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The law of one price: market-based analysis

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Is market-based comparables analysis pertinent to oil company valuations?

One of the most common standards of value is 'fair market value', which may be loosely defined as the value that would be reached in an arm's-length negotiation between a willing buyer and seller, each acting in their own interest, neither under compulsion. Fair market value is often used as a proxy for the value that would be reached by anonymous market participants. The willing buyer and seller are assumed to be typical of the market as a whole and not to embody any specific characteristics. Thus, the fair market value of, say, a pipeline may differ from its value to the owner of the power station that depends upon the gas it delivers.

Two of the most commonly used methods for assessing the value of assets are discounted cash flow (DCF) modelling and market-based (or 'multiples') analysis.[1] A DCF model calculates a single monetary asset value, in present-day terms, by discounting a set of future cash flows at a rate that reflects their risk. Cash flows may be subject to a range of potential risks, whether they are 'macro' risks present in the asset's general environment, or 'micro' risks specific to the investment and the market(s) in which it operates. DCF models often incorporate assumptions that rely on the valuer's judgement and may be used to assess value under any standard, 'fair market' or otherwise.

Although markets exist for assets that are identical to one another (ie, commodity markets), most markets trade heterogeneous assets. No two pieces of real estate are the same; companies differ in their operations, customers and managements; bond prices vary with their issuer, maturity and coupon; the values of Picasso paintings differ from one another, and from those of paintings by other artists. A market-based assessment of value is therefore often an inference based on prices of similar, but not identical, assets with publicly available prices.

A market-based approach to valuation seeks to identify the value of an asset from the market prices of comparable assets. A market-based valuation is expressed by reference to an appropriate characteristic (or 'metric') of the asset, such as its profits, sales or book value. For example, the value of a company might be expressed as, say, twice its sales or 12 times its earnings. Unlike a DCF model, a market-based approach assumes that market value is the appropriate valuation standard, although adjustments might be made to reflect the specific circumstances of a given transaction.

In the recent ICSID arbitration of *Occidental Petroleum Corporation and Occidental Exploration and Production Company v Republic of Ecuador* (the *Occidental* case), the Tribunal was confronted with both DCF and market-based approaches put forward by quantum experts appointed by the parties.[2,3]

The case related to the termination (in 2006) of a participation contract between Occidental and PetroEcuador for the exploration and exploitation of Block 15 of the Ecuadorean Amazon. In its award, the tribunal found that the termination of the contract constituted a breach of the US–Ecuador BIT and awarded Occidental compensation equal to 'the full fair market value of the Participation Contract as of the date of the Caducidad Decree, i.e., 15 May 2006'.[4]

In their submissions on quantum, the parties agreed that DCF analysis could be used to estimate the value of the contract. The respondent, however, submitted that the tribunal should also consider sales of comparable assets. In particular, the respondent alleged that comparable sales would allow 'the evaluator to test the reasonableness of the DCF assumptions against market conditions'.[5]

The claimants, however, averred that 'each oil and gas property presents a unique set of value parameters: size, quality of oil, type of contractual relationship, environmental or remedial obligations'.[6] In the claimants' view, it was not possible to identify sufficiently comparable companies upon which to base a market analysis. The tribunal agreed with the claimants, concluding that 'it can derive no assistance from an analysis of the seven transactions which the respondent has submitted as comparable sales'.[7]

This article comments on the circumstances in which it might be appropriate to use a market-based approach to assess the value of a natural resource property.

Overview of market-based analysis

Market-based analysis is underpinned by 'the law of one price', the economic principle that identical assets should sell at the same price. If shares in a gold mine are traded at, say, twice sales, an identical gold mine should exhibit the same ratio of value to sales. A market-based approach reflects market conditions at the date of valuation and provides a measure of the relative value of an asset.

There are two commonly used sources of pricing data for comparable assets:
- the trading prices of assets observed in public markets, whether bonds, companies or commodities (trading multiples); and
- the prices at which similar or identical assets have been sold in arm's length transactions (transaction multiples).

When using multiples analysis to value a privately held asset, it is implicit in the approach that the relative value of a publicly traded asset is close to the intrinsic value of the private asset. It is further assumed that market prices accurately reflect all the available information about an asset. If the price quoted by the market was distorted by, say, investor sentiment or imperfections in the functioning of the market, then the estimated multiple will be similarly distorted.

In practice, it is usually impossible to find an asset that is wholly identical to the target asset. Most individual assets are subject to specific risks that render them different to other assets and, very often, are unique. Care must therefore be taken to ensure that the assets from which value is to be inferred are sufficiently comparable to the target asset. There are few definitive rules for including an asset

in the comparable set, and the construction of such a set requires the exercise of judgement by the valuer.

For these reasons, market-based analysis is most useful when there are a large number of transparently-priced comparable assets. The availability of comparable assets depends on several factors, including:

- the target's stage of development;
- the industry in which the target operates; and
- the country in which the target operates.

Most publicly traded companies are mature, with proven, stable revenues and profit streams. Multiples analysis may therefore be less useful when valuing young firms, which are often loss-making but display potential for strong short-term growth allied to higher-than-average risk. At the other end of the firm life cycle, in contrast, there are often publicly traded firms in mature or declining industries, or firms with large transactions in their shares.

Industry focus may also affect the availability of appropriate comparables: it may be easier to find comparables for a car manufacturer than for a supplier of precision electronics or an engineering consultancy. A similar observation applies to a firm's geographic situation: it is easier to find comparables for US firms than for those located in countries with small economies, or which lack well-developed capital markets.

A key attraction of market-based analysis is simplicity. Multiples are easy to calculate, particularly when based on readily available public information, and can quickly estimate an asset's value at a given point in time. Perhaps for this reason, they are commonly used as a reference point in equity research reports and merger discussions.

A major drawback of market-based multiples, however, is their lack of transparency. A company's earnings multiple, for example, embodies a set of assumptions about, inter alia, growth potential, cost drivers and risk. It is not possible, however, to 'unpack' the composite number, the multiple, into its constituent parts or to adjust for a change in any one of them. For example, market-based analysis cannot be used to determine the effect on a company's value of an increase in its expected growth rate from, say, 5 per cent to 8 per cent. Differences in accounting treatments between companies and, particularly, between countries can distort comparisons between companies that appear similar in other respects.

A lack of transparency renders multiples analysis potentially vulnerable to manipulation through the choice of comparable assets or the multiple used. The price/earnings multiples of the comparable set might imply one value for the target firm, the price/sales multiples another value altogether. For this reason, a valuer should have regard for the different values derived using different valuation metrics and should be satisfied that the valuation metric selected is appropriate for use.

Averages of multiples drawn from the comparable set of assets should also be used with care. Although an average may reduce the impact of asset-specific risks on the target valuation, it may also conceal relevant information about the reasons for dispersion in the comparable assets' values.

Even once an appropriate multiple has been estimated, it may still be necessary to adjust the estimated value of the company to reflect the context in which the asset is being valued. Such adjustments may include a discount for illiquidity or lack of marketability, a premium for control or a discount to reflect a specific risk associated with the target asset. Once again, the decision to adjust an asset's value, and the magnitude of the adjustment made, are matters of expert judgement.

Despite these drawbacks, market-based valuation is an essential part of the valuation landscape simply because it is based on the prices that market participants actually pay for assets. In this respect, it is different from a DCF model, which is the product of a set of assumptions created by the valuer. Although a DCF calculation may use market-based assumptions, it is not necessarily aimed at an assessment of market value and may, intentionally or otherwise, use different assumptions from those used by market participants. In contrast, market-based evidence of value is by definition based on 'real-world' transactions and, for that reason, sometimes given primacy over or equal footing with other methods in a range of contexts.

Market-based valuations of resource companies

In principle, one might expect the major producers of any widely traded commodity to have a significant number of comparable companies. Most major commodities, such as oil and gas, are either sold on spot markets or under long-term contracts linked to the spot price. Many of these contracts, such as NYMEX gas futures or IPE Brent contracts, are highly liquid, financially speaking. A similar observation might apply to derivative contracts for metals or agricultural commodities.

As noted above, firm valuations may be expressed as a multiple of an appropriate metric, such as their sales or profits. In contrast, commodity company valuations are sometimes expressed as a multiple of their resources. For example, an oil company might be valued as a multiple of its proven and provable reserves, or its daily output of barrels of oil. In principle, this is possible for commodity or resource companies because of the largely homogeneous nature of their products. For the remainder of this article, we will focus on oil companies because they represent a well-known and widely traded set of assets based around a well-known commodity.
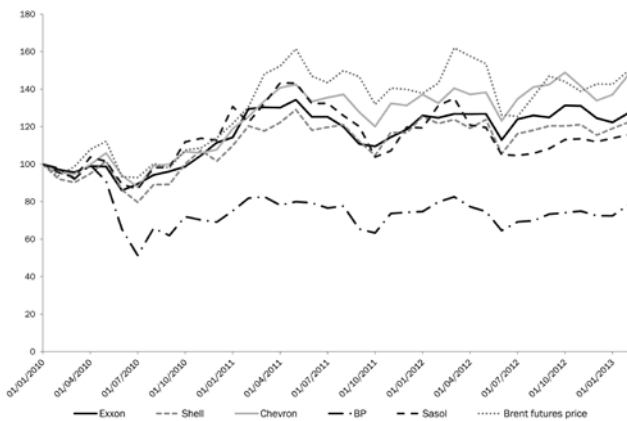
It might be thought that all oil companies have access to broadly similar technology and engineering equipment and are exposed to similar macroeconomic risks and opportunities.[8] In consequence, it is possible that:

- companies' efficiency will tend to cluster around the average; and
- company valuations will tend to move up and down with the oil price.

If this were so, oil company valuations should be largely comparable to one another. Although there will be variations in the size, quality and location of each company's proven and probable reserves, this effect will show up in the magnitude of the valuation, not in its behaviour or driving forces. Put simply, these companies should be comparable to one another and market-based valuation could be used to identify their value.

To illustrate this, we have analysed the share price trends of five major oil companies; Exxon, Chevron, Royal Dutch Shell, BP and Sasol alongside the price of a barrel of oil between 1 January 2010 and 1 January 2013.

Figure 1: Indexed market capitalisation of Brent futures – 1 January 2010 = 100
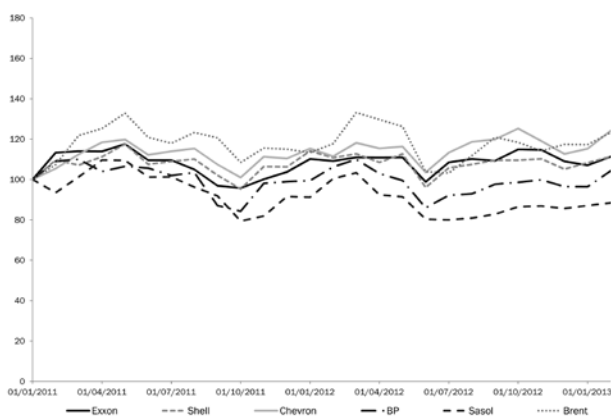

Source: Capital IQ

From the chart, by observation, it seems that although there have been differences in the growth experienced by major oil companies, their indexed market capitalisations have generally tended to cluster. This is particularly true of those firms domiciled or listed in the developed world.

The notable exception in our sample is BP. Following the destruction of BP's Macondo oil rig in April 2010, BP's share price fell significantly and remains low. The Macondo disaster is a specific event that has affected the magnitude of BP's share price but is not the force driving it. The disaster affected BP's value in three main ways:

• it reduced its proven and probable reserves;
• it introduced a liability on to its balance sheet to pay compensation and penalties; and in consequence,
• it reduced the company's ability to invest in new value-creating projects for the future.

We would expect all three effects to be reflected in a one-off adjustment to value and, thereafter, for BP to trade again in line with its peers, as illustrated in the chart below.

Figure 2: Indexed market capitalisation of Brent futures – 1 January 2011 = 100

Source: Capital IQ

As discussed above, an average multiple may be used to value the target asset if it can be assumed that the asset-specific factors of the comparable set will tend to cancel each other out across the group. In the case of BP, however, it is possible that the distortion introduced by the Macondo disaster is so great that it would be more appropriate to exclude BP from a set of oil company comparables, certainly around the time of the Macondo disaster and perhaps for a longer period.

As highlighted by the *Occidental–Ecuador* decision, identifying a comparable set is even more difficult when it comes to valuing individual oil properties, rather than portfolios of properties, like most of the companies included in our sample. At the corporate level, oil companies are able to use a combination of hedging and diversification to minimise their exposure to the specific risks associated with individual properties. This still leaves them exposed to wider market risks that cannot be so easily diversified away. Thus, for many oil companies their operations and risk profiles are sufficiently similar for them to be considered comparable to one another.

This diversification is not possible at the level of individual resource properties. The specific characteristics of each property, such as its location, the quality of its reserves and the ease of extraction are therefore fundamental to its value. Each property is likely to have a unique combination of these factors, making it difficult to be confident that a sufficiently comparable asset can be found. In these circumstances alternative valuations approaches, such as DCF models, may be more appropriate.

Nonetheless, for portfolios of oil companies, comparables analysis may still be appropriate if it can be demonstrated that there are common factors that tend to drive value. We sought to test this idea as a matter of principle using a simple regression analysis.

Are oil companies comparable to one another?

The extent to which each of these major oil companies, listed in the table below, is exposed to common underlying factors, such as commodity price, macroeconomic trends or developments in extraction technology can be illustrated using regression analysis. At the macroeconomic level, the returns to an oil company's share price are driven by, inter alia, the expected future price of oil and a broad set of general macroeconomic expectations about the growth of GDP, inflation, interest rates and consumer confidence. For the purposes of this analysis, we have assumed that movements in the MSCI World Index can be used as a proxy for changes in global market expectations, while recognising that this is an approximation.[9]

Our analysis indicates that the market capitalisations of the 10 companies considered are significantly influenced by the level of the MSCI World Index and the expected future oil price, measured by the prices for Brent Crude futures traded on the Intercontinental Exchange. The table below summarises the estimated coefficients and adjusted R-squared for each regression.[10]

The estimated coefficients in all of the regressions are jointly significant at the 5 per cent significance level. All of the estimated coefficients are individually statistically significant at the 5 per cent level unless marked with an asterisk.

Regression results: oil company share prices v MSCI World Index and Brent oil futures prices

		Estimated Coefficients		
	Domicile	MSCI World Index	Oil Futures Price	Adjusted R-squared
Exxon	N. America	0.79	0.07	0.55
Shell	Netherlands	1.00	0.05	0.54
Chevron	N. America	0.92	0.10	0.64
BP	UK	0.93	0.06	0.32
PetroChina	China	0.22	0.04*	0.05
Petrobras	Brazil	1.10	0.27	0.34
MedcoEnergi	Indonesia	0.43	0.05	0.04
Total	France	1.26	0.05	0.62
Sasol	South Africa	1.25	0.06*	0.45
Indian Oil	India	0.22	0.06*	0.03

Notes
(1) *The estimated coefficients in all of the regressions are jointly significant at the 5% significance level*
(2) *all of the estimated coefficients are individually statistically significant at the 5% level unless marked with an* *

Movements in the MSCI World Index significantly influence movements in the share price of these major oil companies. This suggests that each of the companies is, to some extent, exposed to a common set of global macroeconomic factors, which are also drivers of the MSCI World Index. The extent of the exposure, indicated by the estimated coefficient, varies but in each case is statistically significant.

The estimated coefficients for the MSCI World Index are noticeably lower for companies located outside the developed world. This suggests that, despite the global nature of oil exploration and production the drivers of demand and value depend on the market in which the company is based.

The Brent Crude futures price is also statistically related to the share prices of most of the oil companies. However, the estimated coefficients vary markedly across the companies. Sasol, PetroChina and Indian Oil have the lower coefficients, none of which is statistically significant. In one sense, this is surprising: Brent crude prices are used as a benchmark to determine the prices of crude oils from a wide range of countries and sources and is therefore of global, not regional significance. In another sense, however, it may be less surprising if companies with lower coefficients are primarily refiners and marketers of oil products. If a company has fewer reserves and resources of its own crude oil, it may not benefit from an uplift in the price of oil. Indeed, the reverse may be true if it needs to purchase most of its oil from overseas third parties and also faces domestic constraints on the prices it can charge for its products at home.

In 2012 PetroChina earned about 68 per cent of its revenues in mainland China. Similarly, Indian Oil sells over 90 per cent of its products within India. Sasol has very limited oil reserves of its own. It therefore appears that Sasol, PetroChina and Indian Oil are not global oil market players, but are instead refiners and marketers with a relatively narrow national market focus. A greater reliance on domestic markets may also explain why PetroChina and Indian Oil have relatively low exposure to the MSCI World Index.

Even for the companies for which the relationship is more significant, there is considerable variation in the strength of the relationship. There are three possible explanations for this variance.

First, Exxon, Chevron and BP earn a significant proportion of their revenues in the US. In 2012 these companies earned between 20 per cent and 39 per cent of their revenues in the US. In contrast, Total and Sasol earned only 7 per cent to 9 per cent of their revenues in the US. Oil prices in the US are often benchmarked against West Texas Intermediate prices, rather than Brent Crude prices. Although there is significant co-integration between US and European oil prices, it is not perfect and has weakened markedly since 2011. As a result, one would expect movements in the share prices of US-based oil companies to be less correlated with movements in the Brent crude oil price than movements in the share prices of non-US-based companies.

Second, all the firms in our analysis sell a diverse range of products, in particular natural gas. This product diversification reduces the firms' exposure to movements in the oil price. Of the companies included in our analysis, Petrobras is perhaps the most exposed to oil price fluctuations; in 2012 crude oil production accounted for approximately 84 per cent of Petrobras's output, compared to 51 per cent for Exxon and 50 per cent for Shell. Petrobras's relatively high reliance on oil production may help to explain its high estimation coefficient with the price of Brent.

Third, all major energy firms hedge their exposure to oil prices using a combination of long-term contracts and derivatives. Oil-producing firms may also be 'naturally' hedged through their diversification into downstream markets. Extensive hedging strategies reduce the effect of day-to-day fluctuations in the oil price and reduce the company's exposure to short-term fluctuations in the price of oil. The extent to which each of the companies in our analysis hedges its exposure to the oil price will depend upon, inter alia, their expectations regarding future oil price movements and their appetite for risk.

Conclusion

Multiples analysis can provide valuable insights into the prices at which arm's-length parties value specific assets, even if the asset itself is not traded on an open market. The results of multiples analysis can be very sensitive to the composition of the comparable set. For this reason, multiples analysis is best used in the presence of comparable, transparently priced assets.

We have demonstrated that there is some comparability across the oil firms included in our analysis: each of the major oil firms is exposed to a common set of macroeconomic factors. However, the extent of this exposure depends upon a range of factors, such as where the firm operates, the diversity of its product range, its relative strength in upstream and downstream activities and market appetite for risk. These factors must be taken into consideration when using comparables analysis to value a company or asset.

Even so, what is true at the level of a large resources company may not apply to any single property owned by that resources company. For that reason, any decision to use comparables to value individual resource properties must rely on the availability of good quality data about genuinely similar properties. Once the dissimilarities exceed a certain threshold (itself a matter of judgement), a DCF analysis tailored to the specific characteristics of the property may be more reliable than judgemental adjustments to a market-based valuation analysis.

Notes

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1 Other valuation approaches, such as cost-based or 'real options', are not discussed in this article.

2 *Occidental Petroleum Corporation and Occidental Exploration and Production Company v Republic of Ecuador* (ICSID Case No. ARB/06/11) (5 October 2012).

3 FTI Consulting was appointed to act for the claimants in these proceedings. It is not the purpose of the article, however, to review the facts, evidence or law of this case.

4 *Occidental Petroleum Corporation and Occidental Exploration and Production Company v Republic of Ecuador* (ICSID Case No. ARB/06/11) (5 October 2012), ¶458.

5 Ibid ¶780.

6 Ibid ¶781.

7 Ibid ¶787.

8 Although there may be marginal variation in firms' technological abilities, average technological capacity ought to be more similar as new technology takes time to be implemented across the properties in each company's portfolio.

9 The MSCI World Index is an index of about 1,600 stocks. The constituents are drawn from 24 developed markets, as defined by Morgan Stanley Capital International.

10 Adjusted R-squared provides an indication of how much of the variance in the share price movements is explained by variation in the change in the MSCI World Index and the oil future price.

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