The Middle Eastern and African Arbitration Review 2019

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Complementing our news service and GAR Live events, we also work with leading practitioners to provide the front-line view on important topics in international dispute resolution. *The Middle Eastern and African Arbitration Review 2019* provides exclusive thought leadership, direct from pre-eminent practitioners. Across 15 chapters spanning 95 pages, the review gathers the expertise of over 30 different leading figures from 16 different firms. Contributors are vetted for international standing and knowledge of complex issues before being approached.

In this edition, our experts consider energy arbitrations in the Middle East and mining arbitrations in Africa, and provide guidance on dealing with expert evidence. Additionally, a chapter on the discounted cash flow approach sheds light on the assessment of damages.

Furthermore, our expert panel consider the landscape for investment arbitration involving African states, the Voluntary Arbitration Law in Angola, increasing foreign direct investment in Mozambique, award enforcement in Nigeria and the long-awaited implementation of the UAE Federal Arbitration Law, heralding a much-needed overhaul of UAE arbitration legislation.

The Middle Eastern and African Arbitration Review is annual and will expand each edition. If you have a suggestion for a topic to cover or would just like to find out how to contribute please contact insight@globalarbitrationreview.com.

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For Beta or Worse: The Small Number that can make a Big Difference to Valuation and Damages Assessments

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Introduction

Assessments of damages are often based on the discounted cash flow (DCF) approach. Under the DCF approach, a valuer measures the present value of the future cash flows that a business, project or asset will earn, or would have earned in a given scenario. A valuation under the DCF approach is, in the simplest terms, a two-stage process:

- the forecast of a central estimate of the future net cash flows for the business, project or asset in question; and
- the application of an appropriate discount rate to those forecasts, to convert the forecast cash flows to a monetary sum as at the date of valuation.

The application of a discount rate is necessary to reflect two factors. The first factor is the time value of money (for example, a dollar received today is worth more than a dollar to be received a year from now). The second factor is uncertainty or risk in relation to the estimate of cash flows forecast to arise in the future.

The appropriate discount rate should reflect the cost of capital for the asset or business in question. The cost of capital is the rate of return that investors require on a portfolio of all of the company's outstanding debt and equity, and is usually calculated on a post-tax basis, as interest on debt is a tax-deductible expense. It is often referred to as the weighted average cost of capital (WACC), as the company's cost of equity and cost of debt are weighted according to their respective market values.

The results of assessments of damages prepared by valuation experts in the context of disputes can be influenced significantly by the discount rate used in the calculations. It is therefore often necessary for arbitral tribunals to engage actively with expert assessments of the appropriate discount rate to apply.

In this article we explore some of the challenges and considerations in measuring beta, a key component in the formula often used to estimate the cost of equity element of an entity's WACC. As it is not possible (or, we suggest, for most readers, desirable) to consider comprehensively all facets of estimating beta within the confines of this article, we focus on some core concepts that underlie the estimation and use of beta in valuation analyses, and identify some of the key decisions and considerations that valuers (and therefore tribunals) may encounter.

The relevance of beta

As explained above, the discount rate applied under the DCF approach commonly reflects the valuer's assessment of the cost of debt and the cost of equity applicable to a given asset or business. The return required by providers of debt capital can often be observed relatively simply from the yield on debt instruments issued by the company in question (or similar companies).

However, it can be significantly more challenging to estimate the return required by providers of equity capital, which is not an observable measure. There are several finance models that estimate the return that equity investors require for bearing the risks associated with a given investment. The model most commonly applied in dispute contexts is the capital asset pricing model (CAPM). The CAPM posits that investors require a return, in the form of a risk premium over the risk-free rate (which is often measured with reference to the return on government bonds), to compensate them for taking on additional risks associated with investments in equities. The CAPM further states that for a given security, the risk premium should be increased or decreased by the beta factor (β) which reflects the exposure of said security to 'market' or 'systematic' risk. The CAPM formula is reproduced below:

$$\textit{Required return} = Rf + \beta \times Rm$$

where Rf represents the risk-free rate of return and Rm represents the premium required to invest in the equity market over the risk-free rate (also known as the 'equity risk premium').

Discount rates, and the results of valuation analyses, may be highly sensitive to changes in beta estimates. In Table 1 we show, under a given set of assumptions, the effect of changing only the beta estimate when calculating the present value of a cash flow of US$100 expected to be received in one, two, five, 10 or 20 years.

Table 1: Effect of beta when discounting

Year	Cash flow (US$)	Beta of 1.0	Beta of 1.5	Difference
1	100	93	91	2%
2	100	87	83	5%
5	100	71	64	11%
10	100	51	40	21%
20	100	26	16	37%

Note: We assume a risk-free rate of 2% and an equity risk premium of 5%. The company is assumed to have no debt.

As the table shows, discounting a cash flow to be received in 10 years using a beta of 1.0 provides a net present value that is over 20 per cent greater than the same analysis using a beta of 1.5. This divergence is even greater when considering cash flows expected to be received further into the future. All else equal, a higher beta estimate will always reduce the result of a DCF valuation, as this means that the providers of equity finance require a greater return (to account for greater anticipated variability of expected future cash flows), meaning that forecast cash flows are discounted using a higher discount rate.

Beta measures exposure to market risks

A fundamental tenet of most conventional finance theories, including the CAPM, is that investors require a return for exposure to risks that cannot be eliminated by holding a diversified investment portfolio. These risks are known as 'market' or 'systematic' risks.

Market risks are those that all companies operating in a specific market are subject to. These may include the prospect of variability in investment returns as a result of business cycles, or unexpected fluctuations in interest and inflation rates. All companies are exposed to such risks to differing extents. Beta seeks to measure the extent of the exposure of the company or asset in question to such market risks.

Importantly, beta is not intended to capture risks or uncertainties specific to an individual company, such as the possibility of product failure or unpopularity. This is because while all outcomes, whether specific to the business or related to the overall market, should be considered when projecting expected cash flows, only variability around those expectations that derive from market risk should be taken into account when estimating an appropriate discount rate. Diversified investors do not require compensation for their exposure to uncertainties that are specific to a company, since those uncertainties are diversified away by holding a portfolio of investments.

When estimating beta, it is assumed that the market as a whole has a beta of one. Accordingly, a company with a beta greater than one is more sensitive to market risks and vice versa. All else being equal, if the market moves by 1 per cent, the share price of a company with a beta of 1.5 would be expected to move on average by 1.5 per cent in the same direction. In theory, 'the market' should constitute every asset within the economy. In practice, valuers measure beta with reference to a diversified stock market index (such as the the S&P 500 in the United States).

As a component of CAPM, beta is required to be a forward-looking measure. It reflects the expected future sensitivity of a business or security to market risks, relative to that of the market as a whole. However, as those expectations cannot be directly observed, beta estimates are normally determined with reference to historical data. Specifically, valuers undertake a statistical analysis that measures the correlation between the movement of a company's historical share price and the movement of a stock market index over a given period of time. In Table 2 we present the result of such an analysis for four prominent companies operating in two contrasting industries, based on weekly data over the two-year period leading up to 11 January 2019.

Table 2: 2YW equity beta, interactive media and beverage industry, 11 January 2019

Interactive media	Facebook *1.29*	Google *1.24*
Beverage	Coca-Cola *0.60*	Pepsi *0.58*

Source: Capital IQ

Table 2 shows that the historical beta observed for Coca-Cola and Pepsi are significantly lower than those observed for Facebook and Google, indicating that the share prices of these established companies in the beverage industry are less sensitive to market risk compared to two of the world's largest interactive media and services companies. This is not surprising. One would expect the demand for Coca-Cola or Pepsi's products to be less sensitive to market risk factors than the demand for Facebook or Google's services, as Facebook and Google depend on advertising revenue to generate a return and therefore may be highly affected by business cycles.

Comparing beta for different companies

If a company is listed on a stock exchange, it is generally possible to observe a historical equity beta on a direct basis by analysing the movement of that company's historical share price in the manner outlined above. However, a company's historical equity beta may be unrepresentative. For example, if a company anticipates (or has recently undergone) a significant change or restructuring, it may be inappropriate to assume that its historical equity beta reflects current expectations of the sensitivity of the company's operations to market risk.

In any event, a company's observed equity beta is only a single data point and may be unrepresentative for the valuer's purposes, particularly bearing in mind the fluctuations that can occur as a result of alternative approaches to the measurement of beta. Furthermore, for unlisted companies it is not possible to observe a historical equity beta on a direct basis. Valuers therefore often also calculate historical equity beta for peer companies deemed to be similar to the subject company in a valuation. This approach assumes that similar market risks are borne by similar companies.

To appropriately compare the observed betas of peer companies, it is necessary to convert the 'equity' beta factors (calculated on the basis of a regression analysis of stock market data), into 'asset' beta factors. An entity's asset beta reflects the exposure of the company's operations to market risk.

The adjustment is applied most commonly to account for the fact that equity investors' perceptions about the riskiness of companies are influenced by their capital structure, because the interests of equity investors are generally subordinated to those of debt investors. In other words, an equity investor will require a higher return to invest in a company that is 90 per cent debt-financed than it would to invest in the same company that was only 10 per cent debt-financed; with higher debt, the risk of bankruptcy, and variability of dividend payments, is higher. Equity betas are therefore influenced by risk factors introduced by factors other than the operations of the company in question. This is not the case for asset betas. Asset betas are therefore the appropriate measure of risk when looking to compare beta across peer companies.[1]

There are various recognised approaches for converting an equity beta to an asset beta. In Table 3, we present asset betas for the companies previously analysed after applying the 'Hamada' formula, which takes into account the proportion of debt and equity financing for a given company and the applicable rate of tax.

Table 3: 2YW asset beta, interactive media and beverage industry, 11 January 2019

Interactive media	Facebook 1.29	Google 1.24
Beverage	Coca-Cola 0.50	Pepsi 0.48

Source: Capital IQ

Table 3 shows that the asset betas of Facebook and Google are the same as the equity betas that we calculated previously. This is because these companies have not held material levels of debt over the past two years. Coca-Cola and Pepsi have lower asset betas compared to their equity betas. This is because, as explained before, the presence of debt adds to equity investors' perceptions of risk.

Time frames and intervals in beta observations

We have explained that historical betas are observed with reference to an analysis of movements in the share price for the company (or peer company) in question, relative to movements in a

stock market index. The valuer must decide how much share price data to include when calculating beta.

Beta is normally estimated using share price data over a period of between two and five years prior to the valuation date. The use of a longer period includes more data points (and therefore provides the potential for more reliable results, in statistical terms), but may not adequately reflect current investor perceptions about exposure to market risk, as the regression analysis weights data across the measurement period equally. As a rule of thumb, longer periods are deployed for companies with stable operations and activities, while shorter periods may be preferred for younger companies, or companies that have undergone significant operational changes.

Valuers must also consider the frequency with which observed returns are measured during the measurement period. Shorter intervals increase the number of data points for the analysis. However, very short intervals (such as daily or hourly) are not typically used, as fluctuations in prices across these short intervals may not accurately reflect the returns associated with holding the shares in question over a longer period. In Table 4, we present equity betas for Facebook, Google, Coca-Cola and Pepsi at 11 January 2019, according to analyses based on a range of measurement periods. We pair two- and three-year measurement periods with weekly return intervals and a five-year estimation period with monthly return intervals. These are common approaches.

Table 4: Equity beta based on various timeframes and intervals, 11 January 2019

	Interactive media		Beverage	
	Facebook	**Google**	**Coca-Cola**	**Pepsi**
2YW Beta	1.29	1.24	0.60	0.58
3YW Beta	1.25	1.23	0.60	0.56
5YM Beta	0.70	1.07	0.57	0.68

Source: Capital IQ

Notably, the equity betas of Coca-Cola and Pepsi are broadly constant regardless of the time period analysed, suggesting that the companies' exposure to market risk has been broadly constant over the past five years. However, the equity betas for Facebook and Google are higher when measured over two or three years, suggesting that these companies have become more exposed to market risk in recent years.

The factors described above relate to whether observed betas may be representative for the purpose of estimating a forward-looking beta in a valuation analysis. Practitioners may also consider the reliability of their results. One method is to review the standard error of betas observed on the basis of a regression analysis. Standard error is a measure of statistical accuracy that provides information about the accuracy with which a sample represents a population. In the case of beta, a greater standard error means that it is more likely that the company's 'true' beta is further away than the result of the calculation than in the case of a lower standard error. By way of example, for a company with beta of 1 and a standard error of 0.2, there is a 95 per cent chance that the company's 'true' beta lies between 0.6 and 1.4.[2] If the standard error was 0.1, there would be a 95 per cent chance that the company's 'true' beta was between 0.8 and 1.2.[3]

Beta trajectory over time

As mentioned above, it is often relevant to consider whether a beta estimate based on an analysis of historical data provides a good basis for an estimate of beta for the subject entity in a valuation analysis on a prospective basis. In other words, to ask to what extent can the future be expected to look like the past.

In that regard, it is relevant to note that beta for a given company can change over time. In Table 5, we present two-year, weekly asset betas for each of the subject companies on the last Friday of each quarter between June 2015 and December 2018.

Table 5: 2YW asset beta based on last Friday of each quarter, June 2015 to December 2018

	Interactive media		Beverage	
2YW Beta	**Facebook**	**Google**	**Coca-Cola**	**Pepsi**
26-Jun-15	0.60	1.15	0.62	0.60
25-Sep-15	0.77	1.37	0.58	0.51
25-Dec-15	0.83	1.22	0.56	0.54
25-Mar-16	0.94	1.22	0.52	0.55
24-Jun-16	0.98	1.26	0.51	0.54
30-Sep-16	0.96	1.24	0.51	0.56
30-Dec-16	1.06	1.26	0.54	0.52
31-Mar-17	1.09	1.37	0.50	0.48
30-Jun-17	1.15	1.39	0.49	0.48
29-Sep-17	1.11	1.18	0.48	0.50
29-Dec-17	1.13	1.23	0.44	0.40
30-Mar-18	1.11	1.40	0.60	0.46
29-Jun-18	1.20	1.41	0.59	0.43
28-Sep-18	1.26	1.43	0.55	0.40
28-Dec-18	1.30	1.27	0.51	0.51

Source: Capital IQ

We observe that the asset beta for each of these companies changes each quarter. However, the extent to which the asset betas have changed over time varies by company. For example, while Facebook's asset beta has risen steadily between mid-2015 and 2018, Google's asset beta has remained more consistent. A valuer may need to assess the implications of such trends when using historical data as the basis for estimating a forward-looking asset beta to apply in a valuation.

In addition, valuers may expect the asset beta for a growing company to converge over time with those of its mature peer companies, perhaps on the basis that over time the cost structures and competitive pressures of the subject company and its peers will align. Adjusting for such factors can be difficult. Sometimes, practitioners apply a 'Blume' adjustment to account for such effects. A Blume-adjusted beta is calculated by giving two-thirds weight to the equity beta and one-third weight to a beta of one.[4] An alternative adjustment that may be applied is known as a 'Vasicek adjustment', which takes into account the beta of selected peer companies and the standard error of those betas.

Days of the week in beta observations

Having noted that an estimation of beta may be sensitive to both the estimation period and return interval deployed in the regression analysis, the situation is further complicated as the valuer's results may also be affected by the starting point of the analysis. For example, beta estimates can vary significantly depending on the day of the week (or month) that is selected as the reference date for the valuation analysis.

In the tables above, we presented beta for the subject companies on 11 January 2019, a Friday. In Table 6, we show how the beta would have differed if we had used a valuation date on the

other weekdays leading up to that date. Some of the differences are very significant.

Table 6: 2YW equity beta based calculated on different weekdays, 7 January 2019 to 11 January 2019

	Interactive media		Beverage	
2YW Beta	**Facebook**	**Google**	**Coca-Cola**	**Pepsi**
7 Jan 2019 (Mon)	1.02	1.38	0.46	0.34
8 Jan 2019 (Tue)	1.39	1.45	0.41	0.47
9 Jan 2019 (Wed)	1.29	1.50	0.32	0.28
10 Jan 2019 (Thu)	1.07	1.39	0.57	0.53
11 Jan 2019 (Fri)	1.29	1.24	0.60	0.58

Source: Capital IQ

This phenomenon has been observed for nearly two decades.[5] It is also not limited to instances where betas are based on weekly return intervals, as differences of a similar scale can be observed when betas based on monthly return intervals are recalculated using different days of the month as the starting point for the calculation.

Data providers such as Bloomberg typically estimate beta using data as at the close of the return interval; that is, on Friday for beta based on weekly returns, and on the last day of the month for beta based on monthly returns. The use of Friday for weekly return intervals is sometimes said to be applied on the basis that the share price of a stock at the end of the week reflects information that has become known during the course of the week. However, this logic does not explain the use of the last day of the month as the starting point for beta calculations based on monthly return intervals.

Overall, there appears to be no clear consensus as to reasons why the differences arise. Nevertheless in some cases, it is a factor that valuers need to be aware of, and to consider whether the results of their valuations are affected by variations arising from the starting dates applied in their calculations.

Conclusion

In this article we explained that beta is an input in the CAPM formula often used by valuers in damages contexts to estimate the cost of equity component of the discount rate applied in a DCF valuation. Beta reflects equity investors' expectations, at the valuation date, as to the extent to which the future operating cash flows of the business, project or asset in question will be exposed to market risks. These are risks that cannot be diversified away by holding a portfolio of investments.

We explored available methods to measure beta, which are based on a quantitative analysis of movements in the share price for the company in question, relative to movements in a stock market index. This analysis alone requires the application of judgment in determining, for example, the time period that is analysed. The comparison of betas across different companies introduces further complexities. More fundamentally, in estimating a beta at the valuation date, the valuer should consider whether observed historical betas are representative of expectations at valuation date.

In some circumstances, the beta used in a valuation can materially affect the outcome of the valuation. As such, the estimation of beta is an exercise that often warrants care and attention. Ultimately, the correct approach will depend on the specific circumstances of the valuation. The most effective analysis will be based on a logical and consistent approach, in which the valuer's choices and assumptions are – as far as possible – consistent with both the market data that is available and the facts of the case.

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Notes

1 As we explain, it is appropriate to compare asset betas between companies (rather than equity betas). However, the CAPM requires an equity beta, applicable to the subject company, to determine the cost of equity. This is calculated by a process known as 're-levering', which is not within the scope of this article.

2 Calculated as 1 ± (0.2 x 1.96), on the basis that 95 per cent of a standard normal distribution lies between the values of -1.96 and 1.96.

3 Calculated as 1 ± (0.1 x 1.96), on the basis that 95 per cent of a standard normal distribution lies between the values of -1.96 and 1.96.

4 The formula for a Blume-adjusted beta is as follows: $_{ba}$ = 2/3 × + 1/3 × 1.

5 McNulty et al. (2002) demonstrated that 'a two-day shift in the sampling day (using Friday's stock prices rather than Wednesday's) to calculate beta [of a UK-based multinational], generated quite different betas of 0.70 and 1.41'. Source: 'What's your real cost of capital', McNulty et al., October 2002, *Harvard Business Review*.

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