Valuation of Oil Companies - The RoACE Era

*By Petter Osmundsen, Frank Asche and Klaus Mohn**

Introduction

Being a successful stock market analyst can be very rewarding, but is indeed also demanding. One single person often has to keep track of a wide range of companies, and provide superior advise and consistent investment recommendations to exacting investors with no concerns but to maximise their returns and to outperform their benchmarks. No wonder, therefore, that both analysts and investors have to relate to some simplified indicators that can help them in developing relative valuations and investment rankings.

For the international oil and gas industry, the most common financial indicators and valuation benchmarks in the oil industry are Return on Average Capital Employed (RoACE), unit cost, production growth, reserve replacement rate, and average tax rates. These indicators can be perceived as an implicit incentive scheme presented to the oil firms by the financial market. In responding to these incentives, the companies need to strike a balance between short-term goals of rentability and medium- to long-term goals of reserve replacement.

First, some basic definitions. RoACE, or return on average capital employed, is usually defined as net income adjusted for minority interests and net financial items as a percentage ratio of average capital employed, where capital employed is total capital minus net interest-bearing debt. DACF, or debt-adjusted cash flow, normally reflects after-tax cash flow from operations plus after-tax debt-service payments; where after-tax cash flow is the sum of net income, depreciation, exploration charge and other non-cash items.

Given the data that is available for external analysts, it is common to use market comparative metric analyses. Cash-flow multiples stand out as especially important in this respect, and one widely used indicator is the relation between enterprise value (EV) and debt-adjusted cash-flow (DACF) – or EV/DACF. An estimate for the value of a company, P, is thus found by taking the mid-cycle *DACF* for company *i* and multiplying it with the metric for the comparable companies (peer group), *EV/DACF* . Thus, $P_i=(EV/DACF)xDACF_i$. Positive investment recommendations are awarded to "cheap" companies, where valuation estimates go beyond current market capitalisation. On the other hand, caution is usually recommended for the more "expensive" companies, where simple valuation estimates fall short of their market capitalisation.

In their *Global Integrated Oil Analyzer*, UBS Warburg states: "Our key valuation metric is EV/DACF". The key arguments are that it is an after-tax value (important in an industry with substantial resource rent taxes) and that it is independent of capital structure (thus facilitating comparisons between companies with different capital structure).

UBS Warburg also appreciates the influence of oil price volatility on their analysis. For valuation purposes, they, therefore, concentrate on what they call mid-cycle conditions. Given the considerable volatility in oil and gas prices, this is clearly important for the international oil and gas industry. For a given year, UBS Warburg identifies a clear relationship between RoACE and the EV/DACF multiple, and conclude:

> "Each of the stocks which we rate a 'Buy' is trading below the average level relative to its returns. EV/DACF versus RoACE provides the key *objective* input into the process of setting our target prices."

Similar statements about valuation, multiples and return on capital are made in Deutsche Bank's publication *Major Oils*.

In presentations of their valuation techniques, investment banks often picture the relationship between market capitalisation (or EV/DACF) and a single financial indicator (like RoACE) in a diagram. They typically show this relationship for different companies at a given point of time. We take this approach a big step further, by including the time-series dimension in a rigid econometric framework for a panel data set. Thereafter, we compare our findings with common analyst perceptions.

Previous Research

McCormack and Vytheeswaran (1998) point out particular problems in valuation of oil companies, since the accounting information in the upstream sector gathered and reported by oil and gas concerns, "does a distressingly poor job of conveying the true economic results". There are measurement errors in petroleum reserves. There is an asymmetric response to new information; bad news is quickly reflected in the reserve figures whereas good news takes more time to be accounted for. Moreover, reserves may be exposed to measurement errors since they are noted in current oil price (and not the mid cycle price), and since they do not include the value of the implicit real options. Finally, McCormack and Vytheeswaran claim there is a bias, as the large and profitable oil companies are more conservative in their reserve estimates. The latter assumption is perhaps open for questions after the recent reserve write-down in RD/Shell.

As for depreciation, with the successful efforts method, initial depreciations are too high. The unit of production method also has the effect of depreciating the assets too quickly. The effect may easily be to punish new activity and reward passivity. Other measurement challenges specific to the oil business are cyclical investment patterns and long lead times, which may exacerbate the measurement errors. We may have similar effects from the fact that discoveries are discontinuous and stochastic.

McCormack and Vytheeswaran (1998) perform econometric tests on financial relations for the largest oil com-

*Petter Osmundsen and Frank Asche are with Stavanger University College and Klaus Mohn is with Statoil ASA. The authors are thankful to Statoil and The Norwegian Research Council for financial support. Petter Osmundsen, may be contacted at: Petter.Osmundsen@tn.his.no

See footnotes at end of text.

panies for the period 1997-2001. Change in shareholder wealth is tested against EBITA, RONA, after-tax earnings, ROE, and free cash flow. The relations between valuation and financial indicators were found to be very weak or non-existent. Stronger relations were established by introducing Economic Value Added (EVA[1]) and reserves.

Antill and Arnott (2002) address the issue of rentability versus growth in the petroleum industry. They claim that current RoACE-figures of some 15 per cent are due to the fact that the companies possess legacy assets that have low book values but still generate a considerable cash flow. If market values of the capital employed were applied, they estimate that the rate of return would fall to approx. 8-9 per cent, being more consistent with the cost of raising capital. One problem of RoACE, they add, is that it reflects a mixture of legacy and new assets, i.e., it does not adequately reflect incremental profitability. Thus, it falls short of being a good measure for current performance. Antill and Arnott (2002) argue that the oil companies should accept investment projects with lower IRR, as the growth potential would give added value to the companies.

Chua and Woodward (1994) perform econometric tests for the American oil industry, 1980-1990. They test P/E-figures for integrated oil companies against dividend payout, net profit margin, asset turnover, financial leverage, interest rate, and Beta. However, they fail to uncover robust relations in the data set. The estimated interactions are weak, and some of them even have different signs than expected. Chua and Woodward do not find support for the P/E-model. They, therefore, go on to test the stock price against cash flow from operations (following year and preceding year), dividend payout, net profit margin, total asset turnover, financial leverage, interest rate, beta, and proven reserves. Future cash flow and proven reserves are statistically significant explanatory factors, thus offering support to a fundamental approach to valuation. An increase in proven reserves of 10% produced an increase in the stock price of 3.7%, in the model estimated by Chua and Woodward.

Empirical Specification and Data

Out objective is to evaluate the current valuation techniques among stock market analysts and professional investors. Standard analyst reports usually illustrate/compute correlations obtained from a cross-section of companies for one year only. We expand the analyses by making use of time series data for a panel of companies. Our econometric approach also allows for a variety of explanatory factors in a simultaneous model. It is, e.g., interesting to test how market capitalisation is affected both by rentability (RoACE) and the reserve replacement rate (RRR). Traditional bilateral correlation studies of EV/DACF may not give the full picture of value generation if there for instance is a negative correlation between RoACE and RRR

A word of precaution is at this stage appropriate. This is the first output from a new, long-term research programme. Our findings are indicative, not final, and should be interpreted with caution. As researchers, we still have a long way to go in the area, in developing high-quality data sets – and to uncover the underlying data-generating processes.

For this study, UBS Warburg have kindly provided us with a panel data for the period 1997-2002, and it includes the following companies[2]:

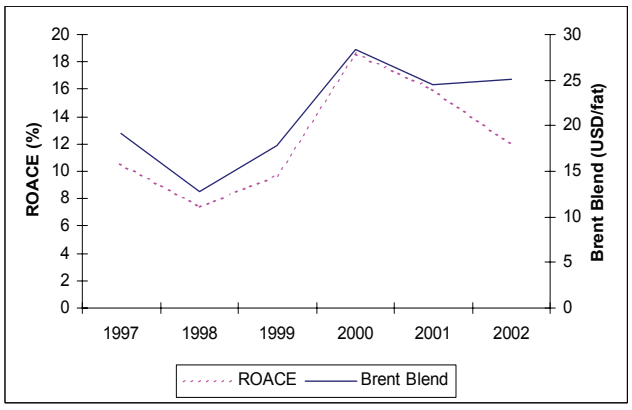
Amerada Hess
BP
ChevronTexaco
Eni
ExxonMobil
Marathon Oil
Norsk Hydro
Occidental
Petro-Canada
Repsol YPF
TotalFinaElf

The exact model specifications and detailed results are given in Osmundsen, Asche and Mohn (2004). In the following, the main findings are presented.

Lack of Normalisation

In a time series setting, performance evaluation of oil companies would have to adjust for the volatility of oil and gas prices. If a company is performing well, it is vital to know whether it is merely due to a favourable oil market sentiment, or if superior stock market performance can be attributed to real improvements in the company's underlying operations. Such normalisation is crucial also in a cross sectional setting, since normalisation is necessary for comparing companies with different portfolios. Companies are not to the same extent exposed to refinery margins and price fluctuations for oil and gas.

Figure 1
Arithmetic Average RoACE versus Brent Blend, 1997-02.[3]



Some oil companies do publish normalised RoACE-figures. One example is Norwegian Statoil, who publishes details of normalisation related to oil price, gas price and refinery margins when communicating their RoACE targets. However, most valuation analyses are based on non-normalised data. It is probably hard for independent analysts to calculate normalised returns for different companies in a consistent manner. To account for the effect of price cycles, they instead emphasise mid-cycle market conditions, which

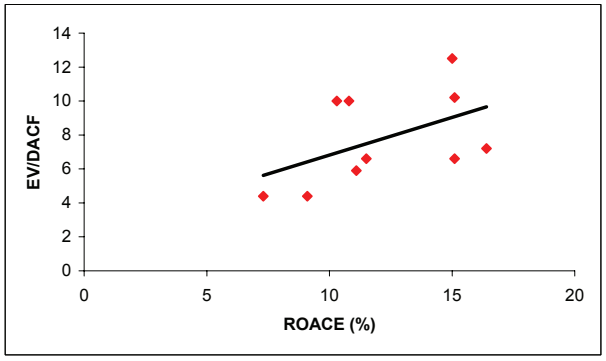
may be seen as a related concept.

Figure 1 indicates that non-normalised RoACE-figures have quite limited information value. Non-normalised RoACE does not seem to provide much beyond the oil price, in this particular time period. Mid 2001, however, the two figures depart and this has continued into 2003. Similar departures might have occurred under previous price cycles. Note also that the diagram is on an aggregate basis, implying that the non-normalised return from individual companies might provide more information. Still, the benefits of normalised return figures should be obvious.

Empirical Results

The metric EV/DACF versus the rentability indicator RoACE is essential to today's standard valuation reports from stock market analysts. As a basis for valuation, they claim to identify a clear, positive relationship between RoACE and the EV/DACF multiple. This relationship is illustrated for the year 2002 in Figure 2. UBS Warburg is unlikely to recommend investing in an oil company unless it is located above the solid line in Figure 2.

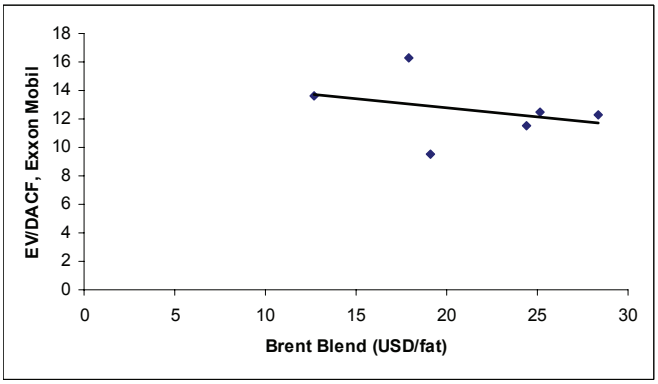
Figure 2
EV/DACF versus RoACE, 2002



Our data set offers support to this relationship for most of the individual years 1997-2002. However, the annual relationship between EV/DACF and RoACE is only weakly significant in the dataset. The relationship is clearest for 2002. This is shown in Figure 2.

We would like to take this further, to see if the relationship between EV/DACF and RoACE prevails over time, and in a setting with multiple explanatory factors. With straightforward testing on time series data, we cannot establish any correlation between EV/DACF and RoACE. But here we need to take one step back and reflect on the input data we use. As explained above, we would have liked normalised RoACE-figures. Having only non-normalised rentability figures at hand, we have to address the issue of oil price fluctuations. With oil companies being priced at mid-cycle oil prices, one would have to assume a strong relationship between the metric EV/DACF and the oil price, as revealed in Figure 3. When the oil price is very high, the market does not expect it to prevail (mean reversion) and, accordingly, a low metric is the result. The reverse is the case at very low prices.

Figure 3
Oil Price Sensitivity. EV/DACF versus Brent Blend, ExxonMobil, 1997-2002



Consequently, we need to single out oil price volatility to isolate the true effect on valuation from underlying profitability, i.e., the effect of normalised RoACE. One way of achieving this is simply to include oil price in the regression. The coefficient pertaining to RoACE will then reflect the effect on valuation from *normalised* rentability on average capital employed. Since all the oil companies more or less face the same oil price in a given year, due to an efficient world market for oil, inclusion of oil price in the regressions is analogous to including a year dummy across the panel.

Introducing year dummies in addition to RoACE, we find from regression analyses on the panel data set that the year dummies (reflecting oil price) are strongly significant whereas RoACE is weakly significant in explaining the metric EV/DACF. However, the overall explanatory power is still relatively poor.

Note that we find significant year effects in the panel data testing, i.e., EV/DACF responds negatively to oil price, as in Figure 3. This supports the perception that oil companies are priced at mid cycle oil prices.

We would like to examine the eternal trade-off between short-term return (RoACE) and growth (reserve replacement rate, RRR). We find that the explanatory power of this basic model is poor. RoACE is weakly significant. RRR has the sign we would expect, but is not significant in explaining valuation. Hence, the classical short-term, long-term trade-off is not sufficient to generate a valid valuation model in the oil industry for the relevant period. One possible explanation to the fact that RoACE is only weakly significant, would be that the strong focus on RoACE in the years 1997-2002 has been at the expense of organic reserve replacement. The valuation metric, therefore, has not responded considerably in response to high RoACE figures, since the investors have not perceived the higher rentability to be sustainable. This explanation, of a stock market primarily concerned with long term potential, however, is not supported by our tests.

Company size plays an important part in pricing of international oil companies. Various practical and theoretical reasons have been provided to explain this fact. We will mention some of them. Larger companies may have a larger growth potential in their portfolios. Size may have a positive effect on governments' discretionary licensing decisions for oil and

gas deposits. Large and prospective operatorships, which also are skill and resource demanding, are often awarded the largest companies. A larger opportunity set in terms of geological deposits may allow large firms to pursue a cream-skimming strategy. The largest international oil companies also have the best opportunities to pursue tax shifting. On the other hand, large companies may face higher co-ordination costs, and may miss out on benefits of focusing strategies and specialisation.

We now check for the effect of size on oil company pricing in our dataset, using oil and gas production (Q&G) as a proxy for size. We find that size is a highly significant explanatory factor in the pricing of oil companies. Note that the sign of RoACE now is negative. This may be due to a likely correlation between RoACE and O&G, to be explored below.

Thereafter, we proceed by including other explanatory factors, like finding & development costs (F&D) and unit of production costs (UPC). The explanatory power of the model now improves substantially. Notably, the perceived relationship between EV/DACF and RoACE now disappears. When additional explanatory factors are introduced, the parameter on RoACE actually becomes negative and significantly so. This is perhaps not surprising. The figures F&D, O&G, RRR, and UPC, affect rentability and can be controlled by the companies. They are therefore likely to be correlated with RoACE, and hence the effect of RoACE on EV/DACF may be crowded out. In the following, the relation between RoACE and these underlying factors is examined.

We find that size, represented by O&G, is a highly significant explanatory factor. F&D, UPC and RRR are not statistically significant.

We now run EV/DACF against the various explanatory factors, excluding RoACE, but including company dummies. The explanatory power is now very high. In this regression each company has its own constant term, where a large constant term indicates a higher EV/DACF for that company that cannot be attributed to any of the other factors. This ranking of company effects deviates from traditional EV/DACF rankings, where the largest companies tend also to have the highest multiples. Occidental has the highest company effect in our regression, and a company like Hydro outperforms Exxon. By including O&G in the regression, we have accounted for the effect of size, and by this isolated reputation effects beyond size.

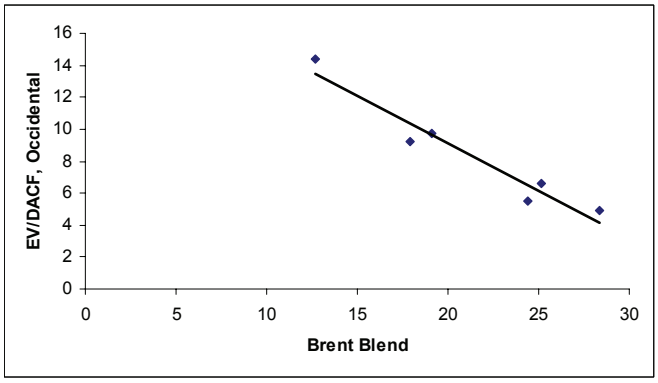
By excluding O&G in the regression, however, we get the traditional result that the largest firms have the most significant company effects. BP and ExxonMobil have by far the highest scores. That is, all things equal, ExxonMobil and BP trade at a premium. Notably, that this simplified regression, containing only year dummies (accounting for oil prices) and company dummies, have a very high explanatory power.

Oil Price Sensitivity

By spreading their activities over the entire value chain, integrated oil and gas companies reduce their exposure to oil price volatility. An oil price fall that hurts the upstream portfolio is often perceived to benefit the downstream activity. (This is not necessarily so, as the refinery industry is a margin business.) This is one of the reasons given to explain that supermajors have high valuation metrics However, there are a number of mid-sized companies that are integrated, without gaining the same level of stock market multiples. Again, size seems to be important.

For other companies, having a stronger upstream focus, the Figure 3 type curve is steeper. This is the case, e.g., for Occidental, see Figure 4.

Figure 4
Oil Price Sensitivity. EV/DACF Versus Brent Blend, Occidental, 1997-2002



The relationship between E&P exposure and oil price volatility could be skewed by other factors. One example is Statoil. Having the same upstream exposure as Occidental we should perhaps expect a slope similar to the one in Figure 4. However, what we probably would find is a a slope similar to ExxonMobil in Figure 3. Unfortunately, lack of sufficient market data prior to the listing of Statoil prevents us from drawing this diagram. However, Table 1 lists some interesting key figures for the three companies.

Table 1
Oil Price Sensitivity, 2000-2002

	E&P assets, % of total, last 2 years	E&P profits % of total last 2 years	Oil price sensitivity profits	Oil price sensitivity, DACF
Statoil	69	74	4.9	2.3
ExxonMobil	44	75	5.2	2.7
Occidental	75	95	11.9	5.0

Table 1 suggests a rather similar risk pattern for Statoil and ExxonMobil, There may be several reasons for this. First, and not surprisingly, the oil price and the NOK/USD exchange rate show a pattern of negative correlation, thus generating a hedge for Statoil's NOK profits. Second, considerable tariff revenues from ownership in pipelines generate a fixed revenue element for Statoil, but this is hardly material enough to explain the relatively low oil price sensitivity in Table 1. Finally, and most important, the tax system for the Norwegian Continental Shelf shifts much risk from the companies to the Norwegian state. The Norwegian petroleum tax system mimics a cash flow tax, and is fairly close to being symmetric. The government take is high at high oil prices, but is reduced to a large extent when prices fall. Most petroleum tax systems do not have the same risk reducing features for the companies.

Conclusion

We have undertaken regression analyses on market and accounting data from oil companies for the years 1997-2002. The objective is to ascertain key valuation drivers. The valuation metric EV/DACF is tested against a number of financial indicators and dummy variables. Making use of year dummies in addition to RoACE, we find from regression analyses on the panel data set that the year dummy (reflecting the oil price) is strongly significant, i.e., EV/DACF responds negatively to oil price. This supports the perception that oil companies are priced at mid cycle oil prices. The effect of RoACE on the valuation metric, however, is only weakly significant. We obtain strongly significant company effects, which to a large extent coincide with company size. A simplified valuation model that includes only year dummies (accounting for oil price) and company dummies proves to have a very high explanatory power.

As indicated above, this paper is an early attempt to substantiate the links between market valuation and financial and operational indicators in the international oil and gas industry. The results are inspiring, but preliminary. We still have a long way to go, developing high-quality data sets – and to uncover the true data-generating processes. Future research should be directed at the development of broader panels for a longer time-horizon. More degrees of freedom would allow for more sophisticated modelling, without loss of quality in the results. This modelling should also take us well beyond the statics of our simple first-cut models. The significance of dynamics should not be neglected, at least not in the stock market.

Footnotes

[1] EVA is a trade mark of Stern Stewart & Co.

[2] We are currently working on establishing a larger dataset, based on Deutsche Bank's *Major Oils*.

[3] RoACE is in the UBS dataset defined excluding goodwill amortisation charges from the returns, but goodwill is included in capital employed.

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