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Discounted cash flows - Part 2, valuation and the financial crisis

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This is the second article in a three-part series summarising the main valuation methodologies used for the purposes of determining economic loss. In part one, I provided an overview of the market-approach methodology. I now turn to the income-based approach, focusing on the discounted cash flow (DCF) methodology.

In [my previous article](#), I noted that a business is only worth what someone is prepared to pay for it. Under the market-approach to valuation, Company A's worth may be informed at least in part by recent transactions in Company A itself and/ or businesses sufficiently comparable to Company A. The ability to apply usefully the market-approach ultimately depends on the availability of relevant and timely transaction data.

Whilst the market-approach provides a useful insight as to what price was paid for any given asset or business, it may be of less help if one wishes to know how the purchase price of a business was determined. Understanding the underlying value of a business, and the drivers of that value, is often central to the quantification of damages in international arbitration.

Although the purchase price of an asset can be determined by many factors, the underlying value of an asset is based on the future economic benefits that accrue to its owner. This notion is at the heart of the income-based approach to valuation. Within the overall income-based approach, one needs to distinguish between **earnings methods** and **cash flow methods**.

Earnings are analogous to the accounting profits that are generated by a company, and attributable to the ordinary shareholders. Since a company's earnings can be heavily influenced by the specific accounting policies it adopts and applies, comparisons of earnings across different companies can sometimes be difficult. For this reason, valuers often choose to focus on a business's actual cash flows as this avoids the distorting impact of accounting. On the other hand, where one does not have sufficient detail about the accounting treatments used, it may be easier to focus on earnings. There are a number of different valuation methodologies focusing on either cash flows or earning methods, a few of which are described very briefly in the footnote to this article.

Introduction to DCF

DCF continues to generate much discussion within the arbitration community; certainly, it is being used ever more frequently in support of claims, if anecdotal and personal experience is any guide. In my experience, however, DCF is not always properly understood by non-valuation professional and/ or is on occasions applied incorrectly. I do wonder if this explains, at least in part, why certain arbitrators are sometimes wary of making awards in respect of claims that are based on DCF valuations.

Although the basic principles may appear simple, great care needs to be taken when constructing a DCF model to avoid nullifying its value to the arbitral process. The output of a DCF model is a single number, representing the net present value (NPV) of a project's or business's projected future cash flows, discounted to take into account the time value of money and the uncertainty - both upside as well as downside - over the projected future earnings. Crucially, DCF focuses on cash movements rather than accounting profits. When DCF is applied correctly, the calculated NPV can approximate to the fair market value (FMV) of a project or business since it reflects the present value of the future cash flows and hence determines a price at which a well-informed and willing vendor and purchaser could transact.

The quality and relevance of the output from a DCF model depends on the quality of the inputs e.g. the reasonableness of the growth assumptions and the discount rate. As we shall see below, far from being a purely 'mechanical' exercise, the derivation of a business's value under DCF requires considerable skill and judgement.

Overview of a DCF model

In order to prepare a DCF valuation, one needs to determine inter alia the following:

- The relevant time-period - a cash flow model will comprise firstly an explicit forecast period, e.g. the first 5-10 years. An explicit forecast period may seek to capture the initial growth of a company until net cash flows stabilise. For example, the net cash flows of a start-up business might grow by 200% in the first year, 100% in the second year, 50% in the third, and decline each year until stabilising at say 3% per year after year 10. Where the duration of a project is fixed (e.g. a non-renewable 20 year concession over a mine), one would normally expect to see an explicit forecast period only. Where a project has an indefinite life, a terminal growth calculation is usually added to value the cash flows from the end of the explicit forecast period to perpetuity.
- The future cash flows themselves - central to producing a robust DCF model is the ability to produce reasonable forecasts of future cash flows. The model should include, in cash terms, all revenues, direct and indirect costs, capital expenditure, working capital movements etc. Since we are only interested in cash, it will not include non-cash (accounting) items like depreciation and amortisation.
- What is being valued - Defining what precisely is being valued is key; for example, valuers distinguish between the enterprise value of a business (being the value to both debt holders and shareholders) and the equity value (the value to equity holders only). The precise DCF approach used will depend on what is being valued.

- The discount rate – discussed below

Determining the discount rate

As noted above, the projected cash flows need to be adjusted to reflect both the time value of money (€100 today is worth more than the right to €100 for certain in a year's time) and the uncertainty of the future cash flows; the greater the relevant uncertainty over the projected earnings, the greater the discount rate needed. Another way of looking at this is to say that the discount rate reflects the expected or required return from investors; the greater the risks to which the investor is exposed, the higher the return required.

The calculation of the discount rate will depend on what is being valued; for example, if we are interested in the enterprise value of a business, the discount rate will typically be based on the weighted average of the returns required by debt holders (cost of debt) (after taking into account the tax benefits of debt finance) and equity holders (cost of equity); this is referred to as the after-tax weighted average cost of capital.

The usual starting point in calculating both the cost of debt and the cost of equity is the use of a so-called risk-free rate of return, being the yield on a 'risk-free' asset such as a long-term US government bond. [NB: In some contexts it is important to consider the risks in fact associated with an investment in US government debt]

Dealing firstly with the cost of debt, in general, since they are paid ahead of shareholders, and hence are exposed to less risk, debt holders require lower returns than equity holders. In addition to the risk-free rate, a premium will typically be added to take into account the additional risk of lending to a company rather than a government; this premium will be determined by factors such as existing indebtedness, the size of the business, ability to cover interest payments from profits etc.

Whereas the calculation of the cost of debt is relatively straightforward, the calculation of the cost of equity can include many risk premia. A common method of calculating the cost of equity is known as the capital asset pricing model (CAPM). In very general terms, one builds up the cost of equity by taking account of several risk premia including:

- the equity risk premium (the additional return required by holders of stocks over bonds) multiplied by beta (a measure of the sensitivity of a given stock to the overall market);
- a country risk premium (CRP) – The assessment of a suitable discount rate for an investment in a developing market or emerging economy (e.g. countries in the former soviet union) requires the investor to consider risks in addition to those related to investments in more mature, developed economies (such as the United States or Germany). The exercise is one of assessing a risk premium over the return required on investments in more mature, stable economies; and
- a small company risk or 'size' premium – whilst this is debatable, some valuers add an additional premium for small companies to reflect the perceived additional risks

when compared with larger, more established companies

This is a complicated area, and a detailed treatment is beyond the scope of this article, but it suffices to say that selecting an appropriate discount rate is an art rather than a science. A major part of the quantum expert's role is to demonstrate to the arbitral tribunal, in as clear and transparent a fashion as possible, that he has considered all relevant issues and has been reasonable in the calculation of the discount rate.

Strengths and weaknesses of the DCF approach

A major attraction of the DCF approach is its inherent flexibility in that it can be applied in many different contexts; it is a commonly accepted basis for assessing the present value of a project, company or asset and can also be used to appraise investment decisions. Importantly, DCF is company or project-specific. Finally, DCF expresses future cash flows in present day terms.

On the other hand, like all valuation methods, a DCF model is only ever as good as the data used and the underlying assumptions. On occasions, it may simply not be possible to make a reasonable estimate of projected future cash flows e.g. because there is insufficient contemporary and/ or historic data; were one to plough on regardless, the output from the DCF model is unlikely to be anything other than pure speculation. In such circumstances, it may be more appropriate to use different valuation methodologies. In any event, the DCF methodology is not the only approach and, as explained in part 1 of this series, best practice requires that a valuation produced under one approach is cross-checked against valuation(s) produced under (a) different approach(es). I discussed approaches to dealing with uncertainty in an earlier article which can be accessed [here](#).

Common mistakes made with DCF

As noted above, it is this writer's experience that DCF is sometimes applied incorrectly, rendering the results of a model useless at best and, at worst, dangerously misleading. Whilst the below is not intended to be an exhaustive list, here are some of the more common errors to watch out for:

- Overlooking capital expenditure - a DCF valuation which assumes steady growth in annual cash flows should also take into account the capital expenditure required to generate that growth. The re-investment of cash in the business is something which can easily be overlooked, resulting in unrealistically high valuations where capital expenditure is ignored. Where a DCF model includes a terminal period, it is critical that the final year of the explicit period reflects the likely annual capital expenditure going forward
- Overly-aggressive terminal growth assumptions - for the purposes of determining the terminal value component of the DCF valuation, the assumed long-term rate of growth should not exceed the sum of inflation and real GDP growth at the most.
- Double-counting of risk - the uncertainty of future cash flows can be taken into account either by directly adjusting the cash flows in the model or through the discount rate. Normally, one should not make adjustments to both as this would constitute double-counting of the risk

- Explicit period too long - uncertainty increases over time. For this reason, the explicit period should not be excessive.
- Scenarios / sensitivity analysis - best practice requires that the use of sensitivity analysis and/ or considering various scenarios (best case, worst case, base case) showing how the valuation changes as adjustments are made to the various inputs. It is not uncommon for small changes (e.g. to the assumed growth rate) to have a major impact on the valuation. Alas, best practice is not always followed, with the result that some valuations are not accompanied by sensitivity analysis.
- Mathematical errors - as a general rule, the risk that a DCF model will contain formulaic errors, errors in referencing data etc increases in direct proportion to the complexity of the model and the number of assumptions.

Impact of the financial crisis on the application of the DCF approach

Having provided above a very high-level overview of the DCF approach, I will consider briefly what implications the financial crisis has for the use of DCF valuations in international arbitration.

In some ways, the financial crisis has arguably changed nothing at all; as a mere methodology for quantifying damages, DCF remains as applicable as it was prior to autumn 2008. The financial crisis has, however, made the application of DCF, including the calculation of an appropriate discount rate, a far more challenging exercise than it was previously, for reasons I touch upon below.

Dealing firstly with factors impacting on the estimation of future cash flows, it cannot be forgotten that the current global economic climate is characterized by tremendous volatility and uncertainty. In constructing a DCF model, the valuer needs to undertake rigorous analysis to ensure that projections of revenue growth and profitability can be justified. The now common sight of major financial institutions and other businesses with household names going insolvent demonstrates clearly we are living in a time of unprecedented change. The valuer must try to make sense of this volatility and make sensible predictions of future cash flows. This is not the same as saying, however, that such projections need always be excessively conservative. Just as the word 'crisis' in Chinese is translated by two symbols representing respectively 'danger' and 'opportunity', so might the DCF model take into account the reality that some businesses (particularly those well-financed and with excess cash) stand to gain from others' demise due to reduced competition, availability of key assets at fire-sell price etc.

The financial crisis has a number of potential impacts on the calculation of the discount rate. Firstly, the sovereign debt crisis and the well-publicized downgrading of US debt has called into question whether there exists a truly risk-free rate. Until recent events, bonds issued by the United States and other stable countries were widely considered the best proxy for the risk-free rate - a key component of the cost of capital - and, in many experts' eyes, still are. With the threat of outright default in some countries and/ or destruction of the currency through monetary inflation in others, the idea of a risk-free rate can seem quaint! If the risk-free rate is not to be derived from US bond yields, however, what possible alternatives are there?

Two further factors to be considered in the calculation of the discount rate include the

market-risk premium and the beta (explained above). Given high volatility, the observed premium of required equity returns over government bond yields can fluctuate significantly over short amounts of time. In a similar way, the beta of a given company in a given industry can also vary a great deal; it may be the case for example, that Company A had a beta of 1.5 on 1 January 2011 but that this subsequently increased to say 2.0 by the summer of 2012. It goes without saying that such changes are by their nature difficult to predict and yet this is precisely what the valuer is required to do.

Conclusion

In my experience, there are few circumstances in which a DCF method, properly applied, cannot be usefully adopted. On occasion, however, applying a DCF method properly can be both costly and difficult. Where such difficulties arise, if the same degree of relevance and reliability is required from the result, the issues giving rise to the difficulty and cost do not 'go away' simply by selecting a different method; on occasions where there is not an observable market price, all valuation methods (properly applied) - in one way or another - require one nonetheless to form a view about possible future outcomes and the uncertainty surrounding those outcomes.

Notes

Cash flow methods include **Discounted Cash Flows** or "DCF" (the focus on this article), and Capitalised Cash Flows, which derive a value for a company based on the company's historical cash flows.

Earnings methods include Capitalised Earnings and Discounted future earnings. Whilst a detailed discussion of these methods is outside the scope of this article, under the capitalised earnings method, a company's valuation is derived by dividing the expected annual maintainable earnings of the company (often based on an average of historical earnings) by the required earnings yield. This method is typically used where future earnings growth is expected to be minimal. If future earnings growth is expected to be high, the discounted future earnings method may be more appropriate. This method aims to calculate the present value of the expected future earnings of a business by using an appropriate discount rate.

A further methodology in the income-approach is the **Discounted Dividends Model (DDM)**. Under the DDM, the value of an investor's shares is based on the present value of the likely current and future dividends earned from those shares. DDM is typically used in the case of minority shareholdings and/ or where the relevant shareholder exercises little control.

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