Discounted Cash Flow

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A Practice Note providing information for attorneys on how experts use the discounted cash flow methodology, a subset of the income-based approach, to quantify damages. This Note offers an overview on how experts create cash flow forecasts, how they determine the applicable discount rates, the advantages and disadvantages of applying the discounted cash flow methodology, and how courts and arbitrators react to it.

This Practice Note explains how experts use the discounted cash flow (DCF) methodology. This Note provides guidance to counsel and experts on the general application of the DCF methodology and the related potential pitfalls to consider. For information on valuation concepts, such as the standard of value, the going concern, and liquidation bases of value, and a brief introduction to the various valuation approaches and methodologies that an expert can apply when conducting their analysis, see Practice Note, Valuation Calculations in Litigation and Arbitration (W-004-8470).

The DCF methodology is a subset of the income-based approach, which experts may apply under a going concern basis of valuation, as illustrated in the following chart:

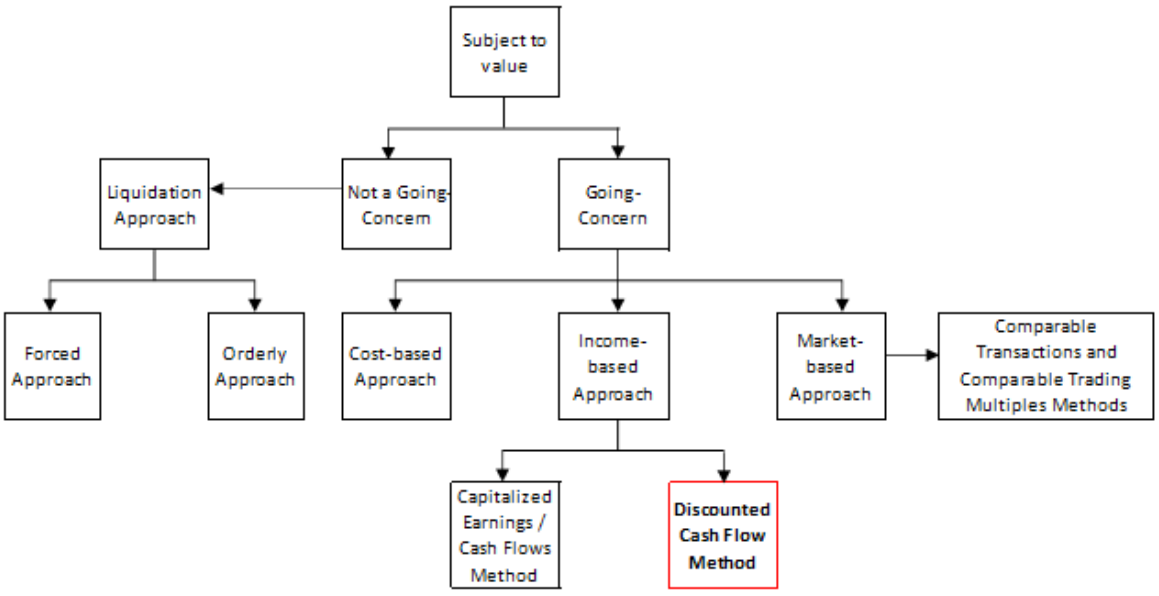

Figure 1: Valuation Approaches

The expert usually applies the DCF methodology when:

- The dispute at issue concerns the future earning potential of a particular asset.
- The expert can reasonably and accurately forecast future cash flows.

Once an expert decides to apply the DCF methodology, he must:

- Develop a cash flow forecast.
- Determine the appropriate discount rate that adequately accounts for the risks of earning those cash flows.
- Apply the discount rate and aggregate the discounted cash flows to calculate the present value of the investment or business.

DCF models are useful when a business is growing and cash flows are expected to change for several years before achieving a stable operating level. These discrete periods can be placed into the DCF model as follows:

$$Value\ of\ an\ asset = \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} \ldots + \frac{CF_n}{(1+r)^n}$$

where CF_t = the expected cash flow in period t

r = discount rate associated with the cash flow

n = life of the asset valued

FREE CASH FLOW

Free cash flow is the cash a business generates minus cash expenses to support operations and maintain capital assets. It is a measure of profitability.

BASIS OF DEVELOPING CASH FLOW FORECASTS

The first step in applying the DCF methodology is to create a forecast of free cash flows. The forecast can be based on:

- Agreement or contract.
- Business plan or projections prepared by the management.
- Historical financial results.

Agreement or Contract

When damages arise because of a breach of contract, the damages represent the foregone cash flows that would have been earned over the periods defined in the contract absent the breach. In this case, the expert calculates free cash flows based on the terms and conditions of the contract. In these cases, cash flows in the DCF model can represent:

- Lost profits.
- Lost revenue.
- Lost royalties.
- Any other form of payments the parties contracted to receive.

Business Plan or Projections Prepared by Management

When experts need to calculate the value of a business to determine the amount of damages, they can rely on the business plan or projections management prepared, which yield the financial forecasts of the business. For example, a business plan for a mining project usually takes the form of a feasibility study that provides detailed projections for financial performance and operating output, including:

- Production level.
- Sales.
- Cost of goods sold.
- Depreciation of equipment.
- Capital expenditures.
- Other expenses.

However, the experts must determine the reasonability and reliability of the projections before using them as a basis of their cash flow forecast.

Historical Financial Results

Experts also use historical financial results as the basis for a forecast when properly adjusted to be representative of the future operating environment. Referencing historical financial statements provides a reliable measure of the company's past operating results, which can provide the expert with insight into what the company has achieved and could potentially achieve. Actual financial results can support the various assumptions experts make when constructing the DCF model. For example, the actual growth rate of the business can provide the experts with a starting point when they make the growth rate assumption for the DCF model. However, when using historical performance as the basis of future cash flows, there is an implicit assumption that those cash flows are achievable in the future. The expert must determine if this assumption is reasonable before preparing his DCF model on this basis.

PROJECTION PERIOD AND TERMINAL PERIOD

The DCF methodology generally assumes that there is a projection period containing varying levels of expected cash flow before the business or cash flows generated by a particular asset (including contracts, which are rights to a stream of cash flows) stabilizes. Once the steady state is reached, the expert must determine if this steady state will continue for a specified time or indefinitely.

Projection Period

The forecasts are usually prepared for two to five years from the valuation date. Because of the rapidly changing economic and business environment, the degree of uncertainty increases significantly with the number of years projected. The expert should assess the reasonableness of the projection period.

Terminal Period

If the cash flows are determined to continue indefinitely, a terminal value is usually added to the discrete period to represent this continued steady state of cash flows. The terminal period represents a time when the business has generally stabilized. The value of the corporation's free cash flows in perpetuity after this first discrete period is known as a terminal value and typically is calculated by applying a perpetual growth rate to the estimated cash flow in the first year of this period. The expert capitalizes projected cash flow based on a stable growth (or nil) rate. The terminal value can be calculated as:

$$Terminal\ Value = \frac{Cash\ flow\ of\ last\ projection\ year \times (1+g)}{r-g}$$

where g = the growth rate

The expert should not include a terminal period when cash flows are expected to end after a certain period. In these instances, the expert should extend the projection period to the final year of expected cash flows. Some examples of situations where cash flows should not include a terminal period are when the cash flows are:

- Limited to the remaining term of a contract that is not subject to renewal or where renewal is deemed to be unlikely.
- Based on a depleting non-renewable resource project that is expected to have a finite life, such as a mine or an oil field.

RELIABILITY OF THE PROJECTIONS

Because expected cash flows are the key input for the DCF model, the expert should be cautious about the assumptions implicit in the projections. These lists are not exhaustive but provide guidance on the kind of issues that experts must address when choosing to rely on a particular forecast.

When assessing the reasonability of their cash flow forecasts, counsel and experts should ask:

- If management prepares the projections (if the expert is relying on business plans, for example):
  - who prepared the forecast and whether both parties agree to the projections;
  - when the forecast was created and what the projection period of the forecast was;
  - why this forecast was created;
  - how past forecasts (or budgets) have compared to the actual performance;
  - what assumptions management relied on while preparing the projections and whether these assumptions were reliable and well-supported;
  - who provided input for the forecast;
  - whether there were any biases from management, the business units providing inputs or assumptions, or the forecasters themselves that may skew the figures presented;
  - whether the business plan makes sense in the context of the industry as a whole (that is, whether revenue should be forecasted to grow significantly if the industry is forecasted to shrink); and
  - whether management created a hockey stick projection, that is, one that shows the company's last few years of actual results as flat and then sharply turns up for future years in the shape of a hockey stick.
- When the expert prepares the projections:
  - whether the expert is qualified to generate their own forecasts due to their previous experience or expertise;
  - whether the projection periods match that of the contract or the expected timeline of the project;
  - what contract-specific terms should be incorporated into the forecast;
  - what the assumptions that experts relied on for the DCF model were and what support the experts relied on when making these assumptions;
  - whether the experts reference industry research, analyst reports, or data provided by research institutions. If so, ask how reliable these sources are;
  - how the forecasts compare to the historical performance of the business as presented in the historical financial statements; and
  - how the expert forecasts compare to management expectations.

Forecasting Stable Growth Rate

The DCF method assumes the cash flows will grow at a constant rate in the terminal period when the life of the project is indefinite. The ability to continue growing over a long period of time generally diminishes as new entrants compete for the profits in question. The expected growth rate once a company has reached a stable state is usually relatively low. Experts should assess the reasonableness of the stable growth rate projection used in the terminal value calculation.

Typical reference points for the growth rate once stability has been achieved are long-term GDP growth rates, the historical growth of stable industries if relevant to the subject business or asset, and management estimates of long-term growth. For a profitable company that is not at risk of insolvency, the growth rate should not be lower than the expected rate of inflation.

OTHER CASH FLOW INPUTS

Capital Expenditures

Capital expenditures (CAPEX) are amounts spent to acquire and upgrade fixed assets, such as equipment, buildings, and properties. The level of CAPEX depends on the industry that the company occupies as well as its stage of development. CAPEX amounts in the DCF model typically vary on an annual basis in the projection period as investments are made by a business to grow and expand.

In preparing CAPEX projections, experts should investigate the amount of maintaining capital reinvestment required to sustain current levels of operations and the amount of incremental capital investment used to expand the operations. Sustaining CAPEX is a regular cash outflow every year and is therefore deducted from profits in the terminal value calculation to calculate cash flows in the terminal period.

CAPEX assumptions usually depend on management's expectations for the future growth of the business and should be aligned with the projected cash flows. For example, if a business expects to double its output of widgets, there should be a consummate investment in CAPEX to enable this increase in output if the required capacity does not already exist.

Change in Working Capital

Working capital refers to the funds required to sustain regular business operations and is usually defined as the excess of current assets (meaning assets expected to be converted to cash within one year, such as accounts receivable and inventory) to current liabilities (meaning liabilities expected to be settled within one year,

such as accounts payable). On its own, forecasted revenue is earned and received in cash in the same cash flow period. However, in the preparation of the forecasts, an increase in revenue also generally leads to an incremental increase in working capital. More working capital is required to finance a growing business because higher revenues drive higher accounts receivable and inventory balances, while higher costs drive higher accounts payable. By extending credit to customers (that is, increasing accounts receivable) instead of demanding cash payment, businesses delay the receipt of cash and decrease period cash flows in the DCF model. These cash flows are only delayed, not eliminated, as they are received in the following period when the accounts receivable balances are converted into cash.

Counterintuitively, in the DCF model, increasing the balance of working capital reduces net cash flows (for example, by increasing receivables and delaying cash inflows) in the period, while reductions in working capital increase net cash flows.

An analysis of historical and forecasted operating revenue, current assets, current liabilities as well as the turnover of accounts receivable, inventory, and accounts payable is helpful when estimating the change in working capital. Significant variations in working capital should be explainable and tied to changes in the business.

Treatment of Debt

A company's debt is usually referred to as its leverage. References to debt usually include long-term interest-bearing debt (such as term debt, bonds payable, and mortgage payable), short-term interest-bearing debt (such as operating credit facilities and lines of credit), and other debt equivalents.

When a company has debt, it is said to be levered, while a company without debt would be considered unlevered. The status of a company as a debtor can affect the cash flow forecast depending on the way the DCF model is constructed, and the riskier nature of a highly leveraged company may require a higher discount rate to apply to the cash flows (see Discount Rate).

Experts are sometimes asked to calculate the enterprise value (EV) of a company, which represents the combined value of the equity and the debt of the company. When calculating EV, the expert should not consider the reduction to cash associated with paying interest to debtholders because the resulting free cash flows in the DCF model should represent cash flows to both equity and debtholders.

However, in some cases, the expert is asked to calculate the value of equity to determine the value of a particular shareholding. In these cases, the expert can either subtract interest expense from cash flows to derive only the cash flows to equity holders or the expert may calculate EV as described above and then subtract the market value of debt from EV to arrive at an isolated value of equity.

Whether the expert should calculate enterprise value or equity value should be determined through consultation with counsel and be based on the specific facts of the case.

Tax Adjustments

Because free cash flows are calculated net of taxes, the three general tax concepts that regularly arise regarding forecasting cash flows are:

- **Statutory tax rate.** The stated tax rate under the applicable law or statute. There are usually multiple statutory tax rates over different income brackets.
- **Marginal tax rate.** The tax rate on each additional dollar of income. The marginal tax rate typically aligns with the highest tax bracket to which a tax filer is exposed but does not consider statutory tax rates applied to all previous cash flows in a certain taxation period.
- **Effective tax rate.** Calculated as the percentage of total tax expenses divided by taxable income. This is used to simplify the presentation of taxes and present a single unified tax rate as opposed to the multiple statutory or marginal tax rates to which a company is exposed.

Experts should differentiate the above tax rates and select the most appropriate rate depending on the situation. Simpler DCF models typically apply the effective tax rate to cash flows to approximate cash taxes that would have to be paid, while more complex ones attempt to take additional steps to set up schedules that mimic income tax returns and apply marginal tax rates to increase the accuracy of the forecasted cash outflow due to taxes.

It is important for experts to consider the effect of other tax issues, such as carry forward losses, capital cost allowance, accounting deprecation, and other taxable deductions, and decide if these deductions are applicable to the calculation of damages. These other considerations can affect the annual tax expense and therefore have an effect on forecasted cash flow, which may result in a material change in value if these are not accounted for correctly.

DISCOUNT RATE

This section describes the individual components of the discount rate in detail and the considerations experts make when determining the appropriate discount rate for a specific valuation.

As applied in the DCF methodology, a discount rate represents the rate of return that a rational investor requires for the realization of a future stream of cash flow from a business. This rate should reflect the opportunity cost of capital as of the valuation date.

Both cost of equity and cost of debt can be used as discount rate when valuing a business, depending on whether a levered or unlevered approach is applied.

LEVERED VS. UNLEVERED APPROACH

The difference between the levered and unlevered approaches is the treatment of financial obligations, namely debt. Counterintuitively, the levered approach considers the perspective of equity investors and therefore starts from the free cash flow to equity, which is typically based on net income as interest expenses (that is, payments to debtholders) need to be removed from cash flows. Correspondingly, the discount rate used in the levered approach is the cost of equity.

In contrast, the unlevered approach considers the free cash flows to the firm, which are based on after-tax operating earnings, before considering the effect of interest payments made to debtholders. The unlevered approach is typically used when the expert wants to calculate the EV of a valuation subject. The corresponding discount

rate is determined using weighted average cost of capital (WACC), which is explained below.

Levered Approach: Cost of Equity

The cost of equity is applied to match the free cash flow to shareholders when an expert estimates the value of shares of a company. The basic framework for all models used to estimate the cost of equity is to add a risk premium to a risk-free rate. The two most widely used methods for calculating the cost of equity are the build-up model and the capital asset pricing model (CAPM).

Build-Up Model

The build-up model is comprised of a risk-free rate (Rf), an equity risk premium (ERP), and some additional premium representing the subjective risk for the particular asset, which can be expressed as:

$$Cost\ of\ Equity = R_f + ERP + Other\ Risk\ Premiums$$

Risk-Free Rate

The risk-free rate is the rate of return on a security that the market considers to be free of the risk of default. The most common proxy used as risk-free assets are government bonds, such as five-, ten-, or 30-year US treasury bonds, where long-term bonds have higher yields due to the additional risk the bond holders take on over the holding period. Because of these differing bond terms, experts should match the duration of the risk-free rate with the forecast period.

Equity Risk Premium

The ERP represents the expected return from an equity market as a whole above the expected return on a risk-free asset. The three generally accepted methods of estimating the ERP are:

- Analysis of historical returns.
- A prospective estimate based on current value.
- A survey of investors.

Experts may disagree about applying one ERP method over the other, but each of them is supportable from the perspective of fundamental principles of corporate finance.

Other Risk Premiums

Other risk premiums can include a variety of factors, such as a size premium, an industry-specific risk premium, or a company-specific risk premium. The size and quantum of the other risk premiums applied in the build-up model is usually subjective and not easily parsed, making supporting a premium more difficult. Depending on the context of the valuation, these premiums can also be negative if they serve to reduce the overall risk of the company. For example, if an industry is known to have stable revenues with little risk of disruption, the industry premium relative to the rest of the market may be negative.

Experts commonly disagree on some of these premiums, such as the size premium. This section covers other areas of common disagreement about the discount rate.

CAPM

As an alternative to the build-up model, CAPM is a commonly used and widely accepted approach of determining the cost of equity. It consists of a risk-free rate, an ERP, and a beta factor that measures the volatility of returns on a stock against return on the overall market. The CAPM model can be expressed as:

$$Cost\ of\ Equity = R_f + beta \times ERP$$

Beta

Beta measures the asset's sensitivity to non-diversifiable risk. It is estimated through a regression of a public company's historical returns against a particular market's returns over time. A beta of 1.0 indicates that a stock price moves perfectly with the market (an increase of 1% in the market corresponds with an increase of 1% in the price of the stock), while a beta of 2.0 means that the stock is twice as volatile as the market. Beta is used in the CAPM to add an investment-specific attribute to the ERP.

When the subject of the valuation is not a public company, being either a private company or a collection of assets, it is common to use comparable proxy companies to estimate what the beta of the subject would be if it was publicly listed. However, this abstraction can lead to some disagreement between experts about which companies or industry groupings are truly comparable or relevant to the subject of the valuation.

Build-Up Model Versus CAPM

Both the build-up model and CAPM model are frequently used to estimate the cost of equity. Choosing between these two approaches is dependent on the implicit assumptions and information available. Some examples are what other premiums should be included in the build-up model or which comparable companies or indices should be used to derive beta. An expert's answers to these questions usually guide their application of either model.

UNLEVERED APPROACH: COST OF CAPITAL

When applying an unlevered approach, an expert should set the discount rate relative to the subject's WACC to match the discount rate to the free cash flows to the enterprise. The WACC considers the cost of different types of financing (that is, equity or debt) as well as the relative weighting of each (that is, the valuation subject's capital structure). Under the WACC approach, the cost of capital is calculated as the sum of the cost of each capital component multiplied by its proportional weight, which can be expressed as:

$$WACC = \frac{E}{V} \times R_e + \frac{D}{V} \times R_d \times (1 - T)$$

where E = *the cost of equity*

D = *the cost of debt*

n = *life of the asset valued*

Re = *the percentage of equity capital*

Rd = *the percentage of debt capital.*

$V = E + D.$

T = *Applicable tax rate.*

The cost of each financing type is not the current cost to the company of borrowing debt or issuing equity but rather the future cost of obtaining financing both from equity and debt sources to the company over the forecast period. When valuing damages, the expert generally should consider the WACC to hypothetical parties instead of a specific party, which means the cost of each financing type and capital structure should be at an optimal level or market prevailing level. Valuations for damages purposes are usually conducted with reference to the fair market value (FMV), which considers a notional transaction between notional parties (see Practice Note, Valuation Calculations in Litigation and Arbitration (W-004-8470)).

For example, if a company does not currently have debt financing but the optimal capital structure with reference to industry best practices includes some debt, management or an independent third-party buyer may take on debt in the future to optimize the value of the subject entity or group of assets. To conform with the FMV standard of value, best practices should take precedent over the entity's existing capital structure.

TAX ADVANTAGE OF DEBT

A specific feature of the cost of debt is the potential tax advantage of being able to deduct interest payments from taxable income to reduce the taxpayer's overall tax burden. As interest expense is only indirectly considered in the unlevered approach, this tax advantage is included in the discount rate as a reduction to the cost of debt and consequentially the discount rate.

The marginal tax rate is usually more appropriate for calculating the after-tax cost of debt because interest can be deducted for tax purposes to offset the income of each marginal dollar declared for tax purposes. However, it is often difficult to determine the exact marginal tax rate of cash flows over an entire projection period. The statutory tax rate is often used as a simplified proxy.

COMMON AREAS OF DISAGREEMENTS

This section describes several common areas of disagreement between the experts, which may have a material effect on the discount rate estimate and therefore the calculation of damages.

Size Premium

The size premium represents the additional rate of return thought to be required by shareholders of small firms. It assumes that the investors in companies with small market capitalizations demand higher returns than those with large market capitalization to compensate for their increased operating risks, such as:

- Difficulties in raising financing.
- Low investor confidence in management.
- Inability to exploit economies of scale available to larger companies.

However, the existence of the size premium has been controversial since it was introduced by Eugene Fama and Kenneth French in 1981. Some researchers believe the historical data used to prove the existence of the size premium might be flawed or the results produced from the historical data are ambiguous. Updated studies conducted by researchers, including Fama and French themselves, have indicated that the size premium may no longer be priced into stock returns. Experts therefore may disagree on whether a size premium is applicable in a given valuation exercise.

Country Risk Premium

Many of the inputs discussed above are based on companies or indices based in the US, but valuation subjects located or doing business outside of the US may vary. The country risk premium seeks to capture the extra risk associated with an investment in a foreign country. The risk reflects the concept that an investment made in certain countries, typically emerging market economies, are inherently riskier, leading investors to demand a higher rate of return on that investment. Country risk usually includes:

- Issues of political risk (the risk that political change could negatively affect an investment).
- Exchange rate risk (the risk that exchange rate differences could affect the investment).
- Legal risk (the risk that the law may change and affect the investment).

For example, all else being equal, an investor would require higher rate of return for an investment in Venezuela than in the US to compensate for the risk from potential political turmoil. However, an experts' opinion on the appropriate country risk premium can differ from each other significantly as shown in the table below, taken from documents filed in investment treaty arbitrations.

Table 1: Examples of Decision on Country Risk Premium

Case	Claimant's Position	Respondent's Position	Tribunal's Decision	Award Date
Tidewater v. Venezuela	1.50%	14.75%	14.75%	13-Mar-15
OI European Group B.V. v. Venezuela	2.00%	6.00%	6.00%	4-Mar-15
Gold Reserve Inc. v. Venezuela	1.50%	6.7% ~ 16.4%	4.00%	19-Sept-14

ADDITIONAL ISSUES

The inputs to the discount rate should always be aligned with the cash flow forecast. Additional considerations include that:

- The underlying currency of the inputs to the discount rate should be the same as the cash flow forecast.
- If the cash flow forecast is stated in real terms (that is, excluding inflation), the discount rate should also be stated in real terms as opposed to nominal terms (that is, including inflation). Many discount rate inputs include the effect of inflation. If the model is denominated in real terms, the discount rate should be adjusted to exclude the effect of inflation.
- The discount rate should not and does not encompass the entirety of the risks in a DCF model. The cash flows themselves should be adjusted to incorporate some of these risks. For example, if aggressive growth is forecasted in business plans that an

expert relies on but that same expert believes that this growth is especially unlikely, they may adjust forecasted cash flows downward to account for this forecast risk.

ADVANTAGE VERSUS DISADVANTAGE

There are several advantages and disadvantages inherent in applying the DCF methodology. The main advantages of the DCF methodology over other valuation methodologies are:

- It conceptually and theoretically represents the future cash flows expected to be received from a business or investment and allows for discrete changes over time to be incorporated in the model.
- It is relatively straightforward to set the discounted value of the cash flows to equal the FMV of the valuation subject.
- It is frequently used and widely accepted in the real world as is its use in the context of damage quantification.
- The estimated value can be accurate if the projections of free cash flow and discount rate are reliable.

However, this methodology, like all others, is not without its disadvantages, such as:

- The DCF model can be sensitive to the expert's assumptions, which can be subjective or speculative if lacking sufficient support. This sensitivity can lead to significant disparities between experts.
- When analyses include terminal values, these sometimes comprise a high portion of the total value, which may reduce the reliability of the DCF model because it is difficult to predict into the indefinite future.

Ultimately, an expert's decision to apply a DCF methodology should be based on the facts of the case and arise out of discussions with counsel and the client.

APPLICATION IN ARBITRATION AND LITIGATION

Although DCF methodology has been widely accepted in the practice of damage calculations, courts and arbitral tribunals remain cautious about applying it to determine damages.

The common reasons cited for rejecting the DCF methodology are:

- The business is not a going concern because it has no history of earning profits (for example, it is a startup) or it has a history of losses (for example, it appears distressed).
- There is an insufficient history of performance to establish that the company will be profitable in the forecast period.
- The claimant has not demonstrated to a sufficient degree of reasonableness that the business would have been profitable.
- Key assumptions are otherwise deemed to be too speculative, imperiling the entire DCF model.
- The value determined under the DCF methodology is simply too high compared to out-of-pocket expenses or actual investments made up to the valuation date.

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