The impact of diversification of production activities by major public oil companies on the value of their shares

Evgeny Busygin
PhD student
ORCID
E-mail: egbusygin@edu.hse.ru

National Research University Higher School of Economics, Moscow, Russia

Journal of Corporate Finance Research, Vol. 13, No. 4, pp. 106-117 (2019)
DOI: https://doi.org/10.17323/j.jcfr.2073-0438.13.4.2019.106-117
Received 21 July 2019 | **Peer-reviewed** 10 September 2019 | **Accepted** 3 December 2019

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Abstract

The studies devoted to the analysis of the diversification of production activities of the largest public oil companies and its impact on their cost do not consider production or financial factors, which are important indicators for assessing the development prospects of companies.

In this article, an econometric analysis will be carried out to identify the external and internal factors affecting the capitalization of the largest vertically integrated oil companies, and for the first time, profitability ratios for each of them will be used to test the hypothesis about the positive impact of diversification of activities on the upstream and downstream segments.

As a result of the study, it was found that an increase in profitability in the upstream segment leads to an increase in the value of oil companies shares, while profitability in the downstream segment turned out to be an insignificant factor that negatively affects the dependent variable.

The obtained results indicate that investors are more oriented to the financial indicator related to the production sector, ignoring the refining segment, which may lead to underestimation of oil companies and subsequent adjustments of stock prices.

The final conclusions can be used by investment companies and other stock market participants as part of investment decision making process regarding the acquisition/sale of shares of large vertically integrated oil companies.

As part of the development of a study on the valuation of oil companies, it could be analyzed the influence of the factors considered in the work on firms that conduct production activities separately in upstream and downstream segments.

Keywords: market capitalization, oil industry, system of factors, Tobin's Q, upstream and downstream, M&A

JEL classification: C10, G32, L16, P18

Introduction

Assessment of prospects of the future rise in value of investment projects is the basis for beneficiaries when making an investment decision. In order to define the current value of an asset and its capability to generate dividends within the chosen time horizon it is necessary to carry out a complex analysis of the factors which influence directly its value. The purpose of the present paper is revealing the group of such factors using an oil company as an example.

A distinguishing feature of defining the investment potential of resource-extracting companies is the necessity of analysis of their dependency on the raw materials prices and considering of their mechanisms of protection from reduction of the amount of financial receipts with the existing risks of high volatility in the raw materials markets. The macroeconomic analysis of the petroleum industry and its prospectives will give us an opportunity to answer the important question of expediency of purchase of oil companies' shares in crucial respect.

Due to a rapid growth of the global economy from 1965 to 2017 the demand for oil increased almost thrice from 1,524 до 4,470 million tons. The biggest contribution in the growth of the composite demand was made by Asia region where the considered indicator increased within the above period more than 9 times (from 163 to 1,598 million tons), while in North America the oil demand increased less than twice (from 620 to 1,056 million tons). This is due to a rapid development of the economies of Asia region. A notable increase of the share of oil consumption in this region also confirms this fact. From 10 % of the total world amount in 1965 it rose to 34.7 % by 2015 and in 2017 it amounted to 35.7 %.

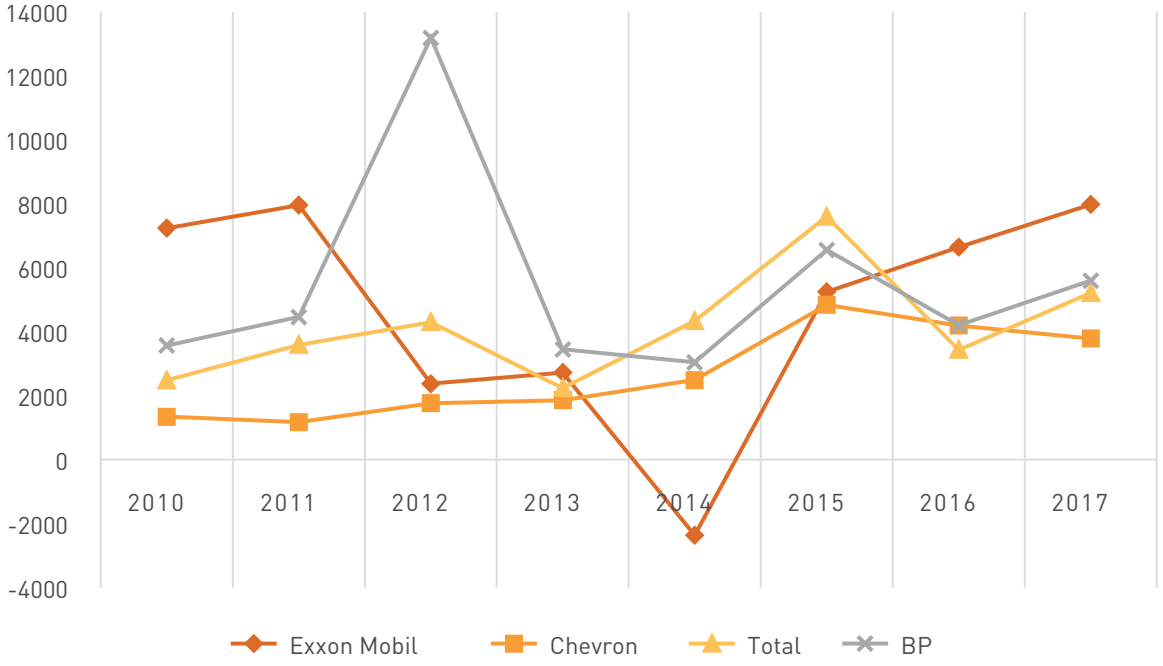
As the results of predicted values of the global oil demand presented in the reports of the global analytical organizations (BP, IEA, OPEC, Institute for Energy Studies of the Russian Academy of Sciences) show the average value of demand by 2040 will be 4,916 million tons, and it exceeds the corresponding value of 2016 by 13%.

It is important to note that in spite of differences in predicted values of demand for energy resources represented in analytical reports of various agencies and organizations an overall trend of oil demand in the coming decades can be seen. It means that development of the oil industry will go on and it will continue to generate profits for its shareholders.

When taking the optimal investment decision stock market traders use the methods of defining the fair value of public companies. Carrying out such analysis it is necessary to take into consideration as much factors influencing the share prices as possible. At present the issues related to assessment of capitalization of oil companies are of greatest relevance due to a high price volatility in the oil market which emerged in 2014.

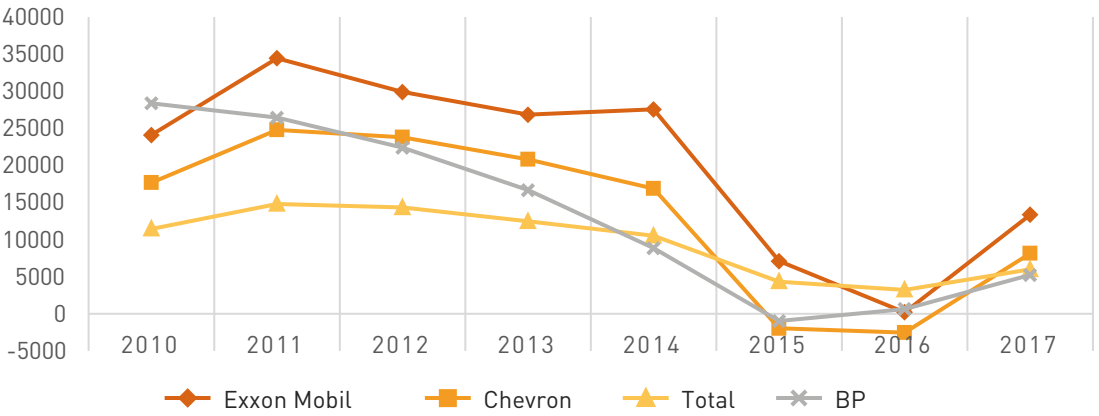
One of the mechanisms which protect capitalization of oil companies from decline is diversification of production activities into upstream and downstream segments. Figures 1 and 2 illustrate a collapse of operating income in the upstream segment for the largest oil companies Exxon Mobil, Chevron, BP and Total in 2014-2015 when oil prices fell significantly, while the same indicator in the downstream segment showed growth within the same period. The presented diagrams show that operating income in the downstream segment is unresponsive to the changes of the oil market which, in its turn, explains why prices of the companies' shares were not reduced pro rata with the fall in oil price.

Figure 1. Operating income of oil companies in the upstream segment from 2010 to 2017 (million US dollars)



Source: made by the author on the basis of companies' annual reports.

Figure 2. Operating income of oil companies in the downstream segment from 2010 to 2017 (million US dollars)



Source: made by the author on the basis of companies' annual reports.

The mechanism of activities diversification of the largest vertically integrated oil companies from the point of view of analysis of financial flows' cost-effectiveness in the upstream and downstream segments has not been studied before. Apart from diversification it is necessary to define and analyze other factors on which capitalization of oil companies depends.

Review of Literature

The majority of researches dedicated to assessment of influence of various factors on capitalization of oil companies are focused on detecting of influence of financial indicators which are external for the companies, for example, change of oil price [6; 7; 10; 12; 15], movement of stock indexes [14], inflation fluctuation and industrial production index [17].

Another group of papers considers not just external factors which are independent of the company operations, but also internal ones – financial and production indicators of companies [8; 11; 13].

The influence of the activity diversification is analyzed from various perspectives, for example, from the point of view of corporate management mechanisms [2] of oil companies in the upstream and downstream segments is considered in a small number of papers dedicated to analysis of influence of factors on companies' capitalization [3; 8; 12; 17].

Analytical paper [3] showed a useful effect of diversification of economic operations for oil companies which manifested itself in smoothing the risk of influence of the falling oil price on financial indicators of large companies in 1997 which was caused by a large cash flow from sold oil products. Influence of diversification was not studied in the paper from the econometric point of view.

Conclusions on existence of the asymmetric effect of influence of the oil price change and cost of companies' shares are stated in the following econometric papers. Research [15] makes the conclusion that growth of oil prices influences the prices of oil companies' shares more than fall of these prices.

However, it should be noted that the final conclusion in the paper was made on the basis of analysis of the selection which comprised large vertically integrated companies (BP, Roya Dutch Shell), as well as the companies which conducted business only in the upstream segment (Pharos Energy, Tullow Oil, Afren etc.). In this regard it is reasonable to carry out a more thorough econometric analysis using a homogeneous sampling which consists only of vertically integrated companies. Besides, among the independent variables applied by the authors of the research there are only financial indicators such as market risk calculated using the London Securities Exchange index, expected daily profitability of shares, oil price. Operational and financial indicators of the companies themselves are not included in the research.

In the other paper dedicated to revealing the asymmetric effect of influence of oil price change on share prices of oil companies the authors conducted the econometric analysis separately for the companies of the upstream segment and those from the downstream segment [17]. The research also states only external factors such as oil prices (Brent, WTI and Dubai) and macroeconomic indicators (inflation, industrial production index). The main conclusion of the paper made by the authors is that share prices of oil companies react asymmetrically to change of oil prices irrespective of the macroeconomic environment in the market, for which reason the authors think that investors should assess oil companies in more than one way in case of diversification of risks of the portfolio they build up.

In paper [12] the authors study external and internal factors and make the conclusion that different structure of amounts which account for the upstream and downstream segments of large vertically integrated companies results in a differently directed movement of shares' price of these companies in case of oil prices growth. However, just as in previous researches the authors focus on the cost of shares and their dependency on oil prices (the difference between the future and spot prices for oil) not including operational and financial factors of companies. However, unlike in previous papers the authors study six

largest vertically integrated companies (including Chevron, Exxon Mobil, Eni) but the econometric analysis is conducted for each company individually.

The authors of research [13] found out that irrespective of the sector of a resource-extracting company the revenue, mineral resource price and EBITDA are the underlying determinants which influence the value of securities. Just as in previous studies macroeconomic factors are not presented in this paper, in article [12] an individual approach to companies is applied – four companies from various sectors, including the power industry, thus it does not give a full picture of the sector because the obtained results may be accounted for the considered companies' leadership or range of activity (capitalization of each company exceeds 25 billion US dollars). Revealing of the diversification effect is not considered.

To sum up the results it should be noted that in the majority of the considered researches dedicated to analysis of the factors which influence capitalization of oil companies' operational and financial indicators which are important indices of assessment of a company development potential have not been considered. In this paper we will carry out the econometric analysis to find out external and internal factors which influence capitalization of the largest vertically integrated oil companies and we will use profitability ratios for the upstream and downstream segment for the first time in order to verify the hypothesis of a positive influence of activity diversification on the above segments.

Research Methodology

For the purpose of our research the following model was used as a basis [13]:

$$m_{it} = A_i + aP_t + \sum_{i=1}^{n} \beta_i KPI_{it} + \gamma R_{it} + u_t, \quad (1)$$

where m_{it} – ratio of EV (enterprise value) to DACF (debt-adjusted cash flow), A_i – a set of dummy variables specific for the company (fixed effects), P_t – price for Brent oil, KPI_{it} – vector of key performance indicators (production volume, costs, expenses for exploration and exploitation of deposits, Reserves Replacement Ratio and others), R_{it} – RoACE.

This model was chosen because it meets the criteria necessary to conduct our research. It comprises the most essential indicators of oil companies' activity, companies' value, besides, the model is intended for using panel data. For the purpose of our research we specified the model as follows.

$$\begin{aligned} Share\_price_{it} &= \beta_0 + \beta_1 * ROE_{it} + \\ &+ \beta_2 * Down\_income_{it} + \beta_3 * DPO_{it} + \\ &+ \beta_4 * Tobin_{it} + + \beta_5 * S\_ratio_{it} + \\ &+ \beta_6 * Prof\_down_{it} + \beta_7 * Prof\_up_{it} + \\ &+ \beta_8 * Cap\_d_{it} + \beta_9 * Purch\_oil_{it} + \\ &+ \beta_{10} * M\_A_{it} + u_i + e_{it} \end{aligned}, \quad (2)$$

where Share_price – price for companies' shares; ROE – return on equity; Down_income – ratio of income in the downstream segment to the consolidated profit in the upstream and downstream segments; DPO – dividend payment ratio; TobinQ – ratio of the company market value to its book value [4]; S_ratio – debt ratio; Prof_down – profitability of sales in the downstream sector; Prof_up – profitability of sales in the upstream sector; Cap_d – capital expenditures for downstream operations as related to aggregated capital expenditures; Purch_oil – the share of purchased oil in the prime cost; M_A – dummy variable, where 1 means a M&A deal, 0 – its absence.

The research will be carried out on the basis of the data obtained by the authors for 5 largest oil companies (Chevron, BP, Royal Dutch Shell, Total, Exxon Mobil) over the period of the 1st quarter of 2006 to the 3rd quarter of 2016. The information on M&A deals was collected using the database of Thomson Reuters Eikon; the financial indicators have been calculated by the authors on the basis of the information from Thomson Reuters Eikon database as well as from quarterly reports of companies (available at the electronic resources of such companies as well as in the database of SEC EDGAR System).

In the furtherance of our objective we will verify the following hypotheses:

- Increase in profits in the downstream segment has positive effect on securities value;
- Growth of profitability of sales in the upstream and downstream segments has positive effect on companies' share value;
- Increase of debt load depreciates share value;
- Increase of capital expenditures for the downstream segment has positive effect on company capitalization;
- M&A deals influence share value.

Data Analysis

Before drawing up the regression we preprocessed the obtained data, the results are presented in Table 1. On the basis of the analysis, one can conclude as follows:

1) the company Exxon Mobil has the maximum value of Tobins'Q of 2.14 and it is the only company which has the mean value and median value of Tobins'Q above 1. Further, it means that this company for a long time has been assessed by the investors as more attractive for investment and this resulted in its overestimation;
2) the average of S_ratio in the selection amounts to 0.59, i.e. on average a little bit over 50% of companies' assets are comprised of debt capital. Such significant size of the share of raised funds is accounted for investment projects which are characteristic of oil industry and are distinct in capital capacity and longtermness;
3) Exxon Mobil shows the highest mean and median value of return on share capital which indicates efficiency of its business activities;

Table 1. Descriptive Statistics Dependent and Independent variables for Each Company

	SHARE PRICE	TOBINQ	S_RATIO	ROE	PURCH OIL	PROF UP	PROF DOWN	M_A	DPO	DOWN INCOME	CAP_D
BP											
Mean	48.48	0.60	0.61	0.03	0.86	0.30	0.02	0.86	0.22	0.24	0.18
Median	44.29	0.48	0.61	0.04	0.88	0.34	0.02	1.00	0.32	0.18	0.18
Maximum	73.95	1.14	0.66	0.13	0.95	0.77	0.05	1.00	1.67	2.79	0.35
Minimum	28.88	0.34	0.57	-0.20	0.58	-0.22	-0.03	0.00	-3.33	-0.58	0.08
Std, Dev,	12.75	0.24	0.02	0.05	0.06	0.21	0.02	0.35	0.79	0.50	0.07
Skewness	0.58	0.99	0.21	-1.93	-2.48	-0.73	-0.25	-2.08	-2.17	3.21	0.52
Kurtosis	2.21	2.58	2.26	9.71	11.02	3.68	3.90	5.33	11.01	17.11	2.52
CHEVRON											
Mean	93.63	0.95	0.44	0.04	0.70	0.48	0.02	0.65	0.26	0.15	0.12
Median	93.58	0.94	0.43	0.04	0.70	0.51	0.02	1.00	0.28	0.13	0.10
Maximum	130.55	1.42	0.50	0.09	0.89	1.06	0.09	1.00	3.57	4.01	0.28
Minimum	57.97	0.55	0.41	-0.01	0.44	-0.66	-0.01	0.00	-3.45	-2.89	0.04
Std, Dev,	19.57	0.18	0.03	0.02	0.11	0.39	0.02	0.48	0.97	0.83	0.06
Skewness	-0.03	0.34	0.71	-0.44	-0.48	-1.29	1.04	-0.63	-1.12	1.14	0.82
Kurtosis	1.90	3.20	2.04	2.65	2.78	4.41	4.50	1.40	10.98	16.32	2.57

	SHARE PRICE	TOBINQ	S_RATIO	ROE	PURCH OIL	PROF UP	PROF DOWN	M_A	DPO	DOWN INCOME	CAP_D
EXXON MOBIL											
Mean	81.08	1.36	0.51	0.06	0.75	0.68	0.02	0.81	0.41	0.25	0.17
Median	83.88	1.21	0.50	0.06	0.76	0.73	0.02	1.00	0.27	0.18	0.12
Maximum	101.20	2.14	0.55	0.12	0.80	1.10	0.07	1.00	1.83	1.09	0.83
Minimum	57.07	0.91	0.48	0.01	0.63	-0.02	0.00	0.00	0.14	-0.03	0.05
Std, Dev,	11.30	0.34	0.02	0.03	0.04	0.26	0.01	0.39	0.38	0.22	0.21
Skewness	-0.31	0.87	0.17	0.05	-1.15	-1.14	1.35	-1.61	2.53	1.88	2.62
Kurtosis	2.26	2.60	2.40	2.49	3.54	4.01	6.52	3.60	8.94	6.97	8.24
ROYAL DUTCH SHELL											
Mean	24.54	0.68	0.53	0.03	0.91	0.35	0.01	0.93	0.91	0.16	0.19
Median	25.19	0.62	0.53	0.03	0.91	0.43	0.01	1.00	0.41	0.23	0.17
Maximum	30.33	1.10	0.59	0.08	0.97	0.71	0.05	1.00	6.71	4.86	0.40
Minimum	16.93	0.42	0.49	-0.05	0.83	-1.07	-0.01	0.00	-0.87	-6.68	0.09
Std, Dev,	3.36	0.18	0.03	0.03	0.03	0.31	0.01	0.26	1.38	1.37	0.07
Skewness	-0.32	1.03	0.23	-0.50	-0.70	-2.55	1.15	-3.38	2.69	-2.13	0.87
Kurtosis	2.45	3.02	2.61	3.46	3.06	11.43	4.05	12.41	10.54	18.79	3.63

	SHARE PRICE	TOBINQ	S_RATIO	ROE	PURCH OIL	PROF UP	PROF DOWN	M_A	DPO	DOWN INCOME	CAP_D
TOTAL											
Mean	44.19	0.69	0.59	0.04	0.74	0.17	0.02	0.84	0.41	0.79	0.13
Median	42.58	0.60	0.59	0.04	0.74	0.21	0.02	1.00	0.52	0.17	0.12
Maximum	60.26	1.19	0.64	0.10	0.95	0.35	0.08	1.00	1.93	25.59	0.34
Minimum	33.24	0.45	0.57	-0.06	0.60	-0.41	-0.08	0.00	-3.19	-0.61	0.04
Std, Dev,	6.77	0.23	0.02	0.03	0.06	0.13	0.03	0.37	0.78	3.88	0.06
Skewness	0.69	0.94	1.05	-0.93	1.14	-3.17	-1.09	-1.83	-2.18	6.28	1.05
Kurtosis	2.40	2.44	3.41	5.38	7.55	13.80	5.44	4.34	12.13	40.66	4.05

4) Royal Dutch Shell shows the highest mean value of DPO – 0.91, but it should be taken into consideration that the mean value is 0.41 (50% of quarterly dividend payout against profit was less than 0.41);
5) for the majority of considered variables |As| > 0.5 which is indicative of a significant asymmetry. Over 50% of observations for each variable have values below average. This fact is accounted for abnormally high observation results which, in our case, cannot be excluded because it will impair the research quality;
6) for all variables Ek > 1 which is indicative of significant kurtoses. In other words, the distribution curves of observations are characterized by peakedness while the observations themselves cluster around the mean value.

On the basis of the submitted data one may make a conclusion of existence of moderate significant positive relations between the following factors: Prof_down and Down_income, TobinQ and ROE, Prof_up and TobinQ, Prof_up and ROE. There are no strong relations between the dependent variable and independent ones, as well as there are no such relations between independent variables themselves (modules of obtained correlations do not exceed 0.8) which is indicative of absence of multicollinearity. Nevertheless, let's calculate variance inflation factors (Table 2). As long as VIF of each explanatory variable is less than 10 it indicates absence of multicollinearity between the variables [24, p. 39].

Table 2. Calculation of variance inflation factors

Variable	VIF	1/VIF
TobinQ	2.5	0.400065
Prof_up	2.45	0.408689
ROE	1.99	0.503379
Purch_oil	1.77	0.564856
S_ratio	1.6	0.623972
Prof_down	1.38	0.724882
Cap_d	1.16	0.864453
DPO	1.13	0.882653
M_A	1.1	0.912802
Down_income	1.09	0.918572
Mean VIF	1.62	

Source: comprised by the author.

We conducted a Breusch-Pagan test for heteroscedasticity where Prob = 0.1946 which exceeds 0.05. So, the null hypothesis is not rejected, hence we can make the conclusion of absence of heteroscedasticity.

The final results of the developed models are presented in Table 3. Developed model 1 of pooled regression is significant at any reasonable level of significance because Prob is less than 0,01. R-squared amounts to 0.69. As judged by the model such independent variables as Prof_down, DPO, Down_income, ROE turned out to be insignificant at the level of significance of 10%.

In order to take into consideration the time component model 2 with fixed effects was developed which is significant at any reasonable level of significance (Prob < 0,01); R-squared (within) amounts to 0.2895. On the basis of the obtained results one may make the conclusion that inter-individual differences between companies manifest themselves stronger than dynamic ones. As long as all predicated variables vary with time all ratios have been evaluated.

The major part of the considered variation of data can be attributed to individual effects: rho = 0.70. The results of F-test indicate that it is necessary to use the deterministic effects model. On the basis of the model the independent variables such as ROE, Prof_up, Prof_down, M_A, DPO, Down_income were insignificant.

Conclusion

The results of verification of hypotheses in accordance with the regression analysis using the fixed effects model are presented in Table 4.

Analyzing the influence of the production activities diversification by the largest vertically integrated companies applying the approach which divides factors into profitability in the upstream and downstream segments it should be noted that growth of profitability in the upstream segment results in increase of shares' price while profitability in the downstream segment turned out to be an insignificant factor which adversely affected the dependent variable.

The obtained results indicate that investors pay more attention to the financial indicator related to the upstream segment leaving aside the downstream segment and this may cause underestimation of oil companies and subsequent correction of shares' prices. This conclusion is confirmed by behavour of oil companies' securities (Figure 3).

Companies' capitalization follows change of oil price but it does not decline so much as the price for the above energy source. Since 2013 and by 2015 the oil price had slumped by 60%, while within the same period the price for shares of the companies Chevron, ExxonMobil and Royal Dutch Shell, taken as an example, reduced by 28%, 23% and 36% respectively. It should also be noted that as a part of price recovery which started in 2015 the price of oil companies' shares bounced back almost to the figure of 2013.

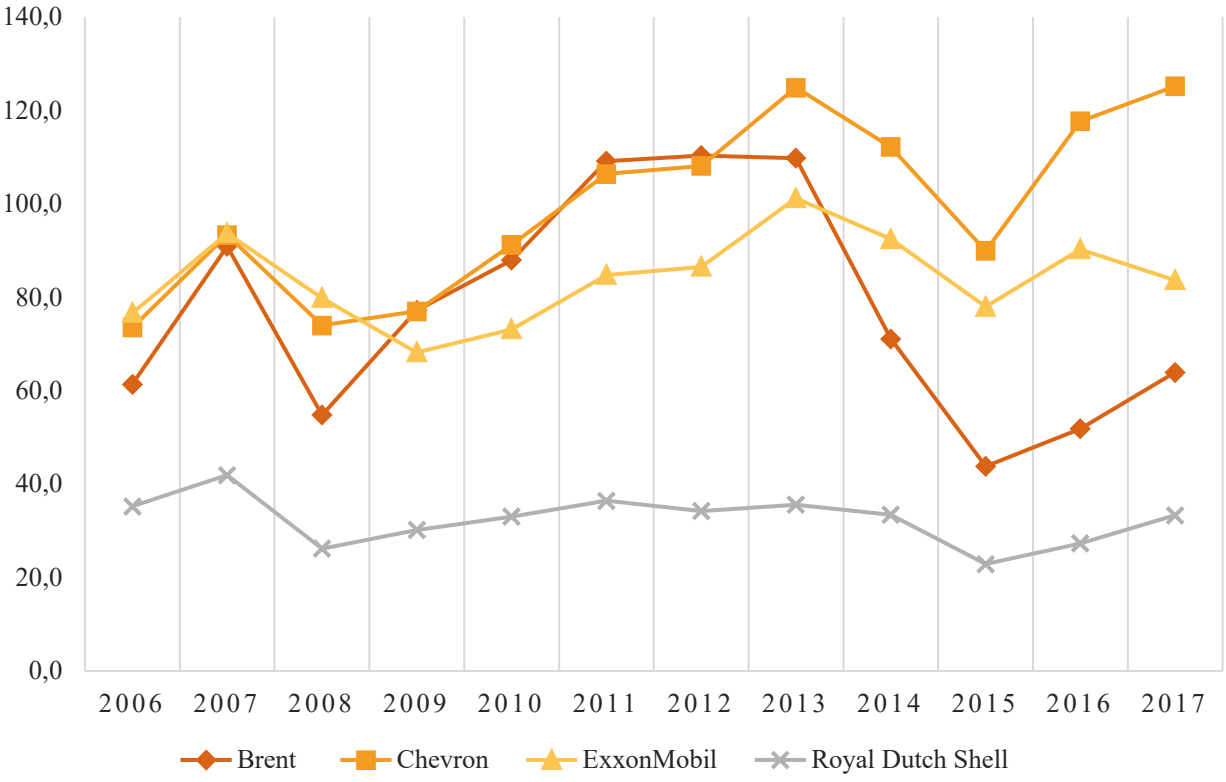
Table 3. Results of Econometric Study of the Pooled Regression Model and Fixed-Effects Model

	Model 1		Model 2	
Independent variables	Coef.	T	Coef.	T
ROE	24.962	0.56	22.2	0.68
Down_income	-.43	-0.72	-.24	-0.62
DPO	-1.02	-0.83	1.06	1.27
TobinQ	19.6	4.19***	18.6	4.63***
S_ratio	-123.1	-5.85***	-166.4	-4.93***
Prof_down	-41.02	-0.64	-54.9	-1.25
Prof_up	17.8	3.37***	5.6	1.57*
Cap_d	-32.31	-3.17***	-27.2	-3.93***
Purch_oil	-110.6	-7.87***	-33.9	-2.40**
M_A	-4.8	-1.66*	-1.07	-0.55
_cons	197.6	13.75***	161.2	8.28***

*** – the factor is significant at the 1% level of significance, ** – the factor is significant at the 5% level of significance, * – the factor is significant at the 10% level of significance.

Source: comprised by the author.

Figure 3. Prices for shares of some companies and Brent oil in the period of 2006 to 2017



Source: comprised by the author on the basis of the database of Thomson Reuters Eikon.

Table 4. Research Results

Hypotheses	Obtained results	Interpretation
1. Growth of income in the downstream segment has positive effect on security prices.	Growth of income in the downstream segment which was expressed as Down_income variable came to be insignificant, therein it should be noted that the assessment in the deterministic effects model and Spearman's correlation coefficient have the minus sign	Notwithstanding that companies improve their financial results owing to the downstream segment when oil price drops, the investors take a negative view of the fact of oil price decrease which makes them sell shares
2. Growth of profitability of sales in the upstream and downstream segments has positive effect on the price of companies shares.	Prof_up variable turned out to be significant at the 10% level of significance while Prof_down came to be insignificant, nonetheless assessments in the deterministic effects model (and other models) have the plus and minus sign respectively	Growth of profitability of sales in the upstream segment results in a rise in companies' share prices while growth of profitability of sales in the downstream segment is related to a drop in prices. The minus sign may be accounted for the fact that oil companies are especially actively involved with the downstream activity when oil price declines, such actions, though they lead to a drop in companies' share prices, mitigate such a drop
3. Increase of debt load decreases the share price	The debt ratio S_ratio turned out to be significant and, as we presumed, it has a negative effect on share prices	Increase of the debt ratio by 0.01 results in decrease of companies' share prices by 166 US dollars, all other conditions being equal
4. Increase of investment costs in the downstream segment has positive effect on the company capitalization	The investment costs in the downstream segment (Cap_d) turned out to be significant, the obtained assessment has the minus sign	Increase of investment costs in the downstream segment against the aggregate investment costs by 0.01 results in a drop in companies' share prices by 27 US dollars, all other conditions being equal
5. M&A deals influence the share prices	M&A variable turned out to be insignificant in the final model	Probably, the issue of influence of M&A deals on share prices should be studied in more detail using monthly data instead of quarterly data

Source: comprised by the author.

The following may be added to the results represented in Table 4:

- changes in the capital structure of large oil companies influence share price: debt growth leads to price decline;
- growth of investment costs in the downstream sector as compared to the aggregate investment costs has an adverse effect on the companies' value. It stems from the fact that when oil price declines large oil companies cut investment costs in the upstream sector simultaneously increasing the investment costs in the advanced petroleum refining sector;
- when Tobin's Q increases the price of shares of large oil companies grows. This suggests that investors are ready to invest their money in the shares of the companies which are overestimated from the market point of view as compared to the shares of other oil companies.

In order to promote the research of assessment of oil companies' value it is reasonable to carry out the analysis of influence of the considered factors not just on capitalization of the largest vertically integrated oil companies but also of the companies carrying out production separately in the upstream and downstream segments. This will let us describe in more detail and explain the obtained conclusions as well as to conduct the comparative analysis of the factors which influence oil companies conducting production in various segments.

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