outstanding**: these are precisely the same as we have seen before.
2. **Mathematical reserves**: these are reserves that are calculated using sophisticated data. They are not a provision against a specific certain event. Instead over the term of the policy, as the holder ages and the likelihood of claim increases, the reserve increases. The calculation of mathematical reserves is a complex task and involves consideration such factors as:
   - Mortality rates
   - Acquisition and administrative expenses
   - Minimum guaranteed returns promised to customers

Mathematical reserves are not really used in the same way for general insurance as the period of cover is defined and the probability of claims is much more straightforward to calculate albeit more unpredictable.

Under US GAAP there is a detailed suite of rules regarding the calculation of mathematical reserves. Generally the calculation is determined by the classification of the products. There are up to eight different types and so the whole thing is rather complex.

Gross written premiums for Life cover

From an insurer's point of view the premium is composed of three distinct parts:

Fair premium	**Safety margin**	**Loading**
PV of insurance compensation X probability of claim (death)	Premium charged slightly exceeds the fair premium as protection for insurer	This covers the insurance company's costs – commission and administrative costs

Pure premium

There is also some government tax paid on top of this. Given that life insurance premiums can be single (one-off lump) or regular (e.g. monthly), short cuts are often used when looking at revenues. One approach is to take annual premiums and add to it a portion for the single premium policies. It is common practice to assume that the average maturity of a single premium policy is 10 years: then the annual premium equivalent or APE would simply be the annual premiums + single premiums X 1/10.

Another approach is to just look at the new business written thereby ignoring business sold (but not earned) that has been included in revenues in the financials.

4.1.5 Further issues in insurance accounting

There are a variety of complications with accounting within insurance companies. Many of these arise from the nature of specific products and are outside the scope of a generalist accounting and valuation text. However, recently the IASB has started on the long journey toward developing coherent integrated GAAP for insurance activity. The first step in this was the issuance of IFRS 4 *Insurance contracts*. This was Phase 1 of the insurance project.

The main elements of IFRS 4 are as follows:

IFRS 4 Insurance contracts – key points

IFRS 4 applies to all insurance contracts that an entity issues or reinsurance contracts that it issues or holds. However, it does not apply to the other assets and liabilities of an insurer that would be covered by other standards such as IAS 39 *Financial Instruments*.

- For purely pragmatic reasons the IFRS exempts insurers from applying certain other IFRS.
- Although not requiring blanket application of other IFRS the standard does:
    1. Prohibit provisions for possible claims (so called catastrophe reserves)
    2. Require an assessment of the adequacy of insurance provisions and impairments tests on insurance assets
    3. Prohibit netting off insurance assets and liabilities
- In addition the IFRS seeks to stop insurance companies choosing accounting policies that would make the financials less relevant/reliable than previously. Although not prohibited if already in use, an insurance company cannot introduce policies that:
    1. Measure insurance liabilities on an undiscounted basis
    2. Recognise rights to future investment management fees at an amount above current fees charged for similar services
    3. Result in the use of non-uniform accounting policies for insurance liabilities in subsidiaries
    4. Result in excessive prudence
- If an insurance company changes its accounting policy for insurance liabilities it may designate some or all of its financial assets as 'at fair value through the profit and loss'.
- There are extensive disclosure requirements. In particular one area where European practice will catch up with US GAAP is the disclosure of claims development. This is often done in a claims development table as illustrated in Exhibit 6.14.

Exhibit 6.14: Insurance claims development table

Underwriting year	2001	2002	2003	2004	2005	Total
Estimate of cumulative claims:	€	€	€	€	€	€
At end of underwriting year	680	790	823	920	968	
One year later	673	785	840	903		
Two years later	692	776	845			
Three years later	697	771				
Four years later	702					
Estimate of cumulative claims	702	771	845	903	968	4,189
Cumulative payments	-702	-689	-570	-350	-217	-2,528
Recognised on balance sheet	0	82	275	553	751	1,661

The disclosure works as follows:

- The **top half** shows how the insurer's estimates of claims develop over time. For example at the end of 2002, the insurer estimated that it would pay €790 for insured events relating to contracts written in 2002.
- By the end of 2003 the insurer has **revised this estimate** from €790 down to €785 (includes paid and still to be paid).
- The **lower half** of the table reconciles these numbers to the amounts in the financials. Obviously if payments have been made then this reduces the liability. For example it is no surprise that after 4 years large amounts of the claims will have been settled.

For users this claims development table can provide some useful insights. First it is a clear statement to users that you cannot estimate claims with 100 per cent accuracy. It is a reminder of the uncertainty. Second, it can also be used to analyse whether particular insurers tend to over or under estimate the level of liabilities. This can feed into detailed comparable company analysis work.

Note that under IFRS 4, and unlike US GAAP, the table must be prepared for all types of business – life and general. However, there is a carve out for policies where the uncertainties are resolved within a year. This is likely to absolve many insurance policies from the requirement. Second, it should go back to the earliest existing material unresolved claim. However, it need not go back further than 10 years.

4.2 Regulation

Insurance companies are subject to extensive regulation aimed at ensuring that they are able to fulfil their commitments to policyholders and that in case of poor operating performance there are sufficient funds to absorb losses without endangering policyholders' rights. For EU insurers, the key regulatory framework is represented by a series of EU Directives.

Insurance regulation covers the following main aspects:

1. Adequacy of technical reserves to cover underwriting risks
2. Admissibility of investments used to cover technical reserves
3. Adequacy of solvency margin, i.e. funds able to absorb operating losses.

These are discussed further below:

- **Adequacy of technical reserves**
  This is achieved not by enforcing minimum reserving ratios, but rather by defining specific, actuarial valuation criteria to calculate reserves (referred to in the paragraph above). This is a particularly sensitive problem both in the case of non-life insurance claims reserves, where there are many uncertainties regarding the quantification of future commitments, and in the case of life insurance, where the recent failure of Equitable Life has highlighted the scope for understating reserves and inflating reported surplus.

- **Composition of investments**

  Regulators monitor the type and composition of investments used to cover technical reserves. For instance, as already mentioned, intangible assets cannot be used to cover technical reserves, and need to be reported separately. In addition, regulators try to promote a sound and well diversified investment strategy, by imposing limits on the amount of admissible investments in one single asset or issuer.

- **Solvency margins**
  In a similar manner to banks having to meet minimum capital ratios, insurers have to report minimum solvency margins. Insurers price their policies on the basis of expected claims. Although they build a safety margin in the 'fair premium' in the calculation of the pure premium, this safety margin might not be sufficient to cover worse than expected claims experience. A solvency margin is required to ensure that permanent capital is available to absorb such unexpected losses, without the insurer breaching its promises and being forced to bankruptcy. The solvency margin is the ratio of available capital to required capital.

What is the available capital?

Insurance available capital includes all permanent capital which is able to absorb losses, i.e. essentially shareholders' funds and some hybrid products (preferred shares and subordinated debt) subject to specific conditions and limitations. Insurance companies have to disclose the amount and calculation of the available capital in the notes to the accounts, as well as the positive or negative difference from the minimum legal requirement.

Available capital includes the following components:

\+ Permanent shareholders' capital, including:
  Fully paid common stock
  All disclosed reserves created by accumulated retained earnings

\+ Equalisation reserves

\+ Cumulative preferred shares

\+ Subordinated debt

\- Goodwill and other intangible assets

= *Available capital*

Notes on the calculation of solvency margin:

- **Equalisation reserves** are the insurance equivalent of reserves for general banking risk for banks. As they do not cover any specific liability, they qualify as permanent capital available for solvency purposes.
- **Goodwill and other intangible assets** have to be deducted from the available capital calculation as they do not contribute to permanent capital which can be relied upon to cover losses. However, in the case of insurance companies, intangible assets might include also deferred acquisition costs (DAC, see above), which can be considered investments to generate future profits. For this reason, some regulators allow DAC to be included in available capital (see below).
- Similarly to banks, **preferred shares and subordinated debt** must fulfil specific conditions to qualify as available capital:
  - They must be unsecured, subordinated and fully paid-up
  - They must be perpetual, or, at least, not redeemable upon the investor's choice
  - Default on interest/dividend payments does not automatically oblige theinsurer to stop trading, i.e. the instruments must be available to participate in losses.

- Preferred shares and subordinated debt fulfilling the conditions above qualify as available capital only up to **50% of the lower of the available capital and the required available capital**. Dated cumulative preferred shares and subordinated debt can also qualify as available capital, provided their term is of at least 5 years and they are subject to an upper limit of 25% of the lower of available and required available capital.
- EU norms allow member states to accept as available capital **additional elements** which, given the specific nature of the insurance business, might present the ability to absorb losses:
  - 50 per cent of **future profits**, calculated by multiplying the estimated annual profit by the lower of the average duration of technical reserves (i.e. remaining period on existing policies) and 6 times. This is an approximation of the concept of in-force business, i.e. the present value of the future stream of profits that insurers (especially in the life business) can expect from their existing policies. Even if the insurer closed its doors to new business, it would still generate profits from existing policies, until they run off. In any event, in-force business is also subject to the upper limit of 25 per cent of the lower of available and required capital.
  - If **acquisition costs** are not capitalised, then they have been deducted from profits and therefore shareholders' funds. Some regulators effectively allow companies to write back shareholders' funds by the amount of acquisition costs which have been deducted, under specific conditions and limitations. The calculation is performed by actuaries.
  - Any **hidden reserves** arising out of the valuation of assets (unless they are exceptional in nature).
  - 50 per cent of **unpaid share capital**, if paid-up share capital amounts to at least 25 per cent to total issued share capital.

One difference between banks' capital and insurers' available capital is that insurers do not have to make deductions for a non-consolidated holding of other insurers' capital, effectively allowing for double-counting of available capital across the system. As is the case for banks, insurers tend to target capital ratios above the minimum required by law to satisfy rating agencies and equity research analysts covering their securities. However, in periods of crisis in the financial markets, where capital is eroded by falling returns or losses, regulators might relax minimum solvency requirements, allowing insurers to continue trading and recover.

Note: This regulation section was adapted from Chapter 19 of Accounting for investment analysts: An international perspective, Kenneth Lee, a BG Publication, 2004. Chapter 19 was originally contributed by Annalisa Caresena, BG's Financial service company valuation expert.

4.3 Valuing insurance companies

4.3.1 What is the problem?

Insurance companies are complicated. Of all the sectors of the market, they are the hardest to value, particularly in their life businesses. The reasons for this are merely extensions of issues that we have already met. As with banks, it is not meaningful to distinguish between the operating business and financial items. As with banks, there are operations on both sides of the balance sheet, so it is generally necessary to model flows to equity. For life businesses, to a far greater degree than with banks, the duration of the cash flows is such that statutory accounts do not present a fair reflection of the businesses. This is recognised explicitly by those companies that publish so-called Achieved Profits (AP) accounts. These reflect movements in accrued value in the same way as the adjustments that we made to Exxon's exploration and production business reflect changes in the value of its reserves, and can be interpreted in much the same way. Unlike either banks or oil companies, the biggest problem with insurance companies is establishing the present value of their liabilities. This is similar to the difficulty in addressing a PBO for a funded pension scheme, and it is not coincidental that both tasks are performed by actuaries. As with pensions, much of what happens in the accounts of a life business reflects treatment of changes in expectation, either of longevity or of investment returns.

In this section we shall divide our treatment of insurance companies between two separate approaches. For general insurance businesses, we shall recommend modelling and valuing them on the basis of their Modified Statutory Solvency (MSS) accounts, and a valuation routine which is essentially the same as we applied to banks. For life businesses, we shall recommend working from AP accounts, and splitting their values between the embedded value of existing business and the present value of expected future new business.

4.3.2 General insurance businesses

The model that we are going to use to illustrate general insurance is based on some projections generated by a business that was put on the market in the year 2000, and the figures are as they were then projected to be. We have codenamed the company, Sundance, and have left the currency unspecified. It makes no difference whatsoever to the analysis, in any case.

The business had four main divisions, for private, commercial, industrial, and marine and energy, in addition to which it had business lines that it was not maintaining, which are modelled as a separate 'run-off'. Since each of the business lines is modelled in the same way, we shall discuss only the first of the four pages, and the runoff.

The remaining forecasting pages relate to the consolidated profit and loss account, the consolidated balance sheet, forecasts of technical provisions, forecasts of investments, debtors and creditors, and projections of cash flow. The latter differs from profits to the extent that the company had tax losses accounted for as deferred tax assets, so while these are utilised it will not pay tax as charged to the profit and loss account. As already explained, there is nothing new about the valuation routine.

Exhibit 6.15 below is our full 12 page model, and we shall comment on it in subsequent paragraphs.

Exhibit 6.15: Model of general insurance business

1. Sundance - Private business

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Gross written premiums	7,553	8,091	8,604	9,023	9,499	9,944	10,398
Reinsured premiums	(270)	(223)	(314)	(280)	(294)	(308)	(322)
Net written premiums	**7,283**	**7,868**	**8,290**	**8,743**	**9,205**	**9,635**	**10,075**
Net earned premiums	7,089	7,593	7,837	8,446	9,020	9,443	9,874
Net claims	(6,145)	(6,531)	(7,266)	(7,426)	(7,740)	(7,988)	(8,156)
Net operating expenses	(1,660)	(1,701)	(1,800)	(2,086)	(2,264)	(2,361)	(2,409)
Underwriting result	**(716)**	**(639)**	**(1,229)**	**(1,066)**	**(983)**	**(906)**	**(691)**
Growth in written premiums		*7.1%*	*6.3%*	*4.9%*	*5.3%*	*4.7%*	*4.6%*
Retention ratio	*96.4%*	*97.2%*	*96.4%*	*96.9%*	*96.9%*	*96.9%*	*96.9%*
Earned/net written premiums	*97.3%*	*96.5%*	*94.5%*	*96.6%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*86.7%*	*86.0%*	*92.7%*	*87.9%*	*85.8%*	*84.6%*	*82.6%*
Expense ratio	*23.4%*	*22.4%*	*23.0%*	*24.7%*	*25.1%*	*25.0%*	*24.4%*
Combined ratio	*110.1%*	*108.4%*	*115.7%*	*112.6%*	*110.9%*	*109.6%*	*107.0%*
Reserves	**11,750**	**12,065**	**13,625**	**13,925**	**14,513**	**14,980**	**15,293**
Reserves/Net earned premiums	*165.7%*	*158.9%*	*173.9%*	*164.9%*	*160.9%*	*158.6%*	*154.9%*

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Gross written premiums	10,858	11,325	11,751	12,209	12,631	13,078	13,554
Reinsured premiums	(337)	(351)	(364)	(378)	(392)	(405)	(420)
Net written premiums	**10,522**	**10,974**	**11,387**	**11,831**	**12,239**	**12,673**	**13,134**
Net earned premiums	10,311	10,755	11,159	11,594	11,995	12,420	12,871
Net claims	(8,548)	(8,937)	(9,050)	(9,380)	(9,895)	(10,432)	(10,735)
Net operating expenses	(2,413)	(2,409)	(2,388)	(2,423)	(2,567)	(2,658)	(2,729)
Underwriting result	**(650)**	**(592)**	**(279)**	**(209)**	**(468)**	**(671)**	**(592)**
Growth in written premiums	*4.4%*	*4.3%*	*3.8%*	*3.9%*	*3.5%*	*3.5%*	*3.6%*
Retention ratio	*96.9%*	*96.9%*	*96.9%*	*96.9%*	*96.9%*	*96.9%*	*96.9%*
Earned/net written premiums	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*82.9%*	*83.1%*	*81.1%*	*80.9%*	*82.5%*	*84.0%*	*83.4%*
Expense ratio	*23.4%*	*22.4%*	*21.4%*	*20.9%*	*21.4%*	*21.4%*	*21.2%*
Combined ratio	*106.3%*	*105.5%*	*102.5%*	*101.8%*	*103.9%*	*105.4%*	*104.6%*
Reserves	**16,029**	**16,758**	**16,970**	**17,588**	**18,556**	**19,563**	**20,129**
Reserves/Net earned premiums	*155.5%*	*155.8%*	*152.1%*	*151.7%*	*154.7%*	*157.5%*	*156.4%*

2. Sundance - Commercial business

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Gross written premiums	5,907	6,093	6,023	6,529	6,820	7,093	7,365
Reinsured premiums	(427)	(627)	(603)	(276)	(284)	(293)	(305)
Net written premiums	**5,480**	**5,466**	**5,420**	**6,253**	**6,537**	**6,800**	**7,060**
Net earned premiums	5,397	5,419	5,404	6,125	6,406	6,664	6,919
Net claims	(5,000)	(4,373)	(5,241)	(5,408)	(5,530)	(5,582)	(5,598)
Net operating expenses	(1,392)	(1,399)	(1,360)	(1,525)	(1,630)	(1,639)	(1,634)
Underwriting result	**(995)**	**(353)**	**(1,197)**	**(808)**	**(755)**	**(556)**	**(313)**
Growth in written premiums		*3.1%*	*-1.1%*	*8.4%*	*4.5%*	*4.0%*	*3.8%*
Retention ratio	*92.8%*	*89.7%*	*90.0%*	*95.8%*	*95.8%*	*95.9%*	*95.9%*
Earned/net written premiums	*98.5%*	*99.1%*	*99.7%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*92.6%*	*80.7%*	*97.0%*	*88.3%*	*86.3%*	*83.8%*	*80.9%*
Expense ratio	*25.8%*	*25.8%*	*25.2%*	*24.9%*	*25.5%*	*24.6%*	*23.6%*
Combined ratio	*118.4%*	*106.5%*	*122.2%*	*113.2%*	*111.8%*	*108.3%*	*104.5%*
Reserves	**10,370**	**9,258**	**9,939**	**10,256**	**10,488**	**10,585**	**10,616**
Reserves/Net earned premiums	*192.1%*	*170.8%*	*183.9%*	*167.5%*	*163.7%*	*158.8%*	*153.4%*

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Gross written premiums	7,633	7,896	8,142	8,413	8,681	8,974	9,295
Reinsured premiums	(318)	(335)	(352)	(368)	(382)	(394)	(403)
Net written premiums	7,314	7,561	7,790	8,045	8,300	8,581	8,892
Net earned premiums	7,168	7,410	7,634	7,884	8,134	8,409	8,714
Net claims	(5,947)	(6,291)	(6,291)	(6,344)	(6,758)	(7,139)	(7,244)
Net operating expenses	(1,698)	(1,759)	(1,736)	(1,723)	(1,830)	(1,911)	(1,973)
Underwriting result	(476)	(641)	(392)	(182)	(455)	(642)	(503)
Growth in written premiums	*3.6%*	*3.4%*	*3.1%*	*3.3%*	*3.2%*	*3.4%*	*3.6%*
Retention ratio	*95.8%*	*95.8%*	*95.7%*	*95.6%*	*95.6%*	*95.6%*	*95.7%*
Earned/net written premiums	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*83.0%*	*84.9%*	*82.4%*	*80.5%*	*83.1%*	*84.9%*	*83.1%*
Expense ratio	*23.7%*	*23.7%*	*22.7%*	*21.9%*	*22.5%*	*22.7%*	*22.6%*
Combined ratio	*106.6%*	*108.6%*	*105.1%*	*102.3%*	*105.6%*	*107.6%*	*105.8%*
Reserves	**11,277**	**11,931**	**11,930**	**12,030**	**12,817**	**13,539**	**13,737**
Reserves/Net earned premiums	*157.3%*	*161.0%*	*156.3%*	*152.6%*	*157.6%*	*161.0%*	*157.6%*

3. Sundance - Industrial business

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Gross written premiums	2,957	3,004	2,923	3,081	3,189	3,300	3,418
Reinsured premiums	(1,506)	(1,602)	(1,579)	(1,157)	(1,192)	(1,230)	(1,270)
Net written premiums	**1,451**	**1,402**	**1,344**	**1,924**	**1,996**	**2,070**	**2,147**
Net earned premiums	1,469	1,352	1,375	1,797	1,956	2,029	2,104
Net claims	(1,253)	(1,147)	(1,311)	(1,797)	(1,701)	(1,713)	(1,714)
Net operating expenses	(338)	(352)	(395)	(410)	(490)	(492)	(489)
Underwriting result	**(122)**	**(147)**	**(331)**	**(410)**	**(235)**	**(176)**	**(99)**
Growth in written premiums		*1.6%*	*-2.7%*	*5.4%*	*3.5%*	*3.5%*	*3.6%*
Retention ratio	*49.1%*	*46.7%*	*46.0%*	*62.4%*	*62.6%*	*62.7%*	*62.8%*
Earned/net written premiums	*101.2%*	*96.4%*	*102.3%*	*93.4%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*85.3%*	*84.8%*	*95.3%*	*100.0%*	*87.0%*	*84.4%*	*81.5%*
Expense ratio	*23.0%*	*26.0%*	*28.7%*	*22.8%*	*25.0%*	*24.2%*	*23.2%*
Combined ratio	*108.3%*	*110.9%*	*124.1%*	*122.8%*	*112.0%*	*108.7%*	*104.7%*
Reserves	**3,264**	**3,360**	**3,187**	**4,368**	**4,136**	**4,164**	**4,168**
Reserves/Net earned premiums	*222.2%*	*248.5%*	*231.8%*	*243.1%*	*211.4%*	*205.3%*	*198.0%*

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Gross written premiums	3,541	3,672	3,804	3,939	4,073	4,210	4,349
Reinsured premiums	(1,313)	(1,358)	(1,405)	(1,452)	(1,500)	(1,548)	(1,597)
Net written premiums	**2,229**	**2,314**	**2,399**	**2,487**	**2,574**	**2,662**	**2,752**
Net earned premiums	2,184	2,268	2,351	2,437	2,522	2,609	2,697
Net claims	(1,813)	(1,914)	(1,930)	(1,966)	(2,101)	(2,200)	(2,246)
Net operating expenses	(514)	(540)	(536)	(536)	(576)	(596)	(617)
Underwriting result	**(143)**	**(187)**	**(115)**	**(64)**	**(154)**	**(187)**	**(166)**
Growth in written premiums	*3.6%*	*3.7%*	*3.6%*	*3.6%*	*3.4%*	*3.4%*	*3.3%*
Retention ratio	*62.9%*	*63.0%*	*63.1%*	*63.1%*	*63.2%*	*63.2%*	*63.3%*
Earned/net written premiums	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*83.0%*	*84.4%*	*82.1%*	*80.6%*	*83.3%*	*84.3%*	*83.3%*
Expense ratio	*23.5%*	*23.8%*	*22.8%*	*22.0%*	*22.8%*	*22.9%*	*22.9%*
Combined ratio	*106.5%*	*108.2%*	*104.9%*	*102.6%*	*106.1%*	*107.2%*	*106.2%*
Reserves	**4,408**	**4,653**	**4,693**	**4,778**	**5,107**	**5,348**	**5,460**
Reserves/Net earned premiums	*201.8%*	*205.2%*	*199.6%*	*196.0%*	*202.5%*	*205.0%*	*202.5%*

4. Sundance - Marine & Energy business

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Gross written premiums	1,365	1,214	1,180	1,043	1,080	1,117	1,157
Reinsured premiums	(580)	(403)	(490)	(279)	(289)	(299)	(309)
Net written premiums	**785**	**811**	**690**	**764**	**791**	**819**	**847**
Net earned premiums	795	869	719	755	775	802	830
Net claims	(438)	(494)	(803)	(702)	(651)	(674)	(689)
Net operating expenses	(205)	(207)	(220)	(268)	(186)	(184)	(183)
Underwriting result	**152**	**168**	**(304)**	**(215)**	**(62)**	**(56)**	**(42)**
Growth in written premiums		*-11.1%*	*-2.8%*	*-11.6%*	*3.5%*	*3.5%*	*3.5%*
Retention ratio	*57.5%*	*66.8%*	*58.5%*	*73.3%*	*73.3%*	*73.3%*	*73.3%*
Earned/net written premiums	*101.3%*	*107.2%*	*104.2%*	*98.8%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*55.1%*	*56.8%*	*111.7%*	*93.0%*	*84.0%*	*84.0%*	*83.0%*
Expense ratio	*25.8%*	*23.8%*	*30.6%*	*35.5%*	*24.0%*	*23.0%*	*22.0%*
Combined ratio	*80.9%*	*80.7%*	*142.3%*	*128.5%*	*108.0%*	*107.0%*	*105.0%*
Reserves	**1,718**	**2,805**	**2,059**	**1,800**	**1,669**	**1,728**	**1,767**
Reserves/Net earned premiums	*216.1%*	*322.8%*	*286.4%*	*238.5%*	*215.4%*	*215.4%*	*212.8%*

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Gross written premiums	1,197	1,239	1,282	1,327	1,374	1,422	1,471
Reinsured premiums	(320)	(331)	(343)	(355)	(367)	(380)	(394)
Net written premiums	**877**	**907**	**939**	**972**	**1,006**	**1,041**	**1,078**
Net earned premiums	859	889	920	953	986	1,021	1,056
Net claims	(713)	(729)	(755)	(800)	(828)	(837)	(887)
Net operating expenses	(198)	(213)	(212)	(210)	(227)	(245)	(246)
Underwriting result	**(52)**	**(53)**	**(46)**	**(57)**	**(69)**	**(61)**	**(77)**
Growth in written premiums	*3.5%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*
Retention ratio	*73.3%*	*73.3%*	*73.3%*	*73.3%*	*73.3%*	*73.3%*	*73.3%*
Earned/net written premiums	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*83.0%*	*82.0%*	*82.0%*	*84.0%*	*84.0%*	*82.0%*	*84.0%*
Expense ratio	*23.0%*	*24.0%*	*23.0%*	*22.0%*	*23.0%*	*24.0%*	*23.3%*
Combined ratio	*106.0%*	*106.0%*	*105.0%*	*106.0%*	*107.0%*	*106.0%*	*107.3%*
Reserves	**1,829**	**1,870**	**1,935**	**2,052**	**2,124**	**2,146**	**2,275**
Reserves/Net earned premiums	*212.8%*	*210.3%*	*210.3%*	*215.4%*	*215.4%*	*210.3%*	*215.4%*

5. Sundance - Runoff business

Year	1997	1998	1999	2000	2001	2002	2003
Gross written premiums	122	163	3	3	3	3	3
Reinsured premiums	(100)	(132)	2	(2)	(2)	(2)	(2)
Net written premiums	**22**	**31**	**5**	**1**	**1**	**1**	**1**
Net earned premiums	210	75	339	1	1	1	1
Net claims	(216)	(164)	(367)	(73)	(73)	(73)	(73)
Net operating expenses	(92)	(24)	(59)	(58)	(47)	(55)	(53)
Underwriting result	**(98)**	**(113)**	**(87)**	**(130)**	**(119)**	**(127)**	**(125)**
Growth in written premiums		*33.6%*	*-98.2%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Retention ratio	*18.0%*	*19.0%*	*166.7%*	*33.3%*	*33.3%*	*33.3%*	*33.3%*
Earned/net written premiums	*954.5%*	*241.9%*	*6780.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*
Loss ratio	*102.9%*	*218.7%*	*108.3%*	*5833.3%*	*4711.1%*	*5481.5%*	*5342.0%*
Expense ratio	*43.8%*	*32.0%*	*17.4%*	*5833.3%*	*4711.1%*	*5481.5%*	*5342.0%*
Combined ratio	*146.7%*	*250.7%*	*125.7%*	*13133.3%*	*12011.1%*	*12781.5%*	*12642.0%*
Reserves	**1,629**	**1,603**	**1,848**	**2,300**	**2,300**	**2,300**	**2,300**

Year	2004	2005	2006	2007	2008	2009	2010
Gross written premiums	3	3	3	3	3	3	3
Reinsured premiums	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Net written premiums	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Net earned premiums	1	1	1	1	1	1	1
Net claims	(73)	(73)	(73)	(73)	(73)	(73)	(73)
Net operating expenses	(52)	(54)	(53)	(53)	(54)	(53)	(53)
Underwriting result	**(124)**	**(126)**	**(125)**	**(125)**	**(126)**	**(125)**	**(125)**
Growth in written premiums	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Retention ratio	*33.3%*	*33.3%*	*33.3%*	*33.3%*	*33.3%*	*33.3%*	*33.3%*
Earned/net written premiums	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*
Loss ratio	*5178.2%*	*5411.7%*	*5342.0%*	*5310.6%*	*5354.8%*	*5335.8%*	*5333.7%*
Expense ratio	*5178.2%*	*5411.7%*	*5342.0%*	*5310.6%*	*5354.8%*	*5335.8%*	*5333.7%*
Combined ratio	*12478.2%*	*12711.7%*	*12642.0%*	*12610.6%*	*12654.8%*	*12635.8%*	*12633.7%*
Reserves	**2,300**	**2,300**	**2,300**	**2,300**	**2,300**	**2,300**	**2,300**

6. Sundance - Profit and loss account

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Gross written premiums	17,904	18,565	18,733	19,679	20,591	21,457	22,340
Reinsured premiums	(2,883)	(2,987)	(2,984)	(1,994)	(2,061)	(2,132)	(2,208)
Net written premiums	**15,021**	**15,578**	**15,749**	**17,685**	**18,529**	**19,325**	**20,131**
Net earned premiums	14,960	15,308	15,674	17,124	18,159	18,939	19,729
Net claims	(13,052)	(12,709)	(14,988)	(15,406)	(15,695)	(16,030)	(16,230)
Net operating expenses	(3,687)	(3,683)	(3,834)	(4,347)	(4,618)	(4,731)	(4,768)
Underwriting result	**(1,779)**	**(1,084)**	**(3,148)**	**(2,630)**	**(2,154)**	**(1,822)**	**(1,270)**
Allocated investment return	1,535	1,380	1,239	1,506	1,564	1,590	1,613
Technical result	**(244)**	**296**	**(1,909)**	**(1,124)**	**(590)**	**(232)**	**343**
Total investment result	2,907	3,450	2,376	2,495	2,576	2,604	2,632
Investment expenses	(203)	(202)	(197)	(203)	(210)	(212)	(214)
Net investment result	**2,704**	**3,248**	**2,179**	**2,292**	**2,366**	**2,392**	**2,418**
less:allocated investment return	(1,535)	(1,380)	(1,239)	(1,506)	(1,564)	(1,590)	(1,613)
Profit/(loss) before tax	**925**	**2,164**	**(969)**	**(338)**	**213**	**570**	**1,148**
Tax charge/credit	(259)	(606)	0	95	(60)	(160)	(321)
Profits/(loss) after tax	**666**	**1,558**	**(969)**	**(243)**	**153**	**410**	**827**
Growth in written premiums		*3.7%*	*0.9%*	*5.0%*	*4.6%*	*4.2%*	*4.1%*
Retention ratio	*83.9%*	*83.9%*	*84.1%*	*89.9%*	*90.0%*	*90.1%*	*90.1%*
Earned/net written premiums	*99.6%*	*98.3%*	*99.5%*	*96.8%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*87.2%*	*83.0%*	*95.6%*	*90.0%*	*86.4%*	*84.6%*	*82.3%*
Expense ratio	*24.6%*	*24.1%*	*24.5%*	*25.4%*	*25.4%*	*25.0%*	*24.2%*
Combined ratio	*111.9%*	*107.1%*	*120.1%*	*115.4%*	*111.9%*	*109.6%*	*106.4%*
Investment return	*8.7%*	*10.4%*	*7.2%*	*7.4%*	*7.4%*	*7.4%*	*7.4%*
Investment expenses	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*
Tax rate	*28.0%*	*28.0%*	*0.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Gross written premiums	23,232	24,134	24,982	25,891	26,762	27,688	28,672
Reinsured premiums	(2,290)	(2,377)	(2,466)	(2,555)	(2,643)	(2,730)	(2,816)
Net written premiums	**20,943**	**21,757**	**22,516**	**23,336**	**24,120**	**24,958**	**25,856**
Net earned premiums	20,524	21,322	22,066	22,869	23,637	24,459	25,339
Net claims	(17,094)	(17,945)	(18,099)	(18,562)	(19,656)	(20,681)	(21,185)
Net operating expenses	(4,874)	(4,976)	(4,925)	(4,945)	(5,253)	(5,464)	(5,618)
Underwriting result	**(1,444)**	**(1,598)**	**(958)**	**(638)**	**(1,272)**	**(1,686)**	**(1,464)**
Allocated investment return	1,668	1,748	1,788	1,820	1,899	1,996	2,061
Technical result	**224**	**149**	**830**	**1,182**	**628**	**310**	**597**
Total investment result	2,694	2,795	2,854	2,891	2,984	3,108	3,200
Investment expenses	(219)	(227)	(232)	(235)	(243)	(253)	(260)
Net investment result	**2,475**	**2,567**	**2,622**	**2,656**	**2,741**	**2,855**	**2,940**
less:allocated investment return	(1,668)	(1,748)	(1,788)	(1,820)	(1,899)	(1,996)	(2,061)
Profit/(loss) before tax	**1,031**	**969**	**1,664**	**2,019**	**1,470**	**1,169**	**1,476**
Tax charge/credit	(289)	(271)	(466)	(565)	(412)	(327)	(413)
Profits/(loss) after tax	**742**	**698**	**1,198**	**1,453**	**1,058**	**842**	**1,063**
Growth in written premiums	*4.0%*	*3.9%*	*3.5%*	*3.6%*	*3.4%*	*3.5%*	*3.6%*
Retention ratio	*90.1%*	*90.2%*	*90.1%*	*90.1%*	*90.1%*	*90.1%*	*90.2%*
Earned/net written premiums	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*	*98.0%*
Loss ratio	*83.3%*	*84.2%*	*82.0%*	*81.2%*	*83.2%*	*84.6%*	*83.6%*
Expense ratio	*23.7%*	*23.3%*	*22.3%*	*21.6%*	*22.2%*	*22.3%*	*22.2%*
Combined ratio	*107.0%*	*107.5%*	*104.3%*	*102.8%*	*105.4%*	*106.9%*	*105.8%*
Investment return	*7.4%*	*7.4%*	*7.4%*	*7.4%*	*7.4%*	*7.4%*	*7.4%*
Investment expenses	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*
Tax rate	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*

7. Sundance - Balance sheet

Year	1997	1998	1999	2000	2001	2002	2003
Assets							
Investments:							
Fixed Income	25,735	25,681	25,396	26,093	26,298	26,661	26,875
Equities	7,583	7,567	7,483	8,698	8,766	8,887	8,958
Total investment assets	**33,318**	**33,248**	**32,879**	**34,791**	**35,064**	**35,548**	**35,833**
Reinsurers' share of technical prov.	5,250	6,263	7,573	7,462	6,999	6,609	6,196
Debtors:							
Arising out of direct insurance operations	na	na	2,162	2,361	2,471	2,575	2,681
Arising out of reinsurance operations	na	na	910	984	1,030	1,073	1,117
Total debtors	**3,039**	**3,885**	**3,072**	**3,345**	**3,500**	**3,648**	**3,798**
Deferred tax	na	na	1,370	1,465	1,405	1,245	924
Other assets	1,788	2,799	2,941	3,257	3,758	4,410	5,174
Deferred acquisition costs	808	819	912	869	924	946	954
Total assets	**44,203**	**47,014**	**48,747**	**51,190**	**51,651**	**52,406**	**52,879**
Liabilities							
Provisions for unearned premiums	7,311	7,598	7,837	6,244	4,956	3,917	3,093
Provisions for claims outstanding	26,691	27,757	30,351	33,868	35,149	36,449	37,247
Technical reserves-gross	**34,002**	**35,355**	**38,188**	**40,112**	**40,105**	**40,366**	**40,340**
Creditors:							
Arising from direct insurance operations	na	na	1,126	1,181	1,235	1,287	1,340
Arising out of reinsurance operations	na	na	240	256	268	279	290
Total creditors	**1,427**	**1,330**	**1,366**	**1,437**	**1,503**	**1,566**	**1,631**
Reinsurer's share of def. acq. costs	62	59	58	52	55	57	57
Net asset value	8,712	10,270	9,135	9,589	9,987	10,416	10,851
Total liabilities	**44,203**	**47,014**	**48,747**	**51,190**	**51,651**	**52,406**	**52,879**
Deferred acq costs/net operating expenses	21.9%	22.2%	23.8%	20.0%	20.0%	20.0%	20.0%
Reinsurers' share of Def. acq. costs	7.7%	7.2%	6.4%	6.0%	6.0%	6.0%	6.0%
Solvency ratio	58.2%	67.1%	58.3%	56.0%	55.0%	55.0%	55.0%

Year	2004	2005	2006	2007	2008	2009	2010
Assets							
Investments:							
Fixed Income	27,911	28,929	29,115	29,693	30,997	32,216	32,875
Equities	9,304	9,643	9,705	9,898	10,332	10,739	10,958
Total investment assets	**37,215**	**38,572**	**38,820**	**39,591**	**41,329**	**42,954**	**43,833**
Reinsurers' share of technical prov.	6,034	5,863	5,493	5,232	5,138	5,016	4,781
Debtors:							
Arising out of direct insurance operations	2,788	2,896	2,998	3,107	3,211	3,323	3,441
Arising out of reinsurance operations	1,162	1,207	1,249	1,295	1,338	1,384	1,434
Total debtors	**3,949**	**4,103**	**4,247**	**4,402**	**4,550**	**4,707**	**4,874**
Deferred tax	635	364	0	0	0	0	0
Other assets	6,110	7,027	7,795	8,295	8,991	9,680	10,167
Deferred acquisition costs	975	995	985	989	1,051	1,093	1,124
Total assets	**54,919**	**56,924**	**57,340**	**58,508**	**61,058**	**63,450**	**64,780**
Liabilities							
Provisions for unearned premiums	2,440	1,923	1,510	1,187	930	730	573
Provisions for claims outstanding	39,436	41,453	41,812	42,794	45,110	47,181	48,109
Technical reserves-gross	**41,876**	**43,376**	**43,321**	**43,981**	**46,041**	**47,911**	**48,682**
Creditors:							
Arising from direct insurance operations	1,394	1,448	1,499	1,553	1,606	1,661	1,720
Arising out of reinsurance operations	302	314	325	337	348	360	373
Total creditors	**1,696**	**1,762**	**1,824**	**1,890**	**1,954**	**2,021**	**2,093**
Reinsurer's share of def. acq. costs	58	60	59	59	63	66	67
Net asset value	11,288	11,727	12,136	12,578	13,000	13,452	13,937
Total liabilities	**54,919**	**56,924**	**57,340**	**58,508**	**61,058**	**63,450**	**64,780**
Deferred acq costs/net operating expenses	*20.0%*	*20.0%*	*20.0%*	*20.0%*	*20.0%*	*20.0%*	*20.0%*
Reinsurers' share of Def. acq. costs	*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*
Solvency ratio	*55.0%*	*55.0%*	*55.0%*	*55.0%*	*55.0%*	*55.0%*	*55.0%*

8. Sundance - Reserves

Year	1997	1998	1999	2000	2001	2002	2003
Total net technical reserves	28,731	29,091	30,658	32,650	33,105	33,757	34,144
Adjustment	21	1	(43)	0	0	0	0
Reinsurers' share	5,250	6,263	7,573	7,462	6,999	6,609	6,196
Total gross reserves	**34,002**	**35,355**	**38,188**	**40,112**	**40,105**	**40,366**	**40,340**
Provisions for unearned premiums	7,311	7,598	7,837	6,244	4,956	3,917	3,093
Claims reserves	**26,691**	**27,757**	**30,351**	**33,868**	**35,149**	**36,449**	**37,247**
Reinsurers' share of technical reserves1	*5.4%*	*17.7%*	*19.8%*	*18.6%*	*17.5%*	*16.4%*	*15.4%*
Provisions for unearned premiums	*40.8%*	*40.9%*	*41.8%*	*31.7%*	*24.1%*	*18.3%*	*13.8%*

Year	2004	2005	2006	2007	2008	2009	2010
Total net technical reserves	35,843	37,513	37,828	38,749	40,903	42,895	43,901
Adjustment	0	0	0	0	0	0	0
Reinsurers' share	6,034	5,863	5,493	5,232	5,138	5,016	4,781
Total gross reserves	**41,876**	**43,376**	**43,321**	**43,981**	**46,041**	**47,911**	**48,682**
Provisions for unearned premiums	2,440	1,923	1,510	1,187	930	730	573
Claims reserves	**39,436**	**41,453**	**41,812**	**42,794**	**45,110**	**47,181**	**48,109**
Reinsurers' share of technical reserves	*14.4%*	*13.5%*	*12.7%*	*11.9%*	*11.2%*	*10.5%*	*9.8%*
Provisions for unearned premiums	*10.5%*	*8.0%*	*6.0%*	*4.6%*	*3.5%*	*2.6%*	*2.0%*

9. Sundance - Investments

Year	2004	2005	2006	2007	2008	2009	2010
Fixed Income	25,735	25,681	25,396	26,093	26,298	26,661	26,875
Equities	7,583	7,567	7,483	8,698	8,766	8,887	8,958
Total investment assets	**33,318**	**33,248**	**32,879**	**34,791**	**35,064**	**35,548**	**35,833**
Total investment result	2,907	3,450	2,376	2,495	2,576	2,604	2,632
Investments/Gross Tech. Res. & equity	***78.0%***	***72.9%***	***69.5%***	***70.0%***	***70.0%***	***70.0%***	***70.0%***
Fixed income securities/total investments	*77.2%*	*77.2%*	*77.2%*	*75.0%*	*75.0%*	*75.0%*	*75.0%*
Equities/total investments	*22.8%*	*22.8%*	*22.8%*	*25.0%*	*25.0%*	*25.0%*	*25.0%*
Bond yield				*6.5%*	*6.5%*	*6.5%*	*6.5%*
Equity return				*10.0%*	*10.0%*	*10.0%*	*10.0%*
Investment return	***8.7%***	***10.4%***	***7.2%***	***7.4%***	***7.4%***	***7.4%***	***7.4%***
Investment expenses	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*

Year	2004	2005	2006	2007	2008	2009	2010
Fixed Income	27,911	28,929	29,115	29,693	30,997	32,216	32,875
Equities	9,304	9,643	9,705	9,898	10,332	10,739	10,958
Total investment assets	**37,215**	**38,572**	**38,820**	**39,591**	**41,329**	**42,954**	**43,833**
Total investment result	2,694	2,795	2,854	2,891	2,984	3,108	3,200
Investments/Gross Tech. Res. & equity	***70.0%***	***70.0%***	***70.0%***	***70.0%***	***70.0%***	***70.0%***	*70.0%*
Fixed income securities/total investments	*75.0%*	*75.0%*	*75.0%*	*75.0%*	*75.0%*	*75.0%*	*75.0%*
Equities/total investments	*25.0%*	*25.0%*	*25.0%*	*25.0%*	*25.0%*	*25.0%*	*25.0%*
Bond yield	*6.5%*	*6.5%*	*6.5%*	*6.5%*	*6.5%*	*6.5%*	*6.5%*
Equity return	*10.0%*	*10.0%*	*10.0%*	*10.0%*	*10.0%*	*10.0%*	*10.0%*
Investment return	***7.4%***	***7.4%***	***7.4%***	***7.4%***	***7.4%***	***7.4%***	***7.4%***
Investment expenses	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*

10. Sundance - Debtors and creditors

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Debtors:							
Arising out of direct insurance operations	na	na	2,162	2,361	2,471	2,575	2,681
Arising out of reinsurance operations	na	na	910	984	1,030	1,073	1,117
Total debtors	3,039	3,885	3,072	3,345	3,500	3,648	3,798
Creditors:							
Arising from direct insurance operations	na	na	1,126	1,181	1,235	1,287	1,340
Arising out of reinsurance operations	na	na	240	256	268	279	290
Total creditors	1,427	1,330	1,366	1,437	1,503	1,566	1,631
Debtors							
Direct insurers/gross premiums written			*11.5%*	*12.0%*	*12.0%*	*12.0%*	*12.0%*
Reinsurers/gross premiums written			*4.9%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*
Creditors							
Direct insurers/gross premiums written			*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*
Reinsurers/gross premiums written			*1.3%*	*1.3%*	*1.3%*	*1.3%*	*1.3%*

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Debtors:							
Arising out of direct insurance operations	2,788	2,896	2,998	3,107	3,211	3,323	3,441
Arising out of reinsurance operations	1,162	1,207	1,249	1,295	1,338	1,384	1,434
Total debtors	3,949	4,103	4,247	4,402	4,550	4,707	4,874
Creditors:							
Arising from direct insurance operations	1,394	1,448	1,499	1,553	1,606	1,661	1,720
Arising out of reinsurance operations	302	314	325	337	348	360	373
Total creditors	1,696	1,762	1,824	1,890	1,954	2,021	2,093
Debtors							
Direct insurers/gross premiums written	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Reinsurers/gross premiums written	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*
Creditors							
Direct insurers/gross premiums written	*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*	*6.0%*
Reinsurers/gross premiums written	*1.3%*	*1.3%*	*1.3%*	*1.3%*	*1.3%*	*1.3%*	*1.3%*

11. Sundance - Cash flow

Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Deferred tax asset - opening balance	1,370	1,465	1,405	1,245	924	635
Tax credit/charge	95	(60)	(160)	(321)	(289)	(271)
Deferred tax-closing balance	1,465	1,405	1,245	924	635	364
Tax paid	**0**	**0**	**0**	**0**	**0**	**0**
Deferred tax	(95)	60	160	321	289	271
Profit after tax	(243)	153	410	827	742	698
Cash flow	**(338)**	**213**	**570**	**1,148**	**1,031**	**969**

Year	**2006**	**2007**	**2008**	**2009**	**2010**
Deferred tax asset - opening balance	364	0	0	0	0
Tax credit/charge	(466)	(565)	(412)	(327)	(413)
Deferred tax-closing balance	0	0	0	0	0
Tax paid	**(102)**	**(565)**	**(412)**	**(327)**	**(413)**
Deferred tax	364	0	0	0	0
Profit after tax	1,198	1,453	1,058	842	1,063
Cash flow	**1,562**	**1,453**	**1,058**	**842**	**1,063**

12. Sundance - Valuation

Year	2000	2001	2002	2003	2004	2005
Cost of equity:						
Risk free rate	*4.82%*					
Equity risk premium	*3.50%*					
Beta	0.7					
Cost of equity	*7.27%*					
Assumed long term growth rate	*2.50%*					
Assumed long term ROE	*7.50%*					

Year	2000	2001	2002	2003	2004	2005
Inputs from forecasts:						
Profit after taxation	(243)	153	410	827	742	698
Deferred tax	(95)	60	160	321	289	271
Adjusted profit after tax	**(338)**	**213**	**570**	**1,148**	**1,031**	**969**
Opening shareholders' funds	9,135	9,589	9,987	10,416	10,851	11,288
Implied free cash flow	**(792)**	**(186)**	**141**	**714**	**593**	**530**
Acc. Return on opening shareholders' funds	*-2.66%*	*1.60%*	*4.11%*	*7.94%*	*6.84%*	*6.18%*
Adj. return on opening shareholders' funds	*-3.70%*	*2.22%*	*5.71%*	*11.02%*	*9.50%*	*8.58%*
Investment spread	*-10.97%*	*-5.05%*	*-1.56%*	*3.75%*	*2.23%*	*1.31%*
Implied residual income	**(1,002)**	**(485)**	**(156)**	**391**	**242**	**148**

Year	2006	2007	2008	2009	2010	Terminus
Inputs from forecasts:						
Profit after taxation	1,198	1,453	1,058	842	1,063	
Deferred tax	364	0	0	0	0	
Adjusted profit after tax	**1,562**	**1,453**	**1,058**	**842**	**1,063**	**1,045**
Opening shareholders' funds	11,727	12,136	12,578	13,000	13,452	13,937
Implied free cash flow	**1,153**	**1,011**	**636**	**390**	**579**	**697**
Acc. Return on opening shareholders' funds	*10.21%*	*11.98%*	*8.41%*	*6.47%*	*7.90%*	
Adj. return on opening shareholders' funds	*13.32%*	*11.98%*	*8.41%*	*6.47%*	*7.90%*	
Investment spread	*6.05%*	*4.71%*	*1.14%*	*-0.80%*	*0.63%*	
Implied residual income	**709**	**571**	**144**	**(104)**	**85**	**32**
Discounted cash to equity value:						
PV eleven year free cash flow	2,600	*27.8%*				
PV terminal value	6,751	*72.2%*				
Value of shareholders' funds	**9,351**	***100.0%***				
Residual income valuation:						
Adjusted opening shareholders' funds	9,135	*97.7%*				
PV eleven year residual income	(95)	*-1.0%*				
PV of terminal value (no growth)	204	*2.2%*				
PV terminal value (future growth)	107	*1.1%*				
Value of shareholders' funds	**9,351**	***100.0%***				

4.3.2.1 Underwriting results

To understand page one, which relates to the private business, it is necessary to understand that insurance business, once written, may be retained by the company or it may be laid off through reinsurance. Premium income earned is the accrual, whereas premiums written are as the name implies. There are two costs to be set against earned income. The first is the cost of paying out against claims, and the second is the operating cost of running the business. The total of these costs, as a proportion of earned income, is known as the combined ratio, and is often more than 100 per cent. Claims drive the loss ratio and expenses the expenses ratio.

How can a business be profitable if it has negative margins? Because there is a timing difference between when it receives income and when it pays out against claims. The other side of the insurance business is its investment activity, and when investment returns are taken into account the overall business should (under normal circumstances) generate a profit. Not for nothing have insurance companies been named ‘investment trusts with an expensive hobby’, though this is unfair. The underwriting business generates cash on which the investment business aims to earn a return.

Although we have not yet looked at the balance sheet, it is evident that the balance sheet of an insurance company will be dominated by two items. The first is investment assets, and the second is a provision for the payments that it is likely to have to pay out in future against claims. Estimating the required reserves is clearly an actuarial matter, but it is notable that in this business reserves represent more than 100 per cent of net earned premiums. The reason for this is that many contracts have a life of more than one year. General insurance contracts will vary in length, and it is not surprising that reserves in the industrial and marine and energy businesses represent a larger multiple of annual net earned premiums. The contracts cover longer periods. Establishing the appropriate level of reserves is clearly the most complex task for the management of an insurance company and its actuaries.

We shall pass over the subsequent three pages of this model without comment, since these work in exactly the fashion just described. But we need to pause at page five, the Runoff business. This represents a long-tailed exposure to a business that the company is discontinuing (imagine insurance against asbestos-related health claims as a possible example) and against which the company believes that it will be required to place considerable reserves, despite enjoying no operating income from the business.

4.3.2.2 Consolidated profit and loss account

Most of the profit and loss account on page six of the model represents an aggregation of the businesses that we have already modelled. The main item requiring explanation is the investment return. We shall look at how this is forecast later, but at this stage will merely concentrate on the allocation of investment income. Insurance company investments comprise two separate sources of funds. The larger part represents the provisions that have been made against future expected claims. The smaller part represents the equity shareholders’ interests. Unlike an industrial company, or even a bank, for an insurance company equity does not finance the operations of the business. For an industrial company, we finance invested capital with debt and equity. With a bank we finance the assets with capital and deposits. But with an insurance company the act of underwriting generates cash. The equity does not, in that sense, finance anything, other than at the start of the company’s life, when it is required to fund the acquisition cost of the first new business. Once the company is mature, equity is just there to provide a cushion, which is why part of our profit is the return that we make on the equity capital. Underwriting operations relate to the liabilities side of the balance sheet. The asset side of an insurance company's balance sheet is dominated by financial investments, and these are allocated between those that relate to the underwriting business and those that relate to the equity shareholder.

So the allocated investment income relates to the proportion of gross reserves and net asset value represented by attributable provisions (gross reserves minus the portion that is attributable to the reinsurers' share of technical provisions).

4.3.2.3 Balance sheet

On the asset side of the balance sheet (page seven) the dominant item is, as expected, investment assets. We also find the reinsurers' share of technical provisions which are stated gross as a liability. We shall turn next to the modelling of provisions. As we shall also see, debtor and creditor items are grown with gross premiums written. As we have seen, deferred acquisition costs represent prepayments relating to business not yet earned. There are three items on page seven of the model on which we should concentrate here.

First, as with modelling a bank, the residual item in the balance sheet is the 'other assets' line. It is a result of all the other forecast items, and must be watched as a reality check.

Secondly, Sundance had generated substantial tax losses by end 1999, and these were in its balance sheet as deferred tax assets. These get utilised in forecast profitable years, and will have to be modelled.

Thirdly, net assets are modelled by using the solvency ratio, the proportion of net assets to net earned premiums. So we are saying that with its mix of businesses a prudent amount of equity to retain within the business represents 55 per cent of annual net earned premiums. As with capital ratios in banks, solvency ratios are regulated, and, again as with banks, companies generally operate with significantly higher ratios than those set by regulation. Clearly, computing a satisfactory solvency ratio is a similar exercise to establishing the required level of economic capital in a bank.

4.3.2.4 Modelling reserves

As we have seen, quantifying the appropriate level of reserves from inside the company is both crucial and extremely complex. From the outside it is essentially impossible. What we can do, and have done, is to model technical reserves by business, so that differential growth rates will result in changes in the ratio of reserves to net earned premiums.

The reserves that we modelled by business were net (excluding those relating to reinsured businesses). The two main additions to get from this figure to the gross technical reserves in the balance sheet are to add back the reinsurers' share and to include a provision for that part of gross written premiums that relates to as yet unearned income. This is modelled on page eight as a proportion of gross written premiums.

4.3.2.5 Investments

Investments are shown on page nine of the model. They are assumed to represent 70 per cent of gross technical reserves and equity, the surplus over and above this figure being in effect allocated to other assets. Given their need for predictable cash flows from their investments, insurance companies tend to maintain a fairly high proportion of their investments in bonds, rather than equities. But the allocation, and the expected returns from each asset class, again represent an important actuarial assumption and management decision.

4.3.2.6 Debtors and creditors

As already mentioned, when we discussed the balance sheet, the debtor and creditor items on page ten of the model are derived as a proportion of gross written premiums.

4.3.2.7 Cash flow and taxation

As a general rule the statutory accounts of an insurance company reflect cash flows. As we have seen, earned premium income is a cash item as are claims and expenses. In the case of Sundance, however, we are carrying large deferred tax assets in the balance sheet that it is expected will be relieved against future tax liabilities. This is modelled on page eleven, and the technique used is identical to that which would apply for an industrial company in the same situation.

To the extent that the company creates losses, these add to the deferred tax asset, and to the extent that it makes profits these reduce it. The opening balance for each year is relieved against tax charges until it is exhausted, at which point the company starts to pay tax. The consequence is that there may be a run of years, as in this case, where there are tax charges in the profit and loss account, but no tax payments made, to the benefit of the cash flow.

The cash flow figure derived here is prior to retentions, which represent that proportion of earnings that are not distributable if the company is to maintain its required solvency ratio.

4.3.2.8 Valuation

After a lot of comment on the forecasting of the accounting items we have nothing to say about the mechanics of the valuation on page twelve. The cost of equity is derived in the usual fashion, and the cash flows to equity and residual income to equity are discounted in the normal way. It should be noted that free cash flow is cash flow from operations minus the retentions required to maintain the solvency ratio.

The conclusions for Sundance were that the 11 years of specific forecast represented less than 30 per cent of its cash flow valuation with over 70 per cent in the terminus. The forecast cash flow for the first two years were very negative, only reversing subsequently.

The residual income value suggested that the company was worth a very small premium over its book net asset value. This premium was more than 100 per cent attributable to the terminal value, with an expected small value destruction over the 11 years of the forecast period.

Readers may be interested to know (but should not be surprised to hear) that the attempt to sell the business at an acceptable price was a failure.

4.3.3 Life insurance

The main differences between the life business and the general insurance business of an insurance company are that the life business is much longer term and also susceptible to much greater actuarial accuracy, and that the products on offer are more varied and often contain an investment component. One consequence is that Modified Statutory Solvency accounts, which are essentially reflections of annual cash flows, are deeply misleading about accrual of value, for reasons that we have discussed intermittently since Chapter three. Another is that the investment returns achieved are not all attributable to the insurance company. With profits life policies, for example, are complicated by the question of how investment returns are to be allocated between policy holders and shareholders.

Before turning to a real company's report and accounts, we shall start by examining a single, traditional life insurance policy, from three perspectives. The first is the stream of cash flow that it is expected to produce. The second is the way in which this is represented in Achieved Profit accounts, which reflect accrual of value. The third is the way in which this is represented in Modified Statutory Solvency accounts. Exhibit 6.16 shows the numerical analysis.

Exhibit 6.16: Achieved profit versus statutory profit

Achieved Profits versus Statutory Profits (£000)

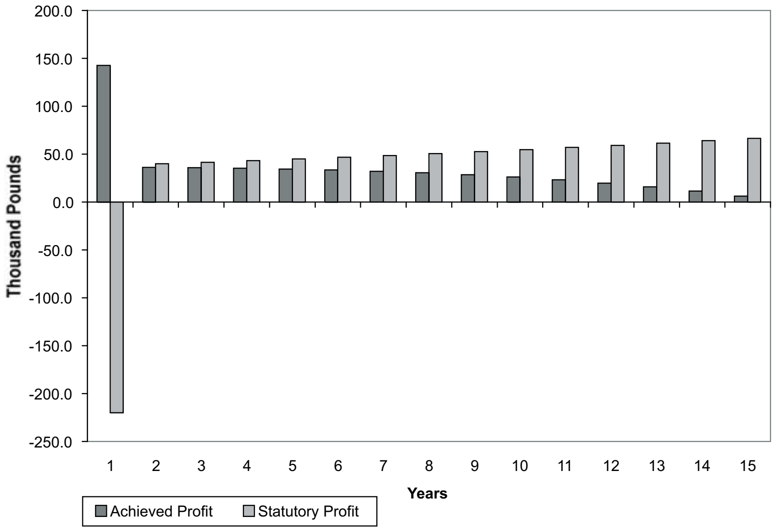
	Achieved Profits									
Year	Cash Flow	Embedded Value	Value of new bus.	Unwind of Disc rate	Achieved Profit	Economic ROE	Statutory Profit	Statutory NAV	Statutory ROE
0		129.7						0.0	
1	**-220.0**	362.7	129.7	13.0	**142.7**	*110%*	**-220.0**	-220.0	na
2	**40.0**	358.9	0.0	36.3	**36.3**	*10%*	**40.0**	-180.0	na
3	**41.6**	353.2	0.0	35.9	**35.9**	*10%*	**41.6**	-138.4	na
4	**43.3**	345.3	0.0	35.3	**35.3**	*10%*	**43.3**	-95.1	na
5	**45.0**	334.8	0.0	34.5	**34.5**	*10%*	**45.0**	-50.1	na
6	**46.8**	321.5	0.0	33.5	**33.5**	*10%*	**46.8**	-3.3	na
7	**48.7**	305.0	0.0	32.2	**32.2**	*10%*	**48.7**	45.3	na
8	**50.6**	284.9	0.0	30.5	**30.5**	*10%*	**50.6**	95.9	*111.7%*
9	**52.6**	260.7	0.0	28.5	**28.5**	*10%*	**52.6**	148.6	*54.9%*
10	**54.7**	232.1	0.0	26.1	**26.1**	*10%*	**54.7**	203.3	*36.8%*
11	**56.9**	198.3	0.0	23.2	**23.2**	*10%*	**56.9**	260.2	*28.0%*
12	**59.2**	158.9	0.0	19.8	**19.8**	*10%*	**59.2**	319.5	*22.8%*
13	**61.6**	113.3	0.0	15.9	**15.9**	*10%*	**61.6**	381.0	*19.3%*
14	**64.0**	60.5	0.0	11.3	**11.3**	*10%*	**64.0**	445.1	*16.8%*
15	**66.6**	0.0	0.0	6.1	**6.1**	*10%*	**66.6**	511.7	*15.0%*
	511.7		129.7	382.0	**511.7**		**511.7**		

The first column of figures shows the annual cash flows that the policy is expected to generate. The initial negative item reflects the cost of acquiring the business. The net present value of the policy at the moment of writing is £129,700, and this is recalculated at the end of each year, to derive what is often referred to as the Embedded Value of the policy. It is the shareholders' funds under Achieved Profits accounting.

As we move through time, Achieved Profit (AP) accounting will reflect, in the first year, the value added by the policy, and the unwinding of its discounted value for the first year. In all subsequent years, the Achieved Profit is simply the unwinding of the discount rate. Return on embedded equity is thus merely the discount rate, by definition, just as economic ROCE as calculated in Chapter three was equal to the IRR, for any asset.

Under Modified Statutory Solvency (MSS) accounting, profit reflects annual cash flows. The contribution to group shareholder's funds made by the policy, its retained earnings, follow a dramatically different path from that under AP. Notice that the cumulative cash flow from the policy, of £511,700 is identical to the cumulative profits both under MSS and under AP accounting. But the timing differences are considerable. Exhibit 6.17 charts the two streams of profit.

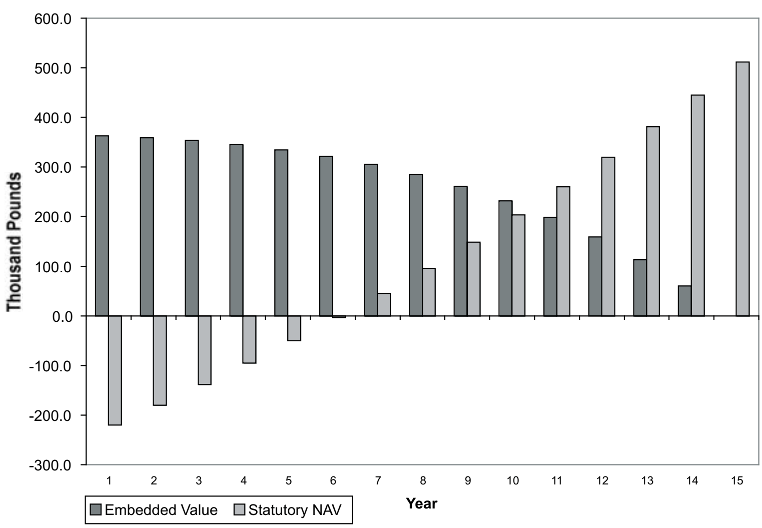
Exhibit 6.17: AP versus MSS profit chart



The AP profit stream has its major positive item in the year in which the contract is written, and has subsequent falling annual profits to reflect an unwinding of the discount rate applied to a diminishing opening embedded value. The MSS profit stream reflects the cost of acquiring the business as a large negative, and then the growing stream of cash flows from the contract thereafter.

The contrast between the trends in contribution to year end balance sheet shareholders' funds is even greater, as illustrated in Exhibit 6.18.

Exhibit 6.18: AP versus MSS NAV



Under AP, the contract is valued at the year end net present value of its future cash flows. This is clearly a declining amount, culminating with zero. Under MSS, retained earnings are negative after the first year, and then recover through zero, so that the cumulative contribution of £511,700 is ultimately reflected in shareholder's funds at then termination of the contract.

Turn back to the numbers in Exhibit 6.16, and let us look at what is happening in Year 5. MSS profit is £45,000. The fall in the embedded value of the contract during the year is £345,300 minus £334,800 (the difference between its opening and its closing value). This gives £10,500 as the fall in value during the year. £45,000 minus £10,500 equals £34,500, which is the profit contribution under AP accounting.

It should be obvious that AP accounting is the same as what we called fair value accounting profit in Chapter three and adjusted income for Exxon's upstream oil business in a previous section of this chapter. In each case we are recognising accrual and impairment of economic value in the adjusted accounts.

So extreme is the effect for life insurance companies that many companies present their accounts under both conventions. We would recommend that readers concentrate on AP accounts when looking at life businesses, and that if they are confronted by a composite insurance company (one with both general and life businesses) that they value the two parts separately, concentrating on MSS accounts for the general business and on AP accounts for the life business.

4.4 Valuing Legal & General plc

Legal and General is essentially a UK life insurance company. In 2003 it produced operating profit before taxation on an AP basis of £759 million, of which £620 million was attributable to the life and pensions business, £80 million to institutional fund management, £41 million to general insurance and £18 million to other operational income. Out of the £620 million contribution from life and pensions, £537 million was attributable to the UK and £83 million to the international business.

Out of a total MSS end 2003 equity of £3,260 million, the long term business represented £2,879 million, leaving £381 million of equity allocated to the general insurance business. The implied net of tax return is 7.5 per cent, which does not suggest that the general insurance business is worth wildly more or less than book value. Since it is in any case a small proportion of the overall group, we propose to ignore it, and to value it implicitly at its book value, concentrating instead on the long term business.

It should be remembered that the distinction between AP and MSS accounting relates only to long term business. Both the balance sheet and the profit and loss contributions from the general business are identical under either convention. In the event that we wished to do so, we could attempt to forecast and value L&G's general business just as we did Sundance's above.

Turning to the long term business, its contribution to L&G's 2003 profit and loss on the AP basis is shown in detail below, taken directly from the group's 2003 annual report and accounts.

Segmental Analysis of Results

Contribution from long term business

	Life and pensions							
	UK		International		UK managed pension funds*		Total	
	2003 £m	2002 £m	**2003 £m**	2002 £m	**2003 £m**	2002 £m	**2003 £m**	2002 £m
Contribution from: New business	**271**	211	**34**	38	**31**	32	**336**	281
In-force business – expected return	**215**	264	**45**	46	**13**	15	**273**	325
– experience variances**	**9**	(25)	**(8)**	(18)	**5**	14	**6**	(29)
– operating assumption changes**	**(107)**	(105)	**1**	1	**20**	16	**(86)**	(88)
Development costs	**(2)**	(3)	**–**	–	**(1)**	(1)	**(3)**	(4)
Shareholder net worth	**151**	159	**11**	13	**3**	7	**165**	179
Operating profit	**537**	501	**83**	80	**71**	83	**691**	664
Investment return variances	**346**	(1,045)	**4**	(18)	**16**	(48)	**366**	(1,111)
Effect of economic assumption changes	**(16)**	(14)	**(16)**	8	**0**	0	**(32)**	(6)
Profit/(loss) before tax	**867**	(558)	**71**	70	**87**	35	**1,025**	(453)
Attributed tax	**(231)**	56	**(24)**	(25)	**(26)**	(10)	**(281)**	21
Profit/(loss) after tax	**636**	(502)	**47**	45	**61**	25	**744**	(432)

* Included in the institutional fund management result of £80m (2002: £92m).

** The largest impact on UK life and pensions business in 2003 was from the tightening of future persistency assumptions and the strengthening of provisions for claims on the endowment book, and in 2002, was from an annuitant mortality and other related demographic assumption changes.

There are four components to the contribution from AP operating profit:

1. Value added through writing new business (net of acquisition costs)
2. Development costs associated with building new business lines (not acquisition cost of new business included in item above)
3. Contribution from already in-force business
4. Return on shareholder net worth

It will be noted that the third item was modelled in our simplified example above as if all went according to plan. In reality, there are experience variances (such as failure to achieve expected investment returns) and changes in operating assumptions, which will distort the result versus expectation at the previous year-end. Readers may be reminded of similar issues relating to corporate pension schemes, discussed in Chapter four.

As mentioned above, our approach to valuing L&G will be to separate the value of the in force business from the value that we choose to put on expected new business to be written in future years. In addition to assuming that the general insurance business is fairly valued at book value, we shall also treat the long term business as if it were a single entity, rather than separating out the asset management, pensions, and non-UK businesses. If we were to do so then our approach would be the same, but on a business by business basis.

Our model of L&G is reproduced in Exhibit 6.19, which comprises four pages: the historical balance sheet, the asset allocation of its investment portfolio, a valuation routine for new business, and a corporate valuation model with two permitted cases. As usual, we reproduce the entire model below, and then comment in subsequent paragraphs.

Exhibit 6.19: Legal & General model

1. Legal & General AP Balance Sheet (£ million)

	2002	**2003**	**%**
Assets			
Investments	32,442	35,280	*28%*
Assets held to cover linked liabilities	69,723	84,308	*66%*
Long term in force business asset	1,916	2,365	*2%*
Other assets	4,489	5,320	*4%*
Total assets	**108,570**	**127,273**	***100%***
Liabilities			
Shareholders' funds	5,061	5,596	*4%*
Fund for future appropriations	516	1,498	*1%*
Technical provisions:			
For linked liabilities	67,834	83,730	*66%*
Other long term business provisions	30,679	33,206	*26%*
General insuranc provisions	345	405	*0%*
Total technical provisions	98,858	117,341	*92%*
Borrowings	1,589	1,475	*1%*
Other creditors	2,546	1,363	*1%*
Total liabilities	**108,570**	**127,273**	***100%***
Reconciliation:			
Shareholders' funds on the AP basis	5,061	5,596	
Long term in force business asset	(1,916)	(2,365)	
Purchased interest in long term business asset included in MSS shareholders' funds	39	29	
Shareholders' funds on the MSS basis	**3,184**	**3,260**	

2. Legal & General Investments (£ million)

	2002	2003	%
Land and buildings	**3,589**	**4,228**	***12%***
Equities, variable yield securities and unit trusts	10,323	11,494	*33%*
Debt securities and other fixed income securities	15,977	18,277	*52%*
Loans secured by mortgages	204	183	*1%*
Other loans	72	64	*0%*
Deposits with credit institutions	2,389	1,181	*3%*
Other investments	72	22	*0%*
Amounts payable under margin	(184)	(169)	*0%*
Total financial investments	28,853	31,052	*88%*
Total investments	**32,442**	**35,280**	***100%***

3. Legal & General New Business Contribution (£ million)

	2002	2003	Average
Risk discount rate	*7.2%*		
Long term growth rate	*2.0%*		
Contribution from new businesses	281	336	309
Contribution net of 30% taxation	197	235	216
PV of future growth	**3,783**	**4,523**	**4,153**

3. Legal & General New Business Contribution (£ million)

	2002	2003	Average
Risk discount rate	*8.2%*		
Long term growth rate	*2.0%*		
Contribution from new businesses	240	295	268
Contribution net of 30% taxation	168	207	187
PV of future growth	**2,711**	**3,332**	**3,021**

4. Legal & General Valuation (£ million)

Investment case	1
1.8 Month Investment Return	*0.0%*
2.8 Month Investment Return	*-5.0%*
New business case	1
1. Risk capital discount rate	*7.2%*
2. Risk capital discount rate	*8.2%*
Drivers	
8 month investment return	*-0.0%*
Risk discount rate	*7.2%*
Long term growth rate	*2.0%*
Values	
Embedded value	5,596
PV of future growth	4,153
Total value	**9,749**
Share price	100.25
Shares outstanding	6,504
Market capitalisation	**6,520**
Premium/(discount)	*-33.1%*

4. Legal & General Valuation (£ million)	
Investment case	2
1.8 Month Investment Return	*0.0%*
2.8 Month Investment Return	*-5.0%*
New business case	2
1. Risk capital discount rate	*7.2%*
2. Risk capital discount rate	*8.2%*
Drivers	
8 month investment return	*-5.0%*
Risk discount rate	*8.2%*
Long term growth rate	*2.0%*
Values	
Embedded value	3,832
PV of future growth	3,021
Total value	**6,853**
Share price	100.25
Shares outstanding	6,504
Market capitalisation	**6,520**
Premium/(discount)	*4.9%*

4.4.1 Historical AP Balance Sheet

Page one of the model shows L&G's end 2002 and 2003 AP balance sheets, and the split of assets and liabilities. Assets held to cover linked liabilities and linked liabilities relate to the pension fund management business. The long term in force business asset is the sum that is added to shareholder net worth to arrive at embedded value, and is the adjustment that results from the discounted cash flow analysis of in force long term business.

At the bottom of the balance sheet we have reproduced a reconciliation of MSS and AP shareholders' equity. There are only two adjustments. The first is to add the long term in force business asset. The second is to subtract the capitalised purchased interests in the long term business asset. We are simply replacing a book value with a fair value. Everything else in the balance sheet is the same under both accounting conventions.

On the liabilities side of the balance sheet the fund for future appropriations represents 'funds that have not been allocated on the balance sheet date between participating policy holders and shareholders' (L&G 2003 report and accounts, Note 1, Accounting Policies).

In the absence of any dispute over the basis on which the AP shareholders' equity has been calculated, it represents the fair value of the group as at end 2003. We shall clearly have to add the value of expected future growth opportunities to it, as we would for any other company for whose assets we could establish a fair value, but before we move on to this it is also worth returning to our comments on Sundance, to the effect that it had many of the attributes of a leveraged investment trust. The same applies to L&G, only more so, because the time difference between receipts and claims is so much greater. This difference is reflected in its mix of investment assets.

4.4.2 Investment asset allocation

As can be seen from page two of the model, at end 2003, 35 per cent of the investment assets of the L&G group were represented by land and equity-type investments, and 55 per cent by bonds and deposits. At time of writing, end August 2004, the last balance sheet was eight months old. It is reasonable to suppose that, just as for any other investment instrument, L&G's shares were reflecting the estimated market value, not merely the historical cost book value, of its portfolio.

Insurance company accounts give considerable detail with respect to the breakdown of historical investment returns and the assumptions regarding future returns that drive the value put on the long term in force business asset. For our purposes, a simpler question will suffice. Assuming that the calculations at end-2003 were reasonable, to what extent should we simply be modifying the value of the investment portfolio to adjust it to current market values? Well, about 85 per cent of the portfolio comprised equities and bonds, and the values of both fell during the first eight months of 2004. We shall run our valuation on the basis of two assumptions. Case one will assume no change to the value of the portfolio, and case two will assume that it has fallen in value by 5 per cent since the start of the year, at time of writing.

4.4.3 PV of Future New Business

This is rather like trying to estimate the terminal value in an economic profit model for an industrial company. In fact, it is exactly the same. We are given the value added by the new business written over the past two years. These figures are based on company assumptions, and are before tax. To tax them we use L&G's statutory tax rate of 30 per cent. To capitalise them we need two inputs: long term future growth, since this is a perpetuity calculation; and the cost of risk capital. L&G tells us in its accounts the discount rates that it uses, and they differ between the UK, the US and Europe, but the UK is the larger business and its discount rate is between the other two, so keeping to our simplified consolidated model probably does not result in much distortion to the result.

But do we have to use L&G's discount rate of 7.2 per cent? Well, the company provides sensitivity analyses with respect to a number of its actuarial assumptions, and it does state the impact of a 1 per cent increase in this estimate of the cost of risk capital on its contribution from new business in the UK. We have grossed this up to reflect an assumed equivalent impact on all the new business in 2003. This provides us with our second case. Case one will assume that the cost of risk capital is 7.2 per cent. Case two will assume that the cost of risk capital is 8.2 per cent. Page three is printed twice, with both assumptions shown.

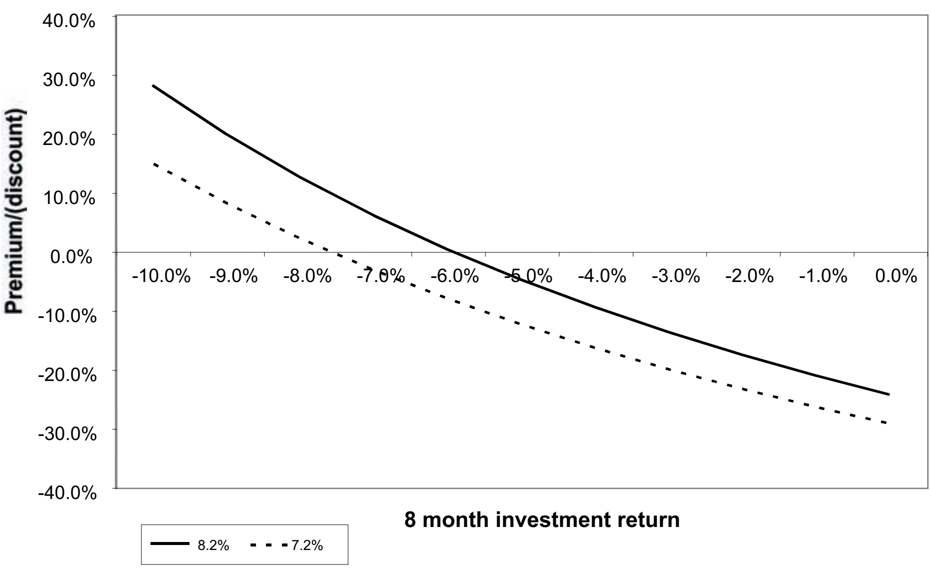
4.4.4 L&G valuation

Page four of our model shows the result of selecting case 2 for both of our switches. It results in a value that leaves the shares standing at about a 5 per cent discount to fair value.

But if we were to set both cases to case 1, instead of case 2, then we end up with the embedded value as at end 2003 plus the higher figure for the PV of future business leaving the shares at an overall discount to fair value of 33 per cent. Despite the various oversimplifications in our model, the second cases seem intuitively more reasonable, as does the result of adopting them.

An obvious conclusion derives from this analysis. It is that the market values of life insurance companies are likely to be very highly leveraged to the market values of their investment portfolios. Exhibit 6.20 below illustrates this. It is a chart of the discounts and premia to fair value that our simple model generates, with variable factors. The first is the cost of risk capital, for which we only have the two figures based on the company's sensitivity analysis. The second is the extent of the decline in the value of the investment portfolio between end 2003 and end August 2004. The sensitivity is striking.

Exhibit 6.20: L&G valuation sensitivities



This analysis still does not take into account the impact of a decline in long term investment returns, for instance bond yields, on the value of in force business and on new business value. If those two elements were explicitly modelled, then the sensitivity would be even greater. In its accounts L&G shows the impact of higher than predicted, but not of lower than predicted, returns on investments, so we have not augmented our calculations here, though it would be possible to use it to estimate the sensitivity to lower expected returns.

As the presentation of sensitivities by the companies becomes fuller and more sophisticated, it is becoming more feasible to produce stochastic valuation models based on probability weighted ranges of variance experiences and changes in assumptions, hence the growing popularity of 'enhanced embedded value' and 'market consistent embedded value' calculations for life insurance businesses.

5. Property companies

5.1 Accounting for property companies

Most of the core IFRS standards are as relevant to property companies, otherwise known as real estate companies, as they are to other sectors. The crucial aspect of accounting in a real estate context is how the property portfolio is reflected in the financial statements. In this regard the key standards are IAS 40 Investment property, and if the company is constructing its own fixed assets then either IAS 16 on property, plant and equipment or IAS 11 Accounting for long term contracts would be relevant (the latter if the construction is for a third party). Here we shall concentrate on the accounting in IAS 40.

IAS 40 – Investment property

What is investment property?

Investment property is land and/or buildings a company holds to earn rentals or for capital appreciation. If a company uses the asset for its own operations then the part used cannot be an investment property and must be separated out.

How are investment properties valued?

For financial statement purposes the initial recognition shall be at cost, including incidental costs of acquiring the property.

Subsequently, two different models exist within IAS 40 to determine the ongoing valuation:

Model 1: Cost model

The cost model requires the investment property to be valued at cost less depreciation/impairments. If this model is chosen the fair values for investment properties must be disclosed.

Model 2: Fair value model

This model requires valuations of property at the balance sheet date are up-to-date with movements going through the income statement. Fair value should be based on sales comparisons or future cash flows in less liquid markets.

The valuation should be based on properties in their current condition.

Note that where the fair value model is adopted the carrying value of an asset will deviate from its tax base (typically cost) and so deferred tax liabilities/assets will arise.

How are disposal profits/losses calculated?

The calculation will be based on the disposal proceeds less carrying amount.

IAS 11 – Construction contracts and work in progress

If a real estate company is constructing an asset for a third party then IAS 11 applies (otherwise back to normal accounting rules for PP&E as discussed in Chapter 4).

This is a relatively straightforward standard and the main point is that, until the asset is complete, any WIP balances (e.g. partially constructed buildings) are recognised at cost in the absence of write downs below this level.

5.2 Valuing property companies

The profit and loss account of a property company can be divided into two basic components: that which relates to rental income and operating costs, and that which relates to capital gains or losses, whether realised or unrealised. Much of the content of this book has been concerned with treatment of different types of accrual, and property companies represent an extreme case of the problem. The operating profit that results from rental income and operating costs does not, on average, produce a return that matches the company's cost of capital. The balance is made up by capital gains on the existing portfolio, whether realised or unrealised, and value added resulting from new developments.

This all suggests that the most appropriate approach to valuing property companies will be to use an economic profit model, for two reasons. First, it clearly makes sense to think of the enterprise value of the company as being the current fair market value of its portfolio, and then to adjust for expected value added or subtracted in future years. And, secondly, much of the value creation or destruction that occurs in any one year will have little to do with cash flows for the year. In many respects the approach is similar to the one that we have already described for life insurance companies, with the benefit that the value of properties is traditionally represented as a function of rental income and a yield. This makes it relatively straightforward to assess the impact on values of expected changes in market yields, for example, and means that the value of a new development can be derived from its expected rental and an assumed future yield.

5.2.1 The modelling approach

Since the principles of economic profit valuation have been well rehearsed in earlier sections, we shall concentrate here on the components of the forecasting process, and shall take the valuation routine as read. The key drivers to a property company model will comprise the following:

At the operating level, we have rental income which may be modelled on an asset by asset basis, complete with rent reviews, void period, etc. At the pre-financing, operating level the main deductions will be administrative costs.

Clearly, often the largest and almost always the most volatile component of the profit and loss account will relate to revaluation gains and losses on the portfolio. This can be approximated as a function of two items: rental income growth and change in rental yield. In other words, if we have a portfolio of property which at the start of the year has a value of £10 million and a rental income of £500,000 then it follows that the rental yield is 5 per cent. If it is expected that rental income will rise year on year by 2 per cent, to £510,000, but that property yields are likely to increase to 5.2 per cent, then the resulting projected valuation is approximately £9.8 million (£510,000 / 0.052). We have suffered a capital loss of some £200,000 on our portfolio during the year, which offsets 40 per cent of our rental income.

In addition to operating profit and capital gains or losses on the existing portfolio, we also have the impact of new developments. Development costs are capitalised as incurred. Expected values on completion are derived from expected rental income and the appropriate rental yield. To the extent that this value exceeds the development cost, a surplus is created which is allocated proportionately to the profit and loss account over the life of the development.

So, if we exclude financing, which we should need to build into a set of financial forecasts, but which will be irrelevant to a valuation routine that values returns to capital, we now have three streams of return to capital: the operating profit, which largely comprises rental income less administrative costs; the gain or loss on the existing portfolio, which is a function of rental income growth and market yields; and profits on new developments, which are a function of costs, expected rental and expected market yield.

5.2.2 Fades in property valuation models

Once capital gains or losses are taken into account, property company returns are extremely volatile, and may range from minus 20 to plus 30 per cent. This clearly means that from the top, or the bottom, of a cycle, trends in yields and values are likely to result in large positive or negative economic profit over a run of years as the market returns to trend rates. But most property company models are very detailed, with rentals forecast asset by asset and committed developments modelled year by year. So we have a tension between the need for a long-term forecast and the impossibility of realistically extending our model for the required period.

The solution is the sort of fade routine described at the end of Chapter 5. In this case it clearly makes sense for profit to be run off the opening capital base, rather than the other way round. And it also makes sense to divide the stream of NOPAT in the valuation model between an operating return, which may be very stable, and a capital return, which may be the volatile component that corrects violently, and then reverts to a mean.

What is different for property companies is that it makes sense, even in the fade period, to assume a stable operating profit, and separately to forecast a trend in capital gains. Since property companies distribute most of their operating profits (Real Estate Investment Trusts, known as REITs, must, for example, distribute at least 90 per cent of operating income), it is reasonable in the fade to assume zero retentions, so the capital base simply grows with capital gains.

Since this all sounds more complicated than it really is, we illustrate it with an example in Exhibit 6.21.

Exhibit 6.21 Property company fade routine

Property company fade routine (£ million)							
Year	**Final forecast**	**1**	**2**	**3**	**4**	**5**	***LT Average***
Opening capital	10,000	8,100	8,973	9,846	10,720	11,593	*3.0%*
Operating return	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*
Capital return	*-20.0%*	*10.8%*	*9.7%*	*8.9%*	*8.1%*	*3.0%*	*3.0%*
ROCE	*-15.0%*	*15.8%*	*14.7%*	*13.9%*	*13.1%*	*8.0%*	*8.0%*
WACC	*8.0%*	*8.0%*	*8.0%*	*8.0%*	*8.0%*	*8.0%*	*8.0%*
Investment spread	*-23.0%*	*7.8%*	*6.7%*	*5.9%*	*5.1%*	*0.0%*	*0.0%*
Economic profit	-2,300	630	604	578	552	0	

What is illustrated here is merely figures from the last year of the forecast period, in year zero, and a very short fade period of five years. The company has a cost of capital of 8 per cent, and this is the rate of return on capital to which it fades, so there is no terminal value. It is assumed to earn a stable 5 per cent operating return on its capital, so the volatility all comes from the capital gains or losses. The last forecast year is clearly a recession, since there is a 20 per cent capital loss on the portfolio, but note that the opening year one value of the capital is £100 million higher than implied by the capital loss, indicating that there was some net investment forecast in this year. As the boxing indicates, both the opening capital numbers for year zero and year one are imported from the underlying forecasts. During the fade itself, capital movements will simply be the result of capital gains or losses, in this case all gains.

The mechanics of the fade are that we assume a trend rate of growth in the value of the portfolio through time. In this simplified case, we are assuming that start year five capital will be equivalent to start year zero capital after a 3 per cent underlying capital growth. The figure of 3 per cent, added to a 5 per cent operating return, ensures that the overall return on capital is the same as the discount rate by the end of the fade, and is derived accordingly. The capital values for the intervening years are a linear interpolation, so the resulting percentage gains are high early in the recovery, and then slow down.

The resulting economic profit numbers would be discounted back to the base year, at the start of the forecast, as usual. It is notable here that although the fade contains a sharp recovery from the recession of year zero, the overall impact of the period on value would be negative. Clearly the opposite would happen if the forecast period were expected to include large capital gains, with a reversion to the normal following on.

The important point here is not the basis for the assumptions, which are clearly artificial, given only one year of explicit forecast, no history and a very short fade, but the points that are specific to property companies: that it is reasonable to fade to a zero value added, that returns can usefully be split between stable operating returns and widely fluctuating capital returns, and that the long end of forecasts can assume no retention of operating profits.

5.2.3 Adjusting for financial liabilities

In Chapter 5 it was made clear that when bridging the gap between a calculated fair value of the enterprise value of a company and that of its equity, deductions for the financial liabilities should be at fair value, rather than at book value. This is particularly important for property companies, since movements in the value of the property portfolio will be accompanied by changes in deferred tax liabilities, and probably also by changes in the fair value of the company's debt, and possibly also of derivatives associated with the debt. This should be clearer after reading the glossary below, but the general point is that where accounts do not record balance sheet items at fair value then fair value number (debt, for example) should be substituted for balance sheet numbers.

5.2.4 Real estate terminology

There are two areas of terminology that relate to property companies that are unique to the sector. The first relates to yield which, as we have seen, is a key determinant of valuation for real estate. And the second relates to the definition of net asset value (NAV). While our proposed approach to modelling property companies is, as with industrials, to model returns to capital, and to deduct financial liabilities at the end, to derive a fair value of equity, property company reports and accounts place heavy emphasis on various measures of net asset value, the point being that this is a proxy for the fair value of the equity based on the current portfolio of assets. The definitions that follow are based on a glossary produced by British Land (REIT). References to EPRA below refer to the European Public Real Estate Association.

Initial yield is the annualised net rents generated by the portfolio expressed as a percentage of the portfolio valuation, excluding development properties.

Reversionary yield is the anticipated yield which the initial yield will rise to once the rent reaches the estimated rental value. Increases to rent arise on rent reviews, letting of vacant space and expiry of rent free periods.

Equivalent yield is a weighted average of the initial yield and the reversionary yield and represents the return a property will produce based upon the timing of the income received. In accordance with the usual practice, the equivalent yields (as determined by the group's external valuers) assume rent received annually in arrears and on gross values including prospective purchasers' costs.

EPRA net assets (EPRA NAV) are the balance sheet net assets plus the surplus on trading properties, excluding fair value adjustments for debt and related derivatives, deferred taxation on revaluations and capital allowances and the effect of those shares potentially issuable under employee share schemes.

EPRA NNNAV is the EPRA NAV less fair value adjustment for debt and derivatives, and the deferred taxation on revaluations and capital allowances.

Chapter Seven

An introduction to consolidation

1. Introduction

Although there may be occasions where an analyst might wish to analyse the financial statements of individual companies it is more normal to find analysts facing interpretation issues related to group or consolidated financials. Consolidated financials are an amalgam of the individual financials of the corporate entities that constitute the group. There is a particular methodology for preparing these financial statements. Analysts need to understand this in order to deal with the output from the consolidation process. This chapter examines the techniques used to prepare consolidated financial statements and the various related analysis points. The final part of the chapter considers the modelling issues raised by groups.

2. Treatment of Investments

2.1 Introduction

IAS 39 is quite explicit about fair valuing equity investments made in one company by another. However, IAS 39 is focusing on the accounting treatment in the investor corporate accounts. In certain circumstances further accounting issues arise which require the application of consolidation principles. A useful starting point is Exhibit 7.1 below. The table shows the three classifications of investments for the purpose of preparing consolidated financials. The classification is driven by the degree of influence the investing company has over the investee. Note that these percentages are merely indicative and IFRS 3 *Business Combinations* makes it clear that it is the substance of the scenario that is important not merely the percentage holding. However, for the purposes of this discussion the percentages form useful guidelines.

Exhibit 7.1: Classifications of investment

	Holding below 20%	**Holding 20% to 50%**	**Holding over 50%**
Extent of influence	Insignificant	Significant	Control
Accounting term	Investment in securities	Associate or affiliate	Subsidiary
Accounting treatment	Fair value	Proportional or Equity method	Acquisition Accounting

3. Methods of consolidation

Historically there have been two methods of consolidation: pooling and purchase. IFRS 3 has prohibited the use of the pooling method. However, this prohibition is prospective so corporates that have previously used this approach do not have to restate prior numbers. Therefore it is still useful for analysts to appreciate the key differences between the two approaches and a section has been included towards the end of the chapter outlining the analytical issues.

As pooling has been prohibited the only consolidation technique available is the purchase method. This method forms the theme for the remaining parts of this chapter until we discuss accounting for associates.

Refresher example – the fundamental mechanics

As this text is aimed at intermediate level and beyond we have provided a refresher example which should be of use prior to addressing some of the more analytical aspect of consolidation.

3.1 Core aspects of consolidation

- There are no 'IAS 39' **investments in subsidiaries** in consolidated accounts. This is because the carrying value of the investments has been replaced by the underlying net assets of the subsidiary.
- The **net assets** represent the amalgamated net assets of each of the subsidiaries. Users are then provided with detailed information allowing them to assess the detailed operations of the group.
- **Minority interest** represents the outside interest in the net assets of the subsidiary that have been consolidated by the holding company, i.e. 100 per cent of the net assets of the subsidiary will have been added to the group's net assets to reflect control, but the holding company may only own 75 per cent so a 25 per cent minority interest must be recognised. It is normally disclosed under shareholders' funds and is calculated as:

  NET ASSETS OF SUBSIDIARY X % OWNED BY MINORITIES

- **Common stock and preferred stock** relate to the holding company only. This is a fundamental aspect of consolidation. The group financials are prepared for the shareholders of the holding company only and therefore only reflect their shares.
- The **retained earnings** equal the holding company's retained earnings plus a share of the subsidiary's post-acquisition retained earnings. This is to reflect the change in ownership of the subsidiary and the ownership of earnings.

These key mechanical building blocks are reviewed in the following computational example (Exhibit 7.2).

Exhibit 7.2: Acquisition without goodwill

Great SA acquired Notes SA on 1st January year 1

Inputs

Consideration	40,000
% acquired	100%
Retained earnings @ acquisition	30,000

Balance sheets before and after consolidation

	Great SA	Notes SA	Adjustments	Consolidated
Investment in Notes SA	40,000	-	-40,000	
Other assets	130,000	40,000		170,000
Total assets	**170,000**	**40,000**		**170,000**
Common stock	38,000	10,000	-10,000	38,000
Retained earnings	132,000	30,000		132,000
	170,000	**40,000**		**170,000**

Points to note

1. Assets are those controlled by Great SA. There is no application of 'proportional consolidation'.
2. No minority interest due to 100 per cent acquisition.
3. Common stock is only that of Great SA, a standard consolidation technique.
4. No goodwill has arisen. This is considered in the next section.
5. Retained earnings are only those of Great SA. We cannot consolidate earnings of Notes SA as these arise pre acquisition and as a result were not controlled by the group.

3.2 Goodwill – Premium on acquisition

The rules governing the recognition of goodwill are covered in IFRS 3. A revised IFRS 3 was issued in January 2008. It provided for two ways of calculating goodwill. Below we explain the partial goodwill method, and in the notes after the calculation in 7.4 we show the alternative 'full' method. Goodwill is a very significant part of the consolidation process although its valuation significance is less clear. In summary IFRS 3 requires that:

1. **A premium** is calculated as the difference between the value of the consideration paid and the value of separable assets acquired. This is then allocated to separable intangibles with the unidentifiable portion being goodwill.

2. **Fair values** will be used for both the consideration given in an acquisition and the assets acquired. Fair values would normally approximate to market values.
3. There is a **prohibition on the amortisation of goodwill**. Instead it is reviewed annually for impairment. The impairment test must be applied annually or more often if changing circumstances indicate that the asset might be impaired. Impairments are recognised in the income statement as expenses.
4. If a business combination involves entities under **common control** (i.e. all controlled by the same party) then the combination is outside the scope of this standard.
5. When estimating the **fair value of the assets acquired** the acquirer shall not recognise liabilities for future losses or other costs expected to be incurred as a result of the business combination. Restructuring provisions (e.g. for redundancy) shall only be recognised if the aquiree had an existing liability at the balance sheet date.
6. Given that **intangibles** form an increasingly important component of the assets acquired in a transaction the IASB have now put much more emphasis on companies separately identifying intangibles. Therefore from now on there will be an obligation on companies to split out separable intangibles rather than to leave them 'blended' within goodwill.

A computational example is given in Exhibit 7.3.

Exhibit 7.3: Acquisition with goodwill creation

MD acquires Sublime SA on 1 January year 1

Inputs

Consideration	10,000
% acquired	100%
Retained earnings @ acquisition	1,000
Amortisation period	5
Years elapsed	2

Balance sheets at end of year 2, before and after consolidation

	MD SA	Sublime SA	Adjustments	Consolidated
Investment in Notes SA	10,000	-	-10,000	
Other assets	17,000	10,000		27,000
Goodwill			600	600
Total assets	**27,000**	**10,000**		**27,600**
Common stock	24,000	8,000	-8,000	24,000
Retained earnings	3,000	2,000		3,600
	27,000	**10,000**		**27,600**

Notes

The goodwill adjustment only happens on consolidation. It does not appear in the individual company financial statements. It needs to be accounted for each year.

1. The unamortised goodwill is recognised in the group balance sheet as an intangible asset.
2. Each year the consolidated income statement would have the amortisation expense of €200. When calculating retained earnings, the cumulative effect needs to be adjusted for as the individual company retained earnings figures would not be affected by goodwill. The transition to IFRS will not result in historic goodwill amortisation being reversed.
3. The retained earnings of the group only include the post acquisition earnings of Sublime.
4. No minority interest due to 100 per cent acquisition of Sublime.

Now we have seen all the key ingredients that make up a consolidated balance sheet it is useful to examine another computational example. Exhibit 7.4 illustrates an acquisition of 80 per cent of the equity in a company.

Exhibit 7.4: Acquisition of 80 per cent of a company

Kane GmbH acquired Able GmbH

Inputs

Consideration	80,000
% acquired	80%
Retained earnings @ acquisition	8,000
Amortisation period	N/A
Years elapsed	N/A

Balance sheets immediately after the acquisition and immediately after consolidation

	Kane	**Able**	**Adjustments**	**Consolidated**
Investment in Able	80,000	-	-80,000	-
Current assets	16,000	32,000		48,000
Other assets	64,000	16,000		80,000
Goodwill			64,000	64,000
Total assets	**160,000**	**48,000**		**192,000**
Current liabilities	80,000	28,000		108,000
Common stock	56,000	12,000	-12,000	56,000
Retained earnings	24,000	8,000	-8,000	24,000
Minority interests			4,000	4,000
	160,000	**48,000**		**192,000**

Points to note

1. Control is obtained via 80% stockholding. Kane GmbH only owns 80% so there is a 20% minority interest.
2. At the original time of acquisition, current assets would have been reduced to reflect the payment to acquire stock in Able GmbH:
   - Increase investment €80,000
   - Decrease cash €80,000
3. Cost of investment cancels with net assets acquired to produce goodwill of €64,000. This is reflected as an intangible asset in the consolidated balance sheet.
4. Minority interest are given their share of net assets of Able GmbH consolidated by the group.
5. Common stock is just that of Kane GmbH.
6. No post acquisition reserves of Able GmbH as consolidation takes place at the same date as acquisition.
7. As mentioned above, a new revised IFRS 3 on business combinations actually allows an alternative goodwill calculation where less than 100% of the shares are acquired. This is referred to as the full goodwill method. In the example above an estimate would be made for the cost of purchasing 100% of the shares rather than 80%. For ease of calculation let us assume this would be a straight line extrapolation of our 80% cost. In other words, if €80,000 was paid for 80% then €100,000 would be paid for 100%. We would then compare this €100,000 with all of the assets at fair value (here assumed to be €16,000) producing a 'full' goodwill of €84,000. The extra €20,000 added to assets is balanced by an increase of €20,000 in minority interests. This is their share of the goodwill.

3.3 Analysis implications of goodwill

Assessing profitability

Measures such as EBIT and EPS have historically been based on post goodwill amortisation numbers. Since goodwill does not have to be replaced it is not an economic cost. Therefore investors typically added it back in the calculation of economic profit for whatever purpose. Therefore we used EBITA instead of EBIT and a so called 'cash based' EPS instead of the accounting one. Note the terminology used in this last part is typical 'City' misnomer – adding back goodwill amortisation in no way turns accounting profit into cashflow. It merely moves profit in the general direction. Now that IFRS 3 has prohibited the amortisation of goodwill there is no requirement to adjust the profit except if there are impairments (see Chapter four).

Returns on capital

Now let us think about the balance sheet rather than measures of income. When calculating return on capital, what do we do with goodwill? What about the balance sheet? Well, when the company builds a new plant it is not going to build goodwill as well, so when forecasting it is returns on capital excluding goodwill that should drive our valuation. So is goodwill irrelevant? Is it irrelevant that management spent lots of money and may not get a fair return on it? Clearly we need both measures, but for different purposes.

4. Further issues in consolidation

The whole area of consolidated financials is full of complex issues. Although the technical issues are important, for modelling purposes the key task is to deal with the output reflected in the financials. Exhibit 7.5 addresses some other areas of consolidation that may be useful for analysts.

Exhibit 7.5: Further issues in consolidation

Issue	Acctg treatment
Preference stock shares	If the holding company owns both common stock and preferred then, unless it holds the some percentage of both, this has an impact on our calculations in a similar way to the calculation of minority interest on the consolidated balance sheet. Therefore the company must disaggregate balance sheet and income statement numbers into those 'owned' by the preference shareholders and the balance residual amounts owned by the common stockholders.
Mid-year acquisitions	A fundamental principle of consolidation is that only post acquisition profits are reflected in the group financials. Therefore an income statement drawn up after a mid-year acquisition will only include those sales, costs and other items that have happened since consolidation.
Inter-company transactions	The process of consolidation involves preparing an additional set of financial statements that reflects the economic position that would exist if the holding and subsidiary companies were a single economic entity. This, quite obviously, does not reflect legal reality. Each entity is typically a separate legal entity. Such companies trade with each other and this is reflected in their financial statements. However, if we are assuming a single economic entity then it no longer makes sense to reflect such transactions in the consolidated accounts
	If a holding company and its subsidiaries trade then such transactions will normally be on credit. Therefore in each set of financials there will be offsetting balances. So if a parent company sold goods on credit to a subsidiary then there would be a receivable in the parent balance sheet and an equal payable in the financials of the subsidiary. As we are making the one entity assumption, both of these numbers will be dropped out of the asset aggregation exercise on consolidation.
Income statements	Consolidated income statements are prepared on a similar basis to balance sheets in that all profits under the control of management are consolidated. Also, in a similar manner to balance sheet consolidations, income statements are consolidated based on the single entity assumption. Therefore the sales of subsidiaries are aggregated with the sales of the holding company in order to calculate group sales. An income statement consolidation example is included in Exhibit 7.6.

Exhibit 7.6: Consolidating income from a subsidiary

Home purchased 75% of Time SA many years ago

Individual and consolidated income statements

	Home SA	Time SA	Adjustment	Consolidated
Revenues	49,000	31,200		80,200
Cost of goods sold	-28,000	-20,000		-48,000
Operating income	**21,000**	**11,200**		**32,200**
Dividend income	3000	-	-3,000	0
Pre-tax profit	**24,000**	**11,200**		**32,200**
Taxes	-10,000	-3,200		-13,200
Post tax profit	**14,,000**	**8,000**		**19,000**
Minorities			-2,000	-2,000
				17,000

Points to note

1. 100% of the **results of the subsidiary** are consolidated from Revenue to Profit after tax.
2. **Dividend income** from Time SA (all intercompany) is not reflected in the consolidated income statement. Dividend income has been replaced by earnings. To include dividend income would be to double count.
3. The **group tax figure** is just an amalgamation of the individual company tax expenses. Group accounts are tax neutral, i.e. have no impact on tax. Tax is levied at the individual company level.
4. **Minority interest** is the share of earnings after tax of the subsidiary.

5. Accounting for associates and joint ventures

We saw in the introductory parts of this chapter that investments fall into three categories. Those that afford the investor no influence are fair valued and accounted for in accordance with IAS 39. The next category we looked at was those shareholdings that afford the investor control and result in the consolidation of subsidiaries. Lastly, there are those investments which fall somewhere in the middle – they offer neither passive investment nor control. We call this level of influence ‘significant’ and there is a completely different set of rules that govern how these type of investments are reflected in the financials as we shall describe below.

5.1 Essential terminology

IAS 27 and 28 includes various definitions and terms. We have reproduced paraphrased versions of these in Exhibit 7.7 so that analysts working with these numbers can understand the nature of the investments more fully.

Exhibit 7.7: IAS 27 and 28 definitions and terms

'Associate'

The need for the preparation of consolidated financial statements is driven by the need of users to understand the full amount of resources and earnings over which the parent company has control. There is a similar need for understanding the resources and earnings over which the parent company has significant influence. These investments are referred to as associates. Associates are a form of inter-corporate investment. Such investments possess the following characteristics:

- Long term investment
- Investing company exercises significant influence
- Typically involves at least 20% ownership

In determining whether or not significant influence exists, IAS 28 *Investments in Associates* states that the following may be indicative:

1. Representation on the board of directors
2. Participation in policy-making process
3. Material transactions between investor and investee
4. Interchange of managerial personnel
5. Provision of essential technical information.

By way of contrast, the following may be indicative of a lack of significant influence:

1. Opposition by other shareholders
2. Majority ownership by a small group of investors
3. Inability to achieve representation on the board or to obtain information on the operations of the investee.

IAS 28 requires the use of the equity method for accounting for associates.

'Joint ventures: Equity accounting – general'

Whereas consolidation under the purchase method requires a line by line consolidation of the individual balance sheet and income statement of the subsidiary, the equity method is simpler. Under IAS the equity method requires accounting for the group share of resources and earnings and is reflected as a one line entity in the consolidated income statement and balance sheet. The concept applied is that of substance over legal form in order to provide more meaningful information to the users.

'Joint ventures: Equity accounting – income statement'

The basic principle is to account for the share of associates' net income. The actual methodology of how this is achieved can vary from jurisdiction to jurisdiction and IAS are not particularly clear on this matter (see Exhibit 7.8 over the page).

'Joint ventures: Equity accounting – balance sheet'

Again, single line consolidation is used here. All we see is a single line entry in fixed assets. It is typically described as 'investment in associate undertakings' and is calculated as:

Share of net assets of the associate (% owned X net assets at balance sheet date)	**X**
+ Unamortised goodwill balance of associate.	**X**
	X

> Owing to the use of a 'net' number, quite large associates, with large assets and liabilities, can appear quite small. For this reason it is often said that equity accounted for vehicles can provide 'useful' ways of hiding debt.

Exhibit 7.8: Accounting for associated interests

Stypen SA purchased 40% of Standard SA many years ago

Individual and consolidated income statements

	Stypen	Standard	Adjustment	Consolidated (equity)
Revenues	2,200	1,200	-1,200	2,200
Cost of goods sold	-660	-600	600	-660
Operating income	**1,540**	**600**		**1,540**
Interest charges	-200	-40	40	-200
Pre-tax profit	**1,340**	**560**		**1,340**
Taxes	-340	-100	100	-340
Post tax profit	**1,000**	**460**		**1,000**
Share of profits of associates			184	184
Attributable income				**1,184**

Points to note

1. The group share of the underlying net assets of Standard SA are incorporated in the group balance sheet and replace the cost of the investment.
2. Net assets of Standard SA at the date of the investment are calculated by reference to stockholders equity at that date.
3. No separate disclosure of unamortised goodwill.
4. Share of post acquisition earnings are incorporated into group retained earnings.
5. Implications for analysis.

Associates throw up some interesting analysis and valuation implications for users.

How to value an associate?

The valuation of associates presents interesting problems for investors. If an analyst is forecasting profits based on accounting numbers then should he blend the associate with the core company or look at it separately? The problem is that valuing the associate separately requires a lot of detailed information. Therefore a pragmatic approach is to blend small associates and/or those in similar businesses into the core earnings-based valuation. Larger and/or more unusual associates may need to be valued separately.

But what about cashflow models?

From the text it is clear that the equity (rather than proportionate, see below) method of consolidation creates a strange outcome in group consolidated amounts. Profit includes the share of profits from associates, but assets and liabilities are netted off in the group balance sheet, which just shows a share of net assets. The cash flow statement is even more unusual in that it excludes the associate, except to the extent of dividends received from it. This means that analysts, when building cash flow models of companies with associates, must often exclude the associate completely from the analysis, and value the interest separately.

5.2 Proportionate Consolidation

As we saw earlier on in this chapter proportionate consolidation is a method of combination that includes the investor share of each account caption. Therefore the relationship is reflected in each income statement and balance sheet caption. There is a reasonable argument that this overcomes a major shortcoming of the equity method whereby the netting off procedure (i.e. reflecting a share of a net number such as net assets or net income) can obfuscate useful information. Proportional consolidation can be seen very much as a disaggregation process and therefore provides significantly more information.

Analysis issues with proportional consolidation

As already mentioned, there is a strong school of thought that proportional consolidation is superior to equity accounting due to the higher information flow that investors receive. If that is the case why is proportional accounting particularly rare – for example it is not used in the US save for specific industries such as oil and gas? Not everyone would agree that proportional consolidation is helpful for analysts. Two reasons are put forward for this. Firstly, proportional consolidation includes items in net assets and income that are not under the control of management. For example an investor would normally look at the revenues number and analyse the marketing strength of a company on the assumption that group management were in control of this number. But of course if proportional consolidation was being used then a component of those revenues are not under the control of management. Secondly, if proportional consolidation is used then it is very difficult for analysts to reverse out the other entity as many of the numbers are ‘tainted’. This reversal is particularly relevant when entities undertaking materially different activities from the main group are proportionally consolidated.

In the case of accounting for joint ventures, IAS 31 *Financial Reporting of Interests in Joint Ventures* allows two possible methods:

1. Equity method, or
2. Proportionate method.

Full consolidation is not warranted on the basis that the investor has significant influence but not control. As discussed earlier in this chapter, the nature of a joint venture is usually such that there are at least two ventures bound by a contractual arrangement and that the agreement establishes joint control of the entity.

The contrast between proportional consolidation and equity accounting is further amplified in Exhibit 7.9 below.

Exhibit 7.9: Equity accounting versus proportional consolidation

Hope plc purchased a 50% stake in Full Ltd on 1 January year 1

Balance sheets on 31 December, year 1 were as follows, together with the relevant accounting methodology

Inputs

Consideration	100
% acquired	*50%*
Reserves at acquisition	80

Balance sheets	**Hope**	**Full**	**Equity adjustment**	**Equity result**	**Proportional adjustment**	**Proportional result**
Current assets	240	100	-100	240	-50	290
PP&E	120	420	-420	120	-210	330
Investment in Full*/Goodwill	100	-	-100	120	-100	10
	460	**520**		**480**		**630**
Current liabilities	90	60	-60	90	-30	120
Debt	140	240	-240	140	-120	260
Common stock	70	100	-100	70	-100	70
Retained earnings	160	120	-100	180	-100	180
	460	**520**		**480**		**630**

* The adjustment consists of reversing out the cost of the investment that has been recognised and replacing it with the relevant share of the net assets of the associate plus goodwill as follows:

Share of net assets = 220 * 50%		110
Goodwill:		
Cost of investment	100	
Net assets* 50%	-90	
		10
		120

6. Purchase accounting and uniting of interests

IFRS 3 prohibited the use of any alternative to the purchase method for consolidating non-common control business combinations. However, this change was not mandatory retrospectively. Therefore companies that previously 'pooled' were not required to make any adjustments. Although there is little investors can do about these issues it is useful to be aware of the differences between the two methods as it can distort analysis. The difference is illustrated in Exhibit 7.10.

Exhibit 7.10: Acquisition versus pooling

The purchase method	Pooling
An acquirer must be identified	There is no acquirer, two parties are coming together for mutual benefit
Consideration paid is recorded at fair value	Consideration, which had to be almost exclusively shares, is recorded at nominal value (par)
Assets acquired of the target are fair valued for consolidation	Assets remain at book value when consolidated
Pre and post acquisition periods are designated and only post acquisition items are recognised in income and retained earnings	There is no concept of pre and post acquisition The pooling mechanics operate as if the entities had always been combined.
Goodwill is recorded and recognised as an asset. Impairments are recognised as required to reflect diminutions in value	There is no goodwill recognised

These differences can result in very different accounting and interpretative ratios. For example:

- **Pooling will give higher profits**: As assets are at book value these will typically result in lower depreciation charges. In addition there will be no impairments in the future as there is no goodwill.
- **Poolings result in higher returns on equity**: In most circumstances the recognition of the consideration offered at par value rather than fair value, as well as the absence of a goodwill asset, will mean equity will be lower under pooling. This combined with the higher earnings justified above will mean enhanced returns on equity.
- **Asset turnover will be higher**: Lower asset values as book is used instead of fair value would typically result in the illusion of a much leaner more efficient corporate.

7. Foreign subsidiaries

Foreign subsidiaries need to be consolidated into the home group financials. As these will be prepared in a foreign currency, the accounting numbers will need to be translated into what is commonly called the reporting currency. This presents us with a number of mechanical issues relating to the translation of accounting numbers. In essence this boils down to a few questions:

1. **What rate should be used?**
2. **Should accounting captions be translated each year?**
3. **Where will translation gains/losses be shown?**

In addition there are a number of interesting valuation issues:

- **Should foreign currency forecasts be made and then translated or should models focus on the reporting currency *ab initio*?**
- **What cost of capital should be used to discount whatever currency flows are modelled?**

The straightforward aspect is the accounting mechanics although in practice these can present auditors and accountants with huge practical, if not intellectual, problems. Let us take each of the three accounting issues in turn:

What rate should be used? Typically, balance sheets should be translated using closing rates and income statements using average rates.

Should all accounting captions be translated each year? All income statement items are translated every year. Furthermore all assets and liabilities are translated at the closing rate, irrespective of their nature. This is merely a mechanical response to the requirement that we need everything in the same currency prior to consolidation, so we might as well use the most recent rate. At the very least it introduces consistency and clarity into the process.

When will translation gains or losses be shown? Translation differences in the consolidation process go straight to equity (are not shown in the profit and loss account), so they are a commonplace example of a violation of clean surplus accounting.

The valuation points can be made very simply. It is perfectly legitimate to value the local subsidiary of an international company using local currency forecasts and a local discount rate, or by using forecasts that have been exchanged at a reasonable projected exchange rate into the group's reporting currency, and then discounting these at the group's cost of capital. But it is clearly not acceptable to apply a discount rate based on one rate of inflation and interest rates to a set of cash flows denominated in a different currency (whichever way round you make the mistake).

Moreover, where there are currency gains or losses taken straight to equity then these 'dirty surpluses' (or 'dirty charges') should be taken through the NOPAT numbers in our intrinsic value models. As usual, we want to see the accrual of value reflected in what we are discounting, for all the reasons discussed in Chapter one.

8. Accounting for disposals

The nature of accounting disposals and derecognition

A significant number of quite complex accounting issues arise in relation to disposals. Again if a valuer is to appropriately model and conduct meaningful analysis then an appreciation of these is essential. Remember that the fundamental premise of disposal accounting relates to derecognition. In an accounting context derecognition means the removal of an asset (or liability) from the balance sheet. In most cases identifying the need for a derecognition is straightforward – the sale of an asset or the disposal of an entire shareholding are obvious examples. But there can be other more subtle instances such as when a subsidiary issues shares to a party other than the parent. In this case there is a 'deemed' disposal due to the dilution in the effective holding at the group level.

Assets or shares?

The first distinction to make is between asset and share disposals. In a similar way to purchasing decisions, business activities can be sold either by selling an interest in an entity's assets and liabilities, as represented by shares, or by selling some assets directly. This distinction is crucial for a number of reasons. Firstly, the accounting differs dramatically. Secondly, the purchase of an asset will often come with no other obligations whereas if the shares are purchased then there are control issues and a whole plethora of accounting issues. Lastly, the distinction can be very important for tax purposes. If you want to benefit from another entity's tax losses then, under normal circumstances, there is little point in purchasing an asset – the shares are the only route to follow.

The accounting treatment of asset sales is straightforward so let us deal with that first.

Asset disposals

The key questions regarding the accounting treatment of asset sales are:

1. **Derecognition of the asset:** from the date of sale the asset will be derecognised from the balance sheet and, from that point, no depreciation will be charged through the income statement. Note that under IFRS this is not a legal ownership issue. Derecognition will occur when the economic

risks and rewards of an asset pass to another party. This is very much a judgement call by the auditor, decided on a case by case basis.

2. **Recognition of the proceeds of sale**: this will either be in the form of cash (straightforward) or an exchange of assets (use fair value for assets received).

3. **Recognition of a profit/loss on disposal**.
   – The calculation of a profit/loss on disposal is required unless an asset is sold for precisely its book value. Given that assets are valued at cost (or revalued amount) less cumulative depreciation, which is based on judgemental decisions and estimates, it would be most unusual if this (selling at precisely book value) were to happen. It is important to remember that the objective of depreciation is not to establish an accurate valuation of an asset in the balance sheet. Instead it is to charge the entity for the opportunity cost of using the asset rather than disposal. The extensive use of historical cost accounting limits the efficacy of the implementation but does not detract from the soundness of the principle.
   – Typically a profit or loss on disposal is treated as a non-recurring item in the income statement. Again we must be careful here. If we see a continuous stream of profits/losses on disposals could it be argued that these are a normalised part of the business? There is some validity to this argument, especially if disposals are of operating assets such as aircraft or retail stores. The management of a large pool of operating assets via judicious sub-leasing, disposal and exchange is surely a part of on-going activities. On the other hand the disposal of the head office building in central Paris is unlikely to be an ongoing event. Therefore, consideration should be given to treating the disposal of operating assets as recurring items to some degree. However, careful analysis of these numbers would be necessary to make informed decisions.
   – Disposals may also offer an insight into the adequacy, or otherwise, of a company's depreciation policy. A company with consistently high profits on disposals may be overdepreciating its assets whereas one reporting losses may not be charging a sufficient level. It is up to the analyst to consider whether the deviations from an appropriate 'economic' depreciation charge are sufficient to warrant adjustments to a more normalised number.

4. **Any accumulated depreciation on the derecognised asset must be reversed out.** The asset is no longer owned and the company must ensure that the accumulated depreciation recognised on a balance sheet relates to the assets in hand.

Some complications arise where the asset has been revalued. Note that revaluations are permitted under IFRS but not under US GAAP. In this case the profit on disposal is based on a comparison between the sales proceeds and the depreciated revalued amount. This means that *ceteris paribus* assets that have been subject to revaluations will produce lower profits on disposals. A further adjustment is required for revalued assets as the balance in the revaluation reserve must be transferred to retained earnings as this amount has now been realised.

Example

Value place Inc. has disposed of two fixed assets. Asset 1 has not been revalued and the the relevant information together with profit on disposal and required adjustments is given below. The same information is given for Asset 2 but it has been revalued upward by 26,000 some years ago.

Note that:

- It incurs a loss on disposal. If assets have been revalued then there will be systematically lower profits on disposal or higher losses compared with assets that remain at historical cost.
- A transfer must be made of the balance on the revaluation reserve that relates to Asset 2. This amount is now realised and would be available to distribute, etc.

Exhibit 7.11: Accounting for asset disposals

	Asset 1	Asset 2
Cost/revalued amount	124,590	178,435
Accumulated dep'n	-45,876	-34,999
Net book value	**78,714**	**143,436**
Disposal proceeds	234,000	139,000
Profit/(loss)	155,286	-4,436
Adjustments		
Accumulated dep'n	-45,876	-34,999
Revaluation reserve		-26,000
Retained earnings		
Profit on disposal	155,286	-4,436
Revaluation transfer		26,000

Disposal of shares

The treatment of share disposals is more complex and diverse as it depends on the accounting treatment of the underlying investment. In turn this depends on the relationship between the investor and investee companies.

We shall look at three possibilities:

1. There is still a subsidiary after the disposal
2. There is an associate after disposal
3. It is a complete disposal and nothing is left

The exhibit that follows (Exhibit 7.12 addresses the first two scenarios. The third is much more straightforward so we merely describe the income statement and balance sheet treatment below.

Profit on disposal

A profit on disposal will be recognised in the income statement. In a similar way to the disposal of assets a comparison is made between the proceeds and the value of the underlying assets. The numbers in the model are explained below:

Exhibit 7.12: Accounting for disposal of minority

Deconsolidation terms: original stake		**Deconsolidation terms: original stake**	
Per cent sold/floated	*40%*	*Per cent sold/floated*	*55%*
Per cent retained	*60%*	*Per cent retained*	*45%*
Gross consideration	400	Gross consideration	400
NAV sold	80	NAV sold	100
Book profit	320	Book profit	290
Tax rate	*30%*	*Tax rate*	*30%*
Capital Gains Tax	(96)	Capital Gains Tax	(87)
Net profit on disposal	224	Net profit on disposal	203
Net cash receipt	304	Net cash receipt	313
Goodwill sold	(80)	Goodwill sold	(110)
Adjustment to equity	144	Adjustment to equity	93

Notes

1. The percentage sold and retained is based on the assumption that we owned 100 per cent to begin with. Here we assume that a disposal of 40 per cent is made in the first case (Exhibit 7.12), and of 55 per cent in the second.
2. The proceeds are given in each scenario as €400m in both cases.
3. The existing net assets are taken from the subsidiary balance sheet and multiplied by the percentage sold.
4. Book profit is calculated as the difference between the sales proceeds and the net assets disposed of.
5. We then apply a tax rate. Note that as these are disposals of fixed assets, it is the capital gains tax rate that applies although in some jurisdictions this is the same rate as that applied to income.

6. The net receipts is simply the consideration received less the tax that will have to be paid.
7. The goodwill disposed means that we have lost another asset. In the income statement this would also be deducted from the profit on disposal to be recognised.
8. The above calculations would be identical in the case of a complete disposal, i.e. there would be a profit on disposal and it would be based on the proceeds received less the entire NAV of the subsidiary now disposed.

Balance sheet

Scenario	Implications	Model numbers
1. Disposal of 40% so a subsidiary (Exhibit 7.13)	The balance sheet is a statement at a point in time so after the disposal it merely reflects the fact that a 60% subsidiary is now in existence. So there is still full consolidation of the subsidiary	The net proceeds are added to the cash balance Goodwill is adjusted for the portion disposed of The adjustment to shareholder funds is the net proceeds and the adjustment for the goodwill disposed of. Minority interests is based on the new minority number of 40%. There is no time apportionment as the balance sheet merely reflects the position at a point in time.
2. Disposal of 55% so it is now an associate (Exhibit 7.14)	There will no longer be full consolidation. Instead a proportion of the assets will be recognised and no minorities	No assets are consolidated on a line by line basis. Instead a financial asset equal to the share of the other entity's assets (and the remaining goodwill) is recognised. No minorities are recognised as the investing company is only including the share that it actually owns.
3. Complete disposal	In this case there is complete derecognition of the subsidiary and no consolidation	There is recognition of the net proceeds of the disposal in cash and the profit in equity in addition to the adjustment for goodwill disposed of.

Exhibit 7.13 shows the balance sheet calculations for the disposal of a minority stake.

Exhibit 7.13: Disposal of minority stake (balance sheet)

Balance sheet	**Parent**	**Subsidiary**	***Adjustments***	**Proforma**
Cash	100	25	*304*	404
Inventories	200	120	*0*	200
Trade receivables	150	50	*0*	150
Other current assets	50	30	*0*	50
Total current assets	500	225	*304*	804
P,P&E	750	300	*0*	750
Financial assets	50	25	*0*	50
Goodwill (all relates to subsidiary)	200	0	*(80)*	120
Total fixed assets	1,000	325	*(80)*	920
Total assets	**1,500**	**550**	***224***	**1,724**
Short term debt	150	45	*0*	150
Trade payables	100	45	*0*	100
Other current liabilities	150	75	*0*	150
Total current liabilities	400	165	*0*	400
Long term debt	350	120	*0*	350
Provisions	150	65	*0*	150
Minority interest	100	0	*80*	180
Shareholders' funds	500	200	*144*	644
Long term liabilities and equity	1,100	385	*224*	1,324
Total liabilities and equity	**1,500**	**550**	***224***	**1,724**

Exhibit 7.14 shows the balance sheet calculations for the disposal of a majority stake.

Exhibit 7.14: Disposal of a majority stake (balance sheet)

Balance sheet	**Parent**	**Subsidiary**	***Adjustments***	**Proforma**
Cash	100	25	*288*	388
Inventories	200	120	*(120)*	80
Trade receivables	150	50	*(50)*	100
Other current assets	50	30	*(30)*	20
Total current assets	500	225	*88*	588
P,P&E	750	300	*(300)*	450
Financial assets	50	25	*155*	205
Goodwill (all relates to subsidiary)	200	0	*(200)*	0
Total fixed assets	1,000	325	*(345)*	655
Total assets	**1,500**	**550**	***(257)***	**1,243**
Short term debt	150	45	*(45)*	105
Trade payables	100	45	*(45)*	55
Other current liabilities	150	75	*(75)*	75
Total current liabilities	400	165	*(165)*	235
Long term debt	350	120	*(120)*	230
Provisions	150	65	*(65)*	85
Minority interest	100	0	*0*	100
Shareholders' funds	500	200	*93*	593
Long term liabilities and equity	1,100	385	*(92)*	1,008
Total liabilities and equity	**1,500**	**550**	***(257)***	**1,243**

9. Modelling mergers and acquisitions

What is special about modelling and valuing mergers and acquisitions?

Most models of companies assume that they are going concerns, and that they will not undergo corporate changes in the form of acquisitions or disposals of assets, or spin-offs of subsidiaries. Inside companies, much, though not all, planning is undertaken on this basis, and investors generally assume that the entity in which they are investing will grow organically.

Naturally, there are times when this approach is wholly inappropriate. Companies, when they contemplate an acquisition, need to be able to value it and, quite separately, to assess the impact of the acquisition on their consolidated financial statements. Investors in companies that have been bid for need to make up their minds whether or not to accept the bid. And investors in companies that have made or are making acquisitions need to be able to assess them.

As with general company modelling and valuation, it is important to have both an understanding of the accounting issues involved, and to be able to make reasonable inferences regarding valuation. This chapter began with an explanation of the accounting treatment under IFRS of the consolidation and deconsolidation of the elements of a group. We shall now discuss in some detail the valuation and accounting implications of corporate acquisitions, since these represent the most dramatic and complex issues from the perspective of valuation, and they arise quite regularly.

9.1 Valuing an acquisition

Generally, one models a company first and values it afterwards. With mergers it is the other way round. The starting point is whether or not a bid is a good idea, and how much it would be worth paying, if you are acting for the bidder. If you are an investor and a bid has been announced, again, the key question is whether or not it will add value after taking the consideration into account.

But consolidated accounts do matter. There are proforma balance sheet structures that are quite simply unworkable. Whatever the theoretical arguments about how impact on earnings per share is unimportant, the reality is that a severe negative impact will at least have to be sold carefully to shareholders, and possibly also to the Board of the bidding company, whether or not it makes purely economic sense.

So our starting point is the value of the target, but there are two possible differences with respect to this exercise and the ones that we undertook in Chapters five and six. The first is that acquisitions are generally motivated at least in part by the prospect of synergies. And the second is that the financing of the acquisition may mean that the capital structure of the target will be transformed by the acquisition. An extreme example of the latter point is the leveraged buy-out, where much of the upside from the deal may lie in the creation of large tax shelters.

Starting with synergies, these generally come in one of three types: enhancement of revenue; reduction in operating cost; or reduction in capital costs. Revenue enhancement might most likely result from cross-selling opportunities, either because of the ability to sell products in different geographical locations, or because of the ability to cross-sell products to existing customers of two different businesses. Pharmaceuticals mergers offered the former synergy. Bancassurance mergers offer the latter. Pricing power may also result from mergers but for anti-trust reasons is never cited as a motive.

Cost reduction is most obviously achievable at the level of head office costs and layers of management, but may also extend to procurement, and to a general fall in fixed costs relative to the overall size of the business. Mergers in businesses including retail, downstream oil, utilities, and many others have been primarily motivated by these expectations.

Capital requirements are less often commented upon, in the same way that when analysing companies the financial press tends to concentrate more on margins that on capital requirements, but in fact the ability to reduce inventory requirements, for example, or to use fixed assets more efficiently, might well represent a significant driver to forecast synergies.

Turning to the second source of upside from mergers, a reduction in the cost of capital, our general approach to this would be to be very cautious. It is always important to separate out investment from financing decisions, and many bad acquisitions have been justified by arguments relating to tax shelters that could have been created by the bidder quite independently, merely by repurchasing its own shares. This argument is in addition to that expressed in Chapter two, that for technical reasons related to discount rates tax shelters are often overestimated in any case. Probably the most appropriate basis for valuing acquisition targets in most cases is to assume that, however the bidder really funds the acquisition, the appropriate discount rate should be based on what would be a sensible balance sheet structure for the business if it were independently financed.

An extreme example, to prove the point, is the following.

> *If a large well capitalised company borrows money to fund a small cash acquisition, is the appropriate discount rate for the acquisition its net of tax cost of borrowing? Obviously not, because its cost of borrowing is only low because it is a big company with a strong balance sheet. The real question is how much equity it would have to put behind the assets if they were to be funded on a stand-alone basis.*

Whether or not the bidder takes a possible alteration of the cost of capital into account in their assessment of a target, it is highly desirable to segment the valuation into two or three components. The first is the stand-alone value of the target as a going concern. This is what we have been doing throughout the last two chapters of this book. The second component is the value that includes synergies, whether attributable to revenue, cost or capital requirements. The third is, possibly, the value added through more efficient financing.

9.2 The exchange rate delusion

It is often argued (particularly by investment bankers) that the absolute value of the target is the key factor when assessing a cash acquisition, but it is the relative value of the shares that counts when assessing an acquisition for which the consideration will be new shares in the acquirer. This is a seductive argument. Surely, if my shares are trading at three times fair value, and those of the target are trading at two times fair value, then if I can swap my shares for his, the deal is a good one, irrespective of the fact that I shall probably have to write off half of the acquisition cost as impaired goodwill?

Well, actually, the answer is no. To see why, it is necessary to split the acquisition into its component parts: an investment decision and a financing decision. Taking the second one first, is it a good idea, if your share price is high, to use shares to buy things, or even to use the opportunity to accumulate some cash? Answer, yes. Taking the first one, is it a good idea, as a result of your being able to raise equity capital on good terms, to throw away half of this benefit by purchasing something at twice its fair value? Answer, no. Countless managements have made bad acquisitions through confusing investment with financing decisions, and this is a similar argument to the one we have already addressed regarding the appropriate discount rate for appraising targets.

It is always essential to separate investment from financing decisions and it is usually wrong to make a bad investment decision merely on the basis of arguments about financing. The gain created by tax shelters, for example, should also not be used to justify otherwise expensive acquisitions.

9.3 Bidding for Metro

Metro is the company that we have modelled in greatest detail, and we shall analyse it as a potential acquisition target for the US giant, Wal-Mart. As already discussed, detailed consolidations come later. The first question for Wal-Mart would be, 'What would we be prepared to pay?'

Our earlier valuation of Metro in Exhibit 5.2 generated a value per share of €46.06 per share, on the important assumption that we held market gearing stable into the future. Let us return to it and begin with some assumptions about what the change of ownership could plausibly do to the Metro business.

Cross-selling opportunities would be limited in this case, so we would be reduced to an estimate of what a possibly more aggressive management could achieve with the existing business. We shall assume that an uplift to projected revenues of 1 per cent is projected.

More might plausibly be done with costs, especially fixed costs. In reality, there are three lines of fixed cost that could be attacked, but to keep the modelling down we shall ascribe all the benefits to general administrative expenses, and shall assume that these could be halved. We assume no change to cost of goods sold through lower procurement costs.

Exhibit 7.15 contains two additional pages of Metro model. The first (page 15) shows the effect of the synergies described above on after-tax profits and cash flows. The second (Page 16) shows a reworking of the valuation table from Exhibit 5.2, but this time with NOPAT reflecting the synergies form the merger. Our value per share has risen by 50 per cent from €46.06 to €68.90.

Exhibit 7.15: Metro valuation with synergies

15. Metro synergies (€ million)

Year	2004	2005	2006	2007	2008	Terminus
Restructuring costs	**(1,049)**					
Stand-alone revenues	54,900	56,378	58,060	59,990	62,221	
Percentage uplift from merger	*0.0%*	*1.0%*	*1.0%*	*1.0%*	*1.0%*	
Additional revenues	0	564	581	600	622	
Gross margin	*22.7%*	*22.7%*	*22.7%*	*22.6%*	*22.5%*	
Synergy benefit from revenue	**0**	**128**	**132**	**136**	**140**	
General administrative expenses	(1,049)	(1,068)	(1,087)	(1,106)	(1,126)	
Percentage reduction from merger	*0.0%*	*50.0%*	*50.0%*	*50.0%*	*50.0%*	
Synergy benefit from cost reduction	**0**	**534**	**543**	**553**	**563**	
Pre-tax synergies	(1,049)	662	675	689	703	
Tax rate	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	
Net of tax synergies	**(682)**	**430**	**439**	**448**	**457**	

16. Metro target valuation (€ million)

Year	2004	2005	2006	2007	2008	Terminus
WACC	*6.1%*					
Incremental ROCE	*9.0%*					
Long term growth	*2.0%*					
NOPAT	**953**	**1,005**	**1,064**	**1,133**	**1,213**	**1,237**
Net synergy benefits	(682)	430	439	448	457	
NOPAT including synergies	**271**	**1,435**	**1,503**	**1,581**	**1,670**	**1,703**
Depreciation & amortisation	1,521	1,551	1,587	1,628	1,674	
Capital expenditure	(1,500)	(1,600)	(1,700)	(1,800)	(1,900)	
Change in working capital	63	99	115	135	160	
Free cash flow	**356**	**1,485**	**1,506**	**1,544**	**1,604**	**1,325**
Opening capital employed	**11,140**	**11,055**	**11,006**	**11,003**	**11,040**	**11,107**
Earnings growth	*(67.7%)*	*429.5%*	*4.7%*	*5.1%*	*5.6%*	*2.0%*
Return on opening capital employed	*2.4%*	*13.0%*	*13.7%*	*14.4%*	*15.1%*	*9.0%*
Cost of capital	*6.05%*	*6.05%*	*6.05%*	*6.05%*	*6.05%*	*6.05%*
Investment spread	*(3.6%)*	*6.9%*	*7.6%*	*8.3%*	*9.1%*	*2.9%*
Economic profit	**(403)**	**766**	**837**	**915**	**1,002**	**1,031**
DCF valuation						
+ PV 5 year cash flow	5,334	*18.0%*				
+ PV terminal value	24,355	*82.0%*				
= Enterprise value	**29,688**	***100.0%***				
+Financial assets	238					
-Minority interests	(188)					
-Pension provisions	(1,012)					
- Net debt	(6,209)					
= Equity value	**22,517**					
Value per share	68.90					
Economic profit valuation						
+ Opening balance sheet (excl. financial assets)	11,140	*37.5%*				
+ PV 5 year economic profit	2,472	*8.3%*				
+ PV terminal value (ex incremental investment)	12,691	*42.7%*				
+ PV terminal value (incremental investments)	3,385	*11.4%*				
= Enterprise value	**29,688**	***100.0%***				
+Financial assets	238					
-Minority interests	(188)					
-Pension provisions	(1,012)					
- Net debt	(6,209)					
= Equity value	**22,517**					
Value per share	68.90					

Had Metro been holding a large pile of cash in its balance sheet, and suffered from a clearly inflated weighted average cost of capital then it would have been appropriate to run a third valuation, using the synergies as in Exhibit 7.15 and a reduced WACC, based on a more efficient balance sheet. In that instance, we end up with three values: stand-alone, stand-alone plus synergies, and post-synergies plus lower WACC. (We should be unlikely to value the company on the basis of its balance sheet becoming steadily less efficient through time, as we did in the stand-alone model in Chapter five. In fact, in addition to the synergies discussed above, a complimentary shape to stand-alone cash flows is another desirable when assessing the suitability of a target for acquisition.)

9.4 Consolidation of projections

The earlier part of this chapter addressed IFRS accounting treatment for consolidation of acquisitions, when producing a post-merger balance sheet. We need to do more than that, since we shall presumably start with integrated forecasts for both companies, and want to be able to project integrated forecasts for the post-merger consolidated group. For this purpose we shall assume the acquisition of Metro by the US company Wal-Mart.

To keep the modelling under control, we have simplified our forecast of Metro (and converted them into dollar figures), have produced an equally simplified forecast of Wal-Mart, and have consolidated them. Exhibit 7.15 shows on separate pages the stand-alone forecasts for each company, the mechanics of a merger for cash undertaken at fair value, the synergies, and a consolidated five year forecast for the group assuming completion of the deal on 31st December 2004, so the forecasts have been extended for one year to provide a five year consolidation. Naturally, the value acquired should be slightly higher than that at start 2004, on which our valuation was based. Clearly, deals do not generally complete on balance sheet dates, and it is therefore necessary to consolidate balance sheets on the date of completion, with the result that there will be two part years (one for each company) ahead of the consolidation balance sheet and one part year after it (for the consolidated entity), which makes the models larger but does not fundamentally alter the difficulties of the process.

Exhibit 7.16: Wal-Mart/Metro merger model

Wal-mart ($ million)

Year	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Input ratios							
Sales growth		*4.0%*	*4.0%*	*4.0%*	*4.0%*	*4.0%*	*4.0%*
EBITDA margin	*7.0%*	*7.0%*	*7.0%*	*7.0%*	*7.0%*	*7.0%*	*7.0%*
Net interest rate	*4.1%*	*4.1%*	*4.1%*	*4.1%*	*4.1%*	*4.1%*	*4.1%*
Taxation rate	*35.3%*	*35.3%*	*35.3%*	*35.3%*	*35.3%*	*35.3%*	*35.3%*
Fixed asset turn	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Working capital turn	271.4	271.4	271.4	271.4	271.4	271.4	271.4
Net debt/equity	*55.6%*	*55.6%*	*55.6%*	*55.6%*	*55.6%*	*55.6%*	*55.6%*
Depreciation (years)	*15.9*	*15.9*	*15.9*	*15.9*	*15.9*	*15.9*	*15.9*
Pension provisions/Operating costs	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Other provisions/sales	*0.7%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Earning from associates/Recurring net profit	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Minority/Net profit	*2.4%*	*2.4%*	*2.4%*	*2.4%*	*2.4%*	*2.4%*	*2.4%*
Profit and loss account							
Sales	244,524	254,305	264,477	275,056	286,058	297,501	309,401
EBITDA	17,076	17,759	18,469	19,208	19,977	20,776	21,607
Depreciation	(3,432)	(3,569)	(3,712)	(3,861)	(4,015)	(4,176)	(4,343)
Goodwill amortisation	0	0	0	0	0	0	0
EBIT	**13,644**	**14,190**	**14,757**	**15,348**	**15,962**	**16,600**	**17,264**
Non recurring items	0	0	0	0	0	0	0
Net interest	(925)	(941)	(974)	(1,009)	(1,045)	(1,082)	(1,121)
Pre-tax profit	**12,719**	**13,249**	**13,783**	**14,339**	**14,917**	**15,518**	**16,143**
Taxation	(4,487)	(4,674)	(4,862)	(5,058)	(5,262)	(5,474)	(5,695)
Net profit	8,232	8,575	8,921	9,280	9,655	10,044	10,448
Earnings from associates	0	0	0	0	0	0	0
Minority interest	(193)	(206)	(214)	(223)	(232)	(241)	(251)
Attributable profit	**8,039**	**8,369**	**8,706**	**9,058**	**9,423**	**9,803**	**10,198**
Closing balance sheet							
Financial assets and other long term assets	0	0	0	0	0	0	0
Goodwill	9,521	9,521	9,521	9,521	9,521	9,521	9,521
Tangible and intangible assets	54,681	56,868	59,143	61,509	63,969	66,528	69,189
Total fixed assets	**64,202**	**66,389**	**68,664**	**71,030**	**73,490**	**76,049**	**78,710**
Non-cash working capital	901	937	975	1,014	1,054	1,096	1,140
Capital employed	**65,103**	**67,326**	**69,638**	**72,043**	**74,544**	**77,145**	**79,850**
Net debt	22,643	23,438	24,264	25,124	26,018	26,948	27,915
Pension liabilities	0	0	0	0	0	0	0
Other deferred LT liabilities	1,761	1,761	1,761	1,761	1,761	1,761	1,761
Minority interest	1,362	1,568	1,782	2,005	2,237	2,478	2,729
Shareholders' funds	39,337	40,560	41,831	43,153	44,529	45,959	47,446
Capital employed	**65,103**	**67,326**	**69,638**	**72,043**	**74,544**	**77,145**	**79,850**
Check	*0.0*	*(0.0)*	*0.0*	*0.0*	*(0.0)*	*(0.0)*	*0.0*
Cash flow							
Attributable profit	8,039	8,369	8,706	9,058	9,423	9,803	10,198
Minority interest	193	206	214	223	232	241	251
Dividends - earnings from associates	0	0	0	0	0	0	0
Pension provisions	0	0	0	0	0	0	0
Other provisions	1,758	0	0	0	0	0	0
Depreciation	3,432	3,569	3,712	3,861	4,015	4,176	4,343
Goodwill amortisation	0	0	0	0	0	0	0
Change in working capital	(890)	(36)	(37)	(39)	(41)	(42)	(44)
Cash flow from operations	**12,532**	**12,108**	**12,595**	**13,102**	**13,629**	**14,177**	**14,747**
Capital expenditure	(9,709)	(5,757)	(5,987)	(6,226)	(6,475)	(6,734)	(7,004)
Dividends paid/shares repurchased	(4,560)	(7,146)	(7,435)	(7,735)	(8,048)	(8,373)	(8,710)
Change in net cash/net debt	**(1,737)**	**(795)**	**(827)**	**(860)**	**(894)**	**(930)**	**(967)**
Per share statistics							
Shares issued (million)	4,395.0	4,395.0	4,395.0	4,395.0	4,395.0	4,395.0	4,395.0
EPS after goodwill amortization	1.83	1.90	1.98	2.06	2.14	2.23	2.32
EPS before goodwill amortization	1.83	1.90	1.98	2.06	2.14	2.23	2.32
DPS	0.30	1.63	1.69	1.76	1.83	1.91	1.98
Share price	53.1						

Metro ($ million at Euro 1.00 = $1.2395)

Year	2003	2004	2005	2006	2007	2008	2009
Input ratios							
Sales growth		*2.4%*	*2.7%*	*3.0%*	*3.3%*	*3.7%*	*3.7%*
EBITDA margin	*5.4%*	*6.2%*	*6.2%*	*6.3%*	*6.3%*	*6.4%*	*6.4%*
Net interest rate	*8.1%*	*8.0%*	*7.2%*	*6.4%*	*6.4%*	*6.4%*	*6.4%*
Taxation rate	*22.6%*	*34.6%*	*34.6%*	*34.6%*	*34.7%*	*34.7%*	*34.7%*
Fixed asset turn	4.3	4.5	4.4	4.4	4.3	4.3	4.2
Working capital turn	*(14.6)*	*(15.4)*	*(15.4)*	*(15.4)*	*(15.4)*	*(15.4)*	*(15.4)*
Net debt/equity	*142.8%*	*142.8%*	*142.8%*	*142.8%*	*142.8%*	*142.8%*	*142.8%*
Depreciation (years)	9.6	8.0	8.2	8.4	8.5	8.7	8.7
Pension provisions/Operating costs	*(0.0%)*	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*
Other provisions/sales	*0.8%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Earning from associates/Recurring net profit	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Minority/Net profit	*11.5%*	*12.8%*	*14.3%*	*16.0%*	*17.8%*	*19.8%*	*22.1%*
Profit and loss account							
Sales	66,431	68,049	69,880	71,965	74,357	77,123	79,992
EBITDA	3,578	4,222	4,358	4,515	4,697	4,906	5,089
Depreciation	(1,608)	(1,885)	(1,923)	(1,967)	(2,018)	(2,074)	(2,179)
Goodwill amortisation	(337)	(337)	(337)	(337)	(337)	(337)	(337)
EBIT	**1,634**	**1,999**	**2,098**	**2,211**	**2,342**	**2,495**	**2,573**
Non recurring items	0	0	0	0	0	0	0
Net interest	(621)	(591)	(534)	(477)	(489)	(501)	(506)
Pre-tax profit	**1,013**	**1,408**	**1,564**	**1,734**	**1,853**	**1,994**	**2,067**
Taxation	(305)	(604)	(658)	(718)	(759)	(808)	(834)
Net profit	708	805	906	1,017	1,094	1,185	1,233
Earnings from associates	0	0	0	0	0	0	0
Minority interest	(73)	(73)	(73)	(73)	(73)	(73)	(73)
Attributable profit	**635**	**732**	**833**	**944**	**1,021**	**1,112**	**1,160**
Closing balance sheet							
Financial assets	295	295	295	295	295	295	295
Goodwill	4,942	4,605	4,268	3,930	3,593	3,256	2,919
Tangible and intangibles	15,396	15,159	15,765	16,442	17,204	18,071	18,982
Total fixed assets	**20,633**	**20,059**	**20,328**	**20,667**	**21,093**	**21,622**	**22,196**
Non-cash working capital	(4,540)	(4,414)	(4,533)	(4,669)	(4,824)	(5,003)	(5,189)
Capital employed	16,092	15,645	15,795	15,999	16,269	16,619	17,006
Net debt	7,696	7,389	7,433	7,507	7,619	7,777	7,943
Pension liabilities	1,254	1,328	1,404	1,482	1,562	1,643	1,748
Other deferred LT liabilities	1,751	1,751	1,751	1,751	1,751	1,751	1,751
Minority interest	233	306	379	452	526	599	672
Shareholders' funds	5,158	4,870	4,827	4,806	4,811	4,849	4,892
Capital employed	**16,092**	**15,645**	**15,795**	**15,999**	**16,269**	**16,619**	**17,006**
Check	*0.0*	*(0.0)*	*0.0*	*(0.0)*	*(0.0)*	*(0.0)*	*(0.0)*
Cash flow							
Attributable profit	635	732	833	944	1,021	1,112	1,160
Minority interest	73	73	73	73	73	73	73
Dividends - earnings from associates	0	0	0	0	0	0	0
Pension provisions	(7)	74	76	78	80	82	105
Other provisions	500	0	0	0	0	0	0
Depreciation	1,608	1,885	1,923	1,967	2,018	2,074	2,179
Goodwill amortisation	337	337	337	337	337	337	337
Change in working capital	409	(126)	119	135	155	179	186
Cash flow from operations	**3,554**	**2,976**	**3,361**	**3,534**	**3,683**	**3,858**	**4,040**
Capital expenditure	(1,512)	(1,649)	(2,529)	(2,644)	(2,780)	(2,941)	(3,089)
Dividends paid	(523)	(1,020)	(876)	(965)	(1,015)	(1,075)	(1,117)
Change in net cash/net debt	**1,518**	**307**	**(43)**	**(74)**	**(112)**	**(158)**	**(166)**
Per share statistics							
Shares issued (million)	326.8	326.8	326.8	326.8	313.2	299.6	299.6
EPS after goodwill amortization	1.94	2.24	2.55	2.89	3.26	3.71	3.87
EPS before goodwill amortization	2.97	3.27	3.58	3.92	4.34	4.84	5.00
DPS	1.60	3.12	2.68	2.95	3.24	3.59	3.73
Share price	45.6						

Acquisition arithmetic ($ million)

Date of acquisition	**31/12/04**
Share price ($)	45.56
Offer premium	*20.0%*
Offer price per share	54.68
Valuation of target equity	17,868
% paid in shares	*0.0%*
% paid in cash	*100.0%*
New shares issued (m)	0
Equity created on acquisition	0
Debt created on acquisition	17,868
Debt assumed on acquisition	7,389
Minority assumed on acquisition	306
Acquisition enterprise value	**25,563**
Goodwill created on acquisition	17,603
Prior goodwill	9,521
Proforma goodwill	**27,124**
Amortisation period (years)	0
Annual amortisation of new goodwill	0
Goodwill amortisation? (yes, no)	no
Proforma acquiror net debt	**48,695**

Synergies ($ million)

Year	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Addition to target sales			*0.0%*	*1.0%*	*1.0%*	*1.0%*	*1.0%*
Reduction in target costs			*0.0%*	*0.3%*	*0.3%*	*0.3%*	*0.3%*
Restructuring cost			(1,686)	0	0	0	0
Addition to target revenue			0	720	744	771	800
Reduction in target cost			0	169	174	181	187
Change to EBITDA			**(1,686)**	**888**	**918**	**952**	**987**
Change to tax charge			584	(308)	(318)	(330)	(342)
Change to Net Profit			**(1,103)**	**581**	**600**	**622**	**645**

Consolidation ($ million)

	Wal-Mart				Wal-Mart plus Metro				
Year	**2003**	**2004**	**Adj**	**Proforma**	**2005**	**2006**	**2007**	**2008**	**2009**
Interest rate (Acquiror)	*4.1%*	*4.1%*			*4.1%*	*4.1%*	*4.1%*	*4.1%*	*4.1%*
Tax rate (Acquiror)	*35.3%*	*35.3%*			*35.3%*	*35.3%*	*35.3%*	*35.3%*	*35.3%*
Profit and loss account									
Acquiror sales	244,524	254,305			264,477	275,056	286,058	297,501	309,401
Target sales	0	0			69,880	71,965	74,357	77,123	79,992
Synergy revenues	0	0			0	0	720	744	771
Sales	**244,524**	**254,305**			**334,357**	**347,022**	**361,135**	**375,368**	**390,165**
Acquiror EBITDA	17,076	17,759			18,469	19,208	19,977	20,776	21,607
Target EBITDA	0	0			4,358	4,515	4,697	4,906	5,089
Synergy EBITDA	0	0			(1,686)	888	918	952	987
EBITDA	**17,076**	**17,759**			**21,141**	**24,612**	**25,591**	**26,634**	**27,683**
Acquiror depreciation	(3,432)	(3,569)			(3,712)	(3,861)	(4,015)	(4,176)	(4,343)
Target depreciation	0	0			(1,923)	(1,967)	(2,018)	(2,074)	(2,179)
Depreciation	(3,432)	(3,569)			(5,635)	(5,828)	(6,033)	(6,250)	(6,521)
Amortisation of old goodwill	0	0			0	0	0	0	0
Amortisation of new goodwill	0	0			0	0	0	0	0
Goodwill amortisation	0	0			0	0	0	0	0
EBIT	**13,644**	**14,190**			**15,506**	**18,784**	**19,558**	**20,384**	**21,161**
Non recurring items	0	0			0	0	0	0	0
Net interest	(925)	(941)			(2,037)	(2,100)	(2,132)	(2,166)	(2,202)
Pre-tax profit	**12,719**	**13,249**			**13,470**	**16,685**	**17,427**	**18,218**	**18,959**
Taxation	(4,487)	(4,674)			(4,752)	(5,886)	(6,148)	(6,427)	(6,688)
Net profit	**8,232**	**8,575**			**8,718**	**10,799**	**11,279**	**11,791**	**12,271**
Acquiror earnings from associates	0	0			0	0	0	0	0
Target earnings from associates	0	0			0	0	0	0	0
Earnings from associates	0	0			0	0	0	0	0
Acquirer minority	(193)	(206)			(214)	(223)	(232)	(241)	(251)
Target minority	0	0			(73)	(73)	(73)	(73)	(73)
Minority interest	(193)	(206)			(287)	(296)	(305)	(314)	(324)
Attributable profit	**8,039**	**8,369**			**8,431**	**10,503**	**10,974**	**11,476**	**11,947**
Closing balance sheet									
Acquiror financial assets	0	0	0	0	0	0	0	0	0
Target financial assets	0	0	295	295	295	295	295	295	295
Financial assets	0	0	295	295	295	295	295	295	295
Goodwill	9,521	9,521	17,603	27,124	27,124	27,124	27,124	27,124	27,124
Acquiror tangible and intangible assets	54,681	56,868	0	56,868	59,143	61,509	63,969	66,528	69,189
Target tangible and intangible assets	0	0	15,159	15,159	15,765	16,442	17,204	18,071	18,982
Other tangible and intangible assets	54,681	56,868	15,159	72,028	74,908	77,951	81,173	84,599	88,171
Total fixed assets	**64,202**	**66,389**	**33,057**	**99,447**	**102,327**	**105,370**	**108,592**	**112,018**	**115,590**
Acquirer non-cash working capital	901	937	0	937	975	1,014	1,054	1,096	1,140
Target non-cash working capital	0	0	(4,414)	(4,414)	(4,533)	(4,669)	(4,824)	(5,003)	(5,189)
Non-cash working capital	901	937	(4,414)	(3,477)	(3,559)	(3,655)	(3,770)	(3,907)	(4,049)
Capital employed	**65,103**	**67,326**	**28,643**	**95,969**	**98,768**	**101,715**	**104,823**	**108,111**	**111,540**
Net debt	22,643	23,438	25,257	48,695	51,011	51,780	52,593	53,456	54,337
Acquiror pension liabilities	0	0	0	0	0	0	0	0	0
Target pension liabilities	0	0	1,328	1,328	1,404	1,482	1,562	1,643	1,748
Pension liabilities	0	0	1,328	1,328	1,404	1,482	1,562	1,643	1,748
Acquiror other deferred LT liabilities	1,761	1,761	0	1,761	1,761	1,761	1,761	1,761	1,761
Target other deferred LT liabilities	0	0	1,751	1,751	1,751	1,751	1,751	1,751	1,751
Deferred LT liabilities	1,761	1,761	1,751	3,512	3,512	3,512	3,512	3,512	3,512
Acquiror minority	1,362	1,568	0	1,568	1,782	2,005	2,237	2,478	2,729
Target minority	0	0	306	306	379	452	526	599	672
Minority interest	1,362	1,568	306	1,874	2,161	2,457	2,762	3,076	3,400
Shareholders' funds	39,337	40,560	0	40,560	40,680	42,483	44,393	46,423	48,543
Capital employed	**65,103**	**67,326**	**28,643**	**95,969**	**98,768**	**101,715**	**104,823**	**108,111**	**111,540**
Net debt/equity	*55.6%*	*55.6%*		*114.8%*	*119.1%*	*115.2%*	*111.5%*	*108.0%*	*104.6%*
Check	*0.0*	*0.0*		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*

Consolidation ($ million)

	Wal-Mart				Wal-Mart plus Metro				
Year	**2003**	**2004**	**Adj**	**Proforma**	**2005**	**2006**	**2007**	**2008**	**2009**
Cash flow									
Attributable profit	8,039	8,369			8,431	10,503	10,974	11,476	11,947
Minority interest	193	206			287	296	305	314	324
Dividends - earnings from associates	0	0			0	0	0	0	0
Acquiror pension provisions	0	0			0	0	0	0	0
Target pension provisions	0	0			76	78	80	82	105
Pension provisions	0	0			76	78	80	82	105
Acquiror other provisions	1,758	0			0	0	0	0	0
Target other provisions	0	0			0	0	0	0	0
Other provisions	1,758	0			0	0	0	0	0
Depreciation	3,432	3,569			5,635	5,828	6,033	6,250	6,521
Goodwill amortisation	0	0			0	0	0	0	0
Acquiror change in working capital	(890)	(36)			(37)	(39)	(41)	(42)	(44)
Target change in working capital	0	0			119	135	155	179	186
Cash flow from operations	**12,532**	**12,108**			**14,510**	**16,800**	**17,506**	**18,260**	**19,039**
Acquiror capital expenditure	(9,709)	(5,757)			(5,987)	(6,226)	(6,475)	(6,734)	(7,004)
Target capital expenditure	0	0			(2,529)	(2,644)	(2,780)	(2,941)	(3,089)
Capital expenditure	(9,709)	(5,757)			(8,515)	(8,870)	(9,255)	(9,676)	(10,093)
Acquirer dividends paid	(4,560)	(7,146)			(7,435)	(7,735)	(8,048)	(8,373)	(8,710)
Target dividends paid	0	0			(876)	(965)	(1,015)	(1,075)	(1,117)
Dividends paid/shares repurchased	(4,560)	(7,146)			(8,311)	(8,700)	(9,063)	(9,447)	(9,827)
Change in net cash/net debt	**(1,737)**	**(795)**			**(2,316)**	**(770)**	**(813)**	**(863)**	**(881)**
Per share statistics									
Shares issued (million)	4,395.0	4,395.0			4,395.0	4,395.0	4,395.0	4,395.0	4,395.0
EPS	1.83	1.90			1.92	2.39	2.50	2.61	2.72
(Dilution)/enhancement	*0.0%*	*0.0%*			*(3.2%)*	*16.0%*	*16.5%*	*17.1%*	*17.2%*

As with the initial valuation, a key objective should be to make as transparent as possible from where the forecasts are derived. If it is possible to split out the sources of the operating projections between the two underlying company models and the assumed synergies, then this is very helpful. Because we are not assuming any changes in capital requirements, in our case there are only really two lines of the forecasts that need to be split out: revenue and fixed costs.

What will be very different, post-merger, is the financial items, since the level of debt and the shape of the cash flows will be quite different, as, quite possibly, will be the level of dividends paid out. In addition, as we have seen, the equity of the target company disappears on consolidation. So our projections of debt and equity will need to be recalculated, although, because we have not altered our assumptions regarding capital expenditure and working capital requirements (and have not written any assets up to fair value on the acquisition), the asset side of our consolidated balance sheet has remained unchanged, other than through the capitalisation of goodwill.

Naturally, in reality it is highly likely that assets would be written up and that assumed levels of capital requirements might differ from those assumed previously. But these are not difficult additional adjustments to make.

9.4.1 What to do with consolidated forecasts

Companies have to plan, and it is obvious why the management of the bidder will need to have proforma estimates of its projected consolidated accounts. But investors will react to published proforma figures. They may or may not possess information that would permit them to undertake the kind of valuation that the bidding company would have undertaken. In addition, banks will often have extended loans with covenants attached to them that may be triggered by acquisitions. In some cases, loans may automatically become repayable in the case of a change of ownership. In others, there may be restrictions on the level of balance sheet leverage that a company may undertake before triggering repayment.

Credit analysis often becomes a fascinating business when bids occur as the position of different categories of creditor may be very different. Owners of bonds tend to be less well protected than bank creditors, and in extreme cases where the bidder risks becoming over-stretched by a cash transaction, it is quite possible for the value of bank debt in the target to rise (because it is secured against assets and will have to be repayed) while the value of bonds fall (because the consolidated balance sheet that represents their only security will be weaker than that of the target currently).

So, if we assume that we are outside the company, rather than in its corporate planning or treasury departments, then we shall primarily use the forecasts in Exhibit 7.16 to calculate the impact of the deal on projected earnings per share and leverage ratios. If these are such as to result in unacceptable effects on either, then this may result in a forced decision regarding financing.

Cash acquisitions generally enhance earnings per share, because the return on the investment is often higher than the cost of borrowing (though this clearly does not necessarily make it a good deal), and paper acquisitions will be either earnings enhancing or diluting depending on the multiple to earnings of the two companies. So if earnings per share are the priority, use cash.

On the other hand, borrowing to fund a cash acquisition will inevitably raise leverage, unless the target is under-leveraged, in which case the projected consolidated balance sheet may be acceptable. If a company buys another company which is close to it in size and not hugely underleveraged, then it is improbable that a cash acquisition will work without putting undue strain on the balance sheet. Such deals are customarily financed with new shares. In our case an all cash acquisition considerably enhances prospective EPS, but results in high book gearing. That said, interest cover remains high, and the resulting balance sheet is possibly not insupportable.

9.5 A history of growth by acquisition

Some companies grow organically, others by acquisition. They will end up with very different looking balance sheets, even if they now comprise similar bundles of assets. In addition, the rules regarding goodwill amortisation are, as we have seen, changing. So we need not merely to be able to analyse proposed deals but also to analyse companies whose accounts reflect a legacy of growth through acquisition.

9.5.1 The accounting change

The change over to IFRS will result in a very simple change to the accounting treatment of goodwill created on acquisition. It will no longer be subject to annual amortisation and under normal circumstances will therefore remain permanently in the balance sheet at historical cost. It will continue to be subject to impairment tests, and in the event of its value being deemed to be lower than its book carrying value, the surplus will have to be written off.

9.5.2 What should we do?

From the valuation perspective, the key questions are why or whether we should have worried about earnings after amortisation, and what balance sheet figure for goodwill we should be using to determine the company's profitability.

Our answer to these questions is as follows:

1. Goodwill amortisation was always an irrelevance to valuation, and its disappearance is to be welcomed.
2. In assessing the operating performance of a company, and in forecasting its profits, returns on capital excluding goodwill are the key driver, since the company will not build a pile of goodwill on its new investments (unless it is a serial acquirer).
3. But it is important that goodwill is justified in the end, otherwise value has been eroded (this is not a contradiction to the sentence above).
4. For many companies, balance sheets understate economic capital, because much of what was really an investment is treated as if it were an operating cost.

9.5.3 Other intangibles do matter

Let us just kill off the last statement first. Imagine that a consumer goods company had grown entirely organically. All of the cost of building its brand would have been written off as operating costs. So the balance sheet would be hugely understated. Now imagine that a competitor, with an identical set of products, had built its business partly organically and partly by acquisition, which would imply capitalising those acquired either as intangible assets or as goodwill. The solution here is to remove the goodwill and to adjust the balance sheets of both companies to reflect the investments that they have made in building their brands, including investment made by companies that have been absorbed into the acquirer. Clearly, there are limits to what is practically feasible here, but this is the direction in which we believe that equity valuation should move.

9.5.4 Why treat goodwill as we suggest

Returning to the statements that relate directly to goodwill, the reason why it has always been inappropriate to consider amortisation is that goodwill is not an asset that will have to be replaced. We depreciate plant and amortise intangible assets because they are wasting assets, and there is a cost to depleting them. But this does not apply to goodwill, which is actually a capitalisation of future value creation.

9.5.5 Be careful with forecasts!

Turning to forecasts and valuation, it makes no difference whether we value a company with respect to economic profit generated on the balance sheet including goodwill or excluding goodwill. If we include goodwill, we shall have a large balance sheet on which we are making low returns. If we exclude goodwill, we shall have a small balance sheet, on which we are making higher returns. It makes no difference whether we discover that the net present value of the economic profit in the first case is a small positive, or whether we discover in the second case that it is a large positive, which just exceeds the goodwill that we have acquired. What is crucial is that when forecasting, returns on new investments are based on the underlying profitability of the assets in the balance sheet excluding goodwill. Failure to do this will result in undervaluation, but the problem will then lie not with the treatment of goodwill, but with the forecasts.

9.5.6 A worked example

Let us illustrate the point with a simple example. Suppose that an acquirer were to bid for a target for which the key statistics are that it has book value of 1000, earns a 15 per cent return on capital, and grows at 5 per cent annually. The appropriate discount rate is 10 per cent. Then fair value (if we assume that there are no synergies) is as follows (see Chapter one for the explanation):

```
1000 x (0.15-0.05) / (0.10-0.05) = 1000 x 2 = 2000
```

Now, suppose the acquisition is completed, the balance sheet of the acquirer will include 1000 of new tangible assets and 1000 of goodwill. Its profit will be 1000 x 15% = 150, and it will therefore, in its first year, earn a return on capital of 150 / 2000, or 7.5%. Much bad analysis will be produced at this point, claiming that it has not earned its cost of capital on the transaction!

The truth, of course, is that the existing business justifies a value of 1500. The balancing 500 is the net present value of the future investment stream.

What is happening is that we have a growing pile of prospective new capital on which we are earning 15% against a WACC of 10%, and this adds value to the existing capital which earns 7.5% on 2000, or 15% on 1000, depending on whether or not we capitalise the goodwill.

Starting with the existing capital, in the first case (capitalise goodwill) we have a PV for the negative economic profit of:

```
2000*(0.075-0.10)/0.10 = -500
```

so the value of the existing capital is 2000-500 = 1500.

And in the second case (do not capitalise goodwill) we have a PV for the positive economic profit of:

```
1000*(0.15-0.10)/0.10 = 500
```

so the value of the existing capital is 1000+500 = 1500.

This makes quite clear that the question of what to capitalise and what not to capitalise matters not so much to our value for the existing capital, which is worth 1500 either way, but to our value of the future growth opportunities, where it is vital that we assume returns of 15%, and not 7.5%. The (rather unpleasant) formula is as follows (see Chapter one for the explanation):

```
PVGO = NOPAT*g/ROCE*(ROCE-WACC)/[WACC*(WACC-g)]
```

Or:

```
150*0.05/0.15*(0.15-0.10)/[0.10*(0.10-0.05)] = 500
```

so the business is, as we thought, worth 1500+500 = 2000.

Goodwill capitalises expected economic profit

Our recommendation would be to show the calculation with goodwill capitalised, and with the probable result that the existing capital will appear not to be earning its cost of capital. The new capital should earn a stream of economic profit, or the deal really was a disaster! The net effect will be that as the forecasts extend into the future, the total amount of economic profit generated turns positive. The key question then becomes: 'Is the PV of the future stream of economic profit positive?' If yes, then it was a good deal, and if no then it was a bad one, and the negative figure is the measure of the impairment charge that should be taken in the company's accounts. In our worked example the PV of the future economic profit is -500 (on the existing capital) and +500 (on the new capital) so the total is zero (fair value).

An alternative, but less transparent approach, is to project and value the economic profit using capital excluding goodwill, and then to check that the PV of the future economic profit exceeds the goodwill in the balance sheet. In our worked example the PV of the future economic profit is +500 (on the existing capital) and +500 (on the new capital) so the total exactly matches the 1000 of goodwill paid (fair value). The same point is being made either way: goodwill represents the capitalised value of the stream of economic profit expected to be generated by the transaction.

Analytical steps

You may remember our analysis of Danone's return on capital employed in Chapter five. There, Exhibit 5.9 showed four different calculations for profitability. We argued in that chapter that if one were valuing Danone it would, when capitalising future growth opportunities, be crucial to use the figure that excludes goodwill amortisation from profit (because it is not a cost), and that excludes goodwill from measures of capital (because new assets will not have a pile of goodwill put on top of them). But if a deal is to be justified we must, over time, justify the goodwill created on the acquisition. The analytical steps when modelling and valuing a company with goodwill in its balance sheet are therefore as follows:

1. When projecting returns on new investments, assume that new capital earns a return that relates to the profitability of the business excluding goodwill (and with other intangible assets capitalised). In Danone's case, this gave us a figure of 15 per cent.
2. When projecting consolidated accounts, leave the goodwill in the balance sheet. This is how it will appear when published, and it is a reminder that the company's management has only added value if the fair value of the company's assets exceeds the book value, including goodwill.
3. Make sure that the valuation methodology that you use explicitly differentiates between the return that is being generated by currently installed capital and the return that is assumed from newly invested incremental capital.

Chapter Eight

Conclusions and continuations

1. Conclusions

It has been a consistent theme of this book that while there are a number of techniques to estimate the intrinsic value of a company, the assumptions that inform them will almost always be driven off an interpretation of the company's historical financial statements. Our aim is to enable the reader to transfer as easily as possible from an analysis of historical performance to a projection of consolidated accounts to the derivation of a value.

In this process, there is much information provided by financial statements over and above that which may be extracted from the cash flow statement. Specifically, balance sheets increasingly reflect fair values of assets and liabilities (but not all assets and liabilities), and profit and loss accounts reflect accruals that contain useful information about future cash flows. Whatever the mechanics of the model used, ignoring this information will merely result in poor valuations.

The European adoption of IFRS accounting conventions represents an important further step in a direction in which accounting has been moving for many years, away from a purely historical cost, transactions based, reporting and towards a recognition of fair value and accruals. This has advantages and disadvantages. The advantages are that balance sheets should become progressively better indicators of the fair value of the existing business, and that income statements should become progressively better indicators of accrued value creation, whether or not it reflects cash transactions. The disadvantages are a greater subjectivity, and a greater dislocation between reported accruals and reported cash flows. We believe that there will be a substantial net benefit, and that the best approach for valuation is not merely to utilise all the accounting information given but also to extend it towards its logical conclusion, which is to adjust all balance sheet assets and liabilities to fair value.

When an industry buyer decides what to bid for a company, it generally divides its value of the target into two components: the value of the existing business, and the value that it is prepared to put on potential to add value to the business, either through synergies or through organic growth of the target company. In essence, what we have been arguing for is an extension of the same approach to all investment appraisal of companies.

A company can be seen as a bundle of cash generating units (whether tangible assets, patents or brands). These units each have an independent fair value, whether it is a resale value or a value derived from discounting the cash flows that they will generate to the owner. Aggregating these values should, for a mature company, provide one with a large part of the market value of the company.

It is sometimes argued that this approach to valuation is circular, because if the fair value of an asset is derived by discounting its cash flows at the cost of capital, then it is a tautology that it will earn an internal rate of return, calculated at that value, which is equal to its cost of capital. As we saw in our discussion of pensions and of embedded value life insurance accounts, this is only true if everything goes exactly according to plan. But if (in those cases) investment returns are higher or lower than expected, or life expectancies change, then gains or losses are recorded. The same applies to any company. Rolling forward through time merely unwinds the discount rate. Value is added or subtracted either through new investments or through unexpected events. Not for nothing is economic profit sometimes referred to as ‘abnormal earnings’.

But there may be reasons why the value of a particular combination of assets may be greater than the sum or its parts, or why a particular management can achieve a higher value in use from the assets than would be obtained if they were sold at market value. This should be exemplified by a return on their fair value that exceeds the cost of capital, and this clearly justifies a premium for the market value over the fair value of the assets.

Finally, there are the growth prospects. For some companies these may represent a large proportion of the market value. For many, if the existing assets are correctly analysed, then the premium reflecting future growth opportunities may be quite a small proportion of their market value.

Historical cost accounts, even under IFRS, will not provide us with all the information that we need. As we have seen, there are some companies, such as life insurance companies using embedded value accounting, oil companies with SEC valuations of their reserves, regulated utilities and property companies, where we are provided with something approximating to a value of the existing assets. In most other cases we have to use book values, even though these should understate fair values most of the time. The consequence of this is that we probably tend to overestimate the extent to which companies actually achieve a premium over their cost of capital, because we underestimate the capital. At the very least, this requires us to be cautious when we think about returns on incremental capital.

For some companies, those that do not capitalise a significant proportion of what we would prefer to regard as investments, notably marketing costs and R&D costs, we need to make specific adjustments. Capitalising these costs will probably still result in values that are below the fair value of the assets, but will at least provide a more realistic assessment of their actual historical cost.

Mis-allocation of value between the fair value of a company's assets and the value of its existing business is only important to the extent that it misleads us as to our expectations of returns on incremental capital. If a business is not going to grow, and is going to distribute all of its profit, then it makes no difference to our sense of its value whether we see it as a small asset base generating high returns or a large asset base generating fair returns. But once we start to expect it to maintain its current level of profitability and to grow, then it matters terribly that we get the current level of profitability right.

> The closer that balance sheets can be restated to reflect fair values of assets and liabilities, and the fuller the reflection of accruals of value in the profit and loss account, the more accurate assessments of economic returns will be.

Our preferred framework would be to construct valuations for industrial companies to emphasise economic profit, and for financial companies to emphasise residual income, but what is most important is to ensure that the estimated and projected returns are as accurate as possible, which for most companies is essentially an exercise in interpretation of financial statements.

In practice, we have throughout this book alternated between use of fair values and use of fully built up historical costs when deriving valuations. In some cases, we have used one where it would be possible to use another. For example, for asset light companies in the pharmaceuticals sector it would be possible either to capitalise their R&D costs, to derive a fully built up historical cost of their assets, or to discount the projected cash flows from their patents, to derive an estimate fair value of their assets. If the latter derives a higher result than the former then use of the former underestimates their existing assets and overestimates the returns that they are currently making. Again, this only matters to the extent that it is extrapolated onto a value for the R&D pipeline in the future.

While regarding IFRS as a big step forward both in terms of comparability and of the quality of the information that it will provide, we would not wish to imply that it is perfect or the end of a process. In economic terms, what we want to know is the accrual of value that was achieved during a year, with profit fully reflecting all accruals of value during the year. Bringing more onto the balance sheet, and marking more to fair value is clearly a big step in this direction, though it will not be complete, particularly for fixed assets. In addition, our emphasis would always be on comprehensive income, not merely on the accruals that are reflected in the profit and loss account.

Where companies do provide information about fair values, this should always be substituted for book values, and the accruals included in comprehensive income. But where fair values are not provided, there will always be a choice as to whether to use book values, to try to build them up to reflect actual historical investment, or to estimate their fair values. And, just as balance sheet information does not reflect economic value, so depreciation does not reflect impairment. It is again a matter of choice whether to stick with straight line depreciation, or whether to try to estimate what the actual impairment of value has been.

For this reason, we have tried hard not to be excessively dogmatic about methodology. What is an almost essential adjustment for one company may be relatively trivial for another. We believe that it is more practical to bring an approach to modelling and valuation than it is to bring a standardised template which may be inappropriate to the company being analysed. And our approach would be to retain as far as possible the structure of profit and loss account and balance sheet, with such adjustments as are necessary to approximate to economic reality. How far to go is often a matter of judgement and of available resources.

2. Continuations

2.1 Discount rates

As we discussed in Chapter two, there is something rather unsatisfactory about the assumption that the only risk that matters is market risk, and it is an assumption that we completely ignore when looking at illiquid investments, such as venture capital, or when we explain the risk premium of corporate debt in terms of default risk, rather than in terms of its market Beta. In this book we have largely retained the CAPM framework for the pragmatic reason that it is the most widely used, and that the advantages to be derived from alternatives, other than for illiquid investments, are questionable. In particular, Arbitrage Pricing Theory (APT) seems to be better able to explain returns after the event, but there is little evidence for its offering an improved prediction of returns.

One radical alternative to standard CAPM is to assume that the appropriate discount rate is always the risk free rate, and then to deduct the cost of insuring against all other risks. Clearly, there are not market prices for all risks, but there are for many of them. Corporate risk may be broken down into the following five categories:

1. Market risk
2. Operational risk
3. Credit risk
4. Liquidity risk
5. Political risk

Many of these can be hedged, depending on the industry in which the company operates. So an alternative approach to valuation would be to discount expected cash flows at the risk free rate and separately to deduct a cost for each category of risk, in the same way that when using an APV to value a company we valued its assets and its tax shelter by discounting at the unleveraged cost of equity and then deducted a default risk. Clearly, in the present case we would have to make numerous deductions, and there is a problem with duration. For an asset, its cash flows are finite, and the associated risks are more easily quantifiable than for a going concern.

There is a connection between the direction in which this line of thinking takes us and our next suggestion for continuations, namely contingent claims theory. Because option models, on which contingent claims theory is based, discount future values at the risk free rate and then calculate the appropriate 'certainty equivalent probabilities' with which to put weights on different outcomes. This is the equivalent of putting a cost on insurance against unwelcome outcomes.

2.2 Contingent claims

This book has concerned itself entirely with the derivation of intrinsic value, and has largely ignored the contingent claims approach to company analysis and valuation. The latter approach represents an extension of options pricing theory to the valuation of companies. It sees the value of the shares in a company as being largely derived from underlying factors, with the result that it can be seen as a bundle of options on the underlying factors. The classic example is the undeveloped oilfield, which has a negative net present value using current oil price expectations, but which clearly has a market value based on the probability that oil price expectations will rise.

Other real options are the scrap value of existing plant (a put option), the ability to expand a project cheaply (a call option) and the ability to discontinue a research and production programme at any one of a series of decision points (a series of embedded call options). Once one starts to think in these terms it is tempting to see real options almost everywhere.

So why have we not focused more on option pricing, other than in the very specific area of companies that are almost insolvent, where the equity can be seen as a call on the value of the underlying assets with the par value of the debt as the exercise price?

The first reason is that just as the value of equity approximates quite closely to its intrinsic value when the market value of a company's assets is well above the value of its debt, so the value of most assets is quite well approximated by intrinsic valuation, unless they have a negative or very small intrinsic value. Real options tend to be most important in certain quite extreme situations. For a large, mature, financially stable company, they may be useful tools when management values individual investment decisions, but they may not be that important to an overall valuation of the company.

The second reason is scepticism as to the applicability of option pricing models, which were designed to value financial options, to real assets. This does not in any way invalidate the principles of contingent claims. It merely suggests that rather more work may need to be done before the approach yields generally satisfactory results.

To see why, let us return to the example of the out-of-the-money oilfield. The value of an option depends on five factors: the exercise price; the market value of the asset; the volatility of the market value of the asset; the length of the option; and the risk free rate of return. Textbooks on real options generally imply that the volatility of the asset that is being valued is the same as the volatility of the price from which the asset value is derived, but this is clearly not true. Even if it is true that the annual volatility of the oil price is, say, 20 per cent, and that we can therefore propagate forward a series of possible oil prices in future years, which can be used to value our option, it is not the case that the resulting volatility of the oilfield will be 20 per cent, or that it will even be symmetrical to rises or falls in the oil price. Lower prices will have a progressively bigger impact on value, as the impact of price on margin becomes progressively greater. In addition, if the oil price spikes up to a high level or down to a low one, future price expectations do not react proportionately, so it is a forward price curve that we should be using to value the asset at each node in our projections, not a spot price.

The volatility point is even harder for embedded call options such as those implied by drug pipelines. One approach to the problem is to use the volatility of shares in small quoted biotech companies as a proxy for the volatility of the value of the asset, but there is no reason to assume that this will be similar for different stages in the progress of the drug towards clinical approval, each of which has to be valued as an option-on-an-option.

Putting a clear time limit on the option is also often very difficult. This is not the case if the company owns or has an option on a licence, a patent or a franchise with a set life, but this is often not the case. Finally, if the contingent claims approach is to be taken seriously then values will often be derived from options on a variety of underlying factors, which will probably be correlated with one another. The skills required to value this kind of derivative are of a high order even in the financial markets for which the options were derived, let alone in the more opaque asset markets to which contingent claims theory would have to apply them.

We do not wish to imply any scepticism about the validity of real options pricing theory, or to doubt that there is considerable scope for advances that would make it generally useable in company valuation. But we would cast doubt on some of the more optimistic claims that have already been made for the approach. It is more work-in-progress than tried and tested methodology.

Further reading

Introduction

This book has consciously attempted to span gaps between discussion of interpretation of accounts, company modelling, and valuation theory and practice. Rather than offer the reader a lengthy list of academic sources, we shall instead suggest a list of books that to our knowledge are in print and readily available, to which the reader may be interested to refer for either additional information, on or for a fuller representation of, ideas covered in this book. We shall take the subjects in the same order as that in which they appeared in our text.

Corporate finance theory

The two texts that we would recommend in this area are the following:

- *Financial Theory and Corporate Policy*, Copeland and Weston, Addison-Wesley, 2004
- *Principles of Corporate Finance*, Brealey and Myers, Higher Education, 2002

The two books cover much the same ground, introducing all of the key theoretical elements of modern finance theory. They differ in emphasis, with Brealey and Myers offering more practical applications and intuitive explanation, and Copeland and Weston being the more theoretical and mathematically rigorous. Both offer extensive bibliographies for the underlying academic articles.

Interpretation of accounts

Again, we recommend two books on this topic:

- *Accounting for Investment Analysts: An International Perspective*, Kenneth M Lee, BG Training, 2004
- *Interpreting Company Reports and Accounts*, Holmes and Sugden, Financial Times Prentice Hall, 2002

The second of the two is the latest edition of a very long-standing publication which aims to introduce the reader to techniques for interpreting accounts, with the emphasis being entirely on UK principles. The former, by one of the authors of this book, takes a deliberately international perspective, and focuses more on how accounts are constructed as the basis for understanding and interpretation. As the title suggests it focuses very much on the role of the investment analyst in understanding financials.

For keeping abreast of research in accounting, and in particular its links to equity valuation, the Financial analysts journal published by the CFA Institute in the US is an excellent publication that combines academic rigour with practical application. Subscriptions may be made through the CFA website at www.cfainstitute.org.

Practical forecasting and valuation

The authors are not aware of a guide they can recommend that is explicitly focused on the construction of company forecasts, though several books on financial forecasting exist. Some of the books listed below cover both forecasting and valuation, though they mainly focus on valuation. We recommend six books that take rather different approaches from one another.

- *Cash Flow Return on Investment: CFROI Valuation, A Total System Approach to Valuing the Firm*, B.J. Madden, Butterworth-Heinemann, 1999
- *Creating Shareholder Value: A Guide for Managers and Investors*, A. Rappaport, Simon and Schuster, 1998
- *Financial Statement Analysis and Security Valuation*, S.H. Penman, McGraw Hill, 2003
- *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*, A. Damodaran, John Wiley, 2002
- *The Quest For Value: A Guide for Senior Managers*, G. Bennett Stewart, Harper Collins, 1999
- *Valuation: Measuring and Managing the Value of Companies*, Copeland, Koller, Murrin, John Wiley, 2000 (New 4th edition is due May)

Three of these books, by Rappaport, Stewart and Madden, are by senior figures in firms that offer commercial consultancy based on one valuation approach. The books can all be recommended as detailed expositions of the chosen approach. More balanced in its approach to valuation is the book by Copeland et al, which concentrates on techniques of performance appraisal, forecasting and valuation, and continues into the realm of applying real options theory to company valuation. It also has sections on analysis of financial companies. Penman's book is is avowedly aimed at 'going with the grain' of accounting information, and puts great emphasis on the importance of accruals and the interpretation of accounts. Finally, although Damodaran's book does cover the valuation of all assets it is predominantly a discussion of approaches to valuation models, including a very useful discussion of the use of multiples and their relationship to intrinsic value methodologies.

Difficult sectors

There are large numbers of books written about the four sectors that we have singled out, and the list here is merely intended to provide some pointers for further reading. We recommend the following as introductions to their sectors, taken in the order in which the sectors appeared in this book:

- *Competition and Regulation in Utility Markets*, C. Robinson (Ed), The Institute of Economic Affairs, 2003
- *Valuing Oil and Gas Companies*, N.P. Antill and R. Arnott, Woodhead Publishing, 2000
- *Bank Management and Financial Services: with Standard & Poor's Market Insight and Ethics in Finance Powerweb*, P.S. Rose, McGraw Hill, 2004
- *Financial Institutions Management: A Risk Management Approach*, A. Saunders and M Cornett, McGraw Hill, 2003

The Robinson book is one of an annual series published in association with the Institute of Economic Affairs and the London Business School. The chapters are revised versions of papers given in 2001 at the Beesley Lectures on Regulation, jointly arranged by the Institute of Economic Affairs and the London Business School. *Valuing Oil and Gas Companies*, co-written by one of the authors of this book, is an introduction to the oil and gas industry, interpretation of oil company accounts, and techniques for modelling and valuing oil assets and companies. The Rose book is a compendious analysis of banks, which lays detailed emphasis on performance measurement and interpretation of bank accounts. Rather than offer a single book on the insurance industry, we recommend Saunders and Cornett as a general review of the definition and management of all types of risk for financial institutions including banks, insurance companies and fund managers.

Mergers and acquisitions

Once the accounting and valuation issues have been grasped, the interesting publications in this area are mainly papers presenting empirical analysis. Most of these are based on large samples, and concentrate either or comparison of share price performance between companies that have made acquisitions versus their peers, or on comparison of the profitability of acquirers versus their peers. There is rather less material that is based on in-depth analysis of the performance of small numbers of mergers, and we restrict our recommendation of available books to one that contains six such papers.

- *Mergers and productivity*, National Bureau of Economic Research, S. Kaplan (Ed), 2000.

Appendices

IAS and IFRS in, or coming into, force

IFRS 1	First time adoption of International Financial Reporting Standards
IFRS 2	Share Based Payment
IFRS 3	Business Combinations
IFRS 4	Insurance Contracts
IFRS 5	Non-current assets Held for Sale and Discontinued Operations
IFRS 6	Exploration for and Evaluation of Mineral Assets
IFRS 7	Financial Instruments: Disclosures
IFRS 8	Operating Segments
IAS 1	Presentation of Financial Statements
IAS 2	Inventories
IAS 7	Cash Flow Statements
IAS 8	Net profit or loss for the period, fundamental errors and changes accounting policies
IAS 10	Events after the Balance Sheet Date
IAS 11	Construction contracts
IAS 12	Income taxes
IAS 14	Segmental reporting
IAS 15	Information reflecting the effects of changing prices
IAS 16	Property, Plant and Equipment
IAS 17	Leases
IAS 18	Revenue
IAS 19	Employee benefits
IAS 20	Accounting for government grants and disclosure of government assistance
IAS 21	The effects of changes in foreign exchange rates
IAS 22	Business combinations
IAS 23	Borrowing costs
IAS 24	Related party disclosures

IAS 26	Accounting and reporting by retirement benefit plans
IAS 27	Consolidated Financial Statements
IAS 28	Investments in associates
IAS 29	Financial Reporting in Hyperinflationary economies
IAS 30	Disclosures in the Financial Statements of Banks and Similar Financial Institutions
IAS 31	Interests in Joint Ventures
IAS 32	Financial Instruments: Disclosure and Presentation
IAS 33	Earnings per Share
IAS 34	Interim Financial Reporting
IAS 35	Discontinuing Operations
IAS 36	Impairment of Assets
IAS 37	Provisions, Contingent Liabilities and Contingent Assets
IAS 38	Intangible Assets
IAS 39	Financial Instruments: Recognitions and Measurement
IAS 40	Investment Property
IAS 41	Agriculture

Source: IASB

IFRS in Emerging Economics

Jurisdiction	IFRSs mandatory?	Comments on use (if any)
Armenia	Yes	
Azerbaijan	No	Required for banks and from 2008 IFRS permitted
Bahrain	Yes	
Belarus	No	Required for banks and from 2008 IFRS permitted
Bosnia and Herzegovina	Yes	Mandatory for all large and medium sized companies
Botswana	Yes	
Bulgaria	Yes	As adopted by the EU
China	Broadly	Largely IFRS compliant. See list of differences between IFRS and Chinese accounting standards below
Cote D'Ivoire (Ivory Coast)	Yes	
Croatia (Hrvatska)	Broadly	Legally only translated IFRS standards are mandatory. Therefore some more recent standards may not be required
Cyprus	Yes	As adopted by the EU
Czech Republic	Yes	As adopted by the EU
Dubai - UAE	Yes	IFRS required for all banks – listed or unlisted
Egypt	Yes	
Estonia	Yes	As adopted by the EU
Georgia	Yes	
Iceland	Yes	As adopted by the EU
India	No	India has announced a plan to adopt IFRSs as Indian Financial Reporting Standards effective 2011
Indonesia	No	
Iran	No	
Israel	Yes	Not required for banks
Jordan	Yes	
Kazakhstan	Yes	
Kenya	Yes	
Korea (South)	No	Korea has announced a plan to adopt IFRSs as Korean Financial Reporting Standards effective 2011, with early adoption permitted starting 2009
Kuwait	Yes	
Kyrgyzstan	Yes	

Jurisdiction	IFRSs mandatory?	Comments on use (if any)
Laos	No	IFRS is permitted so check if used
Latvia	Yes	As adopted by the EU
Lesotho	No	IFRS is permitted so check if used
Lithuania	Yes	As adopted by the EU
Macedonia	Yes	
Malaysia	No	
Moldova	No	
Montenegro	Yes	
Morocco	No	Listed companies other than banks and financial institutions may choose IFRSs or Moroccan GAAP. Banks/financial institutions must use Moroccan GAAP
Namibia	Yes	
Niger	No	
Oman	Yes	
Pakistan	No	
Poland	Yes	As adopted by the EU
Qatar	Yes	
Romania	Yes	As adopted by the EU
Russian Federation	Yes	Only for banks at present. Full transition to IFRS is delayed and expected to take place from 2011
Saudi Arabia	No	
Serbia (Republic of)	Yes	
Slovenia	Yes	As adopted by the EU
Slovak Republic	Yes	As adopted by the EU
South Africa	Yes	
Syria	No	
Tajikistan	Yes	
Tunisia	No	
Turkey	Yes	
Uganda	No	IFRS permitted, check which rules are used on a company by company basis
Ukraine	Yes	
United Arab Emirates	Yes	
Uzbekistan	No	
Vietnam	No	
Zambia	No	IFRS permitted, check which rules are used on a company by company basis

Chinese Accounting Standards – Major differences with IFRS

Chinese Accounting Standards	IFRS
Does not permit revaluation model for PP&E and intangibles	IAS 16 Property, Plant and equipment and IAS 38 Intangible Assets allow optional revaluations
Classify land use rights as intangible assets. Can be classified as investment property without requiring FV through P&L	IAS 40 Investment properties requires FV through P&L
Prohibits reversal of all impairment losses	IAS 36 Impairments prohibits reversals of impairments of goodwill. Other reversals allowed
State-controlled entities regarded as related parties in far fewer circumstances than IAS 24	IASB has proposed to amend IAS 24 Related Party Transactions
Defined benefit pensions not covered	Covered in IAS 19 Retirement Benefits
Agricultural assets default is cost model (FV only if clear evidence of reliability)	IAS 41 Biological Assets default is fair value model, reliability presumed
Combinations of entities under common control – use previous carrying amounts	IFRS 3 Business Combinations excludes
Direct method for presenting operating cash flows in CF statement	IAS 7 Cash Flow Statements also allows indirect method

Source: Deloitte presentation

Analysis formulae

1. Gordon Growth Model

$$P=D(1+g)/(1+r)+D(1+g)^2/(1+r)^2+\ldots D(1+g)^n/(1+g)^n$$

$$U=(1+g)/(1+r)$$

$$P=DU+DU^2+\ \ldots DU^n$$

$$PU = DU^2 + DU^3 +\ldots DU^{n+1}$$

$$P-PU=DU-DU^{n+1}$$

[As n tends to infinity, U^{n+1} tends to zero]

$$P-PU=DU$$

$$P-P(1+g)/(1+r)=D(1+g)/(1+r)$$

$$P(1+r)-P(1+g)= D(1+g)$$

$$P+Pr-P-Pg=D(1+g)$$

$$P(r-g)=D(1+g)$$

$$P=D(1+g)/(r-g)$$

2. Growth and retention

$$B_t=B_{t-1}+I-D$$

$$B_t=B_{t-1}+B_{t-1}ROEb$$

$$B_t/B_{t-1}=1+ROE\ b$$

$$B_t/B_{t-1}-1=ROEb$$

3. Equivalence of DDM and economic profit valuation models

$P_0=\sum D_t/(1+k)^t$

$B_t=B_{t-1}+E_t-D_t$

$E_t=D_t+B_t-B_{t-1}$

$X_t=E_t-k*B_{t-1}$

$X_t=D_t+B_t-B_{t-1}-k*B_{t-1}$

$D_t=X_t+(1+k)*B_{t-1}-B_t$

$P_0=\sum [X_t+(1+k)*B_{t-1}-B_t]/(1+k)^t$

$P_0=\sum X_t/(1+k)^t+\sum B_{t-1}/(1+k)^{t-1}-\sum B_t/(1+k)^t$

$P_0=\sum X_t/(1+k)^t+B_0-B_t/(1+k)^t$

[As t tends to infinity, $B_t/(1+k)^t$ tends to zero]

$P_0=B_0+\sum X_t/(1+k)^t$

4. Equivalence of dividend discount model and discounted cash flow model

$V_F=FCF/(wacc-g)$

$V_F=(D+I-V_Dg)/(wacc-g)$

$V_F=(D+I-V_Dg)/[(kV_E/V_F+rV_D/V_F)-g]$

$D+I-V_Dg=V_F\ [(kV_E/V_F+rV_D/V_F)-g]$

$D+I-V_Dg = kV_E+rV_D-V_Fg$

$D+I-V_Dg = kV_E+rV_D-V_Eg-V_Dg$

$D=kV_E-V_Eg$ (as $I = rV_D$)

$D=V_E(k-g)$

$V_E=D/(k-g)$

5. Leveraged WACC formulae for different discounting of Tax Shelters

$V_F=V_A+I/(K_{TS}-g)tV_D$

$V_D=V_FW_D$

$V_F=V_A/[1-I/(K_{TS}-g)tW_D]$

$FCF/(WACC-g)=FCF/(K_A-g)/[1-I/(K_{TS}-g)tW_D]$

$WACC-g=(K_A-g)[1-I/(K_{TS}-g)tW_D]$

$WACC=KA-(K_A-g)/(K_{TS}-g)ItW_D$

If $K_{TS}=K_A$

$WACC=K_A-ItW_D$

If $K_{TS}=I$

$WACC=K_A-(K_A-g)/(I-g)ItW_D$

6. Leveraged Beta formulae for different discounting of Tax Shelters

$V_F=V_A+V_{TS}$

$B_AV_A+B_{TS}V_{TS}=B_LV_E+B_DV_D$

$B_A(V_E+V_D-V_{TS})+B_{TS}V_{TS}=B_LV_E+B_DV_D$

$B_L=B_A(1+V_D/V_E-V_{TS}/V_E)+B_{TS}/V_E-B_DV_D/V_E$

$B_L=B_A(1+V_D/V_E)-B_DV_D/V_E-(B_A-B_{TS})V_{TS}/V_E$

$B_L=B_A(1+V_D/V_E)-B_DV_D/V_E-(B_A-B_{TS})[It/(K_{TS}-g)]V_D/V_E$

If $K_{TS}=K_A$

$B_L=B_A(1+V_D/V_E)-B_DV_D/V_E$

If $K_{TS}=I$ & $g=0$

$B_L=B_A[1+V_D/V_E(1-t)]-B_D(1-t)V_D/V_E$

7. Calculation of Fixed Asset Retirement under constant growth

$$R=F/[1+(1+g)+(1+g)^{2}+\ldots(1+g)^{n-1}]$$

$$F/R=1+(1+g)+(1+g)^{2}+\ldots(1+g)^{n-1}$$

$$F/R(1+g)=(1+g)+(1+g)^{2}+(1+g)^{3}+\ldots(1+g)^{n}$$

$$F/R-F/R(1+g)=1-(1+g)^{n}$$

$$-gF/R=[1-(1+g)^{n}]$$

$$R=-gF/[1-(1+g)^{n}]$$

8. Dupont analysis

$$R=P/CE=P/S*S/CE$$

$$CE=D+E$$

$$Y=RE+RD-ID$$

$$Y=RE+(R-I)*D$$

$$Y/E=R+(R-I)*D/E$$

$$r=R+(R-I)*D/E$$

Index

A

B

C

D

E

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

Z