Saint Petersburg State University

Graduate School of Management

Master in Corporate Finance

INDUSTRY-SPECIFIC VALUE CREATION DRIVERS OF OIL AND GAS COMPANIES IN RUSSIA, INDIA AND CHINA

Master's Thesis by 2nd year student

Concentration – Corporate Finance

Yulia Yarovaya

Research Advisor:
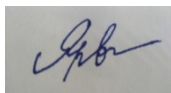
Associate Professor, Tatiana A. Garanina

St. Petersburg

2017

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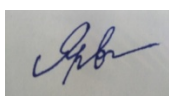
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I, second year master student, program «Management», state that my master thesis on the topic «Industry-specific value creation drivers of oil and gas companies in Russia, India and China», which is presented to the Master Office to be submitted to the Official Defense Committee for the public defense, does not contain any elements of plagiarism.

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АННОТАЦИЯ

Автор	Яровая Юлия Вячеславовна

Название ВКР	«Определение драйверов ценности нефтегазовых компаний России, Индии и Китая»
Направление подготовки	38.04.02 Менеджмент Корпоративные Финансы
Год	2017
Научный руководитель	Гаранина Татьяна Александровна
Описание цели, задач и основных результатов	Нефтегазовая отрасль давно является предметом многочисленных исследований, однако количество исследований по развивающимся рынкам довольно невелико. Сейчас внимание к исследованиям драйверов ценности в отрасли растет ещё больше на фоне кризисной ситуации на рынке. В связи с этим, было решено посвятить данную работу определению драйверов прибыльности и ценности нефтегазовых компаний, в частности в России, Индии и Китае – странах, лидирующих в нефтегазовой индустрии среди стран с развивающейся экономикой. Для этого были поставлены следующие задачи. Во-первых, провести обзор литературы по ценностно-ориентированному менеджменту, в частности, по модели остаточной прибыли и модели Дюпон, а также провести обзор специфических характеристик нефтегазовой индустрии. Во-вторых, собрать необходимые данные и сформировать выборку для проведения регрессионного анализа с использованием компонентов модели Дюпон и специфических для отрасли факторов в выбранных странах. Наконец, сделать выводы о взаимосвязях операционных компонентов модели Дюпон и специфических для отрасли факторов с прибыльностью и созданием ценности в проанализированных странах и предоставить практические рекомендации менеджерам и инвесторам. В результате анализа, были определены несколько драйверов прибыльности и ценности для вошедших в выборку компаний с помощью моделей, объединяющих показатели первого уровня модели Дюпон и специфические для отрасли показатели, что позволило сделать соответствующие управленческие выводы.
Ключевые слова	Драйверы ценности, создание ценности, оценка компаний, нефтегазовые компании

ABSTRACT

Master Student's Name	Yulia Yarovaya
Master Thesis Title	"Industry-Specific Value Creation Drivers of oil and gas companies in Russia, India and China"
Main field of study	38.04.02 Management Corporate Finance
Year	2017
Academic Advisor's Name	Tatiana A. Garanina
Description of the goal, tasks and main results	Oil and gas industry has always been an attractive field for research, although the number of studies for developing markets is not high. Now the importance of the investigation of value creation drivers in the industry is only rising, following the crisis situation in the market. That is why it was decided to devote this work to the identification of profitability and value creation drivers in oil and gas companies, in particular in Russia, India and China as ones of the most prominent players in the industry and representatives of developing economies. In order to do this, the following objectives were stated. Firstly, to conduct a literature review on value-based management concepts, in particular residual income valuation model and Dupont model as well as specifics of oil and gas industry. Secondly, to collect the data and form the representative dataset for the regression analysis on the components of DuPont model and industry-specific factors across the countries. Finally, to draw conclusions about the relationships of operational DuPont model components and industry-specific factors with profitability and value creation in the countries of analysis and provide practical implications for managers and investors based on the research. As a result, several profitability and value creation drivers have been identified via the models uniting first-level DuPont components and industry-specific indicators, allowing to provide corresponding managerial implications.
Keywords	Value drivers, value creation, valuation, oil and gas

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Introduction

The concept of value-based management has been established as one of the key concepts in managing companies' performance during the recent decades. Starting with the fundamental works by [Rappaport, 1986; Brayley and Mayers, 1981; Copeland, 1995] it has now become an integral part of strategic and operating decision-making in business. The principles of value-based management which set the maximization of the value for the shareholders as a key goal also serve as a basis for the evaluation of the company's performance and the identification of the value drivers.

This master thesis is devoted to the identification of the value drivers in oil and gas industry. The sector was chosen as one of the most influential in global economy and, due to a recent crisis, the one that requires a clear understanding of performance and value creation factors. The countries for the study - Russia, India and China – were identified as those that have been investigated much less than mature western ones. The identification of value drivers will be performed via Dupont Model with its operational components: many authors focus on DuPont analysis on the first level of the model, considering operating margin, assets turnover and leverage, but there is a limited number of works connected to the operational level which will be explored here.

Therefore, main goal of the research is to identify the main drivers of profitability and value creation in oil and gas companies in Russia, India and China.

Consequently, the objectives of the research are the following.

- Conduct a literature review on value-based management concepts, in particular residual income valuation model and Dupont model as well as specifics of oil and gas industry
- Collect the data and form the representative dataset for the analysis
- Carry out the regression analysis on the components of DuPont model and industry-specific factors across the countries
- Draw conclusions about the relationships of operational DuPont model components and industry-specific factors on the profitability and value creation in the countries of analysis
- Provide practical implications for managers and investors based on the research

The results of the work will be useful in the following situations:

- Firstly, the results of the research will be valuable for managers of oil and gas companies across countries studied. To get an adequate return on equity and assets, as well as control the value of the company, it is crucial to understand the drivers that contribute to the change and take into account the models that can be used for the analysis.

- Secondly, the results will be useful for investors and investment analytics that are making forecasts about the companies' performance compared to the expectations of the market. While traditional multipliers are often used for the short-term analysis, it would be beneficial to understand how the components of DuPont model, coupled with industry-specific factors, could contribute to the explanation of profitability and value of the companies.

Chapter 1. Value-based management in oil and gas industry

During recent decades the issue of shareholder value creation has attracted a wide interest in both academic and business world. Such authors as [Rappaport, 1986; Stewart, 1991; McTaggert, 1994; Copeland, 1995; Weissenrieder, 1997; Arnold, 1998; Koller and Murrin, 2000; Young and O'Byrne, 2001] have highlighted the necessity of the value-based approach for the financial management of the companies, as well as numerous studies were performed across various markets aimed at the identification of the main drivers of value. Much of literature published relates to value-based management tools influencing the share price of the company, in other words, the straightforward value creation. Another topic which is being discussed largely is implementation of value-based management and its implications on corporate level. Third direction of the studies conducted is devoted to the conflict between stakeholder and shareholder view on the firm. Moreover, it has been also highlighted by several researchers that value is one of the best performance measures as it is basically the only one that requires the analysis of complete information, which also explains its growing popularity.

Generally, there are two main somehow contradicting concepts defining the goal of the companies' existence and the groups interested in their successful performance: shareholder versus stakeholder perspective. The first implies that the value should be maximized for the owners of the company and all the providers of equity, while the second is taking into account all the parties that, according to the definition, affect or can be affected by the organization. Therefore, in performance management the shareholder perspective implies mostly the usage of indicators that would reflect the value maximization for investors, and the stakeholder perspective requires multi-criteria metrics, such as balanced scorecard. Stakeholder approach can be rather beneficial in certain situations, but the categories of interested parties that need to be considered are rather blurred, as well as the interests themselves can be contradictory and hard to weight against each other. The shareholder perspective in that sense is much clearer and therefore has become the basis for the concept of value-based management.

Nevertheless, stakeholder perspective is connected to the paradigm shift considering management objectives. While earlier on earnings growth was mostly seen as an ultimate goal, it has been shown via the residual income model that constant growth does not necessarily generate the value for the company. As Jensen [2001] states in his work, long-term value

maximization as an ultimate goal does not yet provide the management with a strategy to achieve it, and here is when the stakeholder theory helps to explain the process of value creation.

1.1. Value-based management concept

The concept of value-based management implies that the main goal of the company is to maximize the value for all the shareholders, which is the main responsibility of the management. It has various definitions according to different researchers, but all of them concentrate on several main aspects: value creation (strategy), managing for value (corporate governance system, organizational structure) and company valuation. In other words, value-based management suggests a universal metric – value – which serves as a base for all other actions of the firm and aligns the strategic perspectives with key value drivers. When implemented accordingly, it unites both financial and non-financial aspects of management and concentrates on the main value drivers which should be the base for decision-making in the company.

Fundamental works on value based management include publications by [Copeland, Koller, 1994; Stewart, 1991; Rappaport, 1986]. In one of the first works devoted to the topic, Rappaport [1986] provides a theoretical and a practical approach to value-based management. While theoretical approach is concentrated on the review of fundamental indicators of shareholder value creation - planning, evaluation of performance, capital market information - practical approach is connected to its actual implementation: the author suggests using the marginal indicators, cost of capital and growth rates in order to set the performance levels.

As identified by Copeland [1995], value-based management is the system of governance when the aspirations of the firm, analytical tools and management processes are aimed at maximizing the company value by concentrating on the value drivers. According to Claes [2006], the main aspects highlighted in all the definitions of value-based management are the following. Firstly, it is generally distinguished from traditional performance management by the usage of cost of capital. While net profits cover only the cost of debt, value is created by including both costs of debt and equity. Secondly, value-based management is aimed at economic value creation via the residual income approach, which implies that value is created only when all operating costs and cost of capital are covered. Third, it is a managerial concept, meaning that it is not limited to calculating the value. It combines a lot of different techniques and tools which help the firm

achieve its goals in different organizational areas. Finally, value-based management system is based on value drivers, involving both financial and non-financial concepts.

The crucial component of value-based management is the identification of the value drivers that affect the company's performance and help top-management understand the relation of their decisions with all the levels of the organization. Value drivers can be analyzed on different levels according to the decisions that the manager needs to make. In particular, such value drivers as operating profit margin or sales growth can be used in the analysis of all business units but are too general to be applied at operational level where other drivers are useful. In one of the first articles on value-based management, Koller [1994] highlights that value based management links value as a goal with processes and mechanisms of its implementation. In particular, he states that value drivers can be divided into three main categories: generic (for return on investment they consist in operating margins and invested capital), business unit (capacity management, sales force productivity) and "grass roots" where the drivers are connected to specific decisions of front-line managers (unit sales, accounts receivable terms and etc.). Moreover, Koller emphasizes that scenario and sensitivity analyses are the main tools of value drivers' identification.

According to the [Bukhvalov, Volkov, 2005] there are two main classes of value indicators: market and fundamental ones. According to the market approach, the value of the company is presented as capitalization and is generated by financial market where the ownership rights are being redistributed among different participants. As for the fundamental value of the company, it is determined by the cash flows of the company and related to the main activities of the company and the product market where it operates. Nevertheless, whatever type of value the company is concentrating on, it is crucial to understand which factors are influencing the financial results and, consequently, if there is a system that would help to identify the areas of focus.

As highlighted in [Volkov, 2006] value-based management is a system aimed at maximization of the value created when the evaluation of business performance and remuneration are based on the indicators of value added. The concept of value-based management unites the following procedures and decisions: the choice of the model and procedures of identification company's value for shareholders; monitoring of the changes in value; identification of the drivers of new

value creation and the particular linkages between shareholders value and corporate business-strategies; development of the financial strategy of the company aimed at value creation; identification of mechanisms which would align the interests of shareholders and managers, as well creation a system of measurement of performance.

The process of valuation itself, according to the author [Volkov, 2006], consists of three important decisions: about the valuation model, the main performance indicators aimed at monitoring the changes and creation of value drivers. Therefore, one of the most important questions is the choice of a suitable valuation model and instruments that would help to make decisions leading to shareholder value maximization on all the levels of the firm. The choice of the valuation model is implying two important issues: if it is an adequate management tool and if it is a reliable instrument to explain the changes in the value of the company. As for the first one, it requires answering a number of questions considering the performance indicators used in the model: if it reflects correctly the results of the activities of the company; if it is linked to shareholder value creation and if it can be a base for decision-making system; how it would solve the agency problem and align the interests of managers and shareholders; if it can be a base for management incentives system and if it is understandable for managers and investors. Finally, the author also highlights that the chosen indicator should provide the possibility to build a system of value drivers upon it, as well as take into account the individual results of every manager. Regarding the reliability of the model, it means how well the results of fundamental valuation are linked with the actual market price. Considering performance indicators, the most common ones such as return on equity, return on assets and the degree of financial leverage will be discussed further in the work.

1.2. Fundamental value and residual income

One of the main instruments of identification of the value of the company in value-based management is the calculation of fundamental value via the residual income approach. Residual income model implies that the fundamental value of the company depends on four main factors: amount of capital invested, actual return on equity, required return on equity and the stability of the spread of the results (the ability of the company to achieve the return on equity which is higher than the required one). According to [Volkov, 2006], Residual Income model includes two

main elements: book value of equity and discounted residual income cash flows that contribute to the increase in the difference between fundamental and book value. Therefore, the central element of the model is Residual Income that can be presented with the following formula

$$RI_i = \pi_i - k \times I_{i-1} \quad (1)$$

Where RI_i – residual income of the year i

π_i – Net income for the year i

k – Required return on capital

I_{i-1} - Investments in the beginning of the year

In this work, residual income will be calculated via the residual earnings of the company which are computed by subtracting equity cost from net income while investments are understood as book value of equity. Therefore, here the formula can be presented the following way:

$$RE_i = NI_i - k_e \times E_{i-1} \quad (2)$$

Where

RE_i - residual earnings in the period i

NI_i - net income in the period i

k_e - cost of equity

E_{i-1} - equity in the period i-1

Consequently, the value of the company from the equations above can be represented as follows, using residual earnings as a basis

$$V_E^{REM} = E_0 + \sum_{i=1}^{\infty} \frac{RE_i}{(1 + k_e)^i} \quad (3)$$

Where

V_E^{REM} – value of the company calculated via residual earnings model

E_0 - equity of the company at a period zero

RE_i - residual earnings at period i

k_e - cost of equity (return on equity)

The return on equity can be calculated via CAPM Model, as it was done in this work, following the formula below:

$$r_e = \ r_f + (r_m - r_f) \times \beta, \qquad (4)$$

Where

r_e - required return on equity

r_f – risk-free rate (in this work computed as average return on government bonds of the corresponding country for each year: Russian Government 10Y Bond – RUGBITR10Y; India 10Y Government Bond – GINDR10Y; China 10Y Government Bond)[1].

$r_m - r_f$ - equity risk premium of the country for each year (in this work - based on the data provided by A. Damodaran[2])

β – beta of the stock (measure of the stock volatility relative to the market).

Compared to dividend discount model and discounting of cash flows, residual income model is distinguished by several characteristics. Firstly, residual income presents the result of investment and operating activities of the company that create the value. Secondly, residual income, based on accounting principles of gains and losses calculation per period, correctly measures the value added during the period. Finally, in this model additional investments are treated not as losses but as factors that add value. Thus, residual income creates value for the company, at the same time being a metric of financial results. That is why it was used in this work for the calculation of fundamental value.

1.3. Value drivers tree

One of the most common tools used for a comprehensive analysis of value drivers which affect the value generated for shareholders and at the same time can serve as instruments for current and strategic management is Dupont model. It was implemented in 1919 by Donaldson Brown, finance executive of E.I. du Pont de Nemours in order to identify the drivers of change in financial performance of the company, and has become extremely popular due to the

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[1] https://in.investing.com/rates-bonds

[2] Equity Risk Premiums: Determinants, Estimation and Implications // New York University, Stern School of Business

representative approach and clear identification of the factors influencing the value on different levels. It is considered to be one of the clearest and universal means of identification of the value drivers of the company, as it is the most commonly presented disaggregation scheme for ROA/ROE. Generally, in a short form, ROE and ROA are calculated the following way

$$ROE_j = \frac{NI_j}{E_{j-1}} \quad (5)$$

$$ROA_j = \frac{NOI_j}{A_{j-1}} \quad (6)$$

Where

NI_j is the net income of the company for period j,

E_{j-1} stands for equity of the previous period

NOI_j defines net operating income of the company for period j

and A_{j-1} – total assets for the period j-1.

Return on equity characterizes the ability of the company to pay back the investments of the owners and the lenders. Nowadays, many companies are paying special attention to this indicator, for example, by connecting ROE to the salaries of management. In the residual income model it is used to identify the fundamental value of the company. Return on assets indicates the level of net income that the assets of the company are generating, which is crucial for understanding the short-term impacts on the value. It can be also useful in the analysis of strategic alternatives and in particular mergers and acquisitions as it measures the influence of the transaction on the total purchase price.

Financial leverage, which "unites" ROE and ROA, is also one of the most popular indicators that would be used further in the study. It measures the level of financial risk of the company by identifying the relationship between total assets and shareholders equity, indicating the amount of equity which was used to purchase the assets. However, financial leverage is often determined by management for several years ahead and thus is not significantly influenced by market conditions.

$$I_{FLEV} = \frac{ROE}{ROA} \quad (7)$$

Dupont model for these profitability indicators can be presented as follows

$$ROE = Operating\ Profit\ Margin \times Asset\ Turnover \times Financial\ Leverage\ (8)$$

$$ROA = Operating\ Profit\ Margin \times Asset\ Turnover\ (9)$$

Or, more precisely

$$ROE = \frac{Operating\ Income}{Sales} \times \frac{Sales}{Assets} \times \frac{Assets}{Equity} \quad (10)$$

$$ROA = \frac{Operating\ Income}{Sales} \times \frac{Sales}{Assets} \quad (11)$$

Further, return on assets component in the model can be presented via the "lowest" level of the indicators:

$$ROA = \left(1 - \frac{COGS}{Sales} - \frac{General\ expenses}{Sales} - \frac{Managerial\ Expenses}{Sales} - \frac{Tax}{Sales} + \frac{EBI^{other}}{Sales}\right) \div \left(\frac{Non-current\ Assets}{Sales} + \frac{Cash}{Sales} + \frac{Non-cash\ Working\ Capital}{Sales}\right) \quad (12)$$

Where $Non - cash\ WC = Invetory + Account\ Receivable - Accounts\ Payable$ (13)

As it is shown in the formula above, DuPont model decomposes return on assets (sales divided by assets) into asset turnover and profit margin. Return on equity is presented as net return on sales multiplied by assets turnover and opposite financial leverage.

The main advantage of the Dupont Model is its simplicity as it shows how the key financial ratios of the company are linked to financial performance. Moreover, it provides the opportunity to see how changes in the company can affect financial results.

1.4. Application of Dupont model: Empirical studies overview

As one of the most popular instruments for identification of value drivers, DuPont model has attracted the attention of numerous researchers. There is a number of studies for foreign markets

based on DuPont analysis on different levels, with the majority of them concentrated on explanatory and predictive ability of DuPont model in terms of future earnings of the company and the applicability of this forecast for residual income valuation.

Overall, prior studies have shown that asset turnover and profit margin hold explanatory power with the respect to changes of profitability. For example, the study by Nissim and Penman [2009] is based on the residual income framework where DuPont analysis is used: return on net operating assets is decomposed into asset turnover and profit margin. This division contributes to the significant improvement in the forecast, and has a simple explanation: while profit margin usually represents the pricing power of the company, asset turnover is based on efficiency and asset utilization. It is logical to expect the competitive environment of the industry to influence those indicators differently. When the levels of profit margins are high, usually more and more companies are attracted to the segment, which in turn causes the increase in the rivalry and return of the profit margins to normal levels. As for asset turnover, it is less likely to change due to shifts in competition as the efficiency of asset utilization is harder to imitate.

As for the ROE itself, which is also called an accounting rate of return, it is regarded as a fundamental summary measure in ratio analysis. In his theoretical work, Penman [2001] examines the role that ROE plays in pricing the stocks. According to Penman, investment analysis includes investigating two main components: information indicating future earnings and information implying the discounting rate of the future returns, in other words, risk. The author states that traditionally ROE is considered as a profitability measure but, nevertheless, ROE also reflects the expected rate of return: previous studies [Ohlson, 1900] highlight that it is related to leverage and, consequently, to risk. That is why in his work Penman refers to ROE as an indicator of both profitability and risk.

Before the study of Penman [2001] just a few studies were conducted on return on equity. Several authors, for example, [Salamon, 1966; Vatter, 1966; Livingstone and Salamon, 1970] referred to ROE as an internal rate of return, because under particular conditions it satisfies the present value criteria of profitability analysis. However, the only work that discussed the price of stocks in relation to return on equity in equilibrium is the one by Ohlson [1900] which describes the relationship of book value to price of the company in terms of future earnings and served as a base for Penman's paper.

Penman [2001] highlights that financial statement analysis, therefore, is the observation of information that would project further accounting rates of return. He also emphasizes that the issue of projecting future ROE from current ROE relates to profitability, while the question of how ROE corresponds to discount rate is associated with risk. In terms of the risk component, which is usually less discussed, the study concentrates on relationship between ROE and "beta", the systematic risk. Results showed little relationship between the two indicators because in relative terms risk is so small that it cannot be detected. Moreover, it is concluded that ROE by itself is not a sufficient measure of future profitability, but in case of disaggregation it may give better results. The study also provides evidence that ROE contributes to the explanation of change in unrecorded goodwill: it helps to identify when earnings project higher or lower future earnings and correlates with information other than earnings that can predict future profitability and thus explain the returns on stocks.

The authors of [Nissim, Penman, 2001] state that the main tool for equity valuation is still dividend discount model despite of the existence of the variety of other methods. However, they highlight the importance of residual income method implementation and identification of ratios which help to forecast residual income. In particular, those ratios include the components of ROE model. The authors provide an equity valuation approach which is based on residual income and use Dupont analysis, decomposing return on net operating assets into assets turnover and profit margin. They highlight that while profit margin comes from "pricing power", meaning the product positioning, brand recognition and market niche, as well as measures the ability to control the costs, assets turnover is about asset efficiency and utilization (efficient usage of PP&E, inventory processing and other forms of working capital management).

The study by [Lipe, 1986] aimed at investigating the explanatory power of the components of accounting earnings over the stock returns lead to a positive outcome. It was found that the main components investigated - gross profit, general and administrative expenses, interest and depreciation expenses, income taxes – have huge explanatory power over stocks and all provide different pieces of information to the market. Two main conclusions were drawn considering the practical implementation. Firstly, it is stated that the earnings reported do not provide a full summary of accounting information as some information is lost when the components are aggregated into earnings. Secondly, the results prove that additional information is consistent with the rational reaction of market participants to time-series characteristics of the components.

Thus, the authors highlight that the results show how valuation theories can be implemented to develop stronger empirical tests of relations between returns and accounting information and the methodology created can be used in studies with different decomposition of earnings.

Selling and Stickney [1989] also examined ROA, profit margins and asset turnovers of firms in 22 industries from 1977 to 1986 to find out the effects of business environment and strategy on firm's rate of return on assets. The results of regression analysis revealed that industries with high operating leverage and huge entry barriers were characterized by lowest asset turnovers and highest profit margins, while the opposite was true for industries with commodity-like products and low capital intensity (fixed assets divided by total assets gives a small ratio).

The results of the study [Fairfield, Sweeney, Yohn, 1996], conducted on a sample of 33 334 firm-year observations from 1973 to 1990 with the purpose to find out the influence of accounting classification on predictive content of earnings, suggest that disaggregation of earnings (into operating earnings, non-operating earnings and taxes and special items) helps to increase the quality of ROE forecasts one year ahead. According to the authors, operating earnings should be given the highest weights, followed by non-operating earnings. Moreover, they highlight that further insights into earnings classification such as analysis of separate industries can highly contribute to the results.

Thus, in the study by [Chang et al., 2014], DuPont analysis of value drivers in health care industry is performed for the period from 1987 to 2010 with 1211 firm-year observations. As a result of the analysis, a negative correlation has been revealed between PM and ATO, as well as in the previous studies. However, unlike the studies conducted before, a positive correlation was revealed between RNOA and PM, as well as between RNOA and ATO in one the cases investigated (and in the other one the correlation was not significant). Therefore, the assumption that PM has more influence of RNOA that ATO was validated. It was an expected result because of the specifics of the industry. Another industry-specific study - performed for manufacturing and retail sectors in USA and Japan by [Herrman, Inoue, Thomas, 2000] - also proved that the accuracy of earnings forecast increases with larger disaggregation of earnings components (sales, cost of goods sold, selling, general and administrative expenses). Moreover, the study revealed that earnings disaggregation leads to more significant improvements in the accuracy of the

forecast for American firms than for Japanese ones because the reporting guidelines are more detailed in USA and the emphasis on the issue itself is larger there than in Japan.

The research by [Kim, Kross, 2005] has revealed that the predictive ability of earnings is also increasing over time, which justifies forecasting of future operating cash flows based on current earnings. It contradicts the results of previous studies which generally lead to a conclusion that the value relevance of earnings is diminishing over time. In the study performed by [Herciu, Belascu, Ogrean, 2010] the authors investigate ROE, ROA and ROS for 20 most profitable companies in the world. They highlight that the absolute terms are often not relevant for the comparison of several companies, that is why introduction of relative size and efficiency measures are needed to draw further conclusions.

However, not all the researchers share the same point of view on the role of earnings decomposition in predicting future returns. For example, [Fairfield, Lombardi, 2001] argue that there is no evidence proving the usefulness of Dupont model in explanation and forecasting. Their study reveals that Dupont model does not give sufficient information for forecasting the change in ROA one year ahead. Nevertheless, it proves that the disaggregation of the change in ROA into change in PM and ATO still helps to make the forecast about the change in ROA in one year. Moreover, the authors conclude that the while there is correlation between the change in ATO and change in ROA, change in PM and change in ROA are not correlated.

According to the results of the work devoted to investigation of industry-specific influence on profitability by [Fairfield, Ramnath, Yohn, 2009], industry-specific models are in general more accurate in predicting company growth (especially in terms of sales) but not profitability. Authors highlight that although industry has a certain impact on firm operations and performance (demand, business risk, entry barriers), factors within industry itself are more likely to influence the profitability of the companies. However, they say that industry-level analysis is still useful in improving profitability predictions when it comes to industries which are less dependent on overall economic forces, for example regulated industries, those with high entry barriers and characterized by a wide presence of large companies.

Mark Soliman in his study [Soliman, 2007] also reveals that the change in asset turnover is significant to explain future changes in return on net operating assets (after controlling for fundamental signals and variables in extended accrual decomposition). First, the author shows that the information in ROA is a significant accounting signal. Second, the study involves testing of the immediate and delayed responses of analysts and the forecast errors based on ROA, as well the study of Dupont analysis usage by stock market participants. The results of the study [Li, Nissim, Penman, 2014] as well show that DuPont model is helpful in forecasting the variance in future growth rates of operating profits and variance of stock returns. Furthermore, the authors state that DuPont model is useful in explaining the implied volatility in option prices.

One of the latest studies on the topic [Berezinets, Udovichenko, Devkin, 2016] is aimed at identifying whether applying Dupont model would benefit the forecasting of the profitability of Russian companies. To distinguish operational and financial activities of the companies, return on net operating assets was forecasted. The methodology of the study is based on econometric models where RNOA was split into DuPont components. Apart from splitting RNOA into profit margin and return on assets, the model takes into consideration industry component and specific component for the company where industry influence is eliminated. The study was conducted on a sample of 518 Russian companies from eight industries (5019 firm-years). Authors highlight that the main patterns in behavior of profit margin and return on assets were revealed, which can be used in accessing the investment attractiveness of the companies, as well implementation of value-based management techniques in the company. In particular, conclusion is made that when the industry requires a high level of capital expenditures, it is more likely that the high levels of return on assets would be achieved via high profit margin, whereas in the industries which do not require significant capital investments assets turnover plays a bigger role. In general, every industry can be characterized by a certain combination of assets turnover and profit margin which mean revert. If there are any deviations in some companies initiated by managerial decisions, they would also come to median industry levels. Nevertheless, in every case it can be different, sometimes due to manipulations with "special items" and etc., especially in Russian practice.

Therefore, based on the studies presented, it can be concluded that DuPont model components disaggregation is generally a key technique for the identification of profitability and value

drivers of companies and, coupled with industry-specific analysis, can provide managers, investors and analysts with insights for performance evaluation.

1.5. Oil and gas companies in Russia, India and China

The main differentiating feature of oil and gas industry globally is the pricing mechanism: prices are not set by the companies but are determined by a variety of factors: supply and demand for the resources on regional and global markets, amounts of reserves and production rates, investment levels, expected growth rates of economy, geopolitical situation, development of new technologies and alternative energy sources, government regulations and transportation prices. Taking into account the strategic importance of the industry in India, China and Russia, as well as the countries' significant economic growth which presents enormous opportunities and challenges for oil and gas companies, those three countries were chosen for the analysis. Now Russia, India and China are among the first five countries ranked by oil consumption: China occupies the second place after USA with 10.12 million barrels daily, India is on the fourth place with 3.51 million barrels, following Japan, and Russia is the fifth with 3.32 million barrels. The nature of the activities of oil and gas companies is though very different: Russia is the second biggest exporter, while China and India are second and third biggest importers[3].

Considering the situation in the industry during the last three years, 2015 brought the largest changes. Overall, the growth of global economy has decreased by 2.4%, equal to 1.6% for developed and 4.3% for developing economies[4]. The growth rates of the world demand for oil have continued to decrease, and amounted to 1.5%, mainly due to the decrease in China where economy has shown the lowest growth during the recent decade (6.9%). The fall of global oil demand, coupled with the highest extraction volume (3.9 billion tons), has lead to extreme overbalance of supply and demand, increased competition for export markets and the dramatic drop in oil prices that have reached the minimal levels for the last ten years. Moreover, the Organization of Petroleum Exporting Countries decided not to lower the extraction levels in order to keep the market shares. As a result, it also has reached the highest extraction level (31.7 million barrels). However, while 2015 saw a dramatic fall in oil prices, in 2016 situation has changed: for the first time since 2008 OPEC countries have established an agreement to lower

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[3] http://www.globalfirepower.com/

[4] Surgutneftegas - Annual Report 2015

the oil extraction by 1.2 million barrels daily – to 32.5 million, also negotiating with non-OPEC countries to lower the production. All this led to an increase in Brent price up to 57 dollars per barrel[5]. The impact of all those changes on the countries of the analysis will be discussed further.

Russia

It is widely known that oil and gas industry in Russia plays a crucial role in the strategic development of the country: natural resources significantly exceed other elements in the trade balance of the country. Despite the difficulties of 2015, which resulted in devaluation of national currency and fall in investment activity, the upstream sector has shown significant growth during the last year: extraction has reached the historical maximum due to opening up of new wells and increase in extraction coefficient. The majority of oil and gas companies have kept positive extraction dynamics, with capital expenditures growth of almost 10%, with proved reserves surplus in regions of Eastern Siberia, Krasnoyarsk region and Far East. According to the Ministry of Energetics, oil extraction in Russia amounted to 547.5 millions of tons in 2016 due to high investments during the last years, with export equal to 254.2 millions of tons, thus making Russia the world leader in oil extraction. Gas extraction amounted to 640 007 billions of cubic meters[6]: total extraction lowered slightly due to the decrease by the main producer – Gazprom, but oil producers, on the opposite, have increased their gas extraction and production rates. Moreover, the significant change in ruble-USD exchange rate in 2015 allowed the exporters to increase the revenues in rubles and decrease the costs in USD which to some extent was regarded as a positive change for the companies, especially major exporters.

Traditionally, the main volume of oil extraction in Russia is attributed to vertically integrated oil corporations. In 2015, the half of those companies has shown a slight decrease in the extraction, while independent producers have increased the production on average by 10%. Moreover, the extraction in Western Siberia, the main extraction region, is getting lower as the maintenance of the old fields is becoming more and more costly. Therefore, the new centers of oil extraction are establishing strong positions: in particular, Eastern Siberia and Far East.

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[5] https://lenta.ru/news/2017/01/02/oilproduction/

[6] https://minenergo.gov.ru/activity/statistic

As for natural gas extraction and production, the well-known leader here is Gazprom: the company strongly occupies the first position by the amount of gas reserves in the world with 11% share of total global extraction and 66% share of extraction in Russia. Inside the country, the gas is supplied via regulated and unregulated pricing scheme, with Gazprom dominating in the first one. Other major gas producers include Novatek, Yatek, Sibur (the last one engaged only in gas processing and transportation), as well as oil and gas companies mentioned above.

Considering downstream activities, here the situation is very different. While Russia has always been one of the main oil and gas exporters, oil refining has not been developing as fast. During the recent years, however, more accent has been put on the improvement of current refining facilities, which total output in 2015 was equal to 249 millions of tons. The processing depth has also been increasing due to modernization of refining capacities. In 2011, Russian government encouraged the upgrade of the refining systems by imposing a tax burden on lower quality oil products which boosted the changes. However, in 2014 the focus again has been switched back to upstream activities[7]. Moreover, the tax reform in oil and gas industry in 2015 has for now significantly reduced the attractiveness of refining compared to export.

Coming back to the growth in upstream sector despite the unfavorable economic situation, it has been possible due to several reasons. Firstly, capital expenditures in the industry have dropped by more than 25% exactly because many projects in downstream were delayed, as mentioned earlier. Moreover, the falling ruble to USD exchange rate has brought benefits to oil exporters from Russia: revenues in rubles increased and the cost base in dollars almost halved. As a result, in USD terms operating cash flows of the companies during the three recent years have exceeded total capital expenditure. The only exception was 2013 due to the purchase of TNK-BP by Rosneft[8]. Thus, it can be concluded that Russian oil industry managed to "self-fund" itself despite the sanctions. Another aspect to be taken into account is the taxation system. Basically, there are two main types of taxes which significantly influence the financial results of the companies: Mineral Extraction Tax and Export Duty that are charged at a marginal rate of around 90% but depend on the oil price and have a sliding scale. The rebalancing of the system also took

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[7] https://www.oxfordenergy.org/wpcms/wp-content/uploads/2017/02/Russian-Oil-Production-Outlook-to-2020-OIES-Energy-Insight.pdf

[8] https://www.oxfordenergy.org/wpcms/wp-content/uploads/2017/02/Russian-Oil-Production-Outlook-to-2020-OIES-Energy-Insight.pdf

place with the "Tax Maneuver" reform which lowered the export duty and increased MET, but the central idea has not changed: companies are more protected when the oil price falls due to marginal tax rate and sliding scale, and their cash flows are changing much less than the revenues of the government. Therefore, the favorable taxation system combined with decreased costs in dollars leads to a low breakeven price for Russian oil companies – around 10$ per barrel for major fields, allowing to invest high ruble amounts to maintain the output.

Of course, with all the benefits and problems that the fall in oil prices brought to companies, for state budget it cannot be called favorable: before 2014 the share of the government revenues attributed to oil and gas was equal to 50%, while in 2012 it fell to 36%. In addition to this, new sanctions from the West (mainly US) concerning oil and gas sector have brought additional challenges for the companies in terms of development of projects in partnerships with American colleagues. Nevertheless, according to the analysts, so far Russian companies have managed to realize planned investments and open new projects without being dependent on foreign partners[9].

For sure, with all the economic and political events that crucially affect the industry such factors as worsening of the resource base or the drop in the economic effectiveness of the projects also need to be taken into consideration. Therefore, from oil and gas companies it requires new strategies to keep the performance levels high. Here one of the key roles is attributed to successful cost management which would allow companies to stay profitable and sound both in short- and long-term perspective. As stated in the annual report of Surgutneftegas, [2015], "in order to ensure the economic effectiveness of oil and gas extraction operations special attention is paid to cost control"[10]. The profitability of the industry is significantly pressured, and with the existing taxation system the main tool for keeping it up with the required levels is to lower the operating expenses of the company. Thus, now one of the main elements of cost control programs in oil and gas is import substitution that gives the companies an opportunity to decrease costs by contributing to the development of Russian economy. As the company mentions, "we cannot control oil prices, but we can focus on the areas that depend only on us: increasing the quality and safety of operations, decreasing the costs and lifting the productivity". Basically, to some extent it defines the focus of this study too: companies cannot fully predict

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[9] https://www.ft.com/content/cca94692-2061-11e7-a454-ab04428977f9

[10] Surgutneftegas Annual Report 2016

how oil prices will change but should be aware of the most influential factors that they can control in order to develop the strategies accordingly and maintain strong positions without being fatally affected by unfavorable global economic factors.

India

As for India, it is now the third largest oil consumer in the world as well as one of the largest exporters of refined products and importers of crude oil. From 1990s, the average growth rate India's economy has constituted around 6.5% yearly, second only China among large developing economies and 2.5 times more than the global average rate. On PPP basis, it has now become the third largest world economy, which alone contributed more than 9% of global economic output from 1990s[11]. Therefore, the demand for energy in the country is creating significant opportunities and challenges for oil and gas companies. According to International Energy Agency, India has all the potential to soon overtake China as the principal growth driver in oil demand across the globe: three years in a row it outpaces China by the oil demand growth. The country is now becoming one of the main players in global energy market and has all the potential to replace Russia as the third largest oil refiner by early 2020s.[12] Exports of crude and petroleum products contribute around 19% to total exports of the country[13]. Now Indian government owns major stakes in eight largest oil and gas companies of the country, and a large merger of several state-controlled companies is planned in order to become more successful in the international competition[14].

As highlighted in the report of BPCL, reliable energy supplies represent a pillar of development of Indian economy. Rapid growth, experienced now by the country, coupled with fast industrialization, increasing population and, in particular, growing automobile sector, is implying an additional challenge for the country that possesses only 3% of oil reserves and represents 17.5% of the world's population. Therefore, Indian government has implemented several measures to enhance the development of the industry. Thus, foreign direct investments in

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[11] India Energy Outlook, World Energy Outlook Special Report 2015

[12] http://www.hindustantimes.com/business-news/india-to-replace-russia-as-3rd-largest-oil-refiner-iea/story-p0AG87DyjZCHdwXXy51oKP.html

[13] BPCL annual report, 2015

[14] https://www.ft.com/content/18d1fd5a-e914-11e6-893c-082c54a7f539

refining sector are now encouraged by permitting a 49% share in refining companies. Reforms are being discussed for upstream sector as well. In addition, in 2014 a large initiative "Make in India" was announced, aimed at increasing the share of manufacturing GDP up to 25% until 2022. Energy companies, especially oil and gas, were identified as one of the main areas of change[15].

The amount of the resources that India possesses is relatively small, with the majority of oil reserves located in the western part. So far, the upstream sector has been underperforming despite the efforts to open it up for private investors: the regulatory requirements still present a significant obstacle, coupled with the uncertainty about the amount of reserves available and their correct appraisal. Moreover, upstream is dominated by several state-owned companies: ONGC and OIL together produce around two-thirds of the crude oil, and the remaining output can be attributed to joint ventures with national companies. However, considering the instability in the supplies of some of its major partners such as Iran, Libya or Nigeria, in March 2015 the government has announced a strategic aim to decrease the reliance on the imports of crude oil by 10% by 2020[16]. It does not only concern the development of production, but also enlargement of storage facilities. In particular, Strategic Crude Oil Storage has been opened recently in order to be able to store more oil bought in times of low prices.

In contrast, the refining sector has been strengthening significantly: the refining capacities have almost doubled during the last decade. During the recent several years, India has significantly expanded its refining capacities, and Indian companies are now becoming more and more competitive, making the country one of largest centers for petroleum refining. Compared to upstream, the majority of the companies are private, including such large players as Reliance Industries or Essar. The refinery assets of the country include the largest refinery in the world, Jamnagar complex which capacity amounts to 1.2 million barrels of throughput daily, exceeding India's domestic crude oil production as well as domestic demand, making it a net exporter of refined products. The exports are mainly coming from private companies, while national companies satisfy the domestic demand for refined products. As a result, India's modern and highly efficient refineries have been capable of taking the market share from the ones in Europe

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[15] http://www.makeinindia.com/about

[16] https://www.iea.org/publications/freepublications/publication/IndiaEnergyOutlook_WEO2015.pdf

and Japan. While production of oil in the country amounted to only to 41 millions of tons in 2015, the total output of refining capacities was equal to 223.3 millions of tons and is expected to grow further due to the launch of a new Paradip Refinery. Moreover, the project of "West Coast Refinery" by public sector oil companies (IOCL, BPCL, HPCL, EIL) is now widely discussed. If implemented, it will become the largest refinery and petrochemical complex in India.[17]

The drop in crude prices, coupled with huge dependence of the country on crude oil imports (estimated 84%) and diesel marketing decontrol, has also resulted in general concerns about petroleum prices and demanded additional costs constraints[18]. "With a significant increase in drilling, service, production and operating costs due to the increased complexities faced by the sector, cost management has assumed center stage for most companies"[19]. Therefore, the attention has been paid to optimization of the processes and the establishment of strong controls - for example, "leveraging the technology", outsourcing and introducing shared services. "Oil companies have little choice but to address the vital existential issues of how to efficiently manage business in the increasingly carbon-constrained environment"[20].

Natural gas presents only 6% of the energy mix in India. The biggest player in midstream and downstream gas market is a state-owned company GAIL India, followed by private oil giants Reliance and Essar starting to pave their way in the sector. In early 2000s, a lot of expectations have been put on the development of the industry because of large discoveries, but for now not much is going on due to several constraints, mainly subsurface complexity of opened offshore fields and low prices for domestic producers.

China

China is the sixth biggest producer and second biggest oil consumer in the world, primarily due to rising demand for gasoline which is replacing diesel fuel[21]. However, despite the high oil

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[17] BP Annual Statistics, 2016

[18] Indian Oil Annual Report 2015-2016, p.5

[19] BPCL, 2014

[20] BPCL, 2014-2013

[21] http://www.bakerinstitute.org/media/files/files/e0b5a496/WorkingPaper-ChinaOil-093016.pdf

demand, among large international oil and gas players Chinese companies do not have much influence. Being a major producer of crude oil, the country has become a large oil importer during the recent decades due to increasing demand as production rates have been falling despite the significant increase in capital expenditures since 2000[22]. Nevertheless, with the appearance of the three big state-owned giants – China National Petroleum Corporation (CNPC), Sinopec and China National Offshore Corporation (CNOOC) – Chinese oil and gas market saw significant restructuring and is considered to be one of the most promising for foreign investment attraction. Refinery output in China amounted to 460 millions of tons in 2015 and is also expected to grow[23]. Overall, until 2020, the country is aiming to increase the output of crude oil to 200 million tones and capacity for natural gas to 360 billion cubic meters.[24]

As for demand for gas, it slowed down significantly because of uncompetitive gas prices and economic downturns. Gas consumption equaled 191 billion cubic meters, 33% of which imported to the country. In 10 years, its share in China's energy mix is projected to grow from 5% to 8%. Special attention is paid to shale gas which production is also expected to grow significantly, making China second largest shale gas producer after US in the long run (in 2035, according to BP Energy Outlook 2017). Nevertheless, the projections of the exact growth rates have been lowered during the last two years[25].

From 2011 to 2015, oil and gas reserves in China have been steadily growing. Although the upstream investments were declining, significant discoveries were made, adding 1 billion tons of oil and 1 trillion cubic meters of gas to the country reserves base. Even though the rising prices can have a negative impact on the growth of the reserves amount, it is not expected to be significant since the strategic reserves, which constitute the principal amount of all the reserves of the country, are so far the area of responsibility of the government[26].

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[22] https://www.platts.com/latest-news/oil/singapore/outlook-2017-changes-for-chinas-oil-sector-in-27741677

[23] BP annual statistics

[24] http://www.chinadaily.com.cn/china/2017-05/22/content_29437500.htm

[25] http://www.bp.com/content/dam/bp/pdf/energy-economics/energy-outlook-2016/bp-energy-outlook-2016-country-insights-china.pdf

[26] https://www.platts.com/latest-news/oil/singapore/outlook-2017-changes-for-chinas-oil-sector-in-27741677

On 21 May 2015, the reform was announced by Chinese government, aimed at increasing the shares of private ownership in state-owned companies. It is a key element of Five-Year Plan for 2016-2020. The principal focus is put on enhancing the diversification of shareholder base and deepening the mixed-ownership reform. Moreover, attention is paid to the specialization of the companies: engineering enterprises as well as oil and gas equipment producers are to act as independent companies. The three "giants' of the industry were long been accused of monopolizing the market and being inefficient, so the reform is supposed to change the situation and lead to market-based pricing mechanism with government stepping in only in case of abnormal fluctuations. Large players have already started the cooperation with private companies. In particular, Sinopec is planning to establish partnerships in refining, while CNPC announced that it would allow private companies to hold stakes in oil exploration business, but no more than 49 percent[27].

What is more, in summer 2015 an import quota of about 80 million tons was given to several "teapot" refineries in Shandong which was open only for national oil companies before, and 49 million were actually imported[28]. Consequently, around 90% of oil import growth in China in the first half of 2016 can be attributed to teapot refineries[29]. However, with recently introduced stricter tax regulations and increased complexity of quota application procedure the situation may become unfavorable for the independent refineries again. In addition to this, in 2017 the government withdrew the permission for export from independent refineries which can hinder their investment plans.

1.6. Specific characteristics of value creation in oil and gas

As mentioned in [Rogova, 2014] one of the most important problems for oil and gas companies is their profitability and investment appeal growth because of the specifics of their business. Firstly, fixed assets constitute a large part of the assets of the companies. It implies that the entry

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[27] http://www.chinadaily.com.cn/china/2017-05/22/content_29437500.htm

[28] https://www.platts.com/latest-news/oil/singapore/outlook-2017-changes-for-chinas-oil-sector-in-27741677

[29] http://www.reuters.com/article/us-china-economy-trade-crude-idUSKBN1570VJ

barriers of the industry are extremely high and the market shares tend to stay constant throughout the years, as well a high level of capital expenditures that is spent each year to maintain the facilities. Then, the prices are highly dependent on natural extracting conditions and market prices basically meaning that no matter how hard a company tries to achieve certain performance level it always can suffer largely from unexpected changes in the market or unfavorable nature conditions.

Considering particular value drivers, oil and gas companies have been characterized by relatively high profit margin and it is as well one of the key indicators that companies highlight in the reports while assets turnover generally does not have such an attention. However, recent decade saw several crises when operating profit margins for many companies dropped significantly. Therefore, the importance of assets turnover needs to be highlighted as well a crucial metric for the companies which are highly dependent on the assets and how effectively they generate the profit. For example, in the study by Rogova [2014], asset turnover component was significant in its relationship with return on equity, opposite to operating profit margin which showed an insignificant coefficient. As for financial leverage, it is has been generally low for oil and gas companies since they used to have enough funds to maintain their operating and investment activities - though crisis changed the picture largely, plus the situation is different for developed and emerging markets. Moreover, high volatility in oil prices and consideration of additional risks incurred with loans also make companies keep financial leverage low.

Considering the studies of oil and gas industry which are especially close to this work, here two somehow complementing works can be mentioned. First, the study by Rogova [2014] which was already cited above was based on the companies from "Energy Intelligence Top 100" rating, 2008-2012 and aimed at demonstrating the impact of DuPont components on return on equity and, thus, investment appeal of the companies. As a result, 4 components turned out to be significant: earnings before interest and taxes margin, interest burden, tax burden and assets turnover. Thus, it is highlighted that those factors should be especially considered by the managers of oil extracting companies in order to increase ROE and draw investors' attention, and by investors who can evaluate the companies based not only on ROE itself but the factors revealed. The author also states that it would be interesting to create a comprehensive valuation model based on DuPont components and other efficiency ratios.

Concerning the "other" side of oil and gas companies performance evaluation, namely industry-specific factors such as amounts of reserves and extraction, the study by [Ewing, Thompson, 2016] was aimed at identifying the role of proved reserves and production in market capitalization of oil and gas exploration and production companies. The results of the research revealed that there is an "optimal tradeoff between current and future production" given current volume of reserves which are positively valued by the market. The findings also prove the importance of capital structure in capital intensive oil and gas industry, and are industry-unique, being useful for executives of oil and gas companies as well as investors.

Therefore, the analysis of previous studies and the market situation in oil and gas industry shows that DuPont model disaggregation can be a valuable tool for the investigation of the reasons for profitability and value changes of the companies, but alone it does not provide the full picture. That is why DuPont components combination with industry-specific factors in oil and gas is suggested for more precise identification of value drivers.

Chapter 2. Empirical Study

2.1. Methodology

As it was stated in the objectives of the work, the relationship of the industry-specific drivers with the profitability and value of the companies are to be identified in the following models. Return on equity and return on assets of the company were taken as the measures of profitability, while fundamental value and market value were identified as the main value indicators based on the previous research. As for independent variables, for ROA and ROE those were primarily operating profit margin, assets turnover and leverage as first level components of Dupont Model, as well as exploration expenses, amount of reserves, extraction and production, share of government ownership and export sales. EBITDA and exploration expenses per barrel were not included in the models since the calculation of ROA already includes operating profit, while calculation of ROE – net income, which would automatically result in significant coefficients but would not add much value to the analysis. Those factors were included further, to market capitalization, residual income and fundamental value models.

The following factors were chosen to be used for the modeling. For all the indicators initially presented in absolute values – fundamental and market value, amounts of reserves and production, exploration expenses – natural logarithms were taken to be included in the models. The correlations between the variables were also checked so that there is no correlation higher than 50% for the variables included in one model.

Table 1. Variables description

ROA	Return on Assets = Operating Income/ Total Assets
ROE	Return on Equity = Net Income/ Equity
Fundvalue	Fundamental Value of the company
Marcap	Market capitalization of the company
Oilres	Amount of proved oil reserves in barrels of oil equivalent
Gasres	Amount of proved gas reserves in cubic meters
Restot	Amount of total reserves in tons
Oilprod	Amount of oil produced (extracted) during the year, in barrels of oil equivalent
Gasprod	Amount of gas produced during the year, in cubic meters
Prodtot	Amount of total production during the year, in tons

Oilref	Amount of oil refined during the year, in barrels of oil equivalent
Explorexp	Exploration expenses incurred by the company during the year, thousands of US dollars
Ebbarprod	EBITDA divided by the amount of barrels of oil produced
Explorexpbar	Exploration expenses per barrel produced
Government	Share of government ownership in the ownership of the company
Exportshare	Share of foreign sales in total sales of the company
Crisis	Dummy variable, attributed to years 2014-2015

Control variables included logarithms of the revenue of the company and total assets. However, since the reserves are already somehow the measure of the size and assets of the company, they can be themselves treated as control mechanisms of the models and therefore it was not necessary to include size and/ or total assets together with them. Initially, it was planned to include such variables as annual reserves surplus or growth of extraction/ refining amounts, but those values were often negative and logarithms could not be taken.

The models were constructed for total amounts of reserves and production (with barrels and cubic meters converted into metric tons) as well as separately for oil and gas components of business, taking into account the reserves, extraction and refining of oil/ amounts of gas reserves and production. However, since the models built separately for oil and gas components still referred to the same companies and gave generally the same results as the models including total amounts of reserves and production, they are not presented as separate ones here – the results can be found in the Appendix 3.

Table 2. Models tested

Dependent variable	Independent variables
Profitability	
ROA_{it} ROE_{it}	$\alpha + \beta_1 \times OPM_{it} + \beta_2 \times ATO_{it} + \beta_3 \times LEVERAGE_{it} + \beta_4 \times restot_{it} + \beta_5 \times prodtot_{it} + \beta_6 \times explorexp_{it} + \beta_7 \times government_{it} + \beta_8 \times exportshare_{it} + \beta_9 \times size_{it} + v_{it}$
Value	

$\dfrac{Fundvalue_{it}}{Marcap_{it}}$	$\alpha + \beta_1 \times OPM_{it} + \beta_2 \times ATO_{it} + \beta_3 \times LEVERAGE_{it} + \beta_4 \times restot_{it}$ $+ \beta_5 \times prodtot_{it} + \beta_6 \times explorexp_{it} + \beta_7 \times government_{it} + \beta_8 \times$ $exportshare_{it} + \beta_9 \times size_{it} + v_{it}$
$\dfrac{Fundvalue_{it}}{Marcap_{it}}$	$\alpha + \beta_1 \times OPM_{it} + \beta_2 \times ATO_{it} + \beta_3 \times LEVERAGE_{it} + \beta_4 \times$ $ebbarprod_{it} + \beta_5 \times ebbarref_{it} + \beta_6 \times size_{it} + \beta_7 \times restot_{it} +$ $\beta_8 \times government_{it} + \beta_9 \times exportshare_{it} + v_{it}$

Fundamental value computation

As for calculation of residual income and fundamental value of the companies, they were computed according to the formulas mentioned in the first chapter. In order to forecast residual income for five years ahead for every of the companies, the corresponding values of each element of the income statement was forecasted according to its historical growth during the last 3-5 years: revenue, cost of goods sold, selling, general and administrative expenses, depreciation, interest income/expense, in some cases research and development expenses. In cases of a growth which was too high compared to other historical periods due to some one-time events, the forecast rate was adjusted accordingly and thus the influence was mitigated.

In the following tables, risk-free rates and equity premiums used are presented:

Table 3. Risk-free rates 2011-2015 for Russia, India and China

	Russia	India	China
2011	7.87%	8.68%	3.89%
2012	7.86%	8.27%	3.47%
2013	7.19%	8.14%	3.83%
2014	9.39%	8.58%	4.17%
2015	11.25%	7.76%	3.40%

Table 4. Equity risk premiums 2011-2015 for Russia, India and China

	Russia	India	China
2011	8.80%	6.56%	7.60%
2012	7.49%	6.10%	6.75%

2013	7.34%	5.72%	7.81%
2014	7.37%	6.25%	9.61%
2015	9.56%	9.11%	6.71%

Beta was computed for each company for every year as the standard deviation of the company's stock return divided by the standard deviation of the index of the corresponding stock exchange (New York Stock Exchange or Shanghai/ Bombei/ Moscow Stock Exchange) and multiplied by the correlation of these changes. Then, with the cost of capital obtained, terminal value and fundamental value were calculated for each year and compared with market value. Generally, Indian companies were undervalued in the beginning – 2011-2012, and overvalued in the end – 2014-2015, while Chinese companies seem mostly undervalued during the period of study, and for Russian companies no clear tendency can be traced: depends on the year and the company.

2.2. Data

As mentioned earlier, the study is based on 24 companies engaged in oil and gas sector, from year 2011 to 2015, 120 observations. Initially, the sample was supposed to be larger and include all the companies presented in DataStream database, namely 120 companies. Nevertheless, after a more precise look it was identified that the half of those companies belong to oil transportation industry as well as the production of equipment for oil and gas companies. It was decided to eliminate them from the research since the nature of their operations is rather different and the comparison with oil and gas producers would not add any value to the study. Secondly, the companies left included both the "main" market players and a lot of their subsidiaries, which often did not have all the data needed available in public sources. Since leaving both would have been incorrect for the analysis, small subsidiaries were excluded as well.

The names of the companies as well as the quantity was checked with stock exchanges where the shares of the companies are traded in order to make sure that DataStream data includes all the available companies and that nothing was missed. Therefore, the final number of companies allowed conducting a more thorough analysis and examining different data points that would take too long to collect if the number of the observations was much larger. While all the financial data was extracted from Thompson Reuters Database, the majority of non-financial factors such as reserve base, production levels, ownership structure were found in the annual reports of the companies since in most cases they are not available in the databases. In Appendix 1, a short

description of every company included in the sample is presented: 10 Indian companies, 3 Chinese and 11 Russian. Among Indian companies 6 are vertically integrated, 2 are engaged in upstream and 2 in downstream, among Russian – 9 vertically-integrated and 2 downstream, and all 3 Chinese companies are vertically integrated as well. It would have been beneficial for the study to include not only the largest Chinese players but also the smaller refineries that are much more successful in downstream segment, but unfortunately the data could not be found in open sources.

The descriptive statistics of the variables is presented in the table below. The statistics for each of the countries separately is presented in the Appendix 2.

Table 5. Descriptive statistics

	Minimum	Maximum	Mean	Standard deviation
ROA	-8.046	0.516	-0.004	0.808
ROE	-4.514	0.617	0.034	0.620
OPM	-0.23	0.57	0.17	0.19
AT	0.23	1.91	0.74	0.55
Leverage	1.13	3.60	1.88	0.73
Resinc, th USD	-14 443 132	16 010 313	849 589	4 262 770
Fundvalue, th USD	-16 520	1 116 164 431	126 921 257	239 945 223
Marcap, th USD	40 550.75	318 869 900	41 801 560	61 502 080
TA, th USD	23 759	408 515 300	66 139 950	10 050 300
Oilres, mln barrels	0.04	125 607	12 085	29 440
Gasres, mln cubmeters	1.992	23 705 000	2 333 837	5 973 279
Restot, mln tons	5.551	57 130 390	4 219 177	1 267 989
Oilprod, mln barrels	0.007	1478	218	322
Gasprod, mln cubmeters	0.648	513 200	51 435	118 588
Prodtot, mln tons	0.023	1 236 844	82 669	240 142
Oilref, mln barrels	5	713	255	195

Explorexp, th USD	1 343	218 357 100	4 596 114	245 874 800
Ebbarprod, USD	-5 266	147	-62	614
Explorexpbar, USD	0.022	1 619	58	234
Government	0	1	0.25	0.35
Exportshare	0	0.86	0.281	0.3

In order to make to the scale of the variables comparable, logarithms of all the specific factors such as reserves, production and refining were taken, as well as the revenue, total assets, residual income, fundamental value, market capitalization. As for EBITDA per barrel produced or refined, for the companies which are engaged in different segments (vertically integrated companies which represent two thirds of the sample) revenue structure was found with the percentages of each segment contribution: thus, EBITDA was multiplied by the percentage of exploration and production/ refining in total sales of the company and only then divided by the amount of barrels produced and refined, in order to take into account only those activities but not marketing or transportation.

First of all, **ROA and ROE** showed the following traits throughout the period examined. As for ROA, its average value during the period is equal to -0.004. However, it was influenced a lot by the negative value for Hindustan Oil in 2015 - -8.046: if to exclude the company from the sample, the average ROA would have been equal to 0.096. The maximum average value among companies is 0.26 belonging to gas company Novatek, followed by Basneft (0.18). Similar situation characterizes ROE: average value is equal to 0.028 due to extremely low values generated by Hindustan Oil, NNK Khabarovsky and Orsknefteorgsintez. When those values are excluded, the mean is equal to 0.14, maximum average ROE equals 0.29 for Novatek, followed by Yatek, Bashneft and others. 5Y average ROA and ROE for all of the companies in the sample are presented in the Appendix 2. The charts below represent annual average ROA and ROE for the three countries examined with the largest outliers excluded from the calculations. Decreasing trend can be observed for both cases during the period studied. However, a decrease of around 10% characterizes all three countries studied, while the decrease in ROE is more moderate in India than in China or Russia.
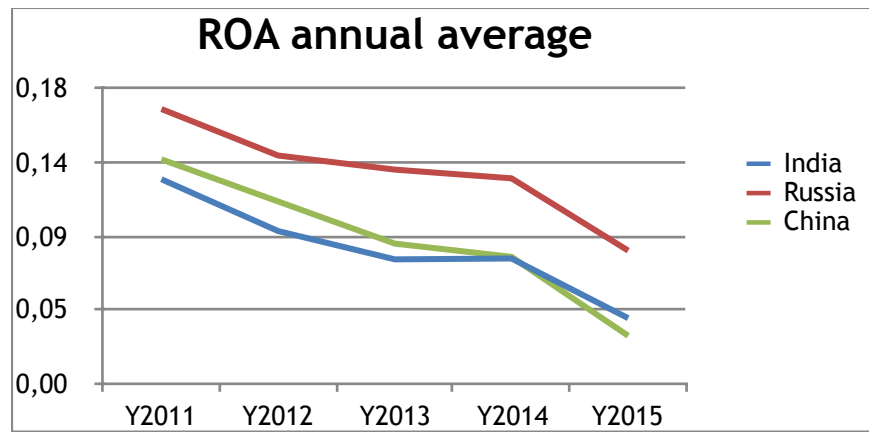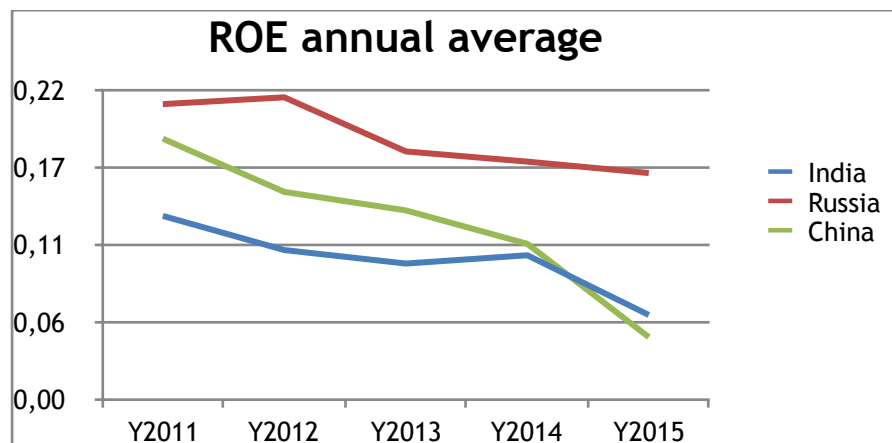
Fig.1 *ROA annual average*

Fig.2 *ROE annual average*

Secondly, the "core" variables included into every model are **operating profit margin, asset turnover and leverage** as the components of DuPont identity. The highest maximum value of operating profit margin belong to an Indian company (0.57), followed by Russia (0.47) and then China (0.28), with the same tendency among the mean values (0.19, 0.16 and 0.13). Overall, however, the level of profit margin in Indian companies can be divided in two groups: there are companies that have a very high relative level of profit margin and those with only 1-2%, while Russian companies are more diverse in values. As for Chinese companies, operating profit margin of CNOOC is much higher than of the other two. In asset turnover, Indian companies are clearly the "leaders" with the highest value of 1.91 and the mean of 1.15, followed by Chinese (1.49 and 0.7) and then Russian companies (1 and 0.38). Generally, asset turnover of Indian companies is higher than 1, while it equals 1.5, 0.3, 0.31 for Chinese companies and stays around 0.3 for Russian. The explanation of this tendency may lay in the nature of operations of the companies: Indian companies are more engaged in refining business while Russian companies are focused more on upstream activities. Leverage is again the highest among Indian companies

with maximum value of 3.6 and a mean of 2.41 followed by Chinese companies (2.78 and 1.8) and then Russian (2.25 and 1.42). Therefore, it shows that Indian companies tend to attract more external financing than Russian and Chinese oil and gas companies.

Charts representing the average values of operating profit margin, asset turnover and leverage for each of the companies in the sample are provided in the Appendix, the average values for each of the countries per year are presented below, with the largest outliers excluded from the calculation. Here the average values of operating profit margin followed decreasing pattern for all three countries, with the most sharp for Russian companies. Assets turnover has been decreasing for Chinese companies, while for Russian and Indian stayed almost stable. As for leverage, it has been increasing throughout the period for India which shows that each year Indian companies on average have been attracting more and more external financing, probably as a means to cope with the crisis. Leverage of Chinese companies has been slightly increasing, of Russian companies – till 2013, coming back to 2011 level in 2015. Overall, Russian companies are distinguished by the highest level of operating profit margin (with China having the lowest), especially during the first years of analysis, and the lowest value of assets turnover (with India and China staying on the same level almost twice as high) which demonstrates the differences in the nature of the companies' operations.
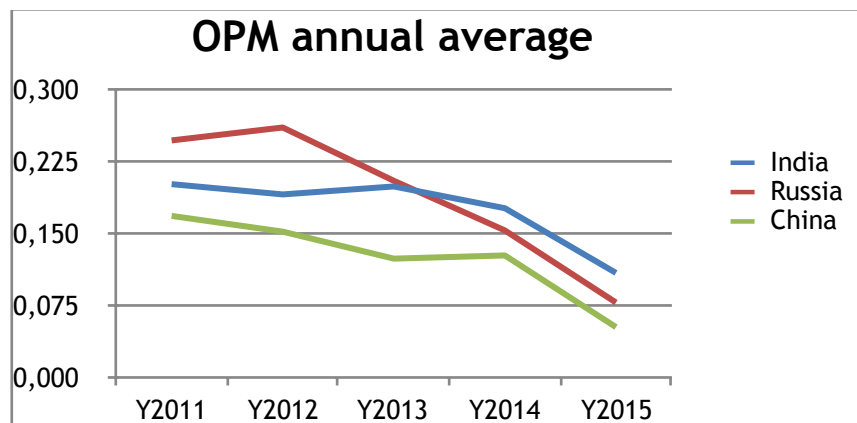
Fig.3 *OPM annual average*
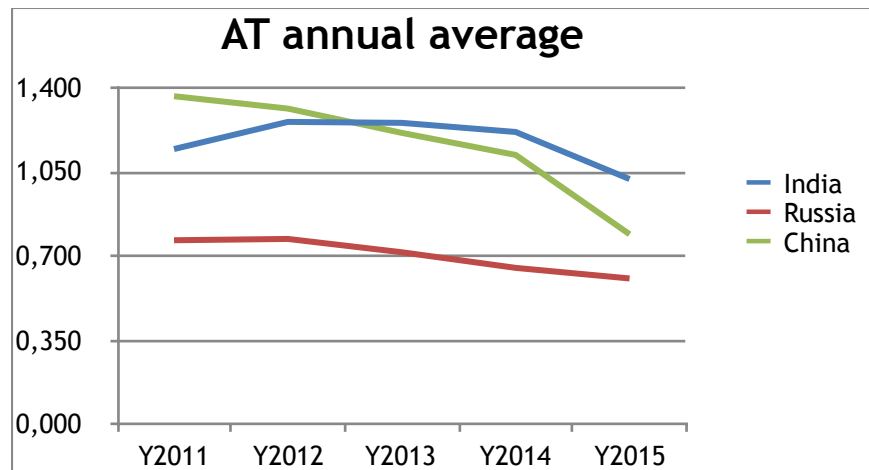
Fig.4 *AT annual average*
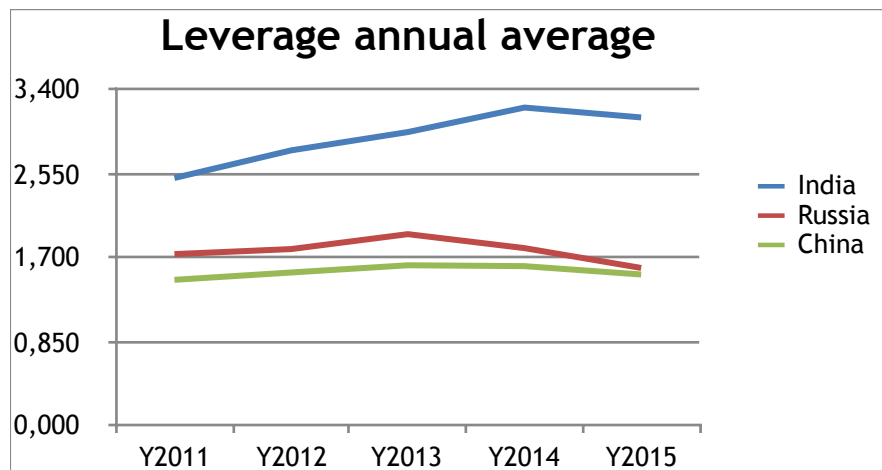
Fig.5 *Leverage annual average*

As for the **industry-specific factors** in the sample, the highest amount of oil **reserves** belongs to Lukoil, while the largest gas reserves base – to Gazprom. The holder of the lowest amount of oil reserves is Yatek – Russian company engaged mainly in gas production. However, the sample includes several Indian companies that operate only in refining segment and do not have or do not disclose the amount of oil reserves. Similarly, the lowest amount of gas reserves belongs to an Indian company Hindustan Oil which activities lay primarily in the segment of oil extraction and production, not gas. The amount of oil refined (among those who are engaged in oil refining) is the lowest for Orsknefteorgsintez – 5.24 million barrels due to the size of the company. The largest amount of oil refined belongs to Chinese China Petroleum which operates more in the sector of oil refining than oil and gas exploration and production. Share of the refining activities is generally higher among Indian companies which include companies 100% engaged in refining activities, while among Chinese companies the share of refining segment in revenue is around

40

35%-45%. Russian companies are relying more on upstream segment (the maximum amount of oil **production** in the sample generated by Rosneft and of gas – by Gazprom) but the share of oil refining in total operations around 45% is also common, with Lukoil being the leader – refining segment constitutes around 75% in total earnings of the company.

Exploration expenses, among the 16 companies for which it was possible to find them, are the highest for Lukoil (in 2013 in particular), but the difference in not huge among the large companies. The lowest exploration expenses belong to Selan Exploration (in particular, in 2013), just because of the size of the company (to avoid the inconsistency in the results caused by the differences in the size of companies logarithms of such indicators were applied). Below, the graph representing the average annual amount of exploration expenses per country of the analysis is presented.
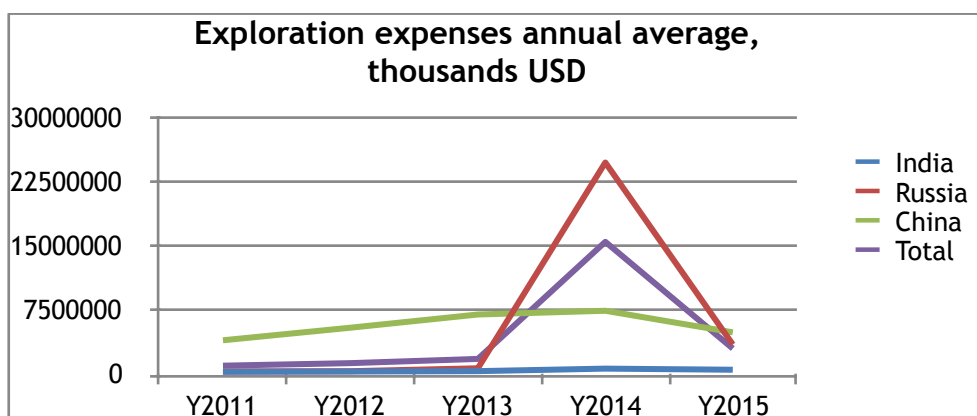
Fig.6 *Exploration expenses annual average*

As for **EBITDA per barrel of oil produced** and **exploration expenses per barrel**, the difference is also quite huge. For example, for Hindustan oil it was negative, more than minus 5000 dollars per barrels because of the negative EBITDA during several years and low amount of production. The highest value of EBITDA and exploration expenses per barrel as well belong to Hindustan Oil in 2011, due to relatively low production amounts. Therefore, corresponding adjustments were made and such outliers eliminated from the analysis.

As for ownership structure, the share of the **government,** it is the highest for Chinese government-owned companies, as well as several Indian ones. In Russia, share of direct government ownership in the companies is generally lower, except for Rosneft where the government still owns around 70% of the equity. As for **the share of exports in the sales** of the company, it is different across the companies but is generally higher for Russian companies than

for Indian ones, often constituting more than 50% of all the sales. Among the Chinese ones, it is quite high for Petro China compared to the other two companies.

The company with the lowest **market capitalization** is Gujarat Natural Resources, while the one with the highest is PetroChina, overall and in 2014 in particular. Fundamental value is sometimes consistent with the market value and sometimes differs significantly, as it was expected. Below, annual values in millions USD for each country are presented.
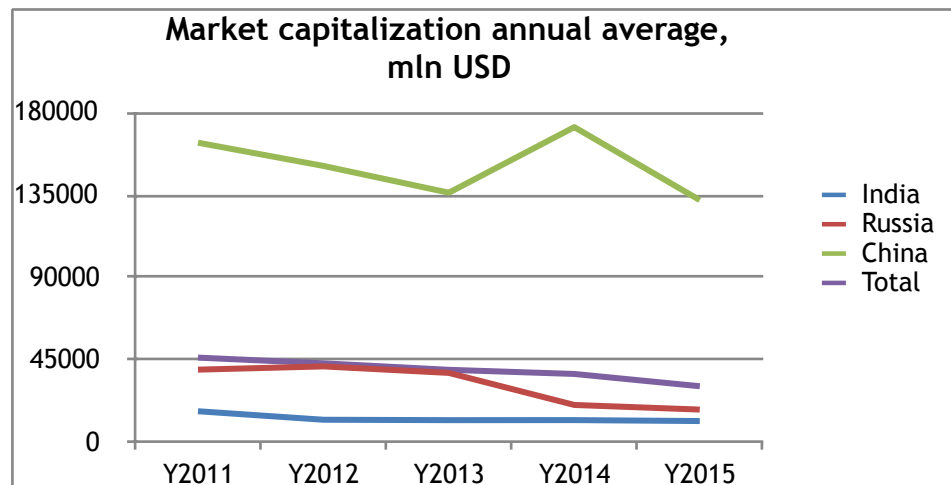
Fig.7 *Market capitalization annual average*
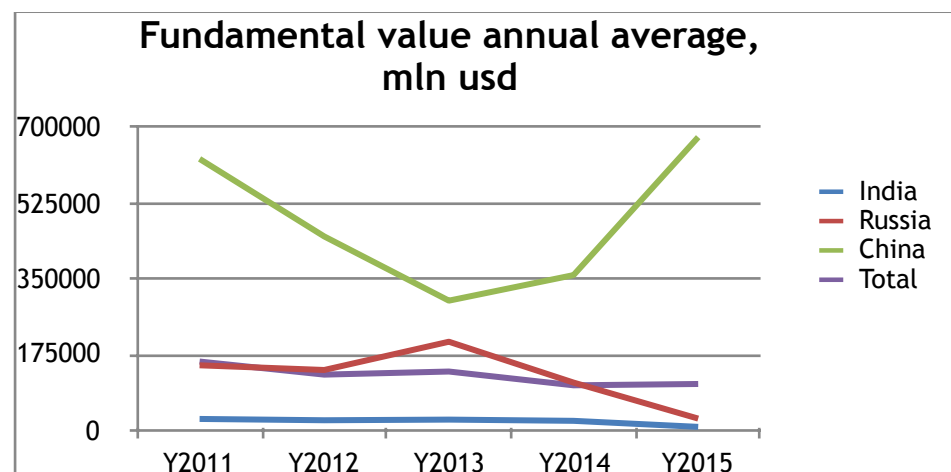
Fig.8 *Fundamental value annual average*
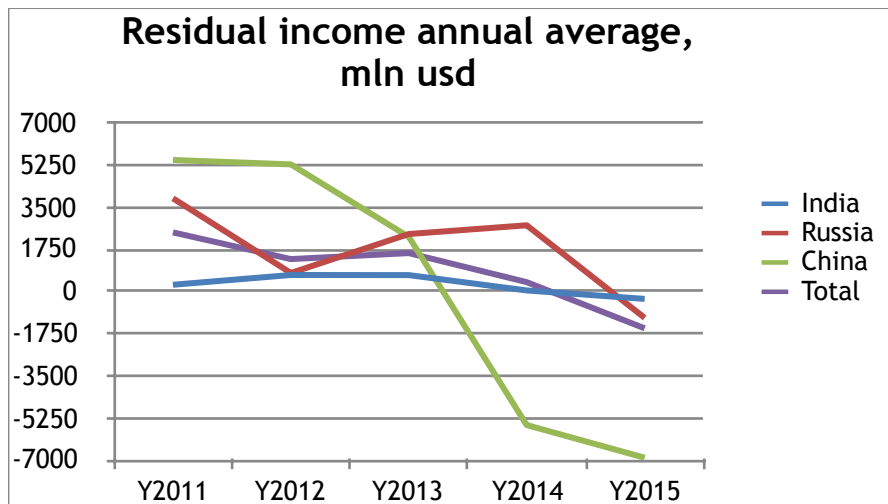
Fig.9 *Residual income annual average*

Residual income of the companies was not always positive throughout the period studied. While Russian companies have been performing rather strongly and only 8 out of 55 observations showed negative value, mainly during the last two years (those companies which do not have a high share of export in sales suffered losses), among Indian companies 25 out of 50 observations were negative. It is connected to the high required rate of return on equity (because of rather high equity risk premium and high risk free rate, coupled with high degree of risk for some companies measured as high beta), and also low net income which was not enough to generate positive residual income. Nevertheless, the most negative residual income was generated by Lukoil in 2015: the required return on equity got higher due to higher risk free rate and equity risk premium, and the net income was still not enough to offset total cost of equity. The highest residual income among all of the observations belongs to Gazprom in 2011 when the net income of the company got to a level twice as high as the previous year and equity increased only 15%. As for fundamental value, the lowest value of all was generated by Indian company Hindustan Oil because of a negative net income in 2015, while the highest belongs to Chinese PetroChina which equity simply does not "allow" the fundamental value to be negative even when the residual income is negative.

2.3. Research questions

Based on the previous research, the following assumptions about the relationships between the variables can be made.

- Significant positive relationship can be assumed between dependent variables and *operating profit margin/ assets turnover* [Stickney et al., 1989; Berezinets et al., 2016], negative and probably insignificant relationship with *leverage* [Rogova, 2014].

- As for *industry-specific* indicators - amounts of reserves and production, they are also expected to be related positively to profitability and value metrics [Ewing, Thompson, 2016], as well as the composite factor of *EBITDA per barrel produced* [Herciu et al., 2010].

- *Exploration expenses* can be expected to be positively related only to market capitalization as a positive sign of the companies' development, while their association with other dependent variables might be negative due to the problems in exploration efficiency discussed in the first chapter (when the revenue from production does not cover exploration costs). As for *exploration expenses per barrel*, a negative relationship with dependent variables also can be assumed as companies are generally working on decreasing the expenses per barrel to achieve higher profitability and, in a more long-term perspective, value.

- *Government ownership*, though indicated by several studies to have a positive relationship with profitability of the companies on developing markets, is expected to be negatively associated with the dependent variables if the opinions of analytics are considered. As for the *share of exports and refining* in sales, they are expected to have a positive relationship with profitability and value creation indicators, as mentioned in [Oxford Energy Annual Outlook, 2016].

Below, a table with the assumptions about the models is presented.

Table 6. Assumptions about the relationships between variables

	ROA	ROE	Marcap	Fundvalue
OPM	positive			
AT	positive			
Leverage	negative			
Restot	positive			
Prodtot	positive			
Explorexp	negative	negative	positive	negative
Explorexpbar	negative	negative	negative	negative
Ebbar	positive			
Government	negative			

Exportshare	positive
Refshare	positive

2.4. Results of regression analysis

As a result of regression analysis, several significant models have been identified: some of the assumptions were confirmed while several unexpected relationships (or their absence) were revealed. All the results are summarized in the table that can be found in the Appendix 3, while here each model for each dependent variable is presented separately, followed by the discussion of the results. The main models are presented below – firstly for the whole sample, then country-specific, with all the coefficients before the industry-specific variables always significant except for constant term.

First of all, return on assets has shown a positive relationship with **assets turnover** and **operating profit margin**, while the relationship with the degree of **financial leverage** turns out to be negative, which is an expected result. The coefficient before operating profit margin is twice as high as before assets turnover: it confirms the fact that oil and gas companies, characterized by a high level of capital investments and long-term horizon of the projects, are more likely to increase their profitability due to high product markup than due to higher assets turnover ratio.

As for the industry-specific factors, a positive relationship also was identified between return on assets and the **amount of gas reserves** as well as **total reserves** but not particularly oil reserves which indicates that the relationship is more applicable to gas companies where prices are generally more predictable than for oil companies. Initially, an attempt was made to include not the absolute values (or their logarithms) in the regression analysis but the reserves surplus. However, in almost half of the cases the surplus turned out to be negative: since it was not possible to derive a natural logarithm from negative values and the number of positive values was not sufficient for a proper analysis, it was decided to stick to total number of reserves annually.

Considering production levels, positive relationship has been identified between ROA and **gas production** per year, as well as **oil production** and **total production**. Therefore, it can be concluded that higher production amounts generate higher sales, and thus, higher return on assets. This is a rather straightforward conclusion which, from the first sight, does not require

any regression analysis to be proved. Nevertheless, it is not always true as sales are still quite dependent on different market conditions, including the volatility in prices, balance of supply and demand, political situation and etc., and thus high production amount does not always lead to higher profitability. Consequently, positive relationship between production levels and ROA means that despite all the difficulties oil and gas companies have been capable to keep the sales consistent with the increase in production. At the same time, the problem of overproduction and its negative influence on the overall situation also should not be disregarded.

In terms of the amount of **oil refined** (see in the Appendix 3), no significant relationship with profitability indicators has been found, unlike for oil and gas production amounts. Thus, the differences between companies depending on their segmental focus can be seen. Probably the coefficient in front the amount of oil refined is insignificant since for most of the companies refining output is held constant during the years and the changes are not large enough to affect ROA or ROE somehow.

Next, in all of the models with return on assets, negative relationship was identified with the amount of **exploration expenses** (total amount and expenses per barrel – all the results are as well presented in the Appendix 3). Thus, the higher is the level of exploration expenses for the companies in the sample, the lower is return on assets. On the one hand, it can be considered as an unexpected result as it can be assumed that exploration expenses would lead to increase in production levels and, consequently, profitability. On the other hand, such an assumption is somehow flawed since the expenses incurred during the year of observation generate the actual results only a year or two after. Even though the amount of exploration expenses is not dramatically different across the years for a particular company and sometimes the return on the investments in exploration can be seen during the same period already, the drawbacks of such straightforward judgment should be considered when drawing conclusions about the results of the analysis. Moreover, since exploration expenses sometimes are not included in the income statement but are capitalized as exploration assets in the total assets of the company, it is clear that with all other components held constant the increase in exploration expenses will lead to increase in total assets and thus the decrease in ROA itself. At the same time, their share in total assets is rather low and would not have significant influence on ROA, especially coupled with other changes generated by increased exploration and development activities. Finally, the exploration expenses per barrel is one the indicators that the companies are trying to decrease, and its negative association with ROA serves as a clear illustration of the reason behind it.

As for other significant coefficients, a positive relationship was identified between return on assets and the **share of exports in the companies' sales**. As dummy variable "crisis" was not significant the appreciation of USD exchange rate to the countries' currencies during the last two years did not influence the situation significantly. Therefore, it can be concluded that there are factors stronger than changes in the exchange rate that contribute to the positive relationship. Possible explanation could have been the size of the companies but it is not the case: both larger and smaller companies of the sample include those with a high share of exports.

Considering the share of the **government** in the equity, no significant relationship with profitability ratios studied was identified. It is often stated that government attention ownership can prevent companies from performing as well as their privately-owned peers do, but for oil and gas companies which generally operate in a strategically important sector it is not the case as far as the results show for this particular sample. The influence, however, can probably be demonstrated for other performance indicators which were not included in the study.

$$ROA_{it} = 0.131 + 0.399 \times OPM_{it} + 0.183 \times AT_{it} - 0.125 \times LEV_{it} + 0.011 \times ln(restot)_{it} - 0.029 \times ln(explorexp)_{it} + 0.134 \times exportshare_{it} + v_{it}$$

$$ROA_{it} = 0.178 + 0.404 \times OPM_{it} + 0.18 \times AT_{it} - 0.119 \times LEV_{it} + 0.012 \times ln(prodtot)_{it} - 0.028 \times ln(explorexp)_{it} + 0.122 \times exportshare_{it} + v_{it}$$

As for **return on equity**, in terms of significant coefficients the results are different from ROA – none of the relationships mentioned above was the same for ROE: there was no relationship identified with the amounts of reserves, production or refining. It was not expected, but the reason for such a result can be the accounting of those specific factors – they are mostly included into assets of the company. Moreover, exploration expenses coefficient is positive compared to ROA case. Significant relationship was identified between ROE and **EBITDA per barrel/ exploration expenses per barrel**. Therefore, it can be clearly seen that the picture is quite different when the assets themselves are not used in the computation of the dependent variable.

$$ROE_{it} = -0.109 + 0.578 \times OPM_{it} + 0.07 \times AT_{it} - 0.008 \times LEV_{it} - 0.001 \times ebbar_{it} + \qquad 0.011 \times explorexpbar_{it} + v_{it}$$

Moving to the valuation part and, particularly, **market capitalization**, positive relationship was identified with the **production amount** – which implies that investors pay attention to the level of production of oil and gas companies, opposite to the levels of **reserves** which showed a negative with market capitalization. Still, positive relationship was identified with **exploration expenses per barrel** of oil produced and **total exploration expenses**. This result probably speaks in favor of the fact that investors' attention is drawn to exploration expenses as to a

positive sign but at the same time indicates that exploration expenses per barrel are probably not the factor investors pay attention to. Also the relationship with **EBITDA per barrel** is significant but negative. The reason behind it can be the exceeding increase in the production levels over the increase in EBITDA: even if the later is increasing, a positive relationship between market capitalization and production level probably does not "allow" the relationship with the indicator to be positive up to a certain point. Considering DuPont model multipliers, a positive relationship was found with operating profit margin and assets turnover, and negative with leverage, which corresponds with the results for previous dependent variables. Relationship with government ownership and share of exports in sales was also proved to be positive, thus probably being treated by the market as positive signs.

$$Marcap_{it} = 0.73 + 0.045 \times OPM_{it} + 0.611 \times AT_{it} - 0.409 \times LEV_{it} - 0.102 \times ln(restot)_{it} + 0.055 \times ln(explorexp)_{it} + 1.607 \times exportshare_{it} + v_{it}$$

$$Marcap_{it} = 11.42 + 0.062 \times OPM_{it} + 0.414 \times AT_{it} - 0.243 \times LEV_{it} + 0.162 \times ln(prodtot)_{it} + 2.26 \times government_{it} + 2.35 \times exportshare_{it} + v_{it}$$

$$Marcap_{it} = 3.62 + 1.34 \times OPM_{it} - 0.229 \times AT_{it} - 0.567 \times LEV_{it} - 0.004 \times ebbar_{it} + 0.007 \times explorexpbar_{it} + 0.837 \times size_{it} + v_{it}$$

Finally, **fundamental value** has shown, firstly, positive relationship with the amount of total **reserve**s and **production** which is consistent with the results for profitability of the companies. A positive relationship was also identified between fundamental value and **EBITDA per barrel** and total amount of **exploration expenses**, and negative with **exploration expenses per barrel**. The positive relationship with EBITDA per barrel comes from the calculation of fundamental value where EBITDA is involved and reserves amount is not. Positive relationship with exploration expenses indicates that they probably can affect fundamental value even in short term, while negative with exploration expenses per barrel shows the importance of differentiating those two metrics. Moreover, it illustrates the importance of expense management: with exploration expenses per barrel getting lower, the fundamental value of the company is increasing. Relationship with DuPont model components is similar to the one of market capitalization: positive coefficient of operating profit margin and assets turnover and negative of leverage.

$$Fundvalue_{it} = 9.7 - 0.185 \times OPM_{it} + 1.424 \times AT_{it} - 0.686 \times LEV_{it} + 0.244 \times ln(restot)_{it} + 3.87 \times exportshare_{it} + v_{it}$$

$$Fundvalue_{it} = 6.85 - 0.148 \times OPM_{it} + 2.169 \times AT_{it} - 0.561 \times LEV_{it} + 0.391 \times ln(oilprod)_{it} + 0.244 \times ln(explorexp)_{it} + v_{it}$$

$$Fundvalue_{it} = 7.74 + 0.025 \times OPM_{it} + 1.535 \times AT_{it} - 0.191 \times LEV_{it} + 0.309 \times ln(prodtot)_{it} + 4.11 \times exportshare_{it} + v_{it}$$

$$Fundvalue_{it} = -1.51 + 2.15 \times OPM_{it} - 0.49 \times AT_{it} - 0.593 \times LEV_{it} + 0.019 \times ebbar_{it} - 0.031 \times explorexpbar_{it} + 1.177 \times size_{it} + v_{it}$$

All the models also included a dummy variable – crisis, which took value 0 from 2011 to 2013 and 1 in 2014 and 2015 as the years when the situation in the industry became less favorable then the three years before. However, the coefficient before this variable was not significant in any of the cases, implying that it did not anyway influence the whole picture largely, though this conclusion is debatable. It is important to mention that whenever size was not included into the final model but possibly could have influenced the significance and signs of the coefficients, the same model with size/ total assets logarithm factor was tested in order to check that its inclusion does not significantly change the results. At the same time, if the results with size component were different, it was included into the models.

In the table below, the average coefficients from all the models for the dependent variables are presented - since the coefficients generally do not differ largely and thus can be put in such form to give an overview of the results for each of the variables. The detailed results for every model are presented in the Appendix 3.

Table 7. Relationships identified – overall average coefficients

	ROA	ROE	Fundamental value	Market value
opm	0.4	0.58	-0.18	0.5
at	0.18	0.07	1.5	0.61
leverage	-0.12	-0.008	-0.65	-0.3
ln (restot)	0.011	-	0.244	-0.102
ln (prodtot)	0.012	-	0.309	0.162
ln (explorexp)	-0.03	-	0.244	0.055
explorexpbar	-0.0007	0.011	-0.031	0.007
exportshare	0.13	-	4	2
ebbar	-	-0.001	0.019	-0.004
government	-	-	-	2.26

Then, a separate country-based analysis was done: since the number of Chinese companies does not allow to perform any analysis in Stata, only samples for India and Russia were tested.

The results are rather different for **India** compared to the results for the whole sample: a significant positive relationship was identified between **market capitalization/ fundamental**

value of the companies and the amount of **total production**, included in the models together with DuPont multipliers, as well as between market capitalization and **government ownership** and **share of exports** in the sales of the companies. The coefficients before any factors in profitability models were not significant. It can be so because generally Indian companies had the lowest ROA and ROE in the sample which were not determined only by the amounts of production of the companies but other external factors.

$$Marcap_{it} = 11.13 + 0.059 \times OPM_{it} - 0.276 \times AT_{it} - 0.242 \times LEV_{it} + 0.161 \times ln(prodtot)_{it} + 2.88 \times government_{it} + 2.93 \times exportshare_{it} + v_{it}$$

$$Fundvalue_{it} = 5.24 + 0.024 \times OPM_{it} - 1.264 \times AT_{it} - 0.092 \times LEV_{it} + 0.432 \times ln(prodtot)_{it} + v_{it}$$

Then, the analysis for Russian sample showed negative relationship between the **ROA** and **exploration expenses** − total amount and per barrel, **reserves and production**, as well as positive relationship between **ROE** and **exploration expenses** and negative between ROE and total amounts of reserves and production. Negative relationship was found between fundamental value and the **amount of oil production**, **share of exports** and **refining segment** in the sales of the company. Positive relationship was identified between fundamental value and amount of **oil reserves**, **total production** and **EBITDA per barrel**. This is consistent with the results for the united sample and indicates that in terms of those coefficients it is largely influenced by the Russian part: while for Indian companies which are more engaged in refining the amount of exploration expenses and the amount of reserves are important but not critical, Russian upstream-oriented companies show a certain degree of dependency between profitability and valuation and those variables. Moreover, negative relationship between **total production** and **return on equity** was identified which is not the case for the united sample.

$$ROA_{it} = 0.127 + 0.547 \times OPM_{it} + 0.079 \times AT_{it} + 0.011 \times LEV_{it} - 0.006 \times ln(prodtot)_{it} - 0.005 \times explorexpbar_{it} - 0.05 \times refshare_{it} + v_{it}$$

$$ROE_{it} = -0.146 + 0.897 \times OPM_{it} + 0.241 \times AT_{it} + 0.033 \times LEV_{it} - 0.006 \times ln(oilres)_{it} + v_{it}$$

$$ROE_{it} = 0.092 + 0.854 \times OPM_{it} + 0.06 \times AT_{it} + 0.024 \times LEV_{it} - 0.016 \times ln(prodtot)_{it} + 0.015 \times ln(explorexp)_{it} + v_{it}$$

$$Marcap_{it} = 9.52 + 2.257 \times OPM_{it} + 0.554 \times AT_{it} - 0.625 \times LEV_{it} - 0.118 \times ln(prodtot)_{it} + v_{it}$$

$$Fundvalue_{it} = 4.25 - 0.526 \times OPM_{it} + 0.516 \times AT_{it} - 0.355 \times LEV_{it} + 0.451 \times ln(prodtot)_{it} + v_{it}$$

$$Fundvalue_{it} = -13.49 - 0.734 \times OPM_{it} + 0.569 \times AT_{it} - 0.777 \times LEV_{it} + 0.086 \times ebbar_{it} - 5.083 \times exportshare_{it} - 3.654 \times refshare_{it} + v_{it}$$

Detailed results of the regression analysis can be also found in the Appendix 3, the average coefficients are presented in the below for an overview.

Table 8. Relationships identified – country-specific average coefficients

	India				Russia			
	ROA	ROE	Fund	Market	ROA	ROE	Fund	Market
opm	-	-	0.024	0.059	0.547	0.854	-0.6	2.257
at	-	-	-1.264	-0.276	0.079	0.06	0.52	0.554
leverage	-	-	-0.092	-0.242	0.011	0.024	-0.5	-0.625
ln (restot)	-	-	-	-	-	-	-0.006	-
ln (prodtot)	-	-	0.432	0.161	-0.006	-0.016	-0.451	-0.118
ln (explorexp)	-	-	-	-	-	0.015	-	-
explorexpbar	-	-	-	-	-0.005	-	-	-
exportshare	-	-	-	2.93	-	-	-5.083	-
ebbar	-	-	-	-	-	-	0.086	-
government	-	-	-	2.88	-	-		-
refshare	-	-	-	-	-0.05	-	-3.654	-

2.5. Findings discussion

The results of the analysis have shown the importance of industry-specific factors consideration when determining the drivers of profitability and value of oil and gas companies. Several groups of factors can be identified depending on their relationships with profitability and value indicators.

First of all, the relationship discovered with the **first level components of DuPont model** corresponds to expectations: operating profit margin and assets turnover are positively related to profitability and value, while leverage is characterized by a negative relationship. Moreover, the degree of the relationship (the coefficient) with operating profit margin is generally higher for profitability while with assets turnover for value, both market and fundamental. It can be explained just by the fact that operating income itself is a profitability indicator while asset turnover turns out to be more closely related to value generation. Then, in some models on fundamental value, the coefficient before operating profit margin also turned out to be negative: this may have taken place due to the Indian part of the sample that is characterized by high assets turnover and low fundamental value due to the crisis.

Considering **industry-specific factors** such as amount of reserves or production, their relationship with the dependent variables in almost all of the models turned out to be positive, implying primarily the same direction of changes between the variables. However, growing level of production at some point can start affecting the profitability and value negatively, especially taking into account the situation of global imbalance of oil supply and demand. Positive relationship means that overall companies manage to keep their production on the level which only benefits their performance when profitability and value are growing, and, at the same time, the fall in production would most likely affect ROE, ROA, market and fundamental value.

Then, the results obtained for exploration expenses are different for the variables: while ROA and fundamental value are characterized by negative relationship with the indicator, the coefficient is positive for ROE and market capitalization. As mentioned before, it may take place due to several reasons; it may happen because of the strong association of exploration expenses with assets of the company where they are capitalized, which are the core for the calculation of return on assets, as well as their significant influence on the calculation of residual income. However, the explanation from the crisis point of view is more probable: while companies were increasing the exploration expenses, ROA and fundamental value have been falling due to unfavorable economic events. Positive relationship with the other two indicators is leading to the conclusion that probably the amount of exploration expenses is perceived by investors as a sign of growth, and, therefore, coupled with other factors boosts the growth of market value of the company.

As for the operational level of DuPont model components – EBITDA per barrel and exploration expenses per barrel – which were initially considered as the main focus of the work, their relationship with the dependent variables is significant in several models presented. The relationship of exploration expenses per barrel with ROA and fundamental value is negative, while relationship with ROE and market capitalization is positive, probably due to the reasons mentioned above for the total amount of exploration expenses. Relationship of EBITDA per barrel, on the opposite, is negative with ROE and market capitalization - probably as a result of the crisis situation that did not allow EBITDA to "take over" the power of influence from barrels produced, while it is still positive for fundamental value.

Factors which generally did not change as much as others during the time observed were government share in ownership, share of exports in the sales of the company and share of refining segment in sales. Coefficient of government ownership share is significant only in one case – positive relationship was discovered with market capitalization, which actually can indicate that investors treat it as a sign of security and stability. Positive relationship of the share of exports in sales was revealed with return on assets, market capitalization and fundamental value – the possible reason is, again, the crisis situation and the fall of exchange rates that benefited somehow the companies with a huge export market, allowing them to diversify the risks and increase revenues in foreign currency. As for refining segment, positive relationship was identified only with residual income. Taking into account that the majority of the companies with positive residual income in the sample are Russian, it can be concluded that those that actually take steps in increasing the share of refining activities in the portfolio are thus paving the way for higher returns – not as high now to affect the value and profitability, but probably in the future and supported by more favorable economic conditions.

But with all the results obtained, it should not be forgotten that there are always factors that are not included into analysis but may affect the situation, especially in oil and gas industry which is largely influenced by different macroeconomic, political and other factors. Even though the relationships identified are based on strong arguments, they can be as well strongly connected to other factors which are not considered in the model.

2.6. Managerial implications

The results of the analysis have proved that models based on the combination of DuPont Model components and industry-specific factors are a key tool to discover the main drivers' influence on profitability and value creation, allowing to see their relationship with profitability and value indicators to form managerial and investment decisions accordingly.

First of all, the assumptions about **DuPont model first-level components** and their relationship with profitability and value were confirmed for the sample studied, representing different degree of relationship with dependent variables and thus the degree of those indicators' importance for

the change in profitability and value creation factors. Thus, as mentioned earlier, operating profit margin is characterized by a stronger relationship with ROA and ROE, while assets turnover – with market and fundamental value. It provides the managers with an insight depending on the perspective of the performance evaluation and the strategies they need to develop: changes in ROA and ROE would more probably be attributed to operating profit margin while fundamental value changes are more closely linked to assets turnover, as well as market capitalization despite the belief that investors generally follow operating profit margin characteristics. Therefore, in short-term perspective operating profit margin would be the more appropriate metric for performance measurement while assets turnover is more of a long-term value metric. Investors, in their turn, also would benefit from being attentive to the particular indicators depending on their investment position. As for leverage, its negative relationship with all the dependent variables and higher association with fundamental value indicates the importance of its monitoring as with the influence of unfavorable economic events companies are relying more on debt which can affect the value negatively.

Moreover, the role of **industry-specific factors** was demonstrated indicating the need for their consideration: reserves base, production amount proved to be significant in their relationship with profitability and value indicators. Thus, positive relationship of **reserves and production amounts** with dependent variables also may indicate that the companies tend to keep levels of production corresponding to the changes in market situation. The fact that no such relationship was identified for Russian companies can be explained via the specifics of the industry: since it is dominated by the upstream sector, planned production levels cannot be changed easily – here the increasing involvement in refining sector can be considered as a hedging strategy. In addition to this, negative association indentified between the amount of oil reserves and return on assets can overall speak for performance management problems of oil giants.

Nevertheless, as it was mentioned earlier, as much as it is important for managers to maintain those indicators on a certain level, it is essential to coordinate it with the demand and monitor **exploration costs**: since they showed negative relationship with ROA and fundamental value it may indicate that high costs do not result in corresponding output. For each company this issue should be investigated individually to control the underlying reasons. The positive association of exploration expenses with the market value of the company can indicate that large exploration

expenses are accessed by the market as a positive sign but its negative relationship with return on assets shows that the exploration expenses do not appear to generate desired profit levels as high investments are followed by a low output. Therefore, it can be concluded that the absolute amount of exploration expenses should not be used as a separate metric for investment appeal and different macro factors should be considered. As for investors, it is important to know that high levels of production and reserves base can be generally considered as a positive sign, while exploration expenses tend to relate differently to different indicators and thus a closer attention to the situation in a particular company should be paid.

Next, positive relationship was also revealed between the dependent variables and the characteristics of **ownership structure** (government ownership), **export orientation** (share of exports in sales) and **nature of operations** (share of refining activities in sales). For managers those are additional points for consideration in long-term strategy planning: while government ownership is considered to be not beneficial for the performance of the companies, it apparently provides companies with benefits that outweigh the disadvantages. Situation with export orientation though is debatable since it is not that easy to increase the export share, as well the share of refining activities due to different external constraints. Nevertheless, when comparing other factors with those of competitors, their degree of involvement in export, level of state ownership and business portfolio should be considered as additional variables that can affect the differences apart from the overall exploration, production and refining management. As for investors, the implication is rather straightforward: the abovementioned factors should be considered when choosing the companies for investment among those from the sample.

Considering **composite indicators of the operational level of DuPont model**, it was expected that the relationship would be significant and positive in the majority of the cases. Nevertheless, it was the case only for several models, otherwise the coefficients were insignificant. Although the variable "crisis" was not significant neither, the issue still can be attributed to the negative situation in the market, especially for EBITDA per barrel, meaning that here the task of managers is basically the mitigation of the unfavorable conditions. For investors, on the other hand, it means that the fall in the indicator does not mean that there are problems with production management inside the company but more a general landscape in the industry. As for

exploration expenses per barrel, this factor showed the same dynamics as total exploration expenses which were discussed above.

In particular, the negative relationship of **EBITDA per barrel**, the most popular performance indicator in oil and gas industry, with ROA, ROE and market capitalization indicates that it may not reflect the market changes – in relative terms meaning that production is generally falling faster than the earnings are growing. Thus, it may be concluded that growing EBITDA per barrel is not an attractive investment or benchmarking metric during crisis.

Moreover, the results of the study showed differences and similarities **between the countries**: while the production/ refining amount as well as government and export share were positively related with almost all the dependent variables of all samples, composite variables' coefficients were significant only for Russian sample. For investors it means that composite indicators can be applied for comparison only between Russian companies, while other indicators can be used for cross-country comparisons. In addition to this, the calculation of fundamental value showed that Indian companies generated negative fundamental value much more often than others, especially during the last 2 years of the study, meaning that investors generally should be careful with buying the stocks of Indian oil and gas companies. Although a separate reliable analysis of Chinese companies could not be performed, it was crucial to take those companies into account when forming the overall sample.

To sum up, the results obtained provide managers and investors with a combination of factors that can be used to investigate the reasons of change in profitability and value of companies, conduct comparisons between companies and countries to benchmark the factors of the company's performance against its peers, get corresponding insights for managerial decisions on operational and strategic levels and for the choice of partner companies or investment targets.

2.7. Limitations and further research suggestions

First of all, the number of the observations in the sample was lower than expected initially: it included all the available information, thus allowing to obtain 120 observations which was enough to perform statistical analysis and draw conclusions for the countries studied.

Concerning data collection process, sometimes it was hard to get the data and annual reports not only for relatively small companies but also for large players, especially in India and China, and therefore it took a lot of time to get the numbers for all the variables and analyze companies one by one. That is why 120 observations was actually a perfect number as given the time constraints it would have been impossible to get correct reliable data on all the indicators. Nevertheless, if time allowed, it would have been interesting to look into more countries – for example, BRICS – and compare their performance between themselves or with highly developed oil companies coming from USA and Norway. Moreover, the number of years could be enlarged to in order to perform not only descriptive analysis but also be able to make long-term forecasts based on historical data with dynamic panel data models. It would also allow to enlarge separate samples for each country and make the country-specific results more reliable. Considering such industry-specific factor as reserves base, there also have been a lot of discussions on whether their re-evaluation is sometimes too subjective and does not reflect the reality. It would possibly be interesting to look into the issue more precisely but this requires a completely separate study.

In addition to this, even though all the main industry-specific factors were included, there always can be factors which also influence the situation but were not considered in the model, from highly technical characteristics to a variety of external factors. Talking about the variables that cannot be influenced by the companies themselves, the main one is for sure the price of oil. In this work, it was considered somehow with the variable "crisis" which did not turn out to be significant for the sample due to differences between the companies, although it is clear that the dramatic changes in oil prices affected the situation largely. On the other hand, inclusion of such variable as the corridor of oil price changes just as separate regression factor probably also would not help a lot. Thus, it would be beneficial to see how the advanced methods of oil price modeling would contribute to the analysis of the performance of the companies of this particular sample.

Conclusion

Value-based management has become one of the most important concepts for the evaluation of performance of companies and choice of particular value factors that are crucial to achieving profitability and shareholder value creation. DuPont model, as the comprehensive tool for analysis, can contribute significantly to value drivers' identification up to operational level, especially coupled with industry-specific factors, although the number of studies in the field is quite limited for developing countries and particular industries. That is why it was decided to concentrate on value drivers' identification of oil and gas companies in India, China and Russia: oil and gas industry is generally characterized by high dependency on macroeconomic factors and the question of how companies can control profitability and value despite the changes that cannot be managed is always topical. In addition, oil and gas companies in Russia, China and India play a crucial strategic role in the development of the economy and, considering recent crisis situation, are facing additional challenges that need to be addressed via the identification of crucial profitability and value creation factors.

The study was based on 10 Indian, 11 Russian and 3 Chinese companies, from year 2011 to 2015, in total 120 observations. The overall situation for oil and gas companies in the countries of the analysis was investigated, as well as a review on value-based management and existing studies on DuPont model application in value drivers' identification conducted. Then, regression analysis was performed to identify the relationships between return on assets, return on equity, residual income, market value and fundamental value as dependent variables and DuPont second level components as well as industry-specific factors and composite indicators as independent variables. As a result, significant relationships were identified based on the models including combination of factors, providing managers of oil and gas companies and investors with the insights for decisions concerning the companies in the countries studied. Nevertheless, it is important to mention that the research was limited by the time and information available and serves as a base for further studies where more factors can be included as well as larger time frame and bigger number of countries considered to allow for more tools of the analysis to be used and discover the relationships (or their absence) that have not been identified in the current study.

Appendix

Appendix 1. Description of the companies

India	
Indian Oil	One of the leading Indian oil and gas companies engaged in exploration, production, refining and marketing. Owns and operates over 10 refineries.
Reliance Industries	Another vertically-integrated oil and gas leader on Indian market
Selan Exploration	Company is principally engaged in exploration and production of oil and gas
Cairn India	Company's main activities lay in extraction of crude oil and natural gas, as well as refining and marketing of the products.
Gujarat Natural Resources	Company mainly involved in oil and gas exploration, operating basins all over India
Mangalore Refinery and Petrochemicals	Holding company engaged in crude oil refining and manufacturing of refined petroleum products
Bharat Petroleum	Company operates in segments of Exploration and Production of Hydrocarbons and Downstream Petroleum, including refining and marketing.
Hindustan Oil	Oil and gas company which main activities are related to exploration and production of hydrocarbons.
Hindustan Petroleum	Vertically-integrated company with a main focus on downstream segment
Oil and Gas Natural	Global vertically integrated energy company
China	
China National Oil Offshore Corporation (CNOOC)	The largest producer of offshore crude and natural gas in China as well as one of the biggest independent oil and gas exploration and production companies in the world.
China Petroleum & Chemical Corporation	Energy (vertically integrated with a focus on refining) and Chemical Company
PetroChina Company Limited	Company is engaged in oil and gas production and distribution, including Exploration and Production, Refining, Chemical, Marketing and Transportation Segments
Russia	
ANK Bashneft'	Company is principally involved in extraction, exploration and production of crude oil and oil products. In 2015 was acquired by NK Rosneft'
Yatek OAO	Company engaged in extraction, processing and marketing of natural gas and gas condensate
Novatek OAO	Natural gas producer operating in segments of exploration, production, processing, transportation and marketing of natural gas.

NK Rosneft'	Vertically integrated oil and gas company which operates via many subsidiaries in Russia and abroad	
NNK Khabarovsky NPZ AO	Company mainly operating in segments of processing and refining of crude oil	
Orsknefteorgsintez PAO	Company involved in refining and manufacturing of petroleum products, active both in Russia and abroad	
Gazprom PAO	One of the largest companies engaged in exploration, production, transportation and sales of natural gas domestically and internationally, as well as crude oil production	
Gazpromneft' PAO	Vertically integrated oil company operating in Russia and abroad	
Lukoil	Oil company involved in exploration, production, refining, marketing and distribution of oil and refined products, domestically and internationally	
Surgutneftegas	Vertically integrated oil company	
Tatneft'	Oil and gas company operating in segments of exploration and production, refining and marketing and petrochemicals	

Appendix 2. Descriptive statistics of variables

	India		Russia		China	
	Min	Max	Min	Max	Min	Max
ROA	-8.04	0.52	-0.47	0.41	0.024	0.24
ROE	-2.98	0.25	-4.5	0.62	0.03	0.26
OPM	-20.34	0.69	-1.49	0.81	0.023	0.38
AT	0.05	2.49	0.17	1.45	0.26	2.37
Leverage	1.11	7.88	1.13	6.31	0.14	2.44
Resinc, th. USD	- 2 014 282	2 860 028	**-7 731 179**	**16 010 313**	-1 4 4 3 3 132	7 426 257
Fundvalue, th. USD	**-16 520**	92 432 389	253 036	691 437 024	56 488 826	**1 166 164 431**
Marcap, th. USD	**40 550**	1 0 8 6 7 0 000	71 920	137 943 988	86 263 255	**318 269 894**
TA, th. USD	**23 759**	81 007 272	152 901	**408 515 319**	61 053 401	3 8 7 6 7 6 855
Oilres, mln	5.36	3 796	**0.04**	**125 607**	2 165	11 128
Gasres, mln	**1.99**	459 332	122 682	**23 705000**	171 319	2 195 499
Restot, mln	**5.55**	1 107 507	277	**57 130385**	413 181	5 292 346

Oilprod, mln	**0.0067**	164	29.45	**1 477**	0.88	404
Gasprod, mln	**0.648**	77 405	925	**513 200**	5 250	242 267
Prodtot, mln	**0.023**	186 574	0.73	**1 236 844**	12 654	583 865
Oilref, mln	91.6	489	**5.24**	712.86	186.43	**1689**
Explorexp, th. USD	**1 343**	2 882 812	1 990	**218 357142**	1 612 305	17 156511
Ebbarprod, USD	**-5 265**	**146**	0.05	20.63	3.4	72.65
Explorexpbar, USD	2.35	**1 619**	**0.02**	15.35	1.07	49
Government	0	**1**	0	0.75	0.28	1
Exportshare	0	0.57	0	0.81	0	**0.86**

	India		Russia		China	
	Mean	St dev	Mean	St dev	Mean	St dev
ROA	-0.17	1.23	0.12	0.13	0.09	0.058
ROE	0.018	0.46	0.03	0.81	0.13	0.06
OPM	-0.36	2.98	0.16	0.31	0.13	0.13
AT	1.14	0.94	0.71	0.35	1.16	0.73
Leverage	3.11	2.07	1.94	0.91	1.56	0.94
Resinc, th USD	274,846	883 703	1 735 240	5 338 145	109 914	6 700 540
Fundvalue, th USD	20 877 326	26 821 851	126 361 221	169 672 104	482 081 138	424 198 896
Marcap, th USD	16 964 889	27 817 835	31 513 644	31 824 545	155 454 230	84 706 307
TA, th USD	20 900 347	23 650 064	65 185 276	98 496 341	220 439 064	116 865 808
Oilres, mln barrels	1 218	1 537	21 355	39 606	5 476	3 697
Gasres, mln cubmeters	139 956	189 410	5 012 331	8 617 895	794 854	880 723
Restot, mln tons	270 006	429 026	7 550 963	17 335746	1 916 364	2 123 041
Oilprod, mln barrels	29	54	424	379	109	160
Gasprod, mln cubmeters	12 770	25 886	77 603	163 917	67 702	86 696
Prodtot, mln tons	18 485	50 350	119 060	326 347	163 178	208 928
Oilref, mln barrels	250	159	258.13	223.62	944.7	606.5
Explorexp, th.USD	527 041	903 342	5 997 452	32 666079	5 817 528	5 002 805
Ebbarprod, USD	-110	775	9.2	6.2	24.94	28.16
Explorexpbar, USD	189	415	2.19	3.72	13.32	17.84
Government	0.28	0.37	0.1	0.23	0.69	0.44

Exportshare	0.10	0.18	0.4	0.29	0.29	0.37

Appendix 3. Regression analysis results

United sample (120 observations, 2011 to 2015)

	ROA (1)	**ROA (2)**	ROA (3)	ROA (4)	**ROA (5)**
opm	0.3931966***	0.3989332***	0.402***	0.3989981***	0.4046958***
at	0.1650579***	0.1837132***	0.125***	0.1602562***	0.1805186***
leverage	-0.1513986 ***	-0.1255528***	-0.151***	-0.1539682***	-0.1185472***
ln (gasres)	0.0259008***				
ln (restot)		0.011435**			
ln (oilprod)			0.00947**		
ln (gasprod)				0.0348118***	
ln (prodtot)					0.0120764***
ln (explorexp)	-0.0336366***	-0.0291745***		-0.0389816***	-0.0283104**
exportshare		0.1344957**			0.1217334**
const	-0.0844863	0.1310065	0.144	0.1304474	0.1784778**
P-value	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.9825	0.9803	0.9776	0.9819	0.9787
№ of obs	55	75	90	65	80

	ROA (6)	**ROE (1)**	Marcap (1)	**Marcap (2)**	Marcap (3)	Marcap (4)
opm	0.3960615***	0.5779177***	0.0757625***	0.04533	0.0357801***	0.0653284***
at	0.0395684	0.0702955***	0.5684649	0.6118083	-0.4267596***	0.8717175*
leverage	-0.0038047	-0.0087242	-0.5919297***	-0.4096449**	-0.5877297***	-0.4028881***
ln (oilres)			0.1871175**			
ln (gasres)						
ln (restot)	0.0157487**			0.1019673**		
ln (oilprod)					-0.1503172***	

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ln (gasprod)						0.1407274***
ln (explorexp)			0.0653168	0.0552874		
ebbar		-0.0014012**				
explorexpbar	-0.0007458***	0.0103838**			-0.0099586	
government			2.64686**			
exportshare			1.482806**	1.607321**		
size					0.8422035***	
const	0.4251752**	-0.1087147***	11.70025**	0.7309***	6.7752***	13.50279**
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.9867	0.5741	0.7289	0.7309	0.9451	0.6775
№ of obs	65	65	75	75	75	80

* meaning 10% significance level
** - 5% significance level
*** - 1% significance level

	Marcap (5)	**Marcap (6)**	**Marcap (7)**	Fundvalue (1)	Fundvalue(2)
opm	0.0625987***	1.343979***	0.297851	-0.1833883	-0.2103443
at	0.4144901**	-0.2293206	-0.34866**	1.461976**	1.276699**
leverage	-0.2433974***	-0.5670692**	-0.2182625***	-0.9500784**	-0.6365753
ln (oilres)				0.3832916**	
ln (gasres)					0.2950954***
ln (restot)					
ln (prodtot)	0.1625925**		0.1411173***		

ln (explorexp)				0.1722523	
ebbar		-0.0037155			
ebbarref			0.0359713***		
explorexpbar		0.0069017***			
government	2.265004***		0.8386544***		
exportshare	2.351691***				
size		0.8374707***			
const	11.42419***	3.620419***	14.11173***	7.376066	9.925555***
P-value	0.0000	0.0000	0.0000	0.0000	0.0006
R-squared	0.7789	0.9163	0.9099	0.6237	0.5785
№ of obs	110	65	50	73	59

	Fundvalue (3)	Fundvalue(4)	Fundvalue(5)	**Fundvalue(6)**	**Fundvalue(7)**
opm	-0.1845112	-0.1477923	-0.1422419	0.025536	2.150652**
at	1.423936***	2.168869***	1.877714***	1.535122***	-0.4920481
leverage	-0.6863884***	-0.5616098	-0.8562958***	-0.1913988	-0.5928116**
ln (restot)	0.2442216***				
ln (oilprod)		0.391181***			
ln (gasprod)			0.3593319***		
ln (prodtot)				0.3099384***	
ln (explorexp)		0.2444916***	0.0529173		
ebbar					0.0188193**
explorexpbar					-0.0305621***
exportshare	3.877187***		2.977115***	4.110099***	
size					1.176849***
const	9.695047***	6.848355***	7.533071***	7.741636***	-1.515168***
P-value	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.7418	0.6901	0.7985	0.7848	0.9177
№ of obs	78	73	64	108	61

India

	Marcap(1)	Marcap (2)	Fundvalue
opm	0.0593043***	0.0163077	0.0247683
at	0.2760338	-1.187897***	1.263822***
leverage	-0.2420234***	-0.4151585	0.0917393
ln (oilprod)		0.6138252***	
ln (prodtot)	0.1608729**		0.4316282***
government	2.881759**	5.18106***	
exportshare	2.934685**	6.673276***	
const	11.12676***	5.931621***	5.241088***
P-value	0.0000	0.0000	0.0000
R-squared	0.7905	0.9558	0.6387
№ of obs	50	35	48

Russia

	ROA (1)	ROA (2)	ROA (3)	ROA (4)	ROA (5)
opm	0.4537168***	0.4977919***	0.4317333***	0.3576801***	0.5478823***
at	0.1081124***	0.0440817	0.072251***	0.1053592***	0.0789999***
leverage	-0.000973	0.0103899	0.0234357***	-0.0183137***	0.0112648
ln (oilres)					
ln (restot)		-0.0051691***			
ln (oilprod)			-0.0265902***		
ln (prodtot)				-0.0057***	-0.006394***
ln (explorexp)	-0.0113605***				
explorexpbar					-0.0047594***
refshare			0.0634955	-0.0923937	-0.0497374
const	0.1095416**	0.1261047	0.4503942***	0.1864967***	0.1265585***
P-value	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.8333	0.77	0.8358	0.9074	0.8867
№ of obs	45	40	40	54	35

	ROE (1)	ROE (2)	ROE (3)	ROE (4)	Marcap
opm	0.8979765***	0.8169381***	0.8549997***	0.5267011***	2.257373***

at	0.2419167***	0.0290428	0.0604749	0.1206272***	0.5543983
leverage	0.0325749***	0.0461548**	0.0242571	0.0102911	-0.6251828*
ln (oilres)	-0.0054247***				
ln (gasprod)		-0.0246534***			
ln (prodtot)			-0.0159604***		0.1175643***
ln (oilref)					
ln (explorexp)		0.0178462***	0.0145099**		
explorexpbar				0.0118415***	
const	-0.1455059***	0.234138	0.0923238	-0.0582655	9.519604***
P-value	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.8773	0.7412	0.7983	0.6890	0.7560
№ of obs	40	35	45	35	40

	Fundvalue (1)	Fundvalue (2)	**Fundvalue (3)**	**Fundvalue (4)**
opm	-0.7856602	0.7117249	-0.5257345	-0.7339036
at	-0.0676162	0.6804048	0.5158992***	0.5687197
leverage	-0.8263207***	-0.3927556	-0.3550182	-0.7769248***
ln (oilres)	0.3745573***			
ln (oilprod)		-0.8590605***		
ln (prodtot)			0.4513059***	
ebbar				0.0857721***
exportshare				-5.082932***
refshare				-3.654061***
size		1.759186***		2.099186
const	11.27718***	4.144994	4.250984	-13.49787
P-value	0.0000	0.0000	0.0058	0.0000
R-squared	0.8288	0.6369	0.3468	0.7270
№ of obs	40	40	45	35

Appendix 4. References

1. Brealey, R., Myers, S. and Franklin A. 2006. Principles of corporate finance. New York: McGraw-Hill/Irwin

2. Copeland, Koller. 2005. Valuation: Measuring and Managing the Value of Companies. McKinsey and Company Inc., 4th Edition.

3. Damodaran A. 1996. Investment valuation. New York: J. Wiley & Sons

4. Penman S. 2013. Financial Statement Analysis and Security Valuation. New York: McGraw-Hill, 5th Edition.

5. Volkov D.L. Theory of Value-based Management: Financial and Accounting Aspects. Graduate School of Management, St Petersburg State University. 2008. 2nd Edition.

6. Belascu L., Herciu M., Ogrean C., 2011. A DuPont Analysis of the 20 Most Profitable Companies in the World. International Conference on Business and Economics Research.

7. Berezinets I.V., Udovichenko O.M., Devkin A.A. 2016. Profitability forecasting of Russian companies with DuPont industry model. Russian Management Journal. 14, 1: 3-28.

8. Buhvalov A.V., Volkov D.L. Fundamental value of equity: usage in company management. Scientific reports № R1-2005 St Petersburg: SPbU 2005.

9. Chang K. et al. On the DuPont Analysis in HealthCare Industry. 2014. Journal of Accounting Public Policy, 33: 83–103

10. Claes P. 2006. Management Control and Value-based management: Compatible or not? Studies in managerial and financial accounting, 16: 269-301.

11. Ewing B., Thompson M. 2016. The role of reserves and production in market capitalization of oil and gas companies. Energy Policy, 98: 576-581.

12. Fairfield P. et al. 1996. Accounting Classification and the Predictive Content of Earnings. The Accounting Review, 71, 3: 337-355

13. Fairfield P. et al. 2009. Do Industry-Level Analyses Improve Forecasts of Financial Performance? Journal of Accounting Research, 47, 1.

14. Fairfield P., Lombardi Y. 2001. Using Asset Turnover and Profit Margin to Forecast Changes in Profitability. Review of Accounting Studies, 6: 371-385

15. Herrman D., Inoue T., Wayne T. 2000. The Persistence and Forecast Accuracy of Earnings Components in the USA and Japan. Journal of International Financial Management and Accounting, 11, 1: 48-70

16. Hoopwood W. et al. 1982. The Potential for Gains in Predictive Ability Through Disaggregation: Segmented Annual Earnings. Accounting Research Center , 20, 2: 724-732

17. Jensen M. Value Maximization, Stakeholder Theory and the Corporate Objective Function. 2002. Business Ethics Quarterly, 12, 2: 235-256.

18. Kim M., Kross W. 2005. The Ability of Earnings to Predict Future Operating Cash Flows Has Been Increasing – Not Decreasing. Journal of Accounting Research, 43, 5.

19. Li M., Nissim D., Penman S. 2014. Profitability Decomposition and Operating Risk. Columbia Business School, New York.

20. Lipe R. The Information Contained in the Components of Earnings.1986. Accounting Research Center, University of Chicago, Studies on Alternative Measures of Accounting Income, 24: 37-64

21. Nissim D., Penman S. 2001. Ratio Analysis and Equity Valuation: From Research to Practice. Review of Accounting Studies, 6: 109–154.

22. Nissim D., Penman S. 2001. Financial Statement Analysis of Leverage and How it Informs about Profitability and Price-to-Book ratios. Journal of Economic Literature, 41, 32.

23. Ohlson, J. Earnings, Book Values and Dividends in Equity Valuation. 1995. Contemporary Accounting Research, 11, 2: 661

24. Rappaport A. 1986. Creating Shareholder Value: The New Standard for Business Performance. New York: The Free Press. Business and Economics.

25. Rogova E. DuPont Analysis of the efficiency and investment appeal of Russian oil-extracting companies. 2014. 8th International Scientific Conference "Business and Management 2014", Vilnius Gediminas Technical University

26. Salamon G., 1970. Models of relationship between the Accounting and Internal rate of return: an Examination of the Methodology. Journal of Accounting Research, 11, 2: 296-303

27. Selling T., Stickney P. 1989. The effects of business environments and strategy on a firm's rate of return on assets. Financial Analysts Journal, 43, 52.

28. Solomon E. 1966. Return on Investment: The Relation of Book-Yield to True-Yield. Research in Accounting Measurement: 232-244.

29. Soliman M. 2004. Using Industry-Adjusted DuPont Analysis to Predict Future Profitability. Stanford University

30. Soliman M. 2008. The Use of DuPont Analysis by Market Participants. The Accounting Review, 83, 3: 823 – 853.

31. Stewart G. 1999. The Quest for Value: A Guide for Senior Managers. New York: Harper Collins Publishers

32. Vatter W. 1966. Income Models, Book Yield and Rate of Return. The Accounting Review, October: 681-698.

33. Bharat Petroleum Annual Report 2013-2014. 2017. BPCL. – Available at: https://www.bharatpetroleum.com/pdf/OurFinancial/F000000184_bpcl.pdf

34. Bharat Petroleum Annual Report 2015-2016. 2017. BPCL. – Available at: https://www.bharatpetroleum.com/pdf/OurFinancial/BPCL-Annual-Report-15-16.pdf

35. BP Energy Outlook: 2017 Edition. 2017. BP p.l.c. – Available at: http://www.bp.com/energyoutlook

36. BP Energy Outlook: Country and regional insights – China. 2016. BP p.l.c. Available at: http://www.bp.com/energyoutlook

37. BP Statistical Review of World Energy. 2016. BP p.l.c. - Available at: http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

38. Driving value in upstream oil and gas – Lessons from energy industry's top performing companies. 2013. PriceWaterhouseCoopers. – Available at: http://www.pwc.com.au/publications/upstream-oil-gas.html

39. Global Fire Power – Oil and Gas. 2017. Globalfirepower. – Available at: http://www.globalfirepower.com/

40. China's Evolving Oil Demand. 2016. Baker Institute for Public Policy. - Available at: http://www.bakerinstitute.org/media/files/files/e0b5a496/WorkingPaper-ChinaOil-093016.pdf

41. China unveils market reform for oil and gas industry. 2017. China Daily. - Available at: http://www.chinadaily.com.cn/china/2017-05/22/content_29437500.htm

42. From Recession to Recovery: Russia Economic Report. 2017. World Bank Group. - Available at: http://www.worldbank.org/en/country/russia/publication/rer

43. Make in India. 2017. Department of Industrial Policy and Promotion. - Available at: http://www.makeinindia.com/about

44. India Energy Outlook - World Energy Outlook special report. 2015. International Energy Agency. . – Available at: https://www.iea.org/publications/freepublications/publication/IndiaEnergyOutlook_WEO2015.pdf

45. India eyes merger of state-controlled oil and gas groups. 2017. Financial Times. - Available at: https://www.ft.com/content/18d1fd5a-e914-11e6-893c-082c54a7f539

46. Indian Oil Annual Report 2015-2016. 2017. Indian Oil. – Available at: https://www.iocl.com/AboutUs/AnnualReports/AnnualReport201516.pdf

47. India to replace Russia as 3rd largest oil refiner: IEA. 2017. HT Media Limited – Available at: http://www.hindustantimes.com/business-news/india-to-replace-russia-as-3rd-largest-oil-refiner-iea/story-p0AG87DyjZCHdwXXy51oKP.html

48. Oil extraction is Russia reached the record. 2017. Lenta.ru – Available at: https://lenta.ru/news/2017/01/02/oilproduction/

49. Outlook 2017: Changes for China's oil sector in the Year of the Rooster. 2017. S&P Global Platts. - Available at: https://www.platts.com/latest-news/oil/singapore/outlook-2017-changes-for-chinas-oil-sector-in-27741677

50. Statistics – extraction including gas condensate. 2017. Ministry of Energetics of Russian Federation. – Available at: https://minenergo.gov.ru/activity/statistic

51. Surgutneftegas Annual Report 2015. 2017. OJSC "Surgutneftegas". – Available at: http://www.surgutneftegas.ru/en/investors/reports/annual/

52. Surgutneftegas Annual Report 2016. 2017. OJSC "Surgutneftegas". – Available at: http://www.surgutneftegas.ru/en/investors/reports/annual/

53. Russia beats Saudi Arabia as China's crude oil supplier in 2016. 2017. Reuters - Available at:
http://www.reuters.com/article/us-china-economy-trade-crude-idUSKBN1570VJ

54. Russian oil groups brave cold of western sanctions to explore Arctic. 2017. Financial Times. - Available at: https://www.ft.com/content/cca94692-2061-11e7-a454-ab04428977f9

55. Russian Oil Production Outlook to 2020. 2017. The Oxford Institute for energy studies. – Available at: https://www.oxfordenergy.org/publications/russian-oil-production-outlook-to-2020/