FinanceTalking

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Understanding Discounted Cash Flows
June 2012

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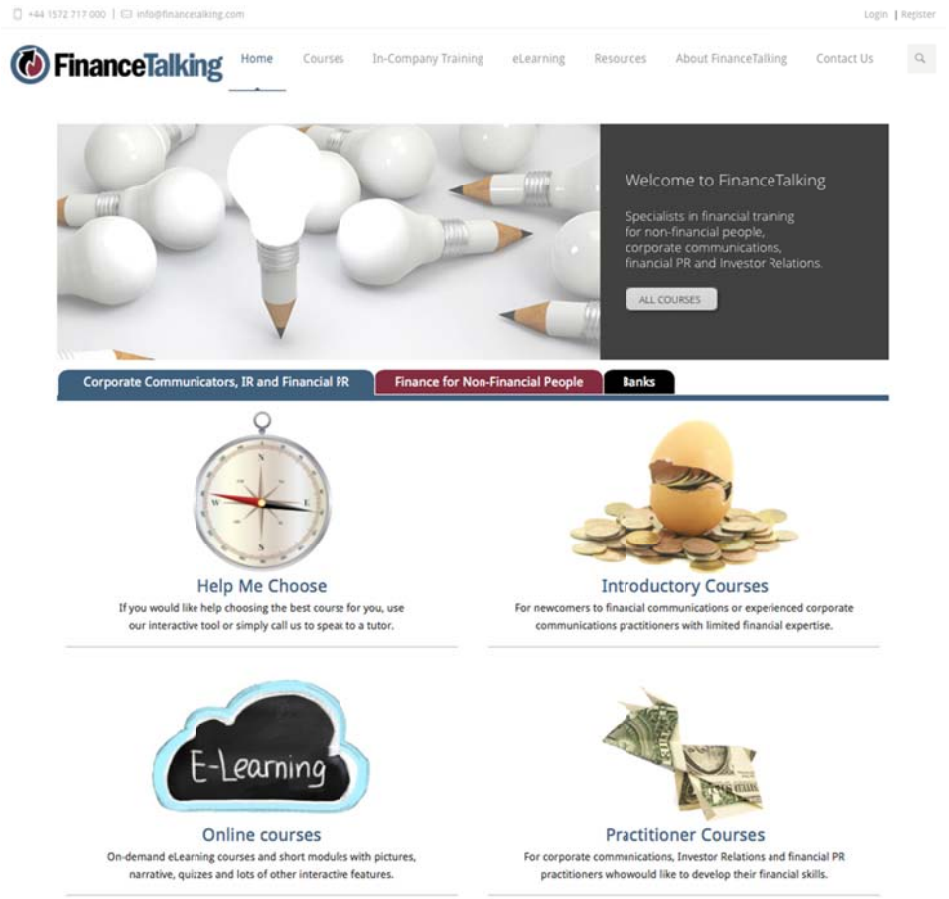

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1 Objective

The aim of this briefing paper is to explain and examine the Discounted Cash Flow (DCF) approach to the valuation of investment opportunities and also of companies and their shares. We first cover the basics of DCF – the principles and the process of discounting and the investment maths itself. Then we go on to look at typical valuation models used by investment analysts and how communications can help to ensure that a company's share price reflects fair value.

1.1 What is Discounted Cash Flow (DCF)?

The value of any investment is the value of all the future cash flows associated with it. So in theory, to value an investment, we simply have to forecast the future cash flows and add them together.

However, there is a problem here. We know intuitively that £1 now is worth more than £1 receivable in 5 years' time. If we had the money now, we could invest it and earn an investment return. There is an opportunity cost to future cash flows and this is referred to as the **time value of money**.

So we need to discount future cash flows to take account of this opportunity cost, before we add them together. The discounting takes account of the time value of money - ie it puts all the cash flows into present day values.

This theory is used extensively in project appraisal, where managers will calculate the net present value (NPV) of an investment, by deducting the initial investment from the present value of all the future expected cash flows. The same theory is also used in company valuation – we could value a company's shares by forecasting all the future dividends and discounting them back to present day values.

1.2 Practical Application of DCF Valuation

As a technique, DCF is at the heart of the valuation of a whole range of investment opportunities. It is used

- To appraise capital expenditure projects within companies
- To value investments in property
- To value life insurance portfolios (Embedded Value)
- To value acquisition opportunities
- And of course, by analysts and investors when they are valuing companies.

You will also come across DCF techniques in the valuation of defined benefits pension scheme surpluses and deficits and in the annual impairment reviews that companies must undertake under IFRS for determining the value of goodwill which has arisen on past acquisitions and other assets.

2 Principles of DCF

First we need to understand 5 key concepts:

- **Valuing investments is all about the future**, not what has happened in the past. It is the future returns that will benefit the new investor so that is what they are interested in. Past returns have already gone to past investors. We can liken investing to driving a car. We always have our view focused on the road ahead. We check the rear view mirror from time to time, but most of our time and energy is directed towards anticipating what will happen next. It is the same with investing.

- **What counts is cash.** Investment is about making money. You would only be interested in investing if you thought you would get cash back at some point. Depending on the type of investment, you might expect your original investment back + a little extra by way of interest. Alternatively you might be expecting to be able to sell your investment at a profit, creating a capital gain in which case income may be less important.

- **Risk and return are inextricably linked.** If you put your money in the bank, you regard it as relatively safe – in effect, risk-free. You will receive interest and you know that you will get your money back. However, there are alternative investment opportunities. You could put the money into shares instead. Shares are more risky - there is no guarantee that you will get your money back, nor is it certain that the shares will pay dividends. So the shares would only be attractive to you if you thought that they would give you a significantly higher return than leaving your money in the bank and taking no risk.

- **Investors always consider the opportunity cost** – the return that they have passed up by settling for a particular investment. The opportunity cost is what the investor could have received for an alternative investment with similar risk characteristics. Very simply, if an investor decides to put money in one bank rather than another, then the opportunity cost is the interest rate that he or she would have earned in the bank that was rejected.

- **Investors also value liquidity and will factor this in to a valuation**. This is the ability to get your money back at a reasonable price at any time. For example, we are generally prepared to accept a lower interest rate from the bank on an instant access account than from a term deposit. Similarly, small company shares may be much more difficult to sell if something goes wrong than the shares of a large company. As a result, they will tend to trade at a lower price.

3 The Time Value of Money

Before we go on to look at DCF techniques for valuation, we need to understand the time value of money.

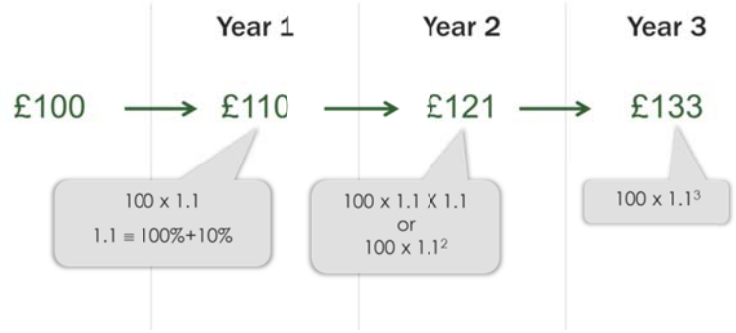
Imagine you are offered either £1,000 today or £1,000 in five years' time. You would take the money now since it is worth more to you today than in five years' time. If you have the money today, you can invest it so that in five years' time it will have grown in value. Or in other words, there is an alternative investment opportunity (or opportunity cost) to take into account.

This means that when we're considering the value of future cash flows, we need to "discount" them back to present day values to understand what they are worth in today's money.

3.1 Compounding

To understand discounting, we must first understand compounding.

Consider an investment of £100 in a bank account, which pays 10% interest a year. Assume that the interest for each period is reinvested:



Future value of £100 invested for a year at 10% is £100 + £10 = £110

or, 100 x (1+ 0.1) = 110

The part in brackets simply represents 100% + 10%. This is simply your original investment with a further 10% added by way of interest.

After two years:
110 x (1+ 0.1) = 121

After three years:
121 x (1+ 0.1) = 133.1

So what we have done is this:
100 x 1.1 x 1.1 x 1.1 = 133.1

There is a short cut to this:

100 x 1.1^3 (this just means multiplied by 1.1 three times over).

100 x 1.13 = 133.1

So future value = present value x $(1 + i)^n$

In this formula, "i" is the interest rate, expressed as a decimal and "n" is the number of years. This is called compounding.

3.2 Discounting

Discounting is simply the opposite of compounding – how to get to the present value of £100 from the future value of £133.1. The opposite of multiplying is dividing, so we simply divide by 1 plus the interest rate n number of times over:

Present value = $\frac{\text{future value}}{(1 + i)^n}$

Example:
What is the present value (PV) of £2,938 receivable in 5 years' time, using a discount rate of 8%? To discount, we need to divide by 1 + 0.08 five times:

Present value = $\frac{£2,938}{1.08^5}$ = £2,000

Discounting lets us assess today's value (ie the present value) of investment returns that will be received at some point in the future.

4 Using DCF for Project Appraisal

Let's consider how we might use DCF techniques to assess a business decision as to whether purchasing a new asset is a worthwhile investment.

4.1 Project Example

A company is considering buying data storage equipment for £30,000. This is expected to reduce labour and storage cost from £60,000 a year to £51,000 a year for the next five years - an annual saving of £9,000.

Simple Cash Flow Model

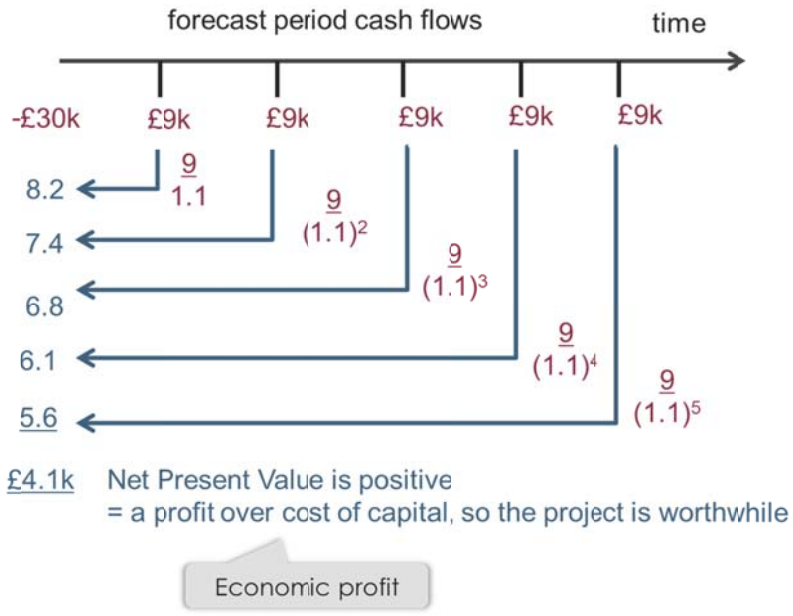
Year	Yearly cash flows
	£
0	-30,000
1	9,000
2	9,000
3	9,000
4	9,000
5	9,000
Cash surplus	15,000

The decision as to whether the total cash profit is enough to justify the project depends primarily on the firm's cost of capital – ie what investors could get for their money if they did not invest in this project. Let us assume that discount rate[1] is 10%.

The picture below shows the cash flows on a time line. We have then discounted each year's cash flow back to present day values. In effect, what this does is to take account of the 10% return that the shareholder would have wanted. So for example, the first £9k received in year 1 wouldn't be worth £9k to the shareholders because if they'd had the money now, they could have earned a year's return of 10%. Taking this into account, the £9k is only worth £8.2k today.

1 See section 4.2 - Where does the discount rate come from?

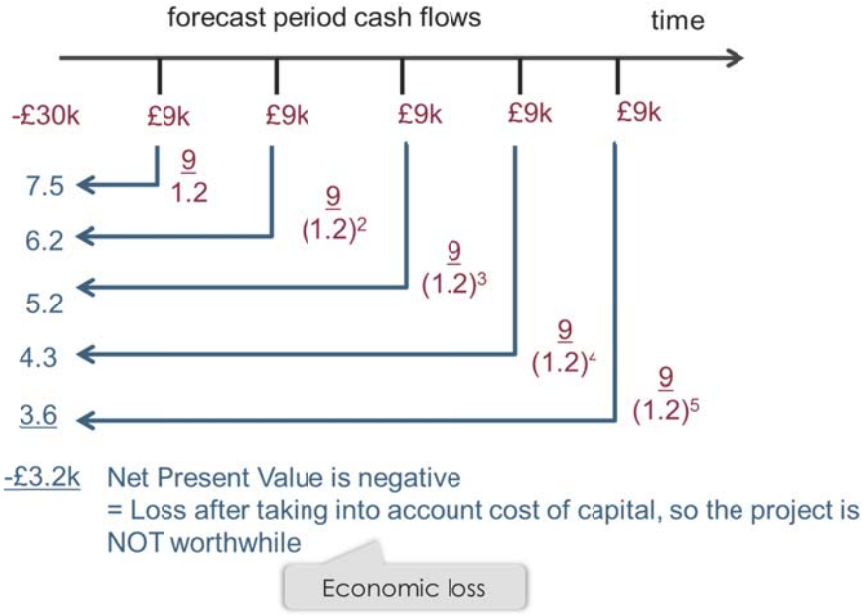
Project Example @ 10%



This project makes a profit, even after taking into account the 10% that the shareholders expect. We call this a positive NPV. Generally, a positive NPV signifies a worth-while project (the project produces a profit of £4,117 over and above what the shareholders expect).

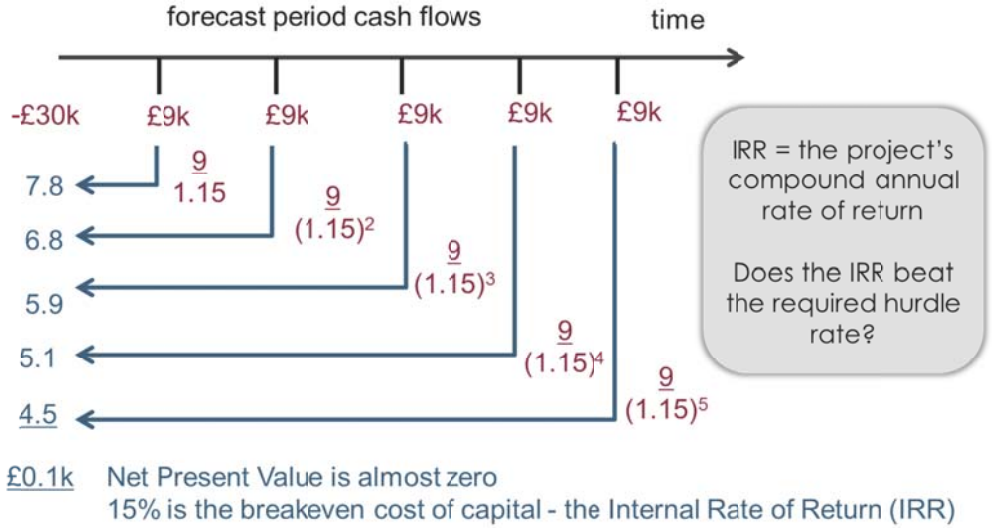
Of course as our cost of capital rises (for riskier projects, for example), the project will look less and less worth-while. If we do the same calculations at 20%, we can see that the NPV is negative – which indicates that it does not cover the cost of capital and is therefore not worth undertaking.

Project Example @ 20%



Project Example @ 15%

At around 15%, the project breaks even. We would refer to this as the internal rate of return (IRR). The IRR is the rate of interest which leaves a net present value of zero. You could also think of it as being the annualised compound rate of return implicit in the project.



Companies might use IRRs to evaluate projects by setting a hurdle rate of return (say, 15%). They would then accept projects with an IRR of more than 15% and reject those with a lower IRR.

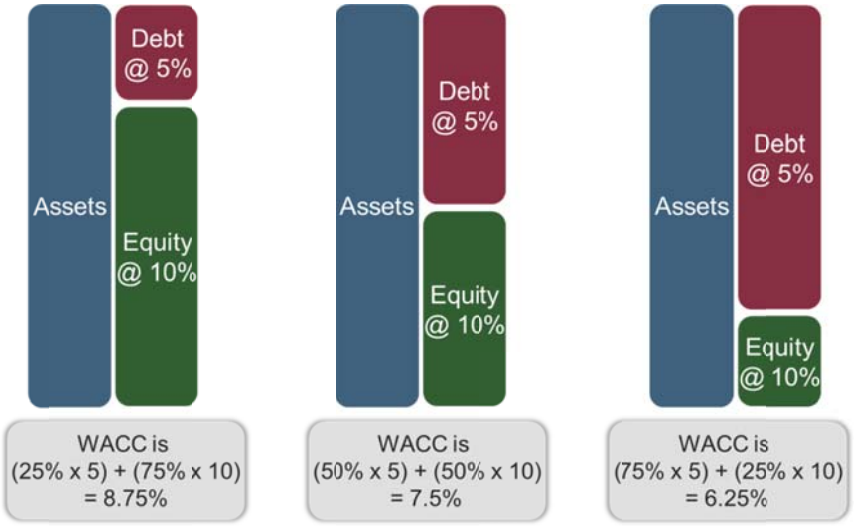
4.2 Where Does the Discount Rate Come From?

The interest rate (or discount rate) takes account of the opportunity cost – ie it is the return that we would expect from an alternative investment with similar risk characteristics.

In a company example, whether we are valuing a project or the company as a whole, the opportunity risk has to be viewed from the perspective of the investors who provide the capital that enables the company to operate and invest.

If a company is entirely funded by shareholders therefore, the discount rate will be the return that shareholders expect from this type of share, given the risk. Of course, the risks involved in shares are much greater than lending the company money – if things go wrong shareholders can (and sometimes do) lose everything. The return that the shareholders expect is the opportunity cost for shareholders or "cost of equity".

If a company is financed by a mixture of debt and equity, then the cost of capital overall will be a blend of the cost of equity and the cost of debt. We call this the weighted average cost of capital (WACC). For example: A company is financed 50% by equity costing 10% and 50% by debt costing 5%. The weighted average cost of capital is therefore 7.5% (half of 10% + half of 5%).



We might appraise a project at the company's WACC since the project will contribute to the returns available to debt and equity investors.

However, if we were valuing a company's dividend stream, we would value this at the cost of equity – since the dividends represent returns to the shareholders only.

5 Using DCF to Value Cost Savings

What happens when the forecast period is not finite? Take for example a company which is restructuring. This may involve the company spending money on new systems and cutting back on staff to achieve permanent cost savings. The expenditure takes place now, but the cost savings are achieved in perpetuity (at least in theory).

In fact the present value of the cost savings can be calculated using a very simple perpetuity formula - you simply divide the annual cash flow by the discount rate.

5.1 How the Numbers Work

£10 per year for ever, with interest rates at 10% would equate to a capital value of £100

$$\frac{£10}{0.1} = £100$$

(The 0.1 is simply 10% expressed as a decimal)

Looking at this the other way around, if you put £100 in the bank at 10%, you would receive annual income for ever of £10.

The formula looks like this:

$$\text{Value} = \frac{\text{Next year's cash flow}}{\text{Cost of capital \%}}$$

5.2 Cost Savings Example

This formula is often used to find the capital value of cost savings. For example: Pre-tax cost savings are estimated to be £100m per year. The tax rate is 25%. The company's cost of capital is 8%.

After tax cost savings are £75 per year for ever (in theory).

So the value is $\frac{£75m}{0.08} = £937m$

The formula looks like this:

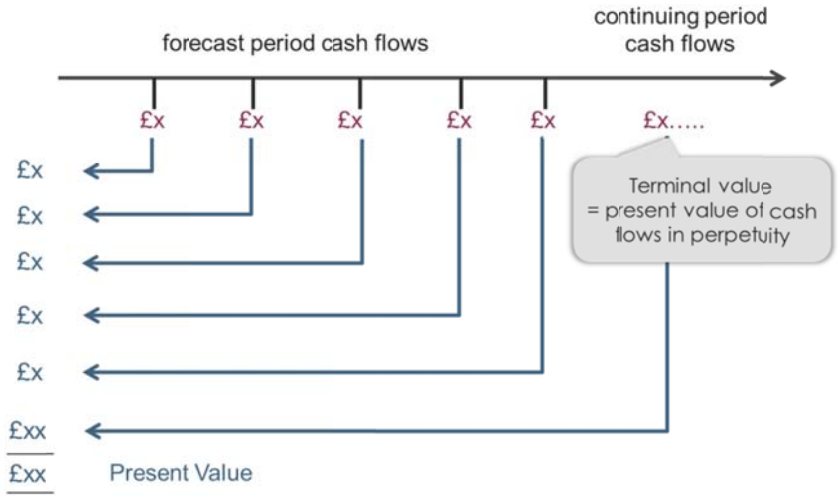
$$\text{Value of cost savings} = \frac{\text{Next year's savings}}{\text{Cost of capital \%}}$$

This is often how analysts and commentators calculate the value of cost savings in M&A (mergers & acquisitions) activity.

6 Using DCF to Value Companies

We have seen how to use DCF techniques for finite projects and we have seen how to value annual cash flows going on forever. Companies present a further challenge. Not only do the cash flows potentially go on forever, but they may continue to grow.

Whole Company DCF Model

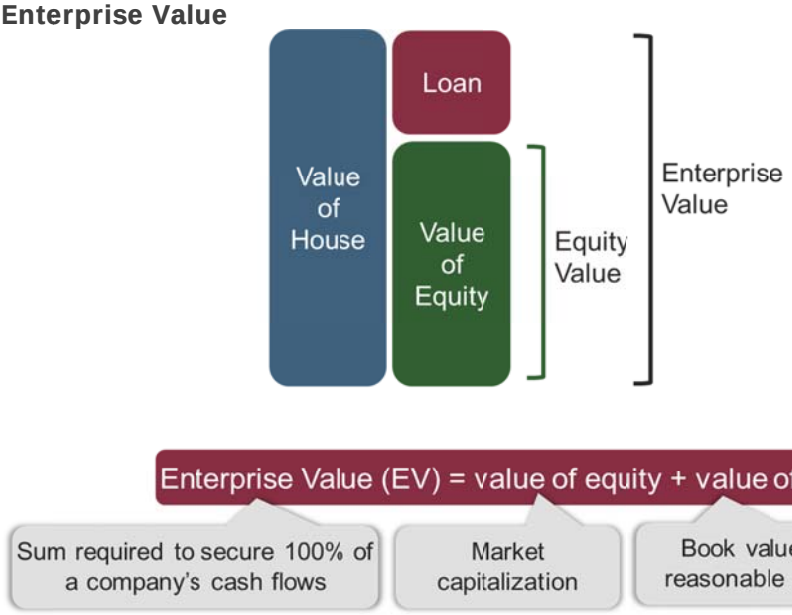


6.1 Equity or Enterprise?

Before we go on to look at a real company example, there's an important concept that applies to all valuation methods that we need to understand, which is whether you are valuing the enterprise or equity.

To see what enterprise value is all about, we need to delve a little deeper into what it is that we are trying to value – a company's shares – its equity. We tend to take the equity value (market capitalisation) as the value of a company. However, if we apply the same concept to our house, we can clearly see that if we have a mortgage, the value of the house does not equate to the value of the equity.

Enterprise Value



The equity is what we have left after selling the house and paying off the loan. You can also see that the value of the enterprise (the house in this case) is the same as the value of the equity and the debt. Exactly the same applies to a company. The value of the enterprise is the value of the equity (the market capitalization) plus the value of debt. You could think of enterprise value as being the amount you'd have to pay to secure 100% of a company's cash flows.
In DCF valuation, the operating cash flows discounted at the weighted average cost of capital (WACC) gives you the value of the enterprise. You would then deduct the value of debt to arrive at the value of the equity. This is the most commonly used model.

Alternatively, net cash flows, or the dividends, discounted at the cost of equity would give you the value of the equity. This model is more commonly used for valuing banks.

6.2 Dividend Discount Model

The dividend discount model is one of the simplest DCF models for valuing companies. This model assumes:

Value of equity = present value of future dividend stream in perpetuity (for ever), discounted at the cost of equity.

The simplest version of this model uses an adaptation of the perpetuity formula to value a share:

$$\text{Value of share} = \frac{\text{Next year's dividend per share}}{\text{Cost of equity \% - growth \%}}$$

The idea of this formula is that the cash flows are discounted at the cost of equity and grown at a chosen growth rate. In effect, we are taking the cash flows down at one rate and growing them on at another – so the bottom of the formula is simply the net of these two effects. The formula will only work if the growth rate is lower than the cost of equity. This is not likely to be a problem as it is hard to imagine a company growing forever at a very high rate.

Example: A company pays a dividend of 5p per share. Future dividends are expected to grow at 4% per year. The cost of equity is 9%.

$$\text{Value of share} = \frac{5p \times 1.04}{0.09 - 0.04}$$

(next year's dividend - grown on at 4%)
(cost of equity – growth, both expressed as decimals)

$$\text{Value of share} = \frac{5.2p}{0.05} = 104p$$

The model is very sensitive to changes in both the growth rate and the discount rate:

Let's now assume that future dividends are expected to grow at 6% per year. The cost of equity is still 9%. Here the high growth rate pushes the value up to 177p.

$$\text{Value of share} = \frac{5p \times 1.06}{0.09 - 0.06} = 177p$$

Let's now assume that future dividends are expected to grow at 4% per year but that the cost of equity is 11%. Now the high cost of equity (perhaps reflecting additional risk) is pushing the value down.

$$\text{Value of share} = \frac{5p \times 1.04}{0.11 - 0.04} = 74p$$

Clearly, this model is best suited for mature companies with long-term stable (often low) growth and a steady, predictable dividend stream.
For companies that have a period of fast growth followed by maturity, you could build a two-stage model – forecasting dividends explicitly for the first 5 years and applying the perpetuity formula above for the continuing steady state period.

This model was commonly used for banks before the financial crisis of 2008-9, as they had been consistently profitably and often paid out 50% or more of their profits by way of dividends. Today, many have cut back their dividends to nothing and the dividend discount model is rarely seen.

6.3 Residual Income (Economic Profit) Model

The residual income model is another way to value a company's equity. The idea here is that the value of a company comprises its current book value plus the present value of all the future economic profits that it will generate (or minus the economic losses!). You can see that this valuation uses the same perpetuity formula as we've used above.

$$\text{Equity Value} = \text{Book Value} + \frac{\text{Next year's EP}}{\text{Cost of equity \% - growth \%}}$$

This model is most successful where the value of the company's net assets in its balance sheet (or book value) is largely reflective of their market value – or in other words, their book value (BV) is also a fair value.

In some sectors, such as banking and insurance, companies are required to 'mark-to-market' or 'fair value' many of their assets (eg financial assets/investments). Such companies are ideal for this methodology.

This model also uses the concept of economic profit. Economic profit is generated when a company makes a return on equity that exceeds the cost of equity. So if the company makes a return on equity of 12% and its cost of equity is 10%, then it makes an economic profit of 2% on the equity invested (or book value).

$$\text{Economic Profit} = (\text{ROE \%} - \text{cost of equity \%}) \times \text{Book Value}$$

If we replace economic profit in our valuation formula above, we can see very clearly the key valuation drivers, which are:

- Return on equity (ROE)
- Cost of equity
- Growth.

$$\text{Equity Value} = \text{BV} + \frac{(\text{ROE \%} - \text{Cost of ecuity \%}) \times \text{BV}}{\text{Cost of equity \% - growth \%}}$$

The formula will work even if the company doesn't make an economic profit, as the company will be worth book value less the present value of the future economic losses.

Example: Wells Fargo's book value of equity is approximately $130bn. The bank's return on equity is 13% and the cost of equity is approximately 10%. We estimate the bank's long term growth rate to be 2% - roughly in line with the growth rate of the US economy.

$$\text{Equity value} = \$130\text{bn} + \frac{(13\% - 10\%) \times 130\text{bn}}{10\% - 2\%}$$

Equity value = $130bn + $49bn = $179bn

Divided by 5.3bn shares = $34 per share.

At the time of writing, Wells Fargo's share price is $32 so if we think our assumptions are right, we could conclude that the company is fairly valued, give or take a couple of dollars.

6.3.1 The Link with Price to Book Ratios

You can also see a direct link to a relative valuation methodology often used for banks, the price to book ratio. Here, you can see that Wells Fargo is trading at a premium to its book value (book value per share is $24.5). And we could consider that this premium is justified by the future economic profit generation.

UK banks, such as Barclays, Lloyds Banking Group and RBS, on the other hand, are trading at a significant discount to book value. The implication here is that investors either don't believe the book values, or that they are anticipating economic losses.

6.3.2 Economic Moat

The long term value of a company's share value is clearly directly linked to the sustainability of the company's future economic profits. Equity Research Analysts at Morningstar highlight the importance of companies' competitive advantage which will prevent others from chipping away at the future economic profit. This is known as the company's 'economic moat', a term used by Warren Buffet.

Morningstar analysts rate a company's economic moat as wide, narrow or none. The wider the moat, the more likely the future economic profits will be sustained. Analysts look at the 'moat trend' in order to view how sustainable the economic profits are by looking at past financial results, competitive position and future prospects.

Strengths such as high barriers of entry, cost advantages and good brand values are the type of advantages that provide a wide moat.

6.4 Operating Free Cash Flow Model

For most (non-bank) companies, instead of looking at the cash flows for shareholders, analysts consider the cash flows generated by the company's operations (ie before interest) and value those.

The idea is to forecast explicitly each year of super-normal growth and then use a perpetuity formula to calculate the terminal value beyond this period.

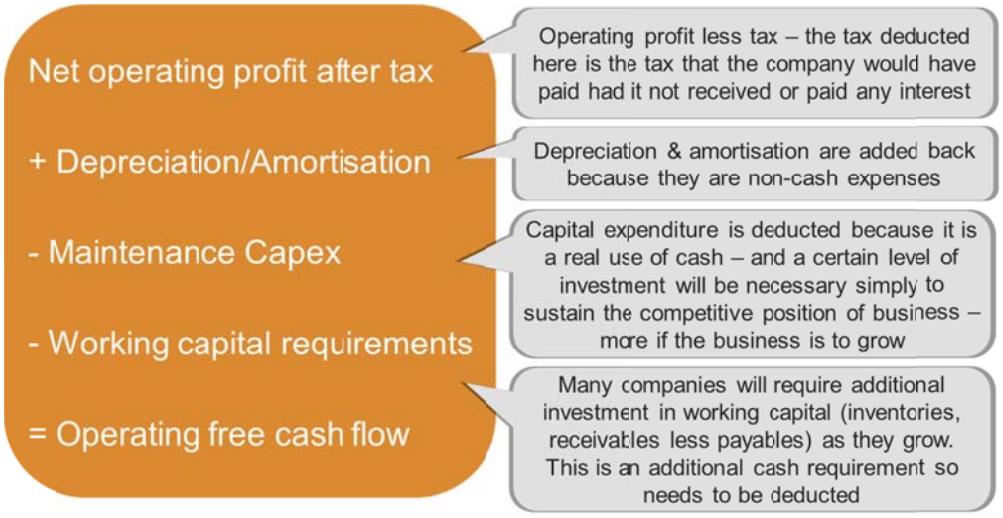
In order to forecast the company's cash flows explicitly for a 5-10 year period, we have to consider the dynamics of the business, its markets and its prospects – or more specifically those elements such as prices, volumes and costs that drive profits, together with the company's investment in capital expenditure and working capital that determine cash flow.

There are five basic elements to the valuation process:

- Defining the correct cash flow number – the operating free cash flow (OpFCF)
- Forecasting the company's OpFCF for the initial forecast period
- Establishing what is likely to happen to cash flows after the explicit forecast period and valuing this (determining a "terminal value")
- Determining the correct rate at which we will discount the cash flows – the weighted average cost of capital (WACC).
- Running the calculation to determine the present value

6.4.1 Defining Operating Free Cash Flow (OpFCF)

Operating free cash flow is normally defined as:



6.4.2 Forecasting OpFCF for the Initial Forecast Period

The initial forecast period is one of growth and is typically between 5 and 10 years. The idea is to forecast explicitly the whole period of rapid growth. We can then assume that cash flows revert to a straight line trend thereafter.

In order to produce an OpFCF forecast, we need to forecast the key variables driving operating cash flow – price and volumes, which together drive revenue and costs. Communication of the key drivers will not only enable analysts to build more robust models but it will also allow the model to be flexed for changing circumstances.

Analysts will pay particular attention to the impact of operational gearing/leverage (where many of the costs in a business are fixed, small increases in revenue can drive significant increases in profits and cash flows) and the sensitivity of profits and cash flow to changes in price.

In particular, analysts will ask themselves the following questions:

- Are the market share growth assumptions likely to trigger aggressive price competition?
- Are volume increases extrapolated from an unsustainable or temporarily inflated current level?
- Are prices likely to come under increased pressure from customers, suppliers or new entrants to the market?
- How are operating margins likely to move given the current stage in the life cycle of the company/industry?

These are therefore all issues to consider when communicating – especially when M&A transactions are presented to the market. In the case of an acquisition, it will have been valued by your company using a DCF process and, of course, issues surrounding price, volume and margins discussed above will be crucial for analysts trying to determine the likely success of the deal. The more thoroughly they have been assessed by the company and dealt with by management in presenting the deal, the more convincing and credible the strategy will appear.

Example OpFCF Forecast

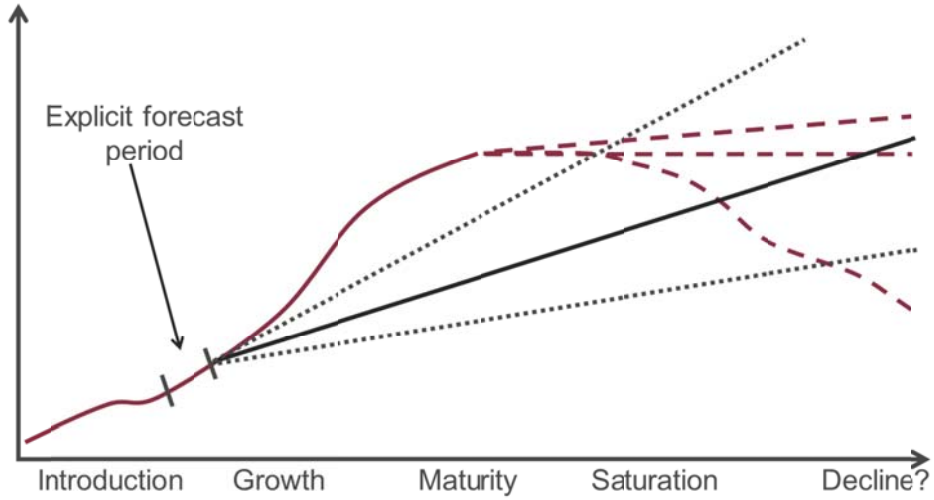
	2012E	2013E	2014E	2015E
	£m	£m	£m	£m
Operating profit (clean)	1,613	1,704	1,696	1,738
Depreciation & amortisation	242	245	271	295
Changes in working capital	50	20	(20)	0
Capex	(368)	(348)	(319)	(351)
Tax	(379)	(401)	(399)	(408)
Operating Free Cash Flow	1,158	1,220	1,229	1,274

6.4.3 Establishing the Terminal Value

In theory, at the end of the initial growth period the company reaches a steady state where we can forecast the future on a straight line basis. In reality, we are using a straight line to replicate what is in all probability a curve. As we can see from the graph below, the rate of growth that we apply in the steady state period will make a significant difference to the value (assume that the value is the area under the graph).

The following graph illustrates this:

Valuation – Science & Art



The terminal value is often 50-60% of the company's value and may be more than 100% in a situation where the company is making losses in the initial forecast period. A small adjustment to assumptions in the steady state period can lead to a substantially different terminal value and subsequent valuation.
This was a major factor in the over-valuation of many of the dotcom companies which came to the stock market in 1999 and 2000.

There are two ways to determine the terminal value.

(i) The multiple approach

The multiple approach takes the operating profits at the end of the initial forecast period and applies a multiple by reference to peer company multiples (see our briefing paper on relative valuation). The resulting value is then discounted back to present value. A downside of this method is that the absolute nature of the DCF approach is compromised by using a multiple which is referenced to sector peers, making it a relative valuation process.

(ii) The steady state approach

The steady state approach ties the growth in the terminal phase to the long term GDP growth trend, using the "Gordon Growth Model":

Terminal Value = Operating Free Cash Flow / (WACC – GDP growth)

The sum generated by the formula is the amount of cash generated from the end of the forecast period for the rest of the company's life, discounted back to the end of the forecast period. To calculate its present value we need to bring it back from the end of the forecast period to today's money. So this part of the calculation is a two phase process – the DCF from the end of the forecast period is calculated by the formula and the second phase is discounting this sum back form the end of the forecast period.

In practice analysts will substitute the GDP growth for a steady state growth rate, which might be slightly higher. This is to simulate continued growth at a level above GDP growth for a period before cash flows revert to the norm.

Clearly, if communications can influence medium to long term growth rate, then this in turn will influence a major element of the valuation.

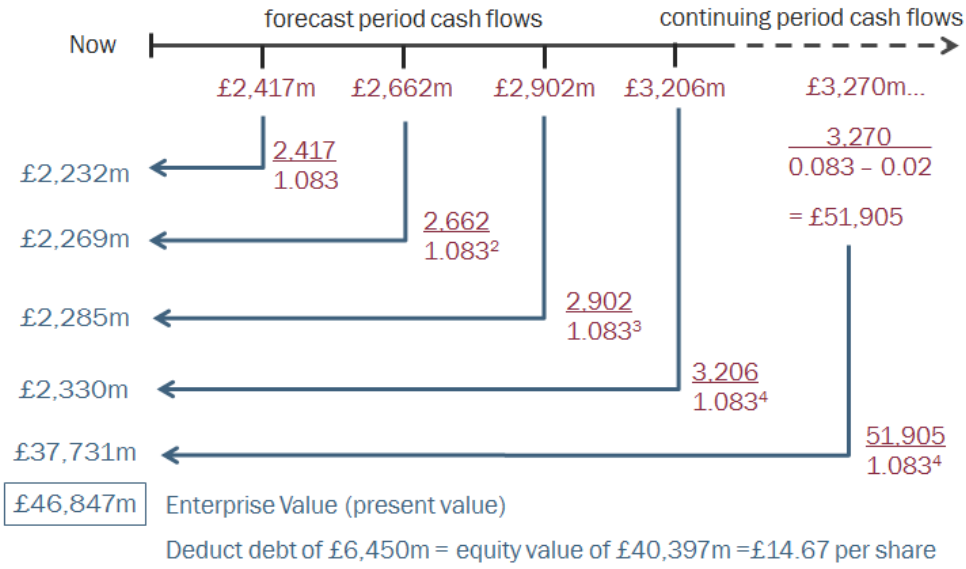
6.4.4 Determining the Discount Rate

The discount rate applied to the forecast cash flows is the weighted average cost of capital (WACC) (see our briefing paper on cost of capital). The idea is that the discounting process takes into account risk – the higher the risk the higher the discount rate. See section 4.2.

6.4.5 Running the Calculation to Determine Present Value

The example below shows the whole process, using Diageo PLC - producers and distributers of branded premium spirits, beer and wine.

Example DCF Model – Diageo (WACC 8.3%, Long Term Growth Rate 2%)



The table below shows the full calculation, including the estimates of operating free cash flow.

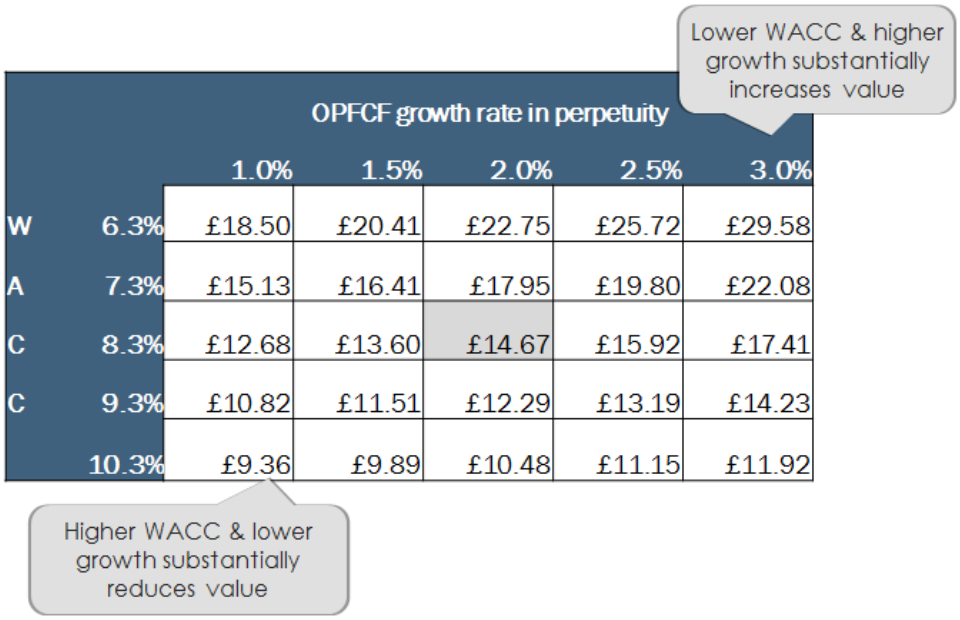
Diageo Valuation Spreadsheet

The table below shows how sensitive the model is to small changes in the assumptions of the WACC and steady state growth rates.

As you can see the value increases dramatically as you move towards the top of the chart (as the cost of capital falls) and as you move to the right (the growth rate increases). This is why share buy-backs can be so powerful as a tool for enhancing shareholder value. Similarly communicating a growth strategy effectively will also have a strong impact on the share price. And of course both together will have a major impact on the valuation of the business.

Discount rate	**8.3%**					
Growth in perpetuity	**2.0%**					
		2012E	**2013E**	**2014E**	**2015E**	**Perpetuity**
		£m	**£m**	**£m**	**£m**	**£m**
Operating profit		3,197	3,509	3,750	4,090	
Depreciation & amortisation		364	377	390	400	
Movement in working capital		(200)	(218)	(180)	(180)	
Cashflow from operations		**3,361**	**3,668**	**3,960**	**4,310**	
Capital expenditure		(432)	(445)	(458)	(450)	
Tax		(512)	(561)	(600)	(654)	
Operating free cash flow		**2,417**	**2,662**	**2,902**	**3,206**	**3,270.0**
Plus in perpetuity flows						
Total		2,417	2,662	2,902	3,206	51,905
Discount factor		**0.92**	**0.85**	**0.79**	**0.73**	**0.73**
Present value of forecast cashflows		**2,232.2**	**2,269.2**	**2,284.6**	**2,330.2**	
Terminal value						**37,730.6**
Total Enterprise Value	**46,847**					
Less: Debt	6,450					
Total Equity Value	**40,397**					
Number of shares	2,754					
Target share price	**£14.67**					

Sensitivity Analysis



At the time of writing, Diageo's share price is just over £15, which suggests that the market broadly agrees with our assumptions.

6.5 Interpreting the Result

It is worth remembering that valuation is an art, not a science. Analysts are in the unfortunate position of having to forecast a relatively short period of a company's life, using a historic record which may not be relevant and then having to make broad assumptions about future growth rates which will have a major impact on valuation.

The example above showed that the flexing of a couple of the variables can lead to a substantially different result. Obviously in communicating the outlook for a company, you should ensure that all the variables that are public information are correctly reflected in the analysts' models. For example, it is usually relatively straight forward to correct misapprehensions as to tax or depreciation rates without referring to information which is not in the public domain. This will help to minimise the range of valuations in the market.

If a company changes its outlook, ideally Investor Relations should run the adjusted variables through a 'dummy' model to sense check the likely outcome both to near term forecasts and overall valuation. This will provide some insight into likely share price movement following publication of the changed outlook.

These models can also be used backwards to establish what assumptions are implicit in the market's price, as per our comment about Diageo's price above.

6.6 Operating Cash Flow Model - Short-cut

For a quick estimate for valuing cash flows which go on for ever (a perpetuity) we can use the Gordon growth model to value the next year's operating free cash flow growing in perpetuity. Clearly this assumes the same growth rate in the short, mid and long term which may not be realistic.

Known as the "Gordon Growth Model"

$$\text{Enterprise Value} = \frac{\text{Next year's operating free cash flow}}{\text{WACC\% - growth\%}}$$

Example – Using the same company as above

$$\text{Enterprise Value} = \frac{£2.4\text{bn}}{8.3\% - 3\%} = £45.3\text{bn}$$

Deduct net debt of £6.4bn
Value of EQUITY = £38.9bn

Divide by number of shares 2.754bn = £14.12 per share.

Note that here we have used a slightly higher long-term growth rate to simulate faster growth initially followed by a reversion to GDP growth.

6.7 DCF in Practice

The example above illustrated the sensitivity of the DCF calculation to small changes in the assumptions. In order to assess the appropriateness of DCF as a valuation technique we need to be aware of its strengths and limitations.

6.7.1 Advantages

- **Cash is the key driver** - when assessing the value of a business earnings or profits can easily be manipulated to suggest good performance however it is much more difficult to distort the cash flows of the business.
- **An absolute measure** – DCF does not rely on comparisons with similar companies to determine value. Often in advance of a rumoured M&A transaction, the market can make a judgement as to its attractiveness based on relative valuations, some of which may not be appropriate. On announcement of a deal, if the DCF variables are communicated clearly, this will quickly ensure that the market prices in the deal realistically.
- **Eliminates accounting issues** – DCF ignores non-cash accounting issues and eliminates the effect of differing accounting policies for depreciation and amortisation.
- **Recognises capital expenditure requirements** – Unlike the use of EBITDA multiples, the capex requirement of the business is explicitly taken into account, recognising it as a true cost of the business.

- **Provides a long term perspective** – DCF relies on long term forecast to determine value and should not therefore be affected by one exceptional year.
- **Allows for startup losses** – A key advantage of DCF is that it can be used for startup businesses, currently incurring losses, but expected to produce long term growth. This allows the calculation of an equity value where other valuation techniques, based on profit multiples, would be inappropriate.
- **Explicitly includes the cost of capital** – discounting the future cash flows by the cost of capital explicitly recognises its importance in generating value. The cost of capital reflects the risks attaching to the company and its funding structure - the higher the risks the lower the value created by the cash flows when discounted back. Using the cost of capital is also vital as it charges management for using a scarce resource. It is important that management understand the critical role of the cost of capital in the valuation of their company and are prepared for discussions on the subject in roadshow meetings with shareholders.
- **Allows for sensitivity analysis** – assumptions can be 'flexed' to see the valuation impact. From a communications perspective this sensitivity also allows an analysis of what the share price is assuming about the company's future. If the DCF implicit in the market capitalisation suggests the market is being very cautious about its long term assumptions this provides very useful intelligence. If the Company believes the market is being too cautious then clearly the management's long term views of volumes, prices and margins is not getting across.

6.7.2 Disadvantages

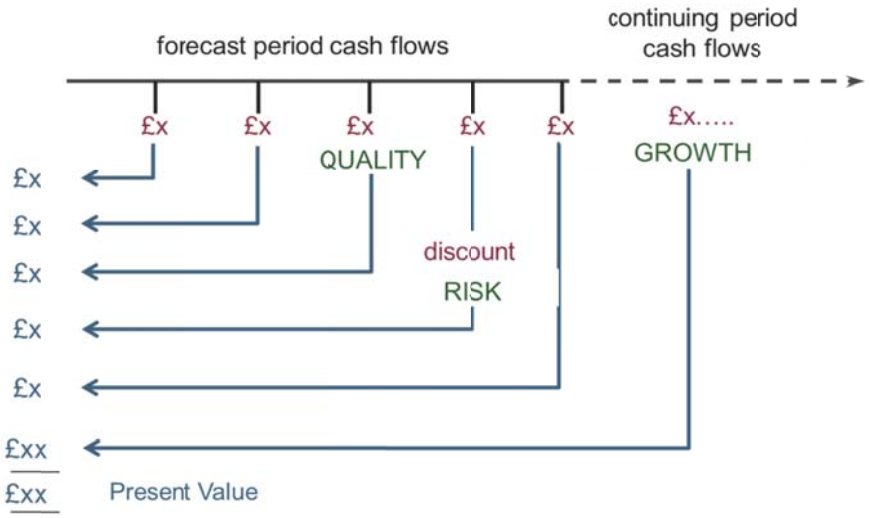
- **Validity of assumptions** – significant risks attach to all the key variables that drive cash flow, affecting both the short and long term. When short term forecasts are reduced this tends to drive down forecasts over the entire forecast period. Similarly if long term assumptions are reduced their impact is often magnified due to the terminal value comprising such a large proportion of the total valuation.
- **Super-normal growth and returns in initial forecast period** – the early period tends to be a period of super-normal growth. It is difficult to assess how long this period will last and how growth rates will settle. For example, the mobile telephony market entered a mature phase much more quickly than the stock market anticipated.
- **"Fitting" the result** – assumptions during the initial forecast period and the terminal value phase are highly subjective. This can lead to assumptions being changed to generate the "right" result – for example, to make an IPO look more attractive. In effect the person doing the calculation knows the answer they want to get and changes the assumptions to get the right result.

6.8 Other Methods for Valuation of Companies

DCF techniques are often used alongside relative valuation - P/E ratios or ratios involving Enterprise Value (see our previous briefing paper on relative valuation). However, for loss-making companies (biotech or high-tech companies for example), relative valuation will often not work. Most relative valuation ratios, like the P/E, compare price to profits. Clearly if a company makes losses in the early years, then the ratios will not work. Crucially relative techniques do not have the long-term perspective that is a key feature of DCF. So DCF tends to be used widely for valuing both loss making companies and sectors which use assets that are built for generating returns over a long timescale.

6.9 Summary

Key Valuation Variables



- The value of an enterprise is the future returns that will benefit the investor. There is an emphasis on these returns being of sound quality (ie controllable, predictable and bankable). Companies should give clear, accurate up-to-date earnings guidance and clear communication of likely variability. It is also important to communicate the assumptions on the economics.
- Investing is all about risk and reward. Risk is factored into the investment maths through use of the discount rate or cost of capital. The higher the risk the higher the discount rate and the lower the value of the company. Companies should give clear communication of risk and how it is being managed with current focus on financial and operational leverage/gearing.
- The estimated long term growth rate of earnings is a huge influence on the valuation of the enterprise. A small increase in the long term growth rate will give a large increase in the company value. Communication of growth plans needs to be realistic (with reference to GDP for example).

7 Conclusion

An understanding of DCF valuation is a powerful Investor Relations tool. Understanding how variables such as the cost of capital and long term growth rate affect your company's valuation is crucial to effective shareholder communications. It can be extremely useful to run your own simple model which will allow you to work backwards to determine the long term growth rate and/or cost of capital implicit in your company's share price.

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