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Valuation of International Oil Companies
-The RoACE era

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Valuation of International Oil Companies

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Abstract

To improve their basis for investment recommendations and decisions, stock market analysts and investors make extensive use of operational and financial indicators. For the international oil and gas industry, a predominant indicator is return on capital employed (RoACE). The rationale for using this indicator is an assumed correlation between rentability and valuation metrics. Based on panel data for 11 international oil and gas companies, we seek to establish econometric relations between market valuation on one hand, and simple financial and operational indicators on the other. Our findings do not support the perceived positive relation between reported RoACE and market-based cash-flow multiples (EV/DACF). A simple valuation model with year dummies (reflecting oil price) and company dummies (reflecting size and reputation) prove to have high explanatory power for valuation in the oil sector.

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1. 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 a simplified 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 production growth and reserve replacement.

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, cautiousness 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, and try to focus on variables that can be influenced by management – i.e. production and unit costs. 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 significant step further, by controlling for other variables that can influence the multiple – like reserves etc. Furthermore, we apply a panel data set that offers observations of the relationship over five years. This allows us to test the hypothesis that a firm’s reputation is among the most important factor in deciding the company’s value. Thereafter, we compare our findings with common analyst perceptions.

2. 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 any implicit real options. Finally, McCormack and Vytheeswaran claim there is a bias in the reported figures, as the large and profitable oil companies are more conservative in their reserve estimates. This is a factor that can explain the importance that many analysts put on company reputation. However, this assumption has perhaps also become questionable, 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 companies 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[2]) and reserves.

Antill and Arnott (2002) address the strategic dilemma between rentability and 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

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

capital. One problem with RoACE, they add, is that capital employed will always reflect a mixture of legacy and new assets. The implication is that RoACEdoes not adequately reflect incremental profitability.[3] 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 internal rate of return (IRR), as the growth potential would add value to the companies.

Chua and Woodward (1994) perform econometric valuation 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 operation (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.

3. Empirical specification and data

Our 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 allow for a variety of explanatory factors in a simultaneous model. For example, it is 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. Our basic equation to be estimated is

$$\text{EV/DACF} = a + b\,\text{ROACE}$$

[3] Using measures as RoACE thus favors companies having a large fraction of legacy assets in their portfolio.

where *a* and *b* are the parameters to be estimated. To investigate the effect of additional variables the model is expanded to

$$EV/DACF = a + b\,ROACE + cX$$

Here, *X* denotes a vector of additional variables that can influence EV/DACF. This vector may include reserve replacement, oil and gas production (as a proxy for company size), unit production cost, finding and development cost and various combinations of these in different specification. The equations are estimated with OLS, where fixed effects are used to distinguish between the years when pooling the observations from different years into a panel. An error term is of course added to the specifications before estimation.

For this study, UBS Warburg have kindly provided us with a panel data for the period 1997-2002, including the following companies:

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

3.1 Lack of normalisation

In a time series setting, performance evaluation of oil companies would have to adjust for the

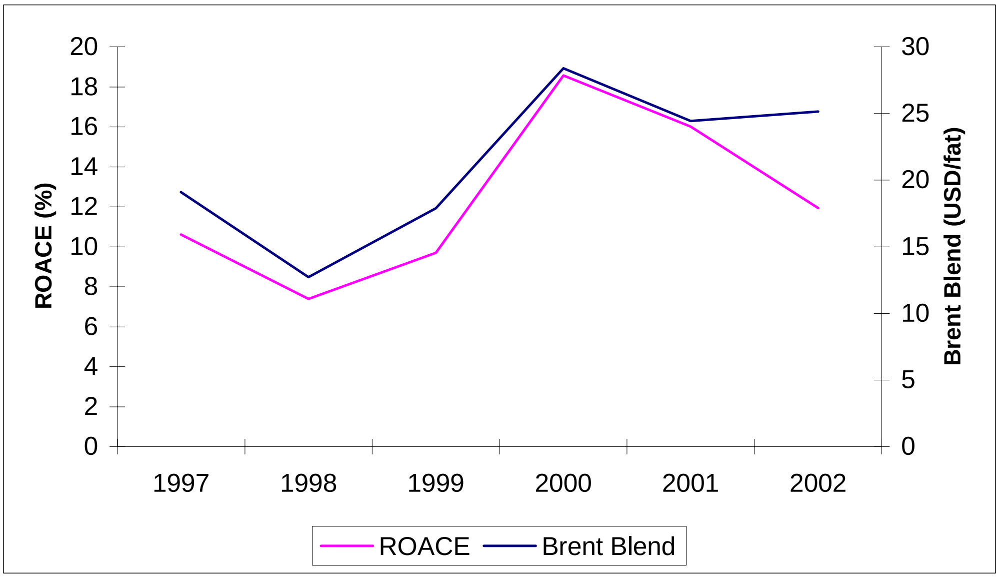

Figure 1: Arithmetic average RoACE versus Brent Blend, 1997-02.[4]

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.

Some oil companies do publish normalised RoACE-figures. In these cases, normalisation procedures and mid-cycle market assumptions will vary across companies. Accordingly, , most valuation analyses are based on non-normalised data.. 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

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

particular time period. In 2001, however, the two figures depart and the spread has widened 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.

4. Empirical results

The metric EV/DACF versus the rentability indicator RoACE are 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.

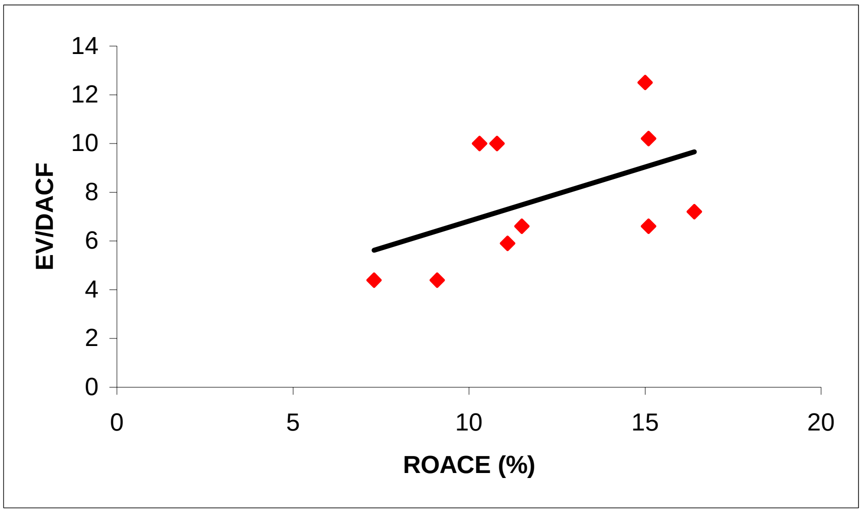

Figure 2: EV/DACF versus RoACE, 2002

Our data set offers support to this relationship for all of the individual years 1997-2002, as reported in Table 1. However, the annual relationship between EV/DACF and RoACE is only weakly significant in the dataset, as the estimated parameter is never significant at a 5% level. The relationship is clearest for 2002. This is shown in Figure 2 and the estimated equation with *t*-values in the parentheses is:

$$EV/DACF = 1.904\ (0.606) + 47.453\ (1.885)^{*}\ ROACE$$

$$R^2 = 0.277$$

ROACE is here weakly significant with a *p*-value of 0.069. For the other years the R^2 is lower and although the estimated parameter is positive it is never statistically significant at any conventional level.

Table 1. Year by year regressions of ROACE on EV/DACF

Year	Constant*	ROACE*	R^2
1997	6,427 (4.804)	19,621 (1.670)	0.237
1998	10,795 (5,367)	0,680 (0,029)	0.001
1999	4,795 (1,000)	51,273 (1,069)	0.113
2000	2,791 (0,344)	21,733 (0,501)	0.027
2001	7,069 (1,824)	4,170 (0,180)	0.004
2002	1.904(0.606)	47,453 (1,885)	0.277

* *t*-values in the parenthesis

We would like to take this further, to see if the relationship between EV/DACF and RoACE prevails over time, 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 our input data. 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.

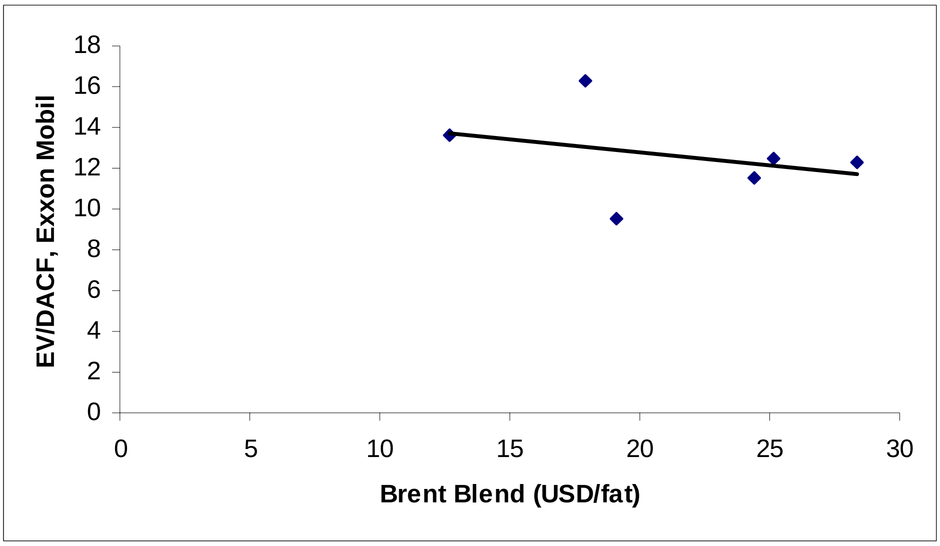

Figure 3: Oil price sensitivity. EV/DACF versus Brent Blend, ExxonMobil, 1997-2002

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 international oil companies more or less face the same oil price in a given year, the inclusion of oil price in the regressions is analogous to including a year dummy across the panel. In all estimations using the panel over the 5 years, 2001 is used as the base year. Hence, the annual dummies are to be interpreted as the deviation from 2001.

Introducing year dummies in addition to RoACE, we find from regression analyses on the panel data set that the year dummies are strongly significant whereas RoACE is weakly significant (p-value=0.068) in explaining the metric EV/DACF. However, the explanatory power is still relatively poor with an R^2 of 0.26.

Table 2. EV/DACF explained by ROACE and annual dummies

Variable	Coefficient	*t*-value
Constant	4.833	2.367
ROACE	22.178	1.869
y97	1.465	1.011
y98	4..764	2.913
y99	3.094	2.078
y00	-1.954	-1.408

This is the only specification using the panel where ROACE is positive. With a *p*-value of 0.068 the parameter is also statistically significant at a 10% level although not at a 5% level.

Note that we find significant year effects, 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 trade-off between short-term return (RoACE) and growth (reserve replacement rate, RRR). The results form this specification is reported in Table 3. The explanatory power for this specification is still poor with an R^2 of 0.28. RoACE is weakly significant, and with a negative sign. On the other hand, the RRR coefficient takes s 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, is not supported by our tests.

Table 3. EV/DACF explained by ROACE, RRR, and annual dummies

Variable	Coefficient	*t*-value
Constant	4.0213	1.789
RoACE	21.059	1.76
y97	1.5087	1.038
y98	4.6535	2.83
y99	2.8929	1.915
y00	-1.9709	-1.416
RRR	0.81509	0.874

Many analysts argue that 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. Company size may have a positive reputational 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 to the largest companies. A larger opportunity set in terms of geological deposits may also allow large firms to pursue a cream-skimming strategy. Finally, the largest international oil companies 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.

Table 4. EV/DACF explained by ROACE, O&G, RRR, and annual dummies

Variable	Coefficient	t-value
Constant	7,4245	5,004
ROACE	-17,936	-1,998
y97	0,22061	0,236
y98	1,8699	1,706
y99	1,0131	1,03
y00	-0.56823	-0,633
RRR	0,32697	0,551
O&G	0,0019059	8,086

We now investigate the effect of size on oil company pricing in our dataset, using total oil and gas production (O&G) as a proxy for size. The results for this specification are reported in Table 4. The explanatory power of this specification is substantially improved relatively to the earlier specifications, as the R^2 is 0.72. We can see that size is a highly significant explanatory factor in the pricing of oil companies. Note also 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. An alternative explanation is that firms that improve their short-run profitability (RoACE) do so by sacrifying their long-run potential (RRR), and are accordingly punished by investors. With unit of production depreciations, which is the accounting standard, new investments imply a temporary decline in RoACE.

Table 5. EV/DACF explained by ROACE, F&D, O&G, RRR, UPC and annual dummies.

Variable	Coefficient	t-value
Constant	10.183	3.808
ROACE	-19.230	-2.074
y97	0.149	0.156
y98	1.622	1.387
y99	0.660	0.642
y00	-0.681	-0.745
O&G	0.002	7.046
F&D_costs	-0.021	-0.357
RRR	0.136	0.178
UPC	-0.526	-1.310

We proceed by including the potential explanatory factors finding & development costs (F&D) and unit production costs (UPC). The results for this specification are reported in Table 5. The explanatory power of this specification does not improve much, as the R^2 is 0.73, which is not too surprising given that none of the parameters on the new variables are statistically significant. Note that the perceived relationship between EV/DACF and RoACE remains negative and statistically significant. This might not be so surprising, after all. Production volumes and unit costs affect rentability and can be influenced by the companies and their management. They are therefore likely to be correlated with RoACE. The implication is that the specific effects of these variables can be hard to identify econometrically. More specifically the effect of RoACE on EV/DACF may be crowded out by the underlying rentability variables.

Table 6. RoACE explained by F&D, O&G RRR, UPC and annual dummies

Variable	Coefficient	t-value
Constant	0.12735	3,152
O&G	1.46E-05	3,916
F&D_costs	0.0011241	1,141
RRR	0.01112	0,868
UPC	-0.0050038	-0,744
y97	-0.045242	-3,133
y98	-0.083414	-5,652
y99	-0.057084	-3,847
y00	0.033583	2,321

To look further into the potential correlation between RoACE and the other explanatory factors, we try to explain RoACE by these factors. The results for this specification are reported in Table 6. The explanatory power of this specification is relatively good, as the R^2 is 0.72. We see that size, represented by O&G, is a highly significant explanatory factor together with the annual dummies. F&D, UPC and RRR are not statistically significant. Hence, it seems like it is primarily the firm size and the oil price that is explaining the variation in RoACE.

Table 7. EV/DACF explained by O&G, F&D, RRR, UPC, annual dummies, and company dummies

Variable	Coefficient	t-value
O&G	0.0010499	0.77
F&D_costs	-0.010579	-0.163
RRR	0.11513	0.127
UPC	-0.59148	-0.963
Hess	7.7361	2.607
BP	11.726	2.359
Chevron	8.5612	1.959
ENI	7.2749	2.348
Exxon	9.2843	1.467
Hydro	7.2656	2.765
Occidental	9.8837	3.53
PetroC	7.3789	3.046
Repsol	9.6002	3.042
TotalFinaElf	8.6209	2.287
y97	0.7743	0.865
y98	2.9693	3.487
y99	1.6338	1.91
y00	-1.3472	-1.717

To investigate the effect of the firm's reputation, we now run EV/DACF against the various explanatory factors, excluding RoACE, but including company dummies. The results for this specification are reported in Table 7. The explanatory is now very high, with an R^2 of 0.98. 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. Note that 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, 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. It is worthwhile to note that none of the explanatory variables with the exception of the firm and annual dummies are significant. When testing whether these parameters jointly are zero, we get an $F(4,32)$ statistic of 20.362. With a p-value of 0.834, we cannot reject the null that these factors should be excluded from out model.

Table 8. EV/DACF explained by annual dummies and company dummies

Variable	Coefficient	t-value
Hess	5.536	6.370
BP	13.396	15.414
Chevron	8.836	10.167
ENI	6.316	7.267
Exxon	11.836	13.619
Hydro	5.736	6.600
Occidental	7.936	9.131
PetroC	5.756	6.623
Repsol	7.616	8.763
TotalFinaElf	9.236	10.627
y97	0.400	0.545
y98	2.991	4.071
y99	1.850	2.519
y00	-1.223	-1.661

In Table 8 we report the results when explaining EV/DACF only by firm and annual effects. We then get the traditional result that the largest firms have the most significant company effects. The explanatory is still high, with an R^2 of 0.98. BP and ExxonMobil have by far the highest scores. That is, all things equal, ExxonMobil and BP trade at a premium to the rest of the industry. Note that this simplified regression, containing only year dummies (accounting for oil prices) and company dummies, have a very high explanatory power, and appears to be the model that best explains the companies' multiple. This is somewhat surprising, as we are not able to pick up any effect of the variables that are thought to be the most important when valuing oil companies. A likely reason for this is, as argued by McCormack and Vytheeswaran (1998) , that the reported accounts often does not contain very much information, and it is necessary to adjust the accounts substantially to obtain accurate information about the true financial shape of the companies. As oil companies must have a long-run perspective, it is then only natural that with a relatively short data set as ours, the companies that have the best reserves and prospects in 1997 is the same as in 2001, and that the firm effect is the most important explanatory factor.

5. Oil price sensitivity

By spreading their activities across the 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 curve in diagram 3 is steeper. This is the case, e.g., for Occidental, see Figure 4.

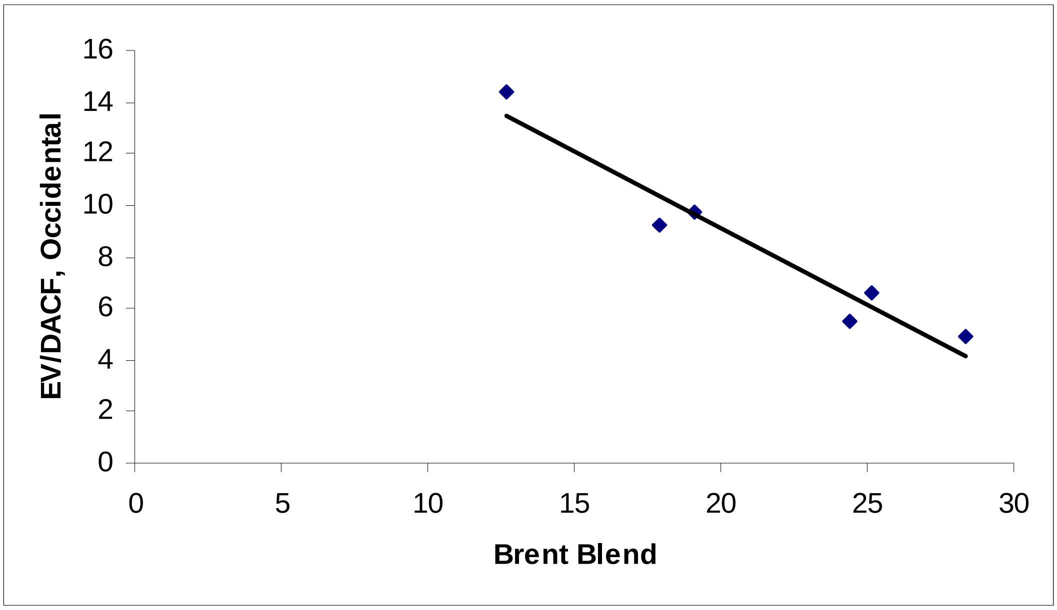

Figure 4: Oil price sensitivity. EV/DACF versus Brent Blend, Occidental, 1997-2002

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 5 lists some interesting key figures for the three companies.

	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

Figure 5: Oil price sensitivity, 2000-2002

Table 5 suggests a rather similar risk pattern for Statoil and ExxonMobil, There may be several reasons for this. First, 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 5. 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.

6. 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 not according to common perceptions. In our multivariate specifications there is a significant negative relation between EV/DACF and RoACE. We have offered some possible explanations to this result. First, the RoACE figures used in external analyses (and in our regressions) are non-normalised. To evaluate performance we would have preferred to normalise for changes in refinery margins and petroleum prices. Such data, generated in a consistent manner, are not readily available. Second, the RoACE figures suffer from the traditional shortcomings that financial accounts have in measuring true profitability. Third, in a multivariate econometric specification, the effect of short-term rentability can be crowded out by interdependent explanatory factors. Fourth, the high RoACE figures in this period may prove to be non-sustainable, as ambitious rentability targets effectively reduce the investment capacity. The last explanation seems to be acknowledged by many of the international oil companies, as we now see less emphasis on RoACE and more emphasis on reserve generation in future business plans.

We obtain strongly significant company effects. These do to a considerable extent coincide with company size, where large companies obtain higher valuation multiples. In addition there is a significant company reputation effect. A simplified valuation model that includes only year dummies (accounting for oil price) and company dummies (accounting for size and reputation) 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, especially not in studies of financial market behaviour.

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