Graduate School of Management
St. Petersburg State University

Master in Management Program

M&A AS STRATEGIC RESPONSE TO OIL PRICE SHOCK

Master's Thesis by the 2nd year student Concentration – Management (General Track)

Marina Politova

Research Advisor: Associate Professor, **Olga L. Garanina**

St. Petersburg
2018

ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

Я, Политова Марина Игоревна, студентка второго курса магистратуры направления «Менеджмент», заявляю, что в моей магистерской диссертации на тему «Слияния и поглощения как стратегическая реакция на падение цен на нефть», представленной в службу обеспечения программ магистратуры для последующей передачи в государственную аттестационную комиссию для публичной защиты, не содержится элементов плагиата.

Все прямые заимствования из печатных и электронных источников, а также из защищенных ранее выпускных квалификационных работ, кандидатских и докторских диссертаций имеют соответствующие ссылки.

Мне известно содержание п. 9.7.1 Правил обучения по основным образовательным программам высшего и среднего профессионального образования в СПбГУ о том, что «ВКР выполняется индивидуально каждым студентом под руководством назначенного ему научного руководителя», и п. 51 Устава федерального государственного бюджетного образовательного учреждения высшего образования «Санкт-Петербургский государственный университет» о том, что «студент подлежит отчислению из Санкт-Петербургского университета за представление курсовой или выпускной квалификационной работы, выполненной другим лицом (лицами)».

_____ _____ (Подпись студента)

_____24.05.2018_____ (Дата)

STATEMENT ABOUT THE INDEPENDENT CHARACTER OF THE MASTER THESIS

I, Politova Marina, second year master student, program «Management», state that my master thesis on the topic «M&A as Strategic Response to Oil Price Shock», 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.

All direct borrowings from printed and electronic sources, as well as from master theses, PhD and doctorate theses which were defended earlier, have appropriate references.

I am aware that according to paragraph 9.7.1. of Guidelines for instruction in major curriculum programs of higher and secondary professional education at St.Petersburg University «A master thesis must be completed by each of the degree candidates individually under the supervision of his or her advisor», and according to paragraph 51 of Charter of the Federal State Institution of Higher Education Saint-Petersburg State University «a student can be expelled from St.Petersburg University for submitting of the course or graduation qualification work developed by other person (persons)».

_____ _____ (Student’s signature)

_____24.05.2018_____ (Date)

Аннотация

Автор	Политова Марина Игоревна
Название магистерской диссертации	Слияния и поглощения как стратегическая реакция на падение цен на нефть
Факультет	Высшая школа менеджмента, Санкт-Петербургский государственный университет
Направление подготовки	38.04.02 «Менеджмент»
Год	2018
Научный руководитель	Ольга Леонидовна Гаранина, Доцент кафедры стратегического и международного менеджмента
Описание цели, задач и основных результатов	Целью данной статьи является проверить корреляцию между резким падением цен на нефть в 2014 году с количеством сделок слияний и поглощений в нефтегазовой отрасли. Помимо фактора цен на нефть мы проверяем, есть ли корреляция с факторами спроса и предложения. Исследование направлено на выявление, как различные типы нефтяных компаний реагируют на условия низких цен на нефть. Результаты свидетельствуют о том, что фактор цены на нефть и фактор мировой динамики добычи нефти показывают умеренную корреляцию с количеством сделок слияний и поглощений, имевших место в отрасли. Также обнаружено, национальные нефтяные компании практически не участвуют в поглощениях. Частные компании демонстрируют разную динамику. Наиболее активен сегмент мидстрима отрасли.
Ключевые слова	Нефтегазовая отрасль, падение цен на нефть, национальные нефтегазовые компании, международные нефтегазовые компании, слияния и поглощения.

Abstract

Master Student's Name	Politova Marina
Master Thesis Title	M&A as Strategic Response to Oil Price Shock
Faculty	Graduate School of Management of St. Petersburg State University
Main Field of Study	Management
Year	2018
Academic Advisor's Name	Olga L. Garanina, Associate Professor
Description of the goal	The aim of this paper is to analyze whether unexpected oil price decline in 2014 correlates with takeover activity in oil and gas industry. Along with oil price factor we test whether supply and demand show correlation. The paper is aimed to identify main trends in response patterns of oil companies to the context of low oil prices. Our results suggest that factors of oil price and world crude oil production growth rate show moderate correlation with M&A deal count occurring in the industry. We also found that NOCs are not actively engaged in takeover activity. Private companies show different dynamics. Across industry value chain midstream segment is most active.
Key words	Oil and gas industry, oil price shock, National Oil Companies, International Oil Companies, M&A, takeover activity.

Table of Content

Introduction

Nowadays oil is one of the major resources unless not the most important commodity in the global economy. Oil accounts for one third of energy mix of global economy. Companies that are in possession of richest oil reserves shape not only the industry dynamics but set the trends of world economic development. Petroleum industry is very diverse and is composed of players that differ by ownership type (state-owned and private owned companies), by position in value chain (upstream, midstream and downstream operators). State-owned companies or NOCs the majority of world's oil reserves and 75% of crude oil output. Private-owned companies can be divided into majors (or IOCs) and independent players. These companies are characterized by more advanced business model aimed at maximizing shareholder's value by finding and exploring more reserves, while minimizing costs.

For the past years both NOCs and IOCs were sure that the demand for oil would continue to increase, so would the prices for oil. However, the recent changes on the international oil market proved these expectations to be wrong. Since 2014 oil prices has plummeted from more than $100 per barrel to less than $60. Such dramatic changes in the market conditions leave no choice for oil companies but to adjust their strategies. The question of the greatest interest is *whether* industry that faces market uncertainties reacts with restructuring via M&A. Thus, we formulate our ***research problem*** as follows: *How do different types of oil companies use M&A to respond to low oil prices?* The primary interest of this research is to analyze how national and international oil and gas companies (NOCs, IOCs and private oil companies) use takeover to react to the unfavorable external conditions, specifically low international oil price. We base our research on assumption that M&A is means for oil companies to respond to the market alterations caused by oil price decline.

The paper is aimed to cover the ***research gap*** of previous studies that do not provide complex study of M&A activity of oil companies in the context of low oil prices and in multiple dimensions, namely identification of differences across company types and industry segments.

To fulfill the goal of this study we will answer the following ***research questions:***

- Does significant relationship between low oil prices and M&A activity in oil and gas industry take place?
- What other factors may be related to industry takeover activity?
- Do different types of oil companies show distinct takeover behavior?

To summarize, the topic is of research value for the following reasons:

- Allows us to analyze the contemporary trends of NOCs' and IOCs' and private oil companies' M&A activity
- Considering the complement approach, we can trace the tendencies of the whole industry
- Findings of our analysis will allow us to identify responses of different types of oil companies in the period of industry shock and bring up implications for industry players.

The ***expected finding*** of this paper is to illuminate main trends in strategic decision-making of oil and gas companies in the context of low oil prices. The pre-research hypothesis is that industry players use takeovers as means to combat the negative external conditions. We expect takeover activity vary among different industry segments (upstream, midstream, downstream).

The research is organized as follows. ***Chapter 1*** is theoretical background aimed to bring brief introduction to petroleum industry, review main reasons behind 2014 oil price shock and identify factors that influence M&A activity in the industry. In ***Chapter 2*** we explore our dataset and research tactics. Finally, ***Chapter 3*** is devoted to results discussion.

Chapter 1. Theoretical background

Chapter 1 or theoretical background organized thematically. Section 1.1 gives the brief introduction to petroleum industry, namely main company types and industry value chain. Section 1.2 discovers the reasons behind unexpected drop of oil price in 2014 and gives typology of oil price shocks. Section 1.3 is devoted to M&A activity in industry: main drivers and recent trend. Also, in this chapter we introduce hypotheses of this study.

1.1 Introduction to oil and gas industry

Petroleum industry plays important role in global economy. Oil remains the world's leading fuel, accumulating one third in global energy mix (BP, 2017). The modern oil and gas industry consists of vide variety of companies of different size and status. We can distinguish the main approaches to analyze the industry structure: by ownership type and by position in industry value chain.

Ownership type

Private-owned oil companies: International oil companies (IOCs) and independent players

As defined by Stevens (2016) IOCs are the privately-owned oil and gas companies with global operations. So-called "majors", represented by such giants as BP, ExxonMobil, Chevron Texaco, Total, Shell, dominated the industry. At the beginning of the 20th century the privileged position of IOCs seemed unshakable. However, starting from the 70s due to the nationalization wave in the emerging economies, the influence of private oil companies started to fade. As a result, these companies lost the access to the oil reserves and low-cost crude oil. The change in the industry balance of power threatens the future of IOCs in several ways:

- Unavailability of low-cost crude oil had far more serious consequences. Upstream cost has risen dramatically, and IOCs are forced to operate in new industry conditions. Obsession with size and scale led to ignorance of development of smaller fields and loss of potential profits (Stevens, 2016).
- Strong demand for oil reserves has changed the perception of what extractable oil is. Shale oil and oil sands previously seen as unprofitable undertaking now are increasing their share in output. These new opportunities in the industry require technical advances, however IOCs are still reluctant to invest in technologies (Bakewell et al., 2005).

- Industry dynamics have changed drastically, recently a lot of independent players have appeared: upstream operators, that possess smaller producing assets; midstream and service companies that provide technology and oilfield services to the upstream; downstream operators that own refineries and distribution chains. These smaller companies are usually geographically focused and have a narrower specialization as opposed to IOCs (Pelegrinni et al., 2012).

Petroleum industry has become more diverse. Given the limited access to crude oil reserves privately-owned companies have to revise their strategies. Their forte became technology and innovation to minimize the extraction cost and to use the existing fields more effectively.

State-owned oil companies: National oil companies (NOCs)

NOCs are the state-owned enterprises, that have the privileged position in global oil and gas industry: these companies possess huge oil and gas reserves and have control over the production of crude oil. To verify, 73% of world's oil reserves and produce 61% of crude oil available on the market are accounted to NOCs. Generally, these companies share some characteristics such as monopoly over extraction of oil and gas recourses, governmental support, key role in economies of their countries. Nevertheless, the role and functions of NOCs may vary. Some NOCs are global players as they are extremely successful and profitable (e.g. Saudi Aramco, Statoil). The others national companies may mix political and social functions together with their commercial activity, and act as political means for their governments (e.g. PDVSA, Gazprom). In the most extreme case, NOCs execute the functions of the government, like Angola's Sonangol which primary objective is to regulate the activity of international oil companies within the country (Victor et al., 2015).

NOCs are mostly concentrated in Middle East, but also present in Africa, Europe, Latin America and Asia. Thus, NOCs are global phenomena and operate all over the world. Traditionally, any kind of state-owned companies is perceived to be less efficient than their private counterparts. In this connection, the following question arises: "What NOCs should even exist?". Victor et al. (2015) answer that question with summarization of the most common reasons that support the existence of NOCs:

- Widely held belief that state ownership allows government to stimulate and have a better control over the economic development of the country, support social justice through and tax income redistribution.
- NOCs, especially in emerging markets, are seen by governments as effective means to win the popular support. In this case, state-owned oil companies are used to please the favored groups with jobs. Also, NOCs are used to control the other products and services for political reasons.
- The third reason arises from mistrust between local governments and IOCs. The foreign enterprises may have their own interests and strategic plans regarding the reserves, that not necessarily coincide with the ones of the policymakers. In this connection, the loss of control over the fields is perceived as a threat to state security.

To summarize, although all public oil companies are defined by common term "NOCs", they are not the same. They differ by the interaction with government: operate independently or to be used as political tool to manage intragovernmental affairs. NOCs existence is not always explained by the profitability of the firms, but primary driven by the necessity to solve social issues, to get political support or to ensure the state control over the resources and economic development of the country.

Value chain position

Petroleum industry value chain

Company's position in industry value chain is an important element of one's activity. It determines not only competitive advantage of a firm, but also its strategic actions. Traditionally, the oil and gas value chain is split up into three main components. **Upstream,** which includes the initial field explorations, development and production. **Midstream** that refers to infrastructure (pipelines, roads, rails, ports) and storage ensure the connection between production and processing facilities and consumer. These activities are important during the different stages of value chain. Finally, **downstream:** oil refining and gas processing and into the final products for further distribution (World Bank, 2011).

Vertical integration

The companies that are involved in one or more activities along the value chain are called vertically integrated. This type of oil companies is supposed to participate in every stage starting from extraction and production and finishing with refining and marketing (World Bank, 2011).

From industry's viewpoint vertical integration is an important attribute that has solid advantages. It reduces risk and facilitates obtaining of potential profits at every stage of industry value chain. Vertical integration helps companies to balance their operations and secures from market instability. Profits across segments may vary asymmetrically, e.g. during the periods of low oil prices the upstream operations incur losses, whereas downstream enjoys higher margins (Al-Moneef, 1998).

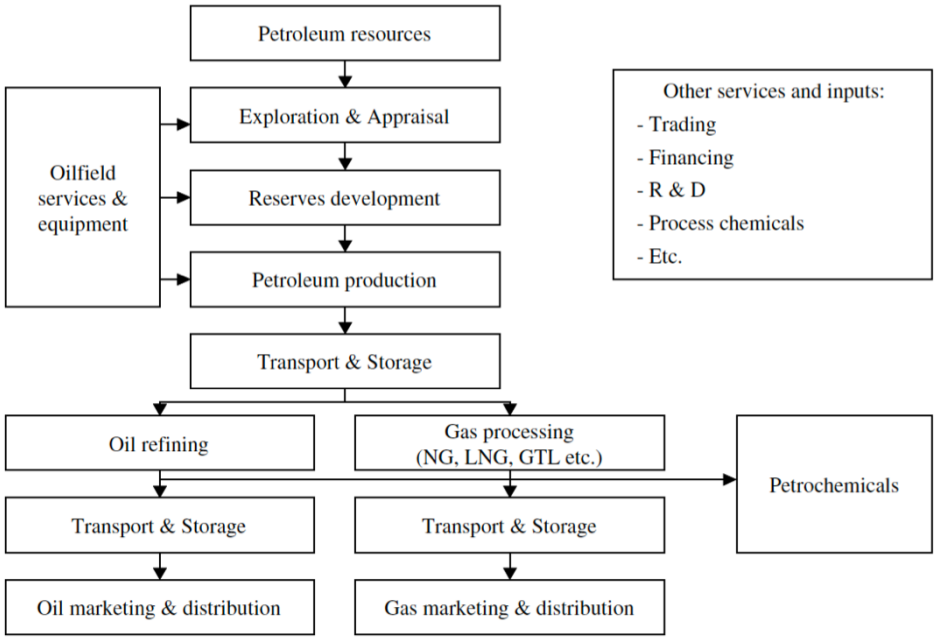


Figure 1. Value chain of oil companies

Source: World Bank, 2011.

Ownership type of oil company has a great impact on a vertical integration. Since different company types aim at different objectives their diversification patterns may also differ. For example, the majority of NOCs are primary concerned with increase of social value at national level. Thus, it is natural to assume, the value chain of state-owned oil and gas tends to be integrated and include the stages of development, production, processing, logistics and marketing of oil and gas to preserve control over strategic resource. This statement can be supported by the evidence observed during industry restructuring observed in the 80's and early 90's caused by ownership changes. At that time NOCs, supported by local governments, actively

invested and participated in acquisitions of downstream facilities to anchor their privileged positions (Abdalla, 1995).

Due to drastic changes in industry dynamics private-owned oil companies were separated from their upstream sector in the emerging markets. The companies were left with no access to world's biggest (and cheapest) extraction projects and limited growth opportunities. In new market environment IOCs adjusted their business strategies and firstly, concentrated on investment in fields of developed countries or/ and offshore and secondly, involved in further diversification of energy sector (Grant, Cibin, 1996).

To sum up, ownership type and position in industry value chain matter a lot for oil and gas companies. Players are aimed at vertical integration to reduce risk and balance profits that fluctuate asymmetrically across different business sectors. Thereby, NOCs, that are traditionally upstream operators, expand into downstream. Private-owned companies, on the contrary, are searching for smaller opportunities in upstream. The question may arise: "*Where midstream and service operators expand to?"*. This was answered by Barreau (2002), who says the companies have demonstrated tendency towards consolidation.

1.2 Oil price shock of 2014

Currently oil and gas industry faces the extremely unfavorable market conditions: between the June 2014 and January 2015 oil price sharply declined from $114 to $46, which is approximately 60% decrease. Currently we observe on of the most rapid and deepest oil price shocks in industry history. The theory on oil price shocks are is well developed in academic literature. Killian (2009), Peersman and Robays (2012) divide oil price shocks into those that are driven by fundamentals (supply and demand) and non-fundamentals.

Oil supply shocks

These type of shocks results from the sudden changes in global oil production. Oil supply curve shifts to the left, and consequently oil price and oil production move in different directions. The situation may result from the military conflict or changes in the production quotas. Impact of supply shocks depends on the amount of crude oil physically available on the market. In case of shortage of crude oil, exporters and importers react differently. Cashin et al. (2014) argue oil-importing countries suffer from prolonged economy decline. The reaction among the oil producers, however, depends on the amounts of the reserves. It seems countries with large amounts of oil continue to increase their output, while their counterparts with limited oil reserves

slowdown the production. In more recent study Mohaddes and Pesaran (2016) contribute that if the world's major oil producer decreases its output the shortage of crude oil on the market is unlikely to be compensated by other exporters. In this scenario, the change in supply of the top-producer will result in global economy slowdown.

Oil demand shocks

These are driven by changes in demand. In this case oil production and oil price move in the same direction. According to Bastianin et al. (2016) for the period of 1975-2015 demand was key factor in oil price fluctuations. The increasing aggregate demand for oil, originated from boost of economic activity and higher demand in commodities, pushed oil prices up, but eventually ended in slowdown of global economy. Of course, the situation is beneficial to the oil producers, but their reaction differs and depends on the oil reserves and weather the country is OPEC member or not. In general, non-OPEC countries tend not to react to the aggregate demand shocks. However, the two countries do not follow this behavioral trend: Mexico and Russia significantly increase their supply., the OPEC nations (mostly the Gulf countries) increase the production to get bigger revenue streams as their budgets are highly dependent on oil exports (Güntner, 2014).

Oil-specific

The previously mentioned researches argue that fluctuations of oil price are mostly influenced by changes in global oil demand and supply. Zhang and Yao (2016), however offer a different approach. Authors suggest that oil price volatility is a complicated issue and can be influenced by other non-fundamental factors namely geopolitics in major oil-extracting regions, speculations regarding oil futures and US dollar exchange rate. When non-fundamental factors determine oil price, the price fluctuation is not supported by shifts in supply and demand curves and so bubble emerges. Thus, the authors propose bubble to be another driver behind oil price increase during period of 2001-2008.

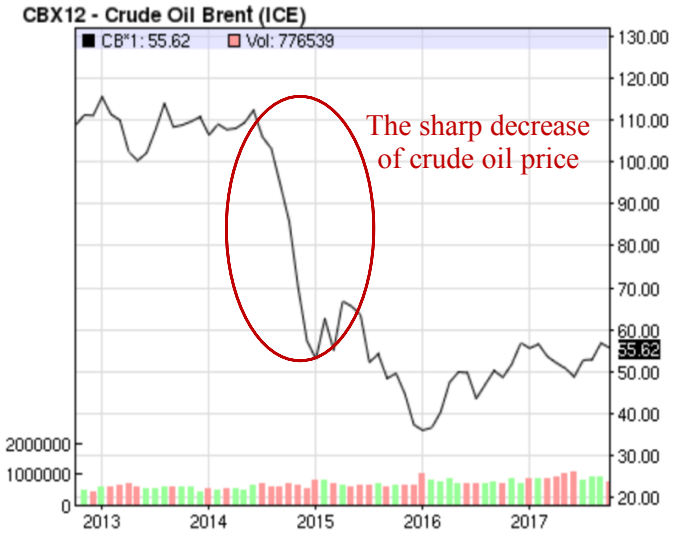


Figure 2. Crude oil price for the period 2013-2017

Source. Nasdaq.

Based on this background, what are the factors that led to such an unexpected oil price crush in June 2014? The experts have actively discussed on the topic.

Arezki and Blanchard (2014) suggest it was due fundamentals, namely supply side. The price for oil reported to be high despite the oversupply on market. Several factors contributed to the situation. For instance, Libyan oil production recovered faster than expected and Iraq output did not decrease despite political instability in the country. Additionally, OPEC has decided not to reduce collective output and preserve production level of 30 mb/d. Continuing the discussion on the supply side, Manesco and Nuno (2015) conclude, that although shale oil producers have added approximately 3.9% to total oil output, shale oil revolution still did little drop of oil prices. The researchers emphasize that since the event was anticipated it was incorporated into oil price fluctuations. Baumeister and Kilian (2015), on their side, add that cumulative effect of adverse demand shock, resulted from slowdown of global economy, also explain oil price drop. Reflecting upon possible outcomes from the situation Mohaddes and Pesaran (2017) conclude that response of oil suppliers will vary. Non-OPEC nations will decrease their output, while cartel member may not react due to political reasons.

Another cohort of the researchers assign the changes to be due to non-fundamentals. For example, Tokic (2015) presents a viewpoint that volatility USD/EUR exchange rates caused oil

price shock. In more recent study (Fantazzini, 2016) the argument towards non-fundamental factors was supported with empirical evidence of negative financial bubble.

To conclude, the recent sharp decline of oil prices appeared as unexpected event for the industry. Although, the experts still have not reached consensus regarding the reasons (whether fundamental or not), but one statement stays solid: industry players have to adjust to the new market conditions.

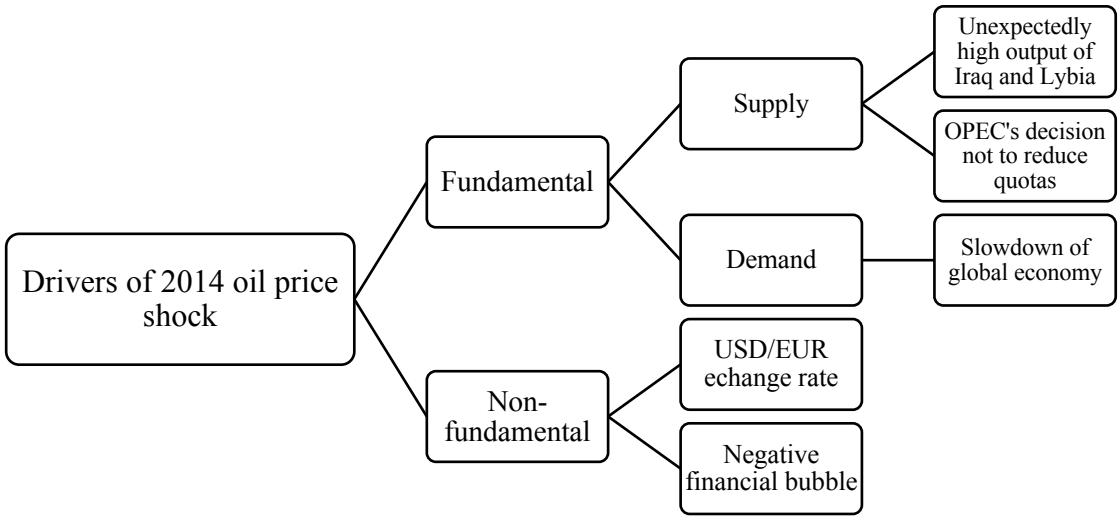


Figure 3. Drivers of 2014 oil price shock

Source. Summarized by author.

To ensure the future survival, the oil companies should primary focus on sustainable profitability. The operations should be adjusted in accordance with different price scenarios. Capital efficiently will become the key element of corporate strategy for oil companies in the upcoming years. The previous prosperous years made it available for major companies to participate simultaneously in multiple operating activities like combining onshore production with extraction on remote fields while not having the required capabilities. The trends suggest, that in future more narrow specialization will take place. The business model of oil companies will be built around specific capabilities. This leads to the evolution of oil and gas sector. However, the transition to new industry architecture may not be easy for some NOCs that prefer complete control over the all assets and production stages. In the changing industry environment portfolio management should be revised to ensure the coherence with company's capabilities. In the future M&A and divestment activities should not be undertaken only to generate more cash. The coherence with organization's capabilities and specialization will become the main rationale

behind portfolio evaluation. The new industry trend will become the opportunity for the companies to divest the noncore assets to adjust the company strategy (PwC, 2017).

1.3 M&A activity in oil and gas industry

General reasons behind M&A

The theory of mergers and acquisitions (M&A) is well-studied in academic literature. What are the triggers for takeovers? The variety of answers exists to that question, we introduce the main rationale for M&A.

Market power

According to the market power theory companies merge to enlarge their market share not necessarily increasing firm's efficiency or quality of product or service. There is an empirical support for proposition that companies acquire to gain market power. The example of airline industry illustrated that during the studied period merged companies increase airfares more essentially as compared to the control group (Kim and Singal, 1993). The more recent evidence from banking sector confirmed the findings of aforementioned researchers. Poghosyan and Haan (2010) have proved that foreign banks prefer to choose as their target comparatively sizable and efficient banks in developing economies to increase the market power of target.

Efficiency improvement

Efficiency theory is based on a proposition that efficient companies will target inefficient ones to transfer their more advanced skills and managerial practices. The motivation, thus, is to improve operations of newly acquired subsidiary. As a result, the company becomes more profitable and competitive. Lanine and Vennet (2007) claim that companies operating in low-margin markets are more tending to expand. In this case their rationale is either export their skills to weaker industry players or aim at entering high-margin markets to secure their profitability in long-run. The empirical evidence from U.S. telecommunication industry (Okoegualea and Loveland, 2017) suggests that mergers produce significantly positive returns to merged firms. Moreover, acquired firms earn greater profits than their non-target rivals.

Resource purchase

King, Slotegraaf and Kesner (2008) suggest that M&A is used as means for companies to obtain technology resources. In this scenario target's R&D act as substitute for acquirer's R&D. In other words, target's R&D with solid investment will generate a greater value for acquirer.

Thus, the firms that experience absence of certain technical skills tend to search target company that will satisfy the need. The recent addition to the theory (Choi and McNamara, 2018) suggests that acquiring companies seek for ways to amalgamate target's knowledge into their knowledge capital to strengthen and extend their innovation activities.

Transaction cost

According to the transaction cost theory companies decide to acquire to reduce transaction cost that arising in following situations (Hennart, 1991): 1) when company needs to get access to the other firm's intermediate products, which are of high transaction cost; 2) when company needs other firm's resources; 3) when company expands outside its domestic market and needs knowledge how to sell and operate on foreign market.

Resource dependence

Casciaro and Piskorski (2005) explain resource dependence to be the reason behind mergers and acquisition. The resource dependence causes the emergence of power imbalance and appearance of struggling dyad. The dependent actor will seek for the opportunities (including restructure activities) to reduce uncertainty and improve its conditions. Although, the desire does not necessarily coincide with the ability to do so. On the other hand, the most powerful actor will try to preserve the status-quo.

Acquisition behavior

In general, acquisition behavior theory is based on proposition that previous acquiring experience increases the likelihood of subsequent takeovers. Haleblian, Kim, and Rajagopalan (2006) have not only provided empirical evidences to the theory but introduced performance factor as predictor of future behavior. The new addition suggests that likelihood of takeover increases when both experience and performance are positive. In other words, high acquisition experience and performance indicate the firm that it has established a reliable pattern to exercise successful takeovers. On the contrary, poor takeover performance and prior acquisition experience questions the management's belief in takeovers, thus decreasing firm's likelihood to merge. The study of South-North acquisitions (i.e. cross-border acquisitions of firms from emerging economies into developed economies) conducted by (Rabbiosi, Elia, Bertoni, 2012) has brought up organizational learning perspective. The results illustrate that emerging market firms exercise takeovers in developed markets in an increasing manner. Takeover experience in

developed markets increases the likelihood of subsequent expansions as compared to M&A activity in developing markets that demonstrates little to no effect.

Industry shock

The pool of researches argues that context, namely industry shock, may also influence the takeover activity. Mitchell and Mulherin (1996) define industry shock as expected or unexpected factor that provokes reshaping of industry structure. Their key assumption is that significant changes in technologies, government regulation, and demand and supply conditions alter the number and size of the firms in industry. Companies that face industry shock may react in two ways: internally or externally (expansion via takeovers). The empirical study included analysis of takeover activity 1,064 companies in 51 industries in the USA for the period of 1982-1989 has provided evidence that M&A activity significantly increased. Moreover, on average 50% of the takeovers tend to cluster within specific range of the studied period suggesting that the same factors affect M&A activity in an industry. While Mitchell and Mulherin (1996) mainly discuss industry specific factors e.g. deregulation, energy price volatility, increase in foreign competition, etc., Qiu and Zhou (2007) claim M&A may be driven by fundamentals (or changes in supply and demand). Researchers have concluded that negative demand shocks are trigger for takeover activity. Mergers occur when the demand falls below a critical level, to stabilize the market firms start consolidating to restore the equilibrium.

M&A activity in oil and gas industry during the low prices

In mid-2014 the oil prices plummet resulted in the most dramatic decline of oil and oil and gas industry over the decade. Oil prices dropped from more than 100$ per barrel to 26$ per barrel, but with oil price about 70$ per barrel the slight recovery takes place. However, the overall situation has threatened profitability of the oil and gas companies. In the new unfavorable market conditions oil firms will have to find to improve their performance. The new industry architecture, as it was discussed before, requires cost and operational efficiency. M&A can be one a means to adapt to the new realities.

In the previous section, we discovered that the general trend suggests that takeover activity increases when the industry faces a shock. Thus, our primary interest is to find whether in oil and gas industry there is an effect on M&A activity.

Geographic trends

Xie, Reddy, & Liang (2017) argue that with the drop of crude oil prices the takeover activity in oil and gas industry noticeably increased. Based on the sample of 150 large-scale (bid more than US $1 billion) acquisition transaction with accumulative value of US$535 billion for the period of 2005-2015 authors claim that firms from the emerging economies like China and Russia has illustrated the blooming activity in M&A deals accounting 41 deals worth over US$166 billion. This trend suggests that companies from emerging markets actively compete on the global markets. Interestingly enough, that the reasoning of emerging oil importers (China, India) and oil exporters (NOCs of Middle East and Asia) is rather different. The former is obviously taking advantage of the low oil prices to diversify their energy risk by investing worldwide. They intensively expand into resource rich regions of North and South America, Africa. While the oil exporters implement internationalization strategies to fund their ambitious internal industrialization and infrastructure projects.

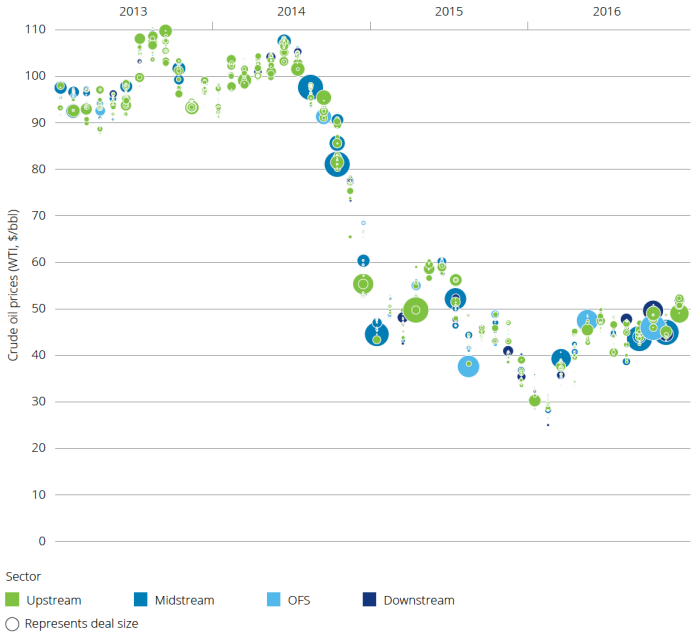


Figure 5. Oil and gas sector M&A deals mapped against oil prices (2013-2016)

Source. Deloitte, 2017.

Sectoral trends

Two interesting observations may be observed from the Figure 5. Firstly, there is a relationship between oil prices and M&A activity (Deloitte, 2017). At the beginning of 2016 the

two reached its' minimum for the four-year period. The mega-deals started only to reappear when prices stabilized at $50 per barrel. Secondly, the M&A activity shifted along industry value chain. If prior the oil price shock, M&A deals mostly occurred in upstream, currently the takeover activity is observed mostly in midstream.

The midstream became the champion of M&A deals in 2016. The possible reasons for such a pivot in industry takeover activity may suggest that in the context of low oil prices the organic growth opportunities in the segment are limited. Also, the lower extraction activity in the upstream threatens the performance of midstream companies.

Previous research on topic and empirical evidence lead us to proposition that low oil price is an indirect factor that affects M&A in oil and gas industry. The next step of current research is to identify to which extent low oil prices influence the volume of M&A in the industry. **Table 1** summarizes the previous research on takeover activity in oil and gas industry. We identified several research gaps that will be covered in the upcoming sections.

- **Global evidence.** The majority of the research lack the global evidence. The study of national oil and gas industry may not be representative for world-wide scale. At the same time acquisition patterns of oil exporters and importers may vary. We intend to highlight these differences.
- **Timing.** The vast papers in the field are mostly focusing on periods of constantly rising oil prices, which was justified by industry growth. But current oil price drop is one of the most drastic industry shocks in the history, which makes companies' reaction a particularly interesting subject to study.
- **Difference across different company types.** As was covered in previous session ownership type traditionally has a great impact on strategy of oil companies. However, the factor of ownership in company's acquisition behavior was not previously covered, apart the studies on industry restructuring in the 90's.
- **Difference across different segments.** The current low oil price period revealed some trend that M&A activity has shifted along industry value chain. We want to justify whether there is an evidence of abnormal takeover activity in different segments of industry value chain.

Table 1. M&A in oil and gas industry: previous academic researches

No	*Journal*	*Year, No*	*Author*	*Article*	*Conclusions*
1	Energy Economics	**2007,** 29	M. M. Boyer, D. Filion	Common and fundamental factors in stock returns of Canadian oil and gas companies	The authors studied the financial determinants of Canadian O&G company stock returns. The key finding is that most of the value of O&G companies comes from the oil price, the factor the firms cannot influence.
2	Energy Economics	**2010,** 32	L. Granier, M. Podesta	Bundling and Mergers in Energy Markets	Study M&A in energy industry (i.e. gas and electricity providers). The main merger incentive between the companies of different sectors is to achieve bundling strategy.
3	Energy Economics	**2011,** 33	I. Henriques, P. Sadorsky	The effect of oil price volatility on strategic investment	Oil price volatility has a strong impact on O&G company's strategic investment. In the increased uncertainty the investment activity is decreasing as it becomes more reasonable to wait until the uncertainty is resolved. Thus, the strategic investment is postponed. However, the following increases in uncertainty stimulates the investment as the risk of not growing becomes higher.
4	Energy Economics	**2013,** 37	A. Ng, H. Donker	Purchasing reserves and commodity market timing as takeover motives in the oil and gas industry	A sample of M&A deals on O&G industry in Canada from 1990 to 2008 illustrated that companies in the sector have a different motivation for the takeovers. The key motivation in the sector is to acquire reserves as it is the main component of firm's value in the long-term because reserves are finite and increase in value over time. Also, commodity prices have a strong influence on takeover activity in O&G industry opposing to generally accepted view that stock prices are the major motivator.
5	Energy Economics	**2017**, 65	K. Hsu, M. Wright, Z. Zhu	What motivates merger and acquisition activities in the upstream oil & gas sectors in the U.S.?	The M&A in upstream oil and gas industry differs from traditional M&A activity. The empirical results illustrated that stock market performance did not statistically correlate with M&A activity in the upstream sector of the U.S. O&G sector. Industry specific variables as oil prices have much more influence on the takeover activity. This is explained by the core significance of commodity prices that determine the value of

					company's assets which is composed from the value of its reserves. The production growth also has the positive effect on M&A activity, as from company's perspective the increased production is an indicator of the volume and value of the reserves.
6	Renewable and Sustainable Energy Reviews	**2017**, 72	K.S. Reddy, E. Xie	Cross-border mergers and acquisitions by oil and gas multinational enterprises: Geography-based view of energy strategy	With the drop of oil prices, the takeover activity in O&G industry has increased. Based on the sample of 150 large-scale acquisition transaction for the period of 2005-2015 authors claim that firms from the emerging economies (has illustrated the blooming activity in M&A deals. The second finding is that the reasoning of emerging oil importers and oil exporters is different. Importers are taking advantage of the low oil prices to diversify their energy risk by investing worldwide, while exporters implement internationalization strategies to fund national projects.
7	Energy Economics	**2018,** 71	M. Bos, R. Demirer, R. Gupta, A. K. Tiwari	Oil returns and volatility: The role of mergers and acquisitions	M&A activity in O&G industry has a predictive power over oil returns and volatility. Thus, takeover activity indicates valuable information regarding the future expectations on oil price fluctuations.

1.4 Hypotheses statement

Although, the literature on M&A in oil and gas industry is limited, the researchers have reached a consensus that takeover in oil and gas industry is influenced by industry specific factor

Oil price volatility

As proved by Boyer and Filion (2007) the value of oil and gas companies comes from the oil price, the factor the firms cannot control. This finding was taken into further development. If the value of the firm depends on commodity prices, thus the volatility can have an impact on strategic investment in the industry. The latest addition to question of relationship between takeover activity and oil prices is illustrating contrariwise perspective. Not only oil prices influence takeover activity in industry, but M&A activity itself has a predictive power over oil returns and volatility, it as it indicates valuable information regarding the future expectations on oil price fluctuations (Bos et al., 2018).

Some researchers have introduced timing concept into interrelation of oil price volatility and industry M&A activity. Henriques and Sadorsky (2011) concluded that when the uncertainty regarding oil prices is increasing, the investment activity decreases. In this situation companies presume it to be more reasonable to wait until the uncertainty is resolved, meaning the firms postpone their strategic investments. However, if the uncertainty continues to increase, the unfavorable market conditions eventually stimulate companies to acquire, since the risk of not growing becomes greater. This conclusion is supported by empirical evidence of more recent research. It has been revealed that oil price has a lagged effect on takeover activity in the industry, as companies need time to arrange and close a deal (Sopta and Uremovic, 2016). Considering the importance of oil price volatility on takeover activity in oil and gas industry and taking into account timing effect, we introduce hypothesis as follows:

H1: The relationship between sharp decline of oil prices and M&A activity in oil and gas industry appears with a lagged affect.

Reserves

One of the key M&A motivations in industry is to acquire reserves. Since oil and gas are not renewable sources of energy, the companies are exposed to risk of reserves depletion. The entire industry is designed the way that to remain competitive the company must constantly

invest in the oil reserves exploration. Additionally, reserves are the main component of firm's value in the long-term as the assets is finite and increases in value over time (Ng and Donker, 2013). So, the reserves are the matter of survival and sustainability: the bigger reserves the company possesses, the more secure the future revenue streams. Takeover is a good strategic option for large oil companies to reduce the risk and cost of exploration of undeveloped fields by acquiring other companies that have already explored undeveloped fields. Thus, we set the following hypothesis:

H2: The higher level of world crude oil reserves, the more M&A deals occur in industry.

Oil production

Hsu, Wright & Zhu (2017) claim that oil prices is not the only industry specific variable that influences industry takeover activity. Although, commodity prices determine the value of company's assets (which is the value of its reserves), the empirical evidence illustrate that oil production has the positive effect on M&A activity. This can be explained by a fact that from company's perspective the increased oil production is an indicator of increasing volume and value of firm's assets. Thus, we propose that:

H3: The higher world crude oil production, the more M&A deals occur in industry.

Other factors

In academia researchers discus other reasons for oil companies to acquire, e.g. *execution of bundle strategies* (Granier and Podesta, 2010) in energy sector to combine, for instance, electricity and gas companies in firm's portfolio to succeed better competitive position. *Geographic diversification* is built on necessity to reduce risk by dispersing it among numerous, unrelated revenue streams and also getting exit to the markets and suppliers. Also, investors' assumption regarding the future *tax and regulatory policy* also can intensify takeover activity. If the higher tax rates are expected, the process of M&A deals can be accelerated (Capstone, 2013).

To summarize, oil and gas companies are subjected both to general and industry specific M&A driver. Still, the researchers conclude that takeover activity in oil and gas sector is mostly triggered by industry specific factors such as the amount of reserves available to the company,

oil prices, etc. The firm's competitiveness and performance are, in fact, dependent on the finite resource of energy which limits the organic growth and forces the companies to seek for the expansion. M&A in oil and gas sector is the effective and cost-efficient solution to get access to the new oil fields, financial leverage, technologies and markets.

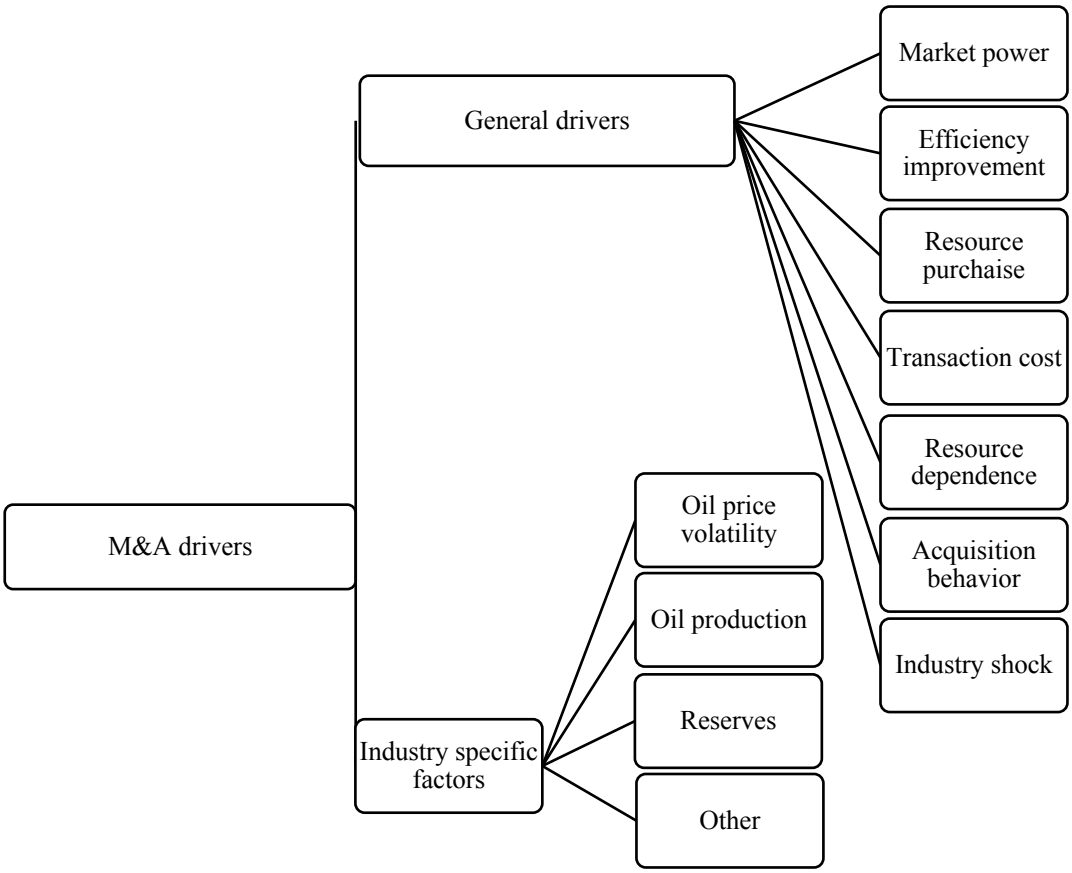


Figure 4. Classification of M&A drivers.

Source. Summarized by author.

Chapter 2. Research strategy: exploring dataset and hypothesis

2.1 Research strategy

The research problem is defined as follows: *How do different types of oil companies use M&A to respond to low oil prices?* In this research, we are primary aimed at identifying the main trends in oil and gas industry, regarding which factors influence intensity of M&A activity, whether takeover behavior differs on company type or company's position in value chain. Thus, the research type applied in the paper is explanatory.

The main focus will be given to quantitative methods of statistical analysis: descriptive statistics and hypothesis testing.

Given the specifics of this paper the Zephyr database is used as the primary source of data. Zephyr is database by the Bureau van Dijk (BvD) company specializing in business information. Zephyr provides an access to huge data collection of M&A deals. The system allows to get the information about companies involved in takeover. The advanced system of preferences allows the user to customize the query. The additional variables like deal status, value of the deal, industry of the companies, financial performance indicators, shareholders information, etc. can be added to table layout to display the information needed for the specific purpose.

2.2 Research tactics

Considering the topic of the research the collected data is the list of M&A deals during time period 2014-present times, as the dramatic decline of oil prices occurred in June 2014.

Variables added to customize the query.

US SIC Industry Classification. Zephyr database collects the information about all announced M&A deals. The focus of the research the takeovers in oil and gas industry, so all classification codes that included key words 'oil', 'gas', 'petroleum' were selected. We are aware that the companies operating in these industries represent the different stages of industry value chain: upstream, midstream, downstream. This information also represents an interest for the research.

Table 2. Selected US CIS Industry Classifications Codes

US SIC Code	Industry Description
1311	Crude petroleum and natural gas
1381	Drilling oil and gas wells
1382	Oil and gas field exploration services
1389	Oil and gas field services, not elsewhere classified
2911	Petroleum refining
3533	Oil and gas field machinery and equipment
4922	Natural gas transmission
4923	Natural gas transmission and distribution
4924	Natural gas distribution
4932	Gas and other services combined
5171	Petroleum bulk stations and terminals wholesale dealing in
5172	Petroleum and petroleum products wholesalers, except bulk stations and terminals

Deal Value. The deals selected are of the value starting from $100 million, enough to be considered noticeable event in the industry. The initial desire to consider only mega-mergers (>$1 billion) was withdrawn. The number of bog players in oil and gas industry is limited and 3-year-period is not enough to analyze game-changing acquisitions.

Deal Status. The deal status was chosen to 'completed'. We are mostly interested in approved and completed takeovers as opposed to 'rumored' and 'suspended'.

Country Code & Region. The geographical position is important for identifying the patterns (if any) in acquirer – target dynamics.

Controlling Shareholder Name and Type. The main interest of the research is to identify the difference in responses to oil price shock of NOCs and IOCs. Unfortunately, Zephyr database does not have ownership type classification (privately-owned / state-owned), however there is a solution to display the information about CSH and its type. This option is suitable to identify

NOCs, as the key stock owner is classified as 'Public authority, State, Government' (for private companies the final owner may be 'Industrial company', 'Bank', 'Individuals', etc.).

2.3 Exploring dataset

As the result of a query, we exported the dataset of more than 1,000 M&A deals in oil and gas industry for the period June 2014 - November 2017. The originally volume of transactions was then decreased to 655 as filter for *Deal Type* was applied. We excluded the cases which were characterized as 'share buyback', 'capital increase' and 'minor stake'.

The final sample includes the information about 655 takeovers in oil and gas industry. The minimum deal US$ value is $100 million (the filter originally applied in the query), the maximum value is $1,300 billion, thus, the average deal value is around $14 billion. The mega-mergers (>$1 billion) represent 268 deals or 41%. The main finding, however, was to discover that the majority of deals (44%) lie in a range between ($100-500 million). That illustrates the situation in the industry, when small oil and gas companies consolidate during low oil prices.

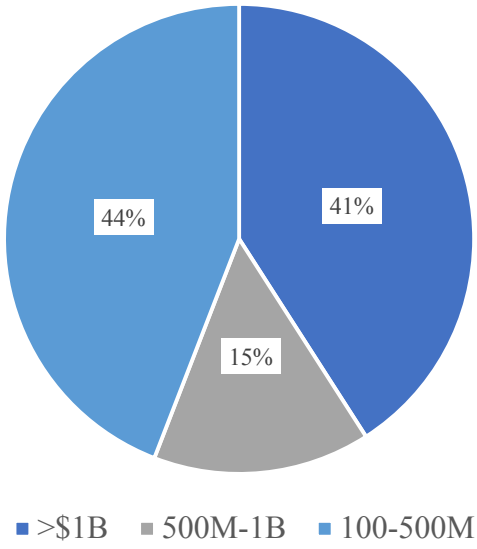


Figure 6. M&A Deal Value, US$ grouped by value range

A closer look on acquirer-target dynamics revealed the following results. The most active acquiring countries are USA (285 deals, 43%), Canada (91 deals, 13%) and Australia (23 deals, 3.5%). Each of the other countries accumulate less than 3% of deal volume. The full table of acquiring countries can be found in **Appendix 1**.

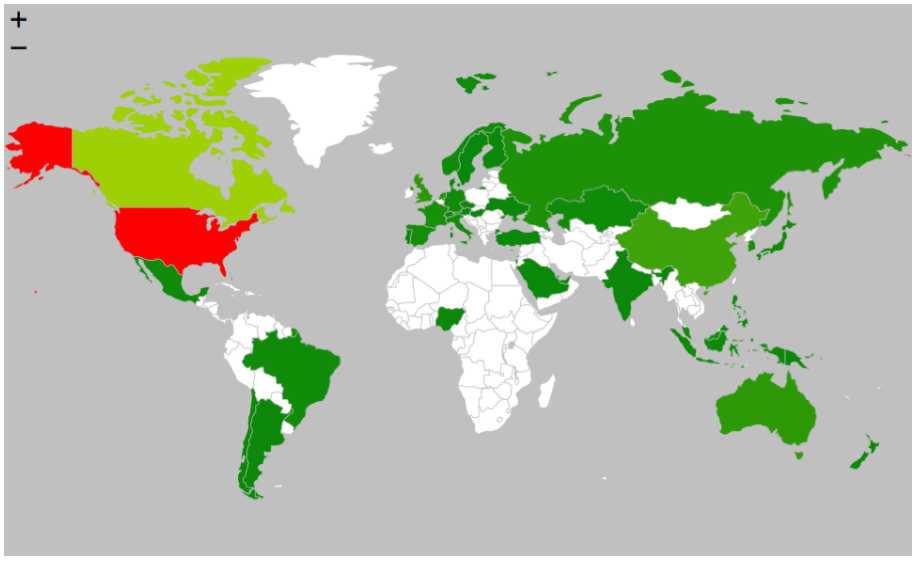


Figure 7. Frequency of M&A deals by acquiring country

Regarding the targets, the results are similar. The most frequent target countries are USA (292 deals, 45%), Canada (94 deals, 14%), China (35 deals, 5%) and Australia (20 deals, 3%). The rest of the countries rarely act as targets. The target list resulted with 647 cases (in the contrast to 655 deals), the missing cases are explained by the fact that some targets are undisclosed and marked as "unnamed assets". The full table of target countries can be found in **Appendix 2**.

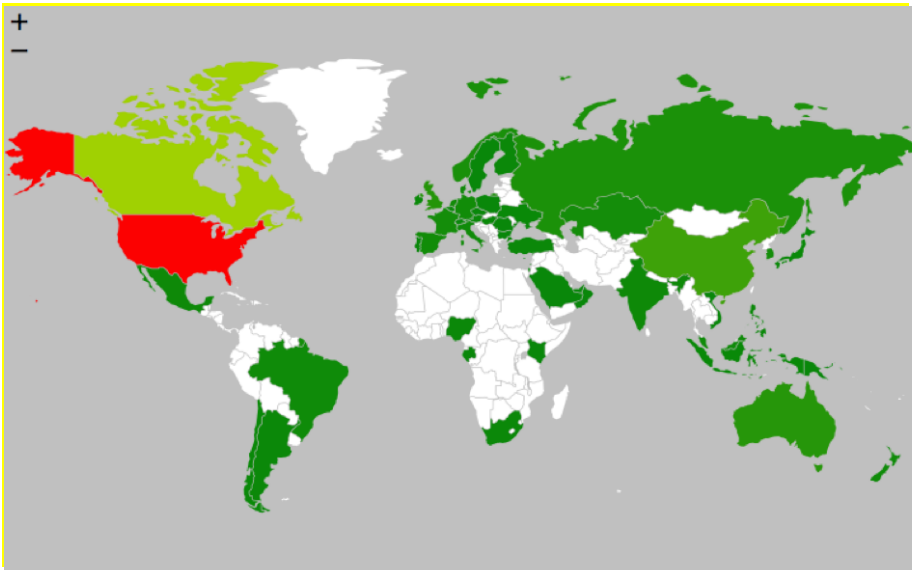


Figure 8. Frequency of M&A deals by target country

Closer look on acquire-target interrelations revealed that the majority of M&A transactions occurs within national borders. Thus, oil and gas companies in the context of extremely low oil prices prefer to consolidate on national basis by acquiring assets of small local companies, instead of going international. The exceptional activity of USA, Canada and Australia in takeover transactions indicates consolidation of shale oil producers, which will strengthen their positions and give a challenge to conventional oil producers. The highlight of strategic responses of shale oil producers is not a research question of this paper. However, it is a possible topic for a different research.

With respect to company types involved in M&A activity (summarized in **Table 2**), privately-owned oil and gas companies are responsible for about 93% of M&A transactions. Such dynamism is explained by the structure of industry. NOCs controlling the majority of the worlds reserves, give private-owned companies little opportunities for the organic growth. Thus, the timing becomes crucially important factor for expansion. Low oil prices that decreases the value of assets of oil producers make them more accessible for a takeover. NOCs, in return, are seeking for means to decrease the operation costs, which requires expertise that may be provided, for example, by service companies.

Table 2. The number of acquirers by company type

Acquirer company type		**No Deals**	**%**
Private		607	92,7%
	Majors	*20*	*3,1%*
	Independent	*587*	*89,6%*
NOC		46	7,0%
Government		2	0,3%
Total		**655**	**100,0%**

However, if we take a closer look on how value is distributed among different company types (**Figure 9)** we can clearly see that average deal value of major oil companies at least 3.5 times exceeds deal value of counterparts. Such a drastic difference is explained by two factors: 1) major oil companies are those that historically have been the biggest industry players (the successors of so-called "Seven Sisters" that dominated the industry throughout 20th century) with global presence; 2) these companies are vertically integrated, their position in industry value

chain allows them to mitigate the risk and compensate asymmetry in profits even during market uncertainty.

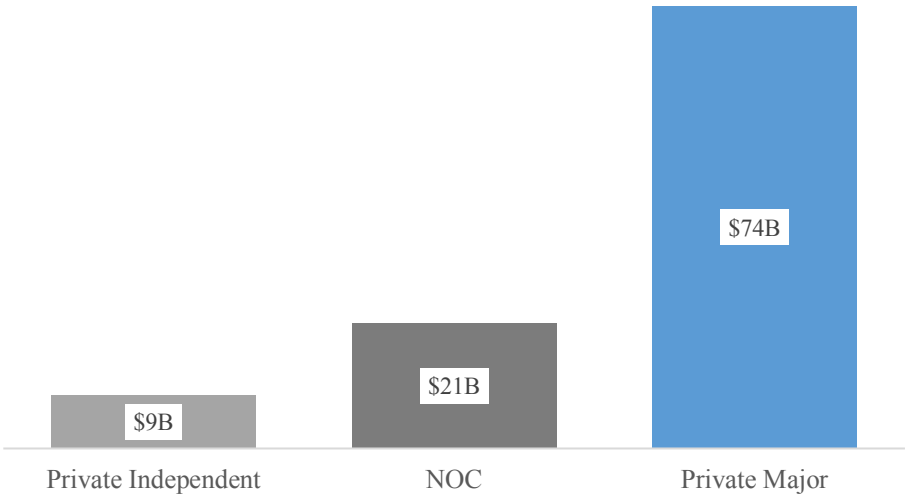


Figure 9. Average deal value by company type

Finally, analyzing takeover activity in different segments of petroleum value chain we discovered that upstream and midstream segments accumulate 72% of all target companies. The second notable observation is that companies also exercise diversification strategies: 13% of all targets were classified as 'Other', meaning the target company does not operate in petroleum industry (**Figure 10)**. The closer look on segment dynamics revealed that in yearly dynamics the share of midstream and service providers is gradually increasing (from 28 to 46%). The growing attractiveness of this segment illustrates companies' interest in obtaining latest technologies or facilities that will cut cost along value chain. One more notion is that upstream assets are second most frequent acquisition, which that during the period of industry shock extracting assets become advantageous object for a takeover due to its decreasing value **(Figure 11)**.

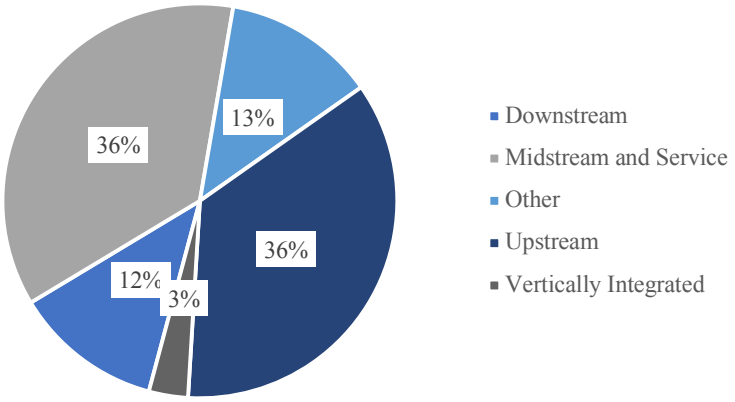


Figure 10. Deal count by company type

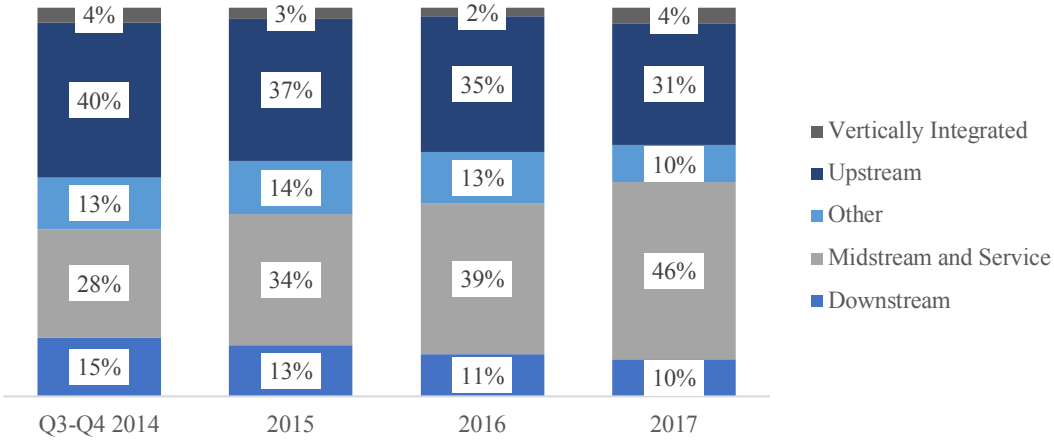


Figure 11. Deal count by segment

Acquirer segment – target segment matrix (Table 3) confirms the previously discussed observations. All company types demonstrate similar takeover behavior by acquiring assets in midstream and upstream segments. We can clearly observe that companies moving towards vertical integration. Upstream providers, however, prefer to accumulate resources, almost half of the deals are occurring within the segment, revealing consolidation of oil operators. Vertical integrated companies, in turn, diversify beyond the core business to lower their dependency on oil prices.

Table 3. Acquirer segment – target segment matrix

	Upstream	Downstream	Midstream	Vertically Integrated	Other
Upstream	46%	6%	30%	3%	15%
Midstream	36%	17%	30%	3%	15%
Downstream	33%	14%	40%	5%	8%
Vertical Integrated	26%	17%	28%	3%	26%
Other	35%	18%	35%	3%	10%

The observation on company-segment (**Table 4)** illustrates that NOCs are aimed at upstream assets to increase their book reserves and midstream operations to access latest technological advances or infrastructure facilities to decrease their cots. Majors show more interest in the midstream segment since these types of companies are interested in grand extraction projects and minor operating assets do not fall into their scope of interest. The latter is, however, opposite for smaller private oil companies. Our dataset provided evidence that small fields (mainly located in U.S. and Canada) attract local operators.

Table 4. Acquirer company type – target segment matrix

	Upstream	Downstream	Midstream	Vertically Integrated	Other
NOC	37%	2%	39%	4%	17%
Private - *Major*	35%	15%	50%	-	-
Private – *Indep.*	37%	15%	31%	3%	14%

2.3 Methodology

Introduction of variables

The choice of variables directly follows from hypothesis framing. Thus, we remind the initial propositions.

H1: The relationship between sharp decline of oil prices and M&A activity in oil and gas industry appears with a lagged affect.

As it was previously discussed, oil and gas industry is sensitive to oil price fluctuations. Various researches are devoted to the establishing the correlation between volatile oil prices and number of M&A transactions in industry. The weak spot is that the previous studies are mostly focused on the period of constantly rising oil prices. Thus, the uphold opinion is that takeover activity (both number of deals and deal value) in the industry is associated with oil price increase. We, in turn, introduce the opinion that dramatic decline in oil prices is also a factor that can influence M&A activity in the industry. However, it is also a question how much time it takes for the companies to react to drop in oil prices. M&A is a complicated process for both sides, even given the extreme changes in the market, it is logical to assume that it takes time to arrange and announce the deal.

Variable a: M&A monthly deal counts, retrieved from the dataset.

Variable b: Crude oil price. But natural question arises: *What price to take?* We will test

- Average spot price of Brent, Dubai and West Texas Intermediate, equally weighed, US$ per barrel.
- Brent crude oil spot price, US$ per barrel.
- West Texas Intermediate oil price, US$ per barrel.

The idea is to discover which price type has the strongest correlation with M&A deal counts. Prices are taken for the period June 2013 – November 2017. Retrieved from indexmundi.com. Oil price data is deliberately taken with excess of one year to set the stage for variable transformation, namely creation of lagged variables.

H2: The higher level of world crude oil reserves, the more M&A deals occur in industry.

Oil prices indeed one of the major, but not the only factor that affects M&A in oil industry. Getting access to reserves is the key driver for oil companies to acquire. However, for the period 2014-2016 world proven crude oil reserves increased only for 0.1%, from 1,490 to 1,492 million barrels (OPEC Annual Statistical Bulletin, 2017), which is not a substantial rise that can correlate with takeover activity in the industry. Thus, **we reject *H2***.

H3: The higher world crude oil production, the more M&A deals occur in industry.

The hypothesis is based on empirical research of Hsu, Wright and Zhu (2017), who concluded that production is a factor that can explain trend of M&A counts. Increases in production signals the potentially increases in value of the company's assets which makes target more attractive for the buyer. The original research questions whether production or production growth rate is a better factor. The authors conclude that growth rate better describes variation in number of M&A deals. Our dataset also supports this finding, illustrated by **Figures 12 and 13.** For the studied period June 2014 – November 2017 oil production increased by 5.49% with average monthly increase of 0.14%.

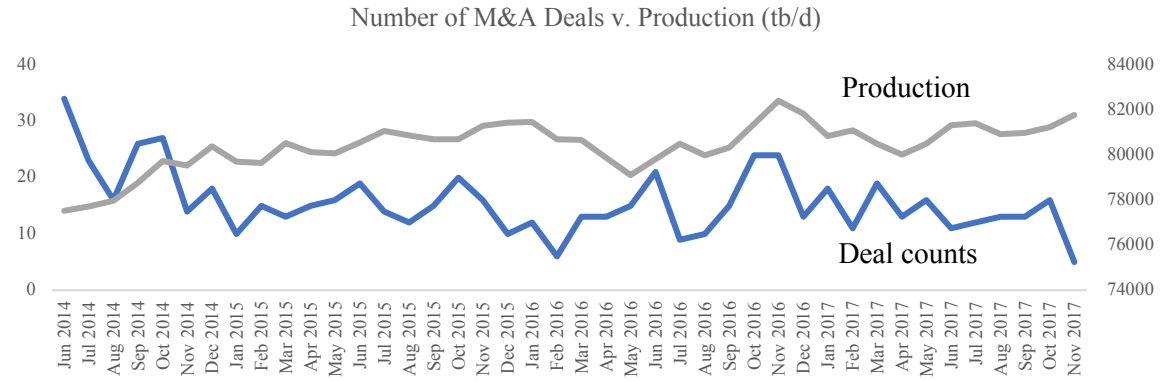


Figure 12. Number of M&A deals against monthly crude oil production

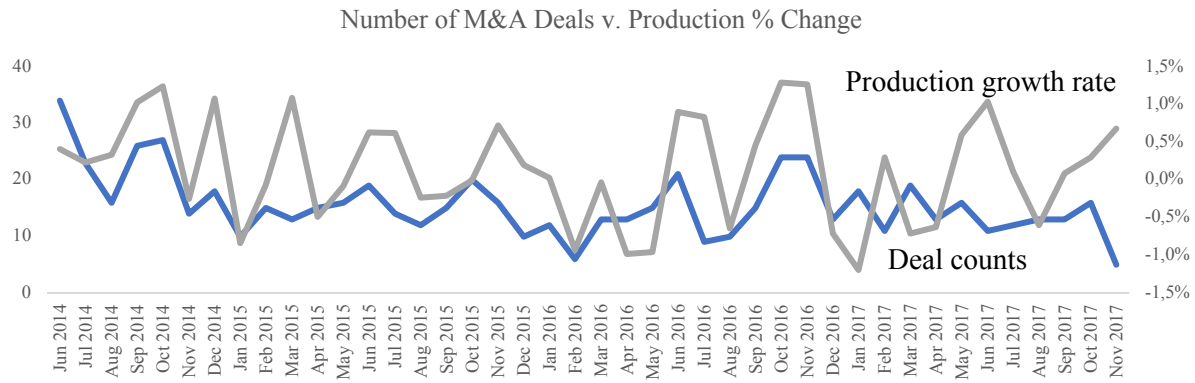


Figure 13. Number of M&A deals against monthly crude oil production growth rate

Thus, we rephrase the initial *H3* into:

H3: The higher world crude oil production growth rate, the more M&A deals occur in the industry.

Variable a: M&A monthly deal counts, retrieved from the dataset.

Variable c: World crude oil production growth rate. Calculated as:

$$(\frac{Production\ of\ year\ n+1}{Prodcution\ of\ year\ n} - 1) * 100\%$$

The monthly data on world crude oil production, thousand barrels per day, is retrieved from U.S. Energy Information Administration (EIA) and OPEC.

Considering, that one of the major industry factors – world crude oil reserves – cannot be used due to limited time period of observation, the more dynamic market indicator is needed. We follow the proposition of Qiu and Zhou (2007), who claim that M&A may be driven by fundamentals or changes in supply and demand. We question whether amount of M&A deals in oil and gas industry relates to oil consumption. Given the fact that oil as energy source is facing increasing competition from the renewables, uncertainty around prospects of oil demand is rising. Transport sector dominates the global oil demand, however with vehicle efficiency improvements and greater penetration of alternative fuels makes growth of oil consumption shaky (BP Energy Outlook, 2018). The main assumption is that in the long-run oil and gas companies cannot be considered as attractive investments. The potential decline in global oil consumption makes companies assets less valuable for the potential buyers. Thus, we introduce the following hypothesis

H4: The higher world crude oil consumption growth rate, the more M&A deals occur in the industry.

Variable a: M&A monthly deal counts, retrieved from the dataset.

Variable d: World crude oil consumption growth rate. Calculated as:

$$(\frac{Consumption\ of\ year\ n+1}{Consumption\ of\ year\ n} - 1) * 100\%$$

The monthly data on world crude oil consumption, thousand barrels per day, is retrieved from U.S. Energy Information Administration (EIA).

Finally, we question if amount of M&A deals relates to production and consumption balance. The extreme deviations from the balance can pull oil price up or down, which correspondingly influences asset value of oil company and its attractiveness to the investors. To theorize, when the production exceeds the consumption, the market faces oversupply that depreciates the commodity. According Ng and Donker (2013) the market should react with caution and reduce takeover activity until the uncertainty is resolved.

We formulate *H5* in the following way:

H5: The higher world oil production and consumption balance, the less M&A deals occur in the industry

Variable a: M&A monthly deal counts, retrieved from the dataset.

Variable e: World crude oil production and consumption balance. Calculated as:

$$World\ crude\ oil\ production_t - World\ crude\ oil\ consumption_t$$

where t is corresponding time period.

Based on the previous researches, the factors that significantly influence the takeover activity in oil and gas industry and how they correspond with hypothesis set in this paper are summarized in **Table 5.**

Table 5. Factors that influence M&A activity in oil and gas industry and corresponding hypothesis

Factor	**Studied by**	**H**	**Final framing**	**Variables**	
Oil price	Boyer, Filion (2007) Ng, Donker (2013)	*H1*	The relationship between sharp decline of oil prices and M&A activity in oil and gas industry appears with a lagged affect	**a.** M&A monthly deal counts	**b.** Crude oil prices (Brent, WTI, average)
Timing	Sopta, Uremovic (2016) Henriques, Sadorsky (2011)				
Oil reserves	Ng, Donker (2013)	*H2*	The higher level of world crude oil reserves, the more M&A deals occur in industry		**Rejected** due to limitations of three-year time period
Production growth rate	Hsu, Wright and Zhu (2017)	*H3*	The higher world crude oil production growth rate, the more M&A deals occur in the industry		**c.** World crude oil production growth rate
Consumption growth rate	Taken into consideration as dynamic market indicator that can influence M&A activity in short-term period	*H4*	The higher world crude oil consumption growth rate, the more M&A deals occur in the industry		**d.** World crude oil consumption growth rate
Production and consumption balance		*H5*	The higher world oil production and consumption balance, the less M&A deals occur in the industry		**e.** World crude oil production and consumption balance

Hypothesis testing method

The hypotheses framing supposes that we are looking for ways to measure the strength of association between two variables and the direction of relationship. Thus, correlation test is the correct method to test our hypotheses. Correlation coefficient indicates the strength of relationship. Its value lies in a range between -1 and +1, where ± 1 indicates a perfect correlation between two variables, while 0 illustrates that there is no relationship observed. The sign of coefficient determines a direction of the relationship, where "+" sign stands for positive relationship (meaning variable move in tandem in one direction) and "-" sign indicates a negative one (variables move in different directions). The correlation coefficient distinguishes by strength (**Table 6).**

Table 6. Strength of relationship

-1.0 to -0.5 or 1.0 to 0.5	Strong
-0.5 to -0.3 or 0.3 to 0.5	Moderate
-0.3 to -0.1 or 0.1 to 0.3	Weak
-0.1 to 0.1	None or very weak

To decide which correlation test is appropriate, we followed decision tree provided by Field (2016). Our first step is to check whether variables meet the certain assumptions.

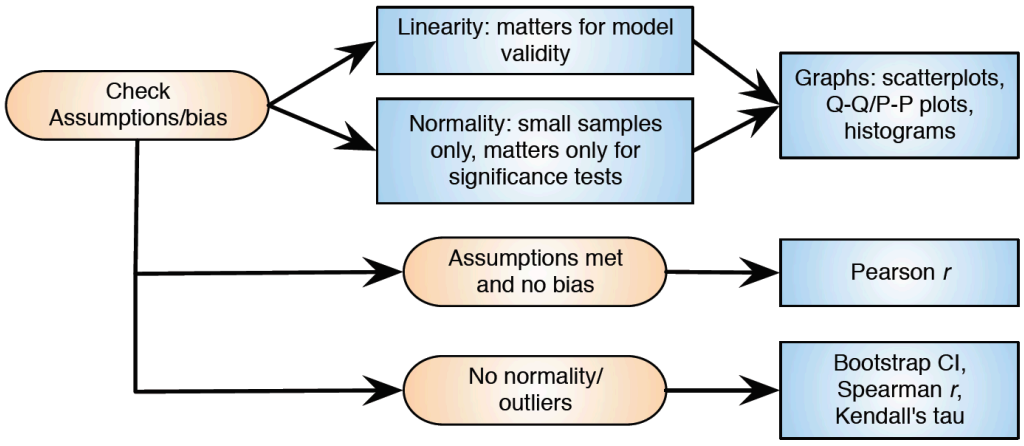


Figure 14. General process for conducting correlation analysis

Source. Field, 2016

As can be seen from **Table 5 Variable a** (M&A monthly deal counts) is constant through all the hypotheses. Thus, we check if **Variable a** meets the assumption of Pearson correlation. Here and after IBM SPSS Statistic is used as software for hypotheses testing.

Assumption 1. The variable should be continuous. M&A monthly deal counts is measured by the amount of deals appeared in a corresponding month. The values vary from month to month and basically are not limited by exact value. Thus, *Assumption 1* is **met**.

Assumption 2. There should be no significant outliers. The boxplot from **Appendix 3** illustrates that case #13, representing 34 deals reported in June 2014, to be an outlier. Considering a nature of our dataset, the outlier cannot originate from data corruption rather it reflects the specific market situation. We are aware of the outlier; however, we do not remove it from the dataset. In this case, *Assumption 2* is **violated**.

Assumption 3. The variable should be approximately normally distributed. To check this assumption, we conducted test of normality. Since we have 42 observations in the dataset Shapiro-Wilk test will be a more appropriate indicator. The Sig. value is 0.014 greater than 0.05, so we can conclude that **Variable a** is approximately normal distribution. *Assumption 3* is **met**.

Since we cannot claim that all the assumptions for Person correlation test are met (**Appendix 3)**, we decide to conduct a non-parametric Spearman correlation test instead. Here and after appendices may be addressed for IBM SPSS outputs.

Chapter 3. Empirical study

3.1 Hypothesis testing

H1: The relationship between sharp decline of oil prices and M&A activity in oil and gas industry appears with a lagged affect

To examine the lag in which companies react to the decline in oil prices, the monthly data of average crude oil price of Brent, Dubai and WTI (equally weighed); Brent crude oil spot price, West Texas Intermediate oil price, were taken for the period of June 2013 – November 2017. Data for M&A deals is taken on monthly basis for the period June 2014 – November 2017. The oil prices are intentionally taken since 2013 to time delays: 3, 6, 9 and 12 months. Although Spearman's correlation does not require linear relationship, the function however should be monotonic (Field, 2016). We built scatterplots to test this assumption **(Appendix 4).** All price types have illustrated monotonic tendencies. Statistical analysis of variables revealed the following results.

Firstly, all oil price types showed similar correlation coefficient (**Appendix 5)**, the strongest however is assigned to crude oil average prices. Spearman's nonparametric correlation test showed moderate positive correlation between number of M&A deals and changes in the average oil prices with a lag of 3 months at 0.05 significance level. At same significance level moderate positive correlation was found with a lag of 12 months ($r=0.336$, $n=42$, $p=0.029$). This means, there is a relationship between oil prices and M&A deal count with a lag of 12 months. For example, if oil price is sharply decreasing the reaction of the company will react with M&A deal in 12 months after the low price is reported. Although, the test showed significant positive correlation between oil price without lag and number of M&A deals, we do not take this result into consideration, as company simply cannot react at glance. M&A deal is a complicated process, that requires certain time to arrange. The important notion is that a positive correlation was observed, suggesting when oil prices are plummeting, industry reacts with decrease in number of M&A deals. It comes in alignment with proposition of Henriques and Sadorsky (2011) who suggested that companies' initial strategy is to wait until uncertainty is resolved. **Thus, *H1* is confirmed.**

Table 7. Correlation between monthly number of M&A deals and lagged average crude oil prices

	Oil price (average)	N	Spearman's Rho	Sig.
Monthly number of M&A deals	No lag	42	.496**	.001
	3m lag		.328*	.034
	6m lag		.224	.154
	9m lag		.133	.401
	12m lag		.336*	.029

* significant at the 0.05 level
** significant at the 0.01 level

H3: The more world crude oil production growth rate, the more M&A deals occur in the industry.

First, we check the assumption for monotonic function (**Appendix 6).** The assumption is met. Spearman's nonparametric correlation test revealed moderate positive correlation between number of M&A deals and world crude oil production growth rate significant at 0.05 level (r=0.343, n=42, p=0.026). Such a result is expected. In oil and gas industry there is a clear relationship between oil production and value of the company. The higher the oil production growth rate, the more valuable target the company becomes since the constant increase in output means increase in value of assets. ***H2*** **is confirmed.**

H4: The more world crude oil consumption growth rate, the more M&A deals occur in the industry

The first step is to check for assumption of monotonic function. However, scatterplot illustrated that assumption is violated (**Figure 15**). Thus, we cannot perform Spearman's correlation test. The relationship between changes in consumption and number of M&A deals in the industry does not present. The possible explanation is that world oil demand growth remains stable. For 2016/2017 the growth was 1.6% (OPEC monthly report 2017). Indeed, the global oil consumption is important metrics of industry, however it does not correlate with volume of takeovers. ***H4*** **is rejected.**

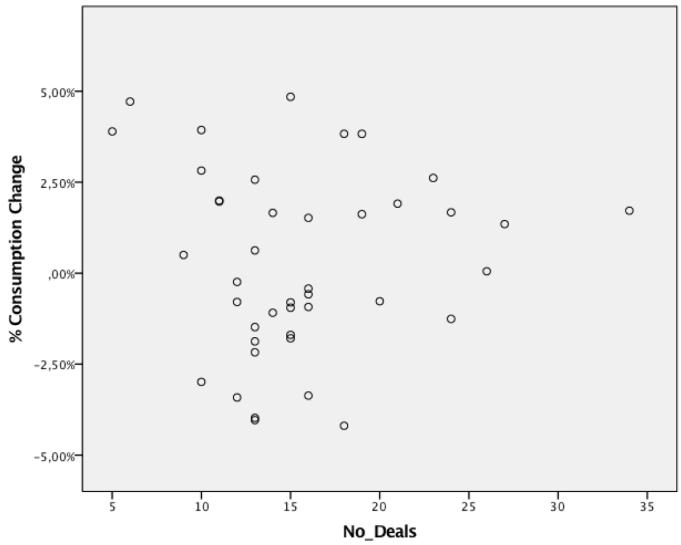


Figure 15. Scatterplot illustrating absence of monotonic function between M&A deal counts and Oil consumption % change

H5: The more world oil production and consumption balance, the less M&A deals occur in the industry

Before running Spearman's correlation test we check the assumption of monotonic function. **Figure 16 shows** that no monotonic function was found. The assumption is violated, meaning we cannot perform correlation test. We assume that during the years of low oil prices, the producers have put an effort to keep consumption and production balance, the data show production and consumption balance fluctuate around zero. ***H5*** **is rejected.**

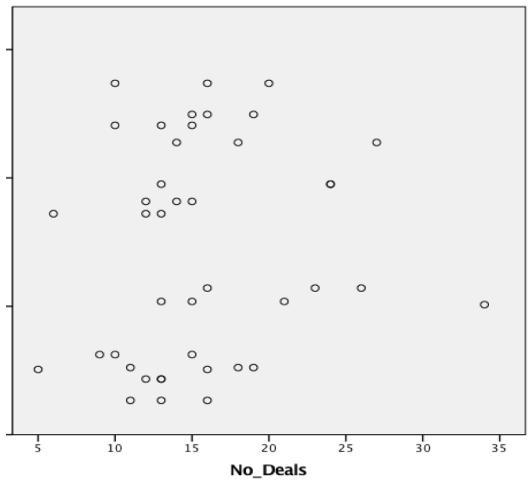


Figure 16. Scatterplot illustrating absence of monotonic function between M&A deal counts and Oil consumption and production balance

We summarized the results of our empiric study in **Table 6.**

Table 6. Hypothesis testing results

Hypothesis	Framing	Result
H1	Sharp decline in oil prices has a lagged effect on M&A activity in oil and gas industry.	**Confirmed**
H2	The higher level of world crude oil reserves, the more M&A deals occur in industry	**Rejected**
H3	The more world crude oil production growth rate, the more M&A deals occur in the industry.	**Confirmed**
H4	The more world crude oil consumption growth rate, the more M&A deals occur in the industry	**Rejected**
H5	The more world oil production and consumption balance, the less M&A deals occur in the industry	**Rejected**

3.2 Discussion of results

To proceed with the discussion of research results it is necessary to rewind our research questions. At the beginning of the paper we set the following research questions:

- Does significant relationship between low oil prices and M&A activity in oil and gas industry take place?

- What other factors may be related to industry takeover activity?
- Do different types of oil companies show distinct takeover behavior?

Does significant relationship between low oil prices and M&A activity in oil and gas industry take place?

Compared to the other industries, oil and gas industry is somewhat different. The takeover activity in the sector is influenced by industry specific factors, one of which is oil prices. We based our assumptions on rich theoretical background. Boyer and Filion (2007) have proved that value of oil and gas companies originates from oil price, a factor the firms cannot control. This was later supported by discover of Ng and Donker (2013), who stated that oil prices have a strong influence on takeover activity in O&G industry opposing to generally accepted view that stock prices are the major motivator. Valuable contribution to a discussion is that M&A activity in petroleum industry per se has a predictive power over oil returns and volatility, as it an indicator valuable of future expectations on oil price fluctuations (Bos et al., 2018).

Our main proposition, however, was that industry specific shocks and M&A are related. In the previous researches the empirical evidence of such connection was found. For example, Mitchell and Mulherin (1996) define industry shock as expected or unexpected factor that provokes reshaping of industry structure, meaning takeover activity intensifies. We tested whether this might be true for oil and gas industry experiencing oil price shock. Our results have revealed a moderate positive correlation between M&A deal count and oil prices (with 12 months lag). Positive correlation means, that despite our proposition, takeover activity in petroleum industry actually decreased following the decline of oil prices. This point is supported by findings of Henriques and Sadorsky (2011) who suggested that companies' initial strategy is to wait until uncertainty is resolved. However, the researchers note, if unfavorable conditions preserve for a relatively long time periods, industry players revive their takeover activity. Based on these assumptions we expect M&A activity in petroleum industry to intensify in short-term period.

What other factors may be related to industry takeover activity?

Hsu, Wright & Zhu (2017) claim that oil prices is not the only industry specific variable that influences industry takeover activity. Although, commodity prices determine the value of company's assets, their finding is that oil production has the positive effect on M&A activity.

Results of our empirical research illustrate that there is a medium relationship M&A deal counts and world crude oil production growth rate. This can be explained by a fact that from company's perspective the increased oil production is an indicator of increasing volume and value of firm's assets. Another vitally important industry specific factor, namely world crude oil reserves, was declined due to the reason that for the studied period 2014-2016 world proven crude oil reserves increased only for 0.1%, which is unsubstantial changes. In a search for alternative variable proposition we addressed the study of Qiu and Zhou (2007) who claim M&A may be driven by changes in supply and demand. According to their empirical results, takeovers are means to stabilize the market, to restore the equilibrium. Since the supply side of equilibrium was already presented by changes in world crude oil output, we introduced changes in world crude oil consumption to stand for demand. Also, we introduced production and consumption balance as difference between the two. But these factors did not even meet the assumption of correlation analysis. The natural question is *why?*

Production and consumption balance is composed of two elements: supply and demand. Supply is regulated by OPEC members. Since the agreement of November 2016 cartel's key members has taken course towards production cut. The main goal behind the policy is to restore balance to the international oil market. Supply will gradually creep back in step with demand. More important, global oil inventories will be reduced, all taken to stimulate oil prices (Stratfor, 2017). Meaning, world crude oil production and consumption balance will fluctuate around zero.

The demand side of the equation, however presents a greater issue. It seems, that demand fluctuation does not influence expectations of the investors. Oil consumption is growing during the observed period, mainly driven by rapidly-growing emerging economies, like China. But in the developed countries oil is slowly replaced by other energy sources. The researchers discuss the prospect that global oil demand will gradually slow. However, the date at which oil demand will stop growing is highly uncertain and small changes in assumptions can lead to vastly different estimates. More importantly, there is little reason to believe that once oil consumption reaches its peak, that oil demand will fall sharply. The world is likely to demand large quantities of oil for many decades to come. Thus, oil is likely to grow less rapidly than other fuels, however these projections are highly uncertain (BP, 2017).

Do different types of oil companies show distinct takeover behavior?

The answers to this question was provided by our dataset. While analyzing data for 655 M&A deals in petroleum industry for the period of 2014 – 2017 we discovered the following findings.

- State-owned oil companies or NOCs are not actively engaged in takeover activity during the period of extremely low oil prices. NOCs are responsible only for 46 M&A deals in the industry. They mainly are involved in acquisition of upstream and midstream assets. This finding may be explained by the reasons that firstly, the value of this type of companies come from reserves. With oil price plummeting, the profitability of upstream operation decreases, limiting funds available for company expansion. Secondly, as was mentioned by Xie, Reddy, & Liang (2017) the previous highly favorable period of high oil prices led to extensive financing of national social programs. Currently NOCs still have to proceed with burden.
- Mega-mergers come from majors. Despite IOCs are responsible for only 20 deals (approximately 3%) it is more than compensated by average deal value which is $74 billion. These deals are of different patterns and cover all segments across value chain, with preference in midstream operations. This is explained by industry composition. Since nationalization wave in 70's in emerging economies, IOCs have lost access to low-cost crude oil reserves, which left this companies with limited growth opportunities in upstream.
- Smaller players are in the process of restructuring. Approximately 90% of all reported M&A deals are accounted for independent players, at the same time their average deal value is around $9 billion, which is relatively small value, compared to that of IOCs. The activity of upstream and midstream segments suggests that low oil prices diminishes the profits of operations in these segments making them vulnerable to the external acquisition.
- Midstream segment is gradually increasing its share. For the observed period the share of M&A deals occurring in the segment increased from 28 to 46%. The growing attractiveness of this segment suggests that in the context of low oil

prices companies are interested in obtaining latest technologies or facilities that will cut cost along value chain.

- We also discovered multiple cases of diversification going beyond petroleum industry. This is supported by the argument of Granier and Podesta (2010) that one of M&A rationale is to achieve better competitive advantage is to acquire companies of different sectors.

Theoretical contribution

This research complement to the previous works by focusing on the context of low oil prices. We provide multi-dimensional analysis of takeover activity in oil and gas industry, namely by studying differences across various company types and industry value chain segments. This conducted complex study contributes to the understanding of response patterns of oil and gas companies to industry shock.

Managerial implications

While it was expected that takeover activity in oil and gas industry is related to oil prices, but when industry shock occurs the main question is *How long will it take companies to react?* In this study we provide the empirical evidence that oil and gas industry reacts to extremely low oil prices with lag of 12 months. M&A activity in the industry slows down revealing industry shock. By knowing this fact oil companies themselves or other market players can anticipate the actions of oil and gas companies in the context of unfavorable conditions, namely their natural reaction wait till uncertainty is resolved. In other words, it may help to stay ahead of competition by understanding the industry dynamics. Secondly, we discovered the response patterns of different company types. NOCs mostly remain 'silent' exposing their vulnerability and inability to project from oil shocks but trying to mitigate the losses by acquiring upstream and midstream assets. Smaller oil companies, on the contrary, show extremely high takeover activity indicating consolidation trends mainly by accumulating minor operation assets and fields. Majors go for midstream to increase their competitive advantages. These findings may help discover additional opportunities for partnership and collaboration in the industry. Thirdly, increasing M&A activity of midstream segment exposes the certain expectations regarding future industry development. Acquisition of these knowledge will contribute companies' decision-making process.

Limitations of the study:

- Time period. Although, three consecutive years of low oil prices represent the substantial industry shock for companies to react, however the responses and industry dynamic may be different for longer periods of unfavorable conditions.
- We take into consideration oil prices as one of the factor that correlates with M&A deal counts. However, many countries also operate on gas market. Even though gas price is following the oil prices, it may also influence the company's decision to acquire.
- In this research we consider only fundamental factors (supply and demand) to be related to takeover activity in the industry, while other factors (e.g. level of crude oil inventories) may also report correlation.

Conclusion

Since mid 2014 one of the most rapid and sharp decline of oil prices is observed. The experts still have not reached consensus regarding the reasons behind current oil price shock, but fact remains unchanged, low oil prices correlate with M&A activity in petroleum industry. Discussing particularities of takeover activity in oil and gas industry, the academics have agreed on that industry specific factors have much more significance. Such factors are oil price volatility, world crude oil reserves, crude oil production level, etc.

Our ***research problem*** was formulated as follows: *How do different types of oil companies use M&A to respond to low oil prices?* The primary interest of this research is to analyze how national and international oil and gas companies (NOCs, IOCs and private oil companies) use takeover to react to low international oil price. We based our research on assumption that M&A is means for oil companies to respond to the market alterations caused by oil price decline.

We conducted a study of 655 M&A deals in oil and gas industry for the period of June 2014 – November 2017. Our results showed that a moderate positive correlation exists between M&A deal count and oil prices (with 12 months lag). Positive correlation means, that takeover activity in petroleum industry actually decreased following the decline of oil prices. It means that companies' initial strategy is to wait until uncertainty is resolved. However, we expect M&A activity in petroleum industry to intensify in short-term period. Regarding the other factors we assumed that fundamentals (or changes in supply and demand) will show significant results. We found empirical evidence that there is a medium relationship M&A deal counts and world crude oil production growth rate. The increased oil production is an indicator of increasing volume and value of firm's assets and financial health of a company. Also, we introduced production and consumption balance as difference between the two. But these factors did not even meet the assumption of correlation analysis and thus are insignificant.

Also, by analyzing our dataset, we found that: 1) NOCs are not actively engaged in takeover activity during the period of extremely low oil prices. NOCs do not actively participate in takeover activity and mainly target upstream and midstream operations; 2) mega-mergers come from majors, despite IOCs are responsible for only 20 deals (approximately 3%) it is more than compensated by average deal value which is $74 billion; 3) smaller players are in the process of restructuring and present interest in smaller fields. Midstream segment is becoming a

most active segment (share of M&A deals occurring increased from 28 to 46%). The growing attractiveness of this segment suggests that in the context of low oil prices companies are interested in obtaining latest technologies or facilities that will cut cost along value chain. The upstream was second most popular target. Based on the activity of these segments we assume that low oil prices diminish the profits of operations making companies vulnerable to the external acquisition.

References

Abdalla, K. (1995). The changing structure of the international oil industry. *Energy Policy, 23 (10),* 871-877.

Al-Moneef, M. (1998). Vertical integration strategies of the national oil companies. *The Developing Economies, 36 (2),* 203-222.

Arezki, R., Blanchard, O. (2014). Seven questions about recent oil price slump. *IMFBlog.* Retrieved from https://blogs.imf.org/2014/12/22/seven-questions-about-the-recent-oil-price-slump/

Bakewell, C., Horsley, C., Futerfas, A. (2005). Innovation lacking in high-tech world of oil: New technologies needed to develop unconventional resources. *Oil & Gas Financial Journal.* Retrieved from http://www.ogfj.com/articles/print/volume-2/issue-4/features/innovation-lacking-in-high-tech-world-of-oil-new-technologies-needed-to-develop-unconventional-resources.html

Barreau, S. (2002). Innovations and external growth strategy: The cas of oil and gas supply and service companies. *Oil & Gas Science and Technology – Rev. IFP, 57,* 193-203.

Bastianin, A., Conti, F., & Manera, M. (2016). The impacts of oil price shocks on stock market volatility: Evidence from the G7 countries. *Energy Policy, 98*, 160-169.

Baumeisrer, C., Kilian, L. (2015). Understanding the Decline in the Price of Oil since June 2014. *Journal of the Association of Environmental and Resource Economists, 3 (1),* 131-158.

Bos, M., Demirer, R., Gupta, R., Tiwari A.K. (2018). Oil returns and volatility: The role of mergers and acquisitions. *Energy Economics, 71,* 62-69.

Boyer, M. M., Filion, D. (2007). Common and fundamental factors in stock returns of Canadian oil and gas companies. *Energy Economics, 29*, 428-453.

BP (2018). Energy Outlook. Retrieved from https://www.bp.com/content/dam/bp-country/de_ch/PDF/Energy-Outlook-2018-edition-Booklet.pdf

Capstone. *Top 5 Strategic Drivers of Oil and Gas M&A*. Retrieved from: http://successfulacquisitions.net/top-5-strategic-drivers-of-oil-and-gas-ma/

Casciaro, T., Piskorski, M. (2005). Power Imbalance, Mutual Dependence, and Constraint Absorption: A Closer Look at Resource Dependence Theory. *Administrative Science Quarterly, 50 (2),* 167-199.

Cashin, P., Mohaddes, K., Raissi, M., & Raissi, M. (2014). The differential effects of oil demand and supply shocks on the global economy. *Energy Economics, 44*, 113-134.

Choi, S., McNamara, G. (2018). Repeating a familiar pattern in a new way: The effect of exploitation and exploration on knowledge leverage behaviors in technology acquisitions. *Strategic Management Journal, 39 (2),* 356-379.

Deloitte. (2017). *Oil & Gas Mergers and Acquisitions Report-Year-end 2016. Out of the starting blocks.* Retrieved from: *https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-oil-and-gas-m-a-report-year-end-2016.pdf*

Fantazzini, D. (2016). The oil price crash in 2014/15: Was there a (negative) financial bubble? *Energy Policy, 96,* 383-396.

Field, A. (2016). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock'n'roll (4th ed.)*. London: Sage.

Granier, L., Podesta, M. (2010). Bundling and mergers in energy markets. *Energy Economics, 32,* 1316-1324.

Grant, R., Cibin, R. (1996). Strategy, structure and market turbulence: The international oil majors, 1970-1991. *Scandinavian Journal of Management, 12 (2),* 165-188.

Güntner, J. (2014). How do oil producers respond to oil demand shocks? *Energy Economics, 44,* 1-13.

Haleblian J., Kim, J., Rajagopalan, N. (2006). The Influence of Acquisition Experience and Performance on Acquisition Behavior: Evidence from the U.S. Commercial Banking Industry. *The Academy of Management Journal*, *49 (2),* 357-370.

Hennart, F. (1991). The Transaction Costs Theory of Joint Ventures: An Empirical Study of Japanese Subsidiaries in the United States. *Management Science, 37 (4),* 483-497.

Henriques, I., Sadorsky, P. (2011). The effect of oil price volatility on strategic investment. *Energy Economics, 33,* 79-87.

Hsu, K., Wright, M., Zhu, Z. (2017). What motivates merger and acquisition in the upstream oil & gas sector in the U.S.? *Energy Economics, 65,* 240-250.

Kilian, L. (2009). Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market. *American Economic Review*, *99* (3), 1053–1069.

Kim, H., Singal, V. (1993). Mergers and Market Power: Evidence from the Airline Industry. *The American Economic Review*, *83 (3)*, 549-569.

King, D., Slotegraaf, R., Kesner, I. (2008). Performance Implications of Firm Resource *Interactions Organization Science, 19 (2)*, 327–340.

Lanine, G., Vennet, R.V. (2007). Microeconomic determinants of acquisitions of Eastern European banks by Western European banks. *Economics of Transition, 15 (2),* 285-308.

Manescu, C., Nuno, G. (2015) Quantitative effects of the shale oil revolution. *Energy Policy, 86,* 855-866.

Mitchell, M., Mulherin, H. (1996). The impact of industry shocks on takeover and restructuring activity. *Journal of Financial Economics, 41,* 193-229.

Mohaddes, K., Pesaran, H. (2016). Country-specific oil supply shocks and the global economy: A counterfactual analysis. *Energy Economics, 59*, 382-399.

Mohaddes, K., Pesaran, H. (2017). Oil prices and the global economy: Is it different this time around? *Energy Economics, 65*, 315-325.

Ng, A., Donker, H. (2013). Purchasing reserves and commodity market timing as takeover motives in the oil and gas industry. *Energy Economics, 37*, 167–181.

Okoegualea, K.I., Loveland, R. (2017). Telecommunications deregulation and the motives for mergers. *Journal of Economics and Business, 94,* 15-31.

OPEC (2017). Annual Statistical Bulletin. Retrieved from http://www.opec.org/opec_web/static_files_project/media/downloads/publications/ASB2017_13062017.pdf

Peersman, G., Robays, I. (2012). Cross-country differences in the effects of oil shocks. *Energy Economics 34*, 1532-1547.

Pellegrini, L., Lazzarottii, V., Pizzurno, E. (2012). From outsourcing to Open Innovation: a case study in the oil industry. *International Journal of Technology Intelligence and Planning, 8 (2),* 182-196.

Poghosyan, T., Haan, J. (2010). Determinants of cross-border bank acquisitions in transition economies. *Economics of Transition, 18 (4),* 671-696.

PwC. (2017). *2017 Oil and Gas Trends.* Retrieved from https://www.strategyand.pwc.com/trend/2017-oil-and-gas-trends

Qiu, L., Zhou, W. (2007). Merger waves: a model of endogenous mergers. *The Journal of Economics, 38,* 214-226.

Rabbiosi, L., Elia, S., Bertoni, F. (2012). Acquisitions by EMNCs in Developed Markets: An Organisational Learning Perspective. *Management International Review*, *52 (2),*193-212.

Sopta, M., Uremovic, M. (2016). The impact of volatile crude oil prices on M&A in the oil industry. N*otitia – journal for sustainable development, 2*, 21-30.

Stevens, P. (2016). International Oil Companies: The Death of the Old Business Model. *The Royal Institute of International Affairs, Chatham House*, 1-46.

Tokic, D. (2015). The 2014 oil bust: Causes and consequences. *Energy Policy, 85,* 162-169.

Victor, D., Hults, D., & Thurber, M. (2005). *State-Owned Enterprises and the World Energy Supply.* Cambridge: Cambridge University Press.

World Bank. (2011). *National Oil Companies and Value Creation*. Retrieved from http://siteresources.worldbank.org/INTOGMC/Resources/9780821388310.pdf

Xie, E., Reddy, K., & Liang, J. (2017). Country-specific determinants of cross-border mergers and acquisitions: A comprehensive review and future research directions. *Journal of World Business, 52,* 127-183.

Zhang, Y., Yao, T. (2016). Interpreting the movement of oil prices: Driven by fundamentals or bubbles? *Economic Modeling, 55*, 226-240.

Appendices

Appendix 1.

Volume of M&A deals by acquiring country

Country	Deal counts	%
United States of America	285	43,5%
Canada	91	13,9%
China	34	5,2%
Australia	23	3,5%
United Kingdom	22	3,4%
Netherlands	17	2,6%
Russian Federation	14	2,1%
France	12	1,8%
Bermuda	11	1,7%
South Korea	11	1,7%
Singapore	10	1,5%
Spain	8	1,2%
Malaysia	7	1,1%
Italy	6	0,9%
Kazakhstan	6	0,9%
Marshall Islands	6	0,9%
Norway	6	0,9%
Brazil	5	0,8%
Germany	5	0,8%
Japan	5	0,8%
Indonesia	4	0,6%
Cayman Islands	4	0,6%
Mexico	4	0,6%
United Arab Emirates	3	0,5%
Switzerland	3	0,5%
Chile	3	0,5%
Curacao	3	0,5%
Hong Kong, SAR China	3	0,5%
Israel	3	0,5%
Luxembourg	3	0,5%
New Zealand	3	0,5%
Saudi Arabia	3	0,5%

British Virgin Islands	3	0,5%
Argentina	2	0,3%
Cyprus	2	0,3%
Czech Republic	2	0,3%
Denmark	2	0,3%
Finland	2	0,3%
India	2	0,3%
Nigeria	2	0,3%
Philippines	2	0,3%
Turkey	2	0,3%
Ukraine	2	0,3%
Austria	1	0,2%
Barbados	1	0,2%
Bahamas	1	0,2%
Hungary	1	0,2%
Mauritius	1	0,2%
Papua New Guinea	1	0,2%
Portugal	1	0,2%
Qatar	1	0,2%
Sweden	1	0,2%
Total	**655**	**100%**

Appendix 2.

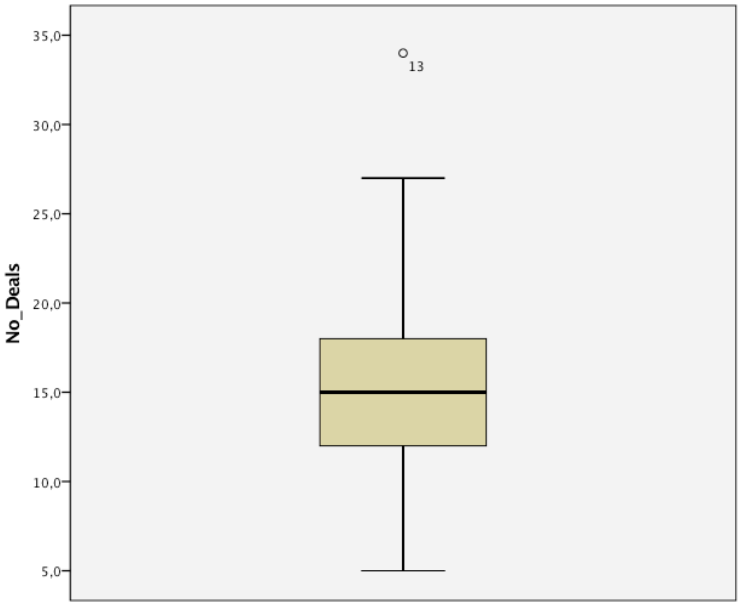
Volume of M&A deals by target country

Country	Deal counts	%
United States of America	292	45,1%
Canada	94	14,5%
China	35	5,4%
Australia	20	3,1%
United Kingdom	19	2,9%
Russian Federation	13	2,0%
Norway	12	1,9%
Kazakhstan	9	1,4%
France	8	1,2%
South Korea	8	1,2%
Germany	7	1,1%
Spain	7	1,1%
Netherlands	7	1,1%
Singapore	7	1,1%
Bermuda	6	0,9%
Brazil	6	0,9%
Italy	6	0,9%
Malaysia	6	0,9%
New Zealand	6	0,9%
Denmark	5	0,8%
India	4	0,6%
Marshall Islands	4	0,6%
Mexico	4	0,6%
Chile	3	0,5%
Hungary	3	0,5%
Indonesia	3	0,5%
Ireland	3	0,5%
Japan	3	0,5%
Ukraine	3	0,5%
Argentina	2	0,3%
Austria	2	0,3%
Belgium	2	0,3%
Bahrain	2	0,3%
Finland	2	0,3%
Hong Kong, SAR China	2	0,3%

Israel	2	0,3%
Cayman Islands	2	0,3%
Luxembourg	2	0,3%
Nigeria	2	0,3%
Philippines	2	0,3%
Turkey	2	0,3%
British Virgin Islands	2	0,3%
South Africa	2	0,3%
United Arab Emirates	1	0,2%
Bulgaria	1	0,2%
Switzerland	1	0,2%
Cyprus	1	0,2%
Czech Republic	1	0,2%
Gabon	1	0,2%
Kenya	1	0,2%
Mauritius	1	0,2%
Oman	1	0,2%
Papua New Guinea	1	0,2%
Poland	1	0,2%
Portugal	1	0,2%
Romania	1	0,2%
Saudi Arabia	1	0,2%
Sweden	1	0,2%
Vietnam	1	0,2%
Total	**647**	**100,0%**

Appendix 3.

Variable a: testing assumptions



Boxplot for **Variable a** indicating the presence of outlier

Tests of Normality

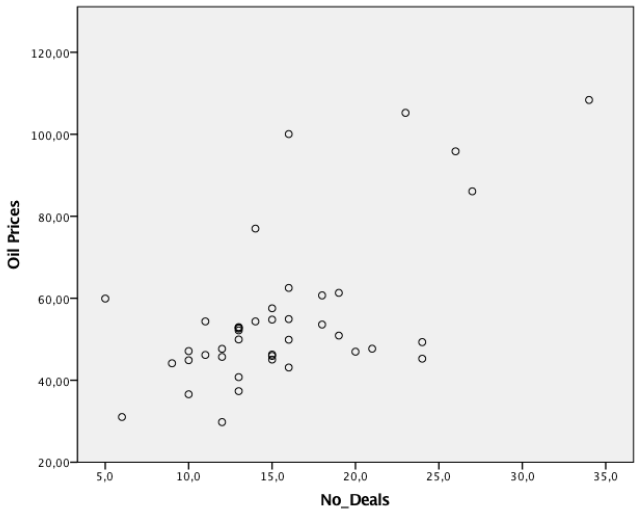
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
No_Deals	,186	42	,001	,931	42	,014

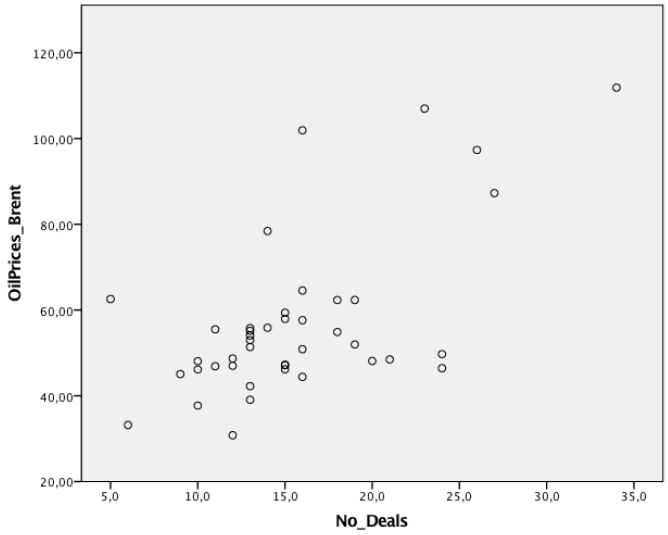
a. Lilliefors Significance Correction

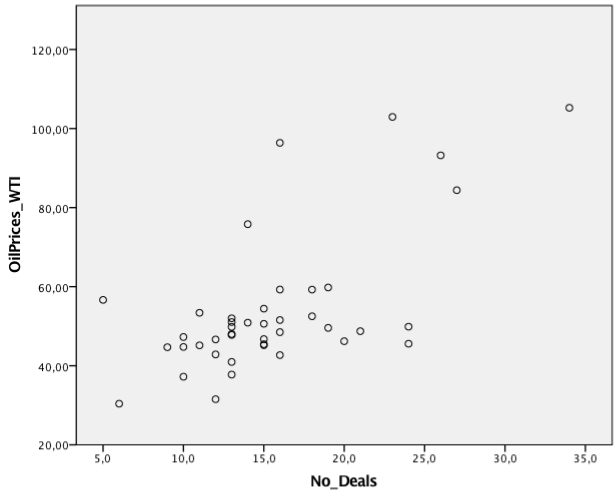
Test of Normality of **Variable a**

Appendix 4.

H1: testing for monotonic function. Boxplots for different types of oil price as follows (Average, Brent, WTI)







Appendix 5.

H1: Spearman's correlation test for oil prices different types of oil price as follows (Average, Brent, WTI)

Correlations

			No_Deals	Oil Prices	Q1_lag	Q2_lag	Q3_lag	Q4_lag
Spearman's rho	No_Deals	Correlation Coefficient	1,000	,496**	,328*	,224	,133	,336*
		Sig. (2-tailed)	.	,001	,034	,154	,401	,029
		N	42	42	42	42	42	42
	Oil Prices	Correlation Coefficient	,496**	1,000	,784**	,657**	,564**	,419**
		Sig. (2-tailed)	,001	.	,000	,000	,000	,006
		N	42	54	51	48	45	42
	Q1_lag	Correlation Coefficient	,328*	,784**	1,000	,806**	,674**	,576**
		Sig. (2-tailed)	,034	,000	.	,000	,000	,000
		N	42	51	51	48	45	42
	Q2_lag	Correlation Coefficient	,224	,657**	,806**	1,000	,812**	,688**
		Sig. (2-tailed)	,154	,000	,000	.	,000	,000
		N	42	48	48	48	45	42
	Q3_lag	Correlation Coefficient	,133	,564**	,674**	,812**	1,000	,812**
		Sig. (2-tailed)	,401	,000	,000	,000	.	,000
		N	42	45	45	45	45	42
	Q4_lag	Correlation Coefficient	,336*	,419**	,576**	,688**	,812**	1,000
		Sig. (2-tailed)	,029	,006	,000	,000	,000	.
		N	42	42	42	42	42	42

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

			No_Deals	OilPrices_Brent	Q1_lag_Brent	Q2_lag_Brent	Q3_lag_Brent	Q4_lag_Brent
Spearman's rho	No_Deals	Correlation Coefficient	1,000	,486**	,332*	,247	,134	,335*
		Sig. (2-tailed)	.	,001	,032	,115	,397	,030
		N	42	42	42	42	42	42
	OilPrices_Brent	Correlation Coefficient	,486**	1,000	,794**	,678**	,570**	,435**
		Sig. (2-tailed)	,001	.	,000	,000	,000	,004
		N	42	54	51	48	45	42
	Q1_lag_Brent	Correlation Coefficient	,332*	,794**	1,000	,794**	,678**	,570**
		Sig. (2-tailed)	,032	,000	.	,000	,000	,000
		N	42	51	54	51	48	45
	Q2_lag_Brent	Correlation Coefficient	,247	,678**	,794**	1,000	,800**	,689**
		Sig. (2-tailed)	,115	,000	,000	.	,000	,000
		N	42	48	51	53	50	47
	Q3_lag_Brent	Correlation Coefficient	,134	,570**	,678**	,800**	1,000	,820**
		Sig. (2-tailed)	,397	,000	,000	,000	.	,000
		N	42	45	48	50	50	47
	Q4_lag_Brent	Correlation Coefficient	,335*	,435**	,570**	,689**	,820**	1,000
		Sig. (2-tailed)	,030	,004	,000	,000	,000	.
		N	42	42	45	47	47	47

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

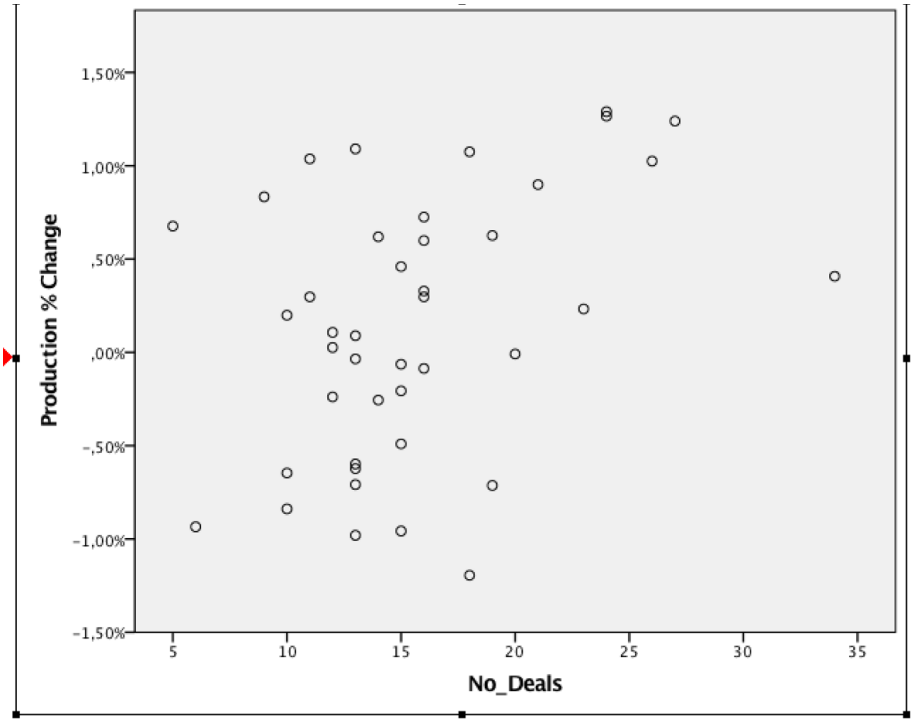
			No_Deals	OilPrices_WTI	Q1_lag_WTI	Q2_lag_WTI	Q3_lag_WTI	Q4_lag_WTI
Spearman's rho	No_Deals	Correlation Coefficient	1,000	,535**	,312*	,236	,096	,326*
		Sig. (2-tailed)	.	,000	,044	,133	,544	,035
		N	42	42	42	42	42	42
	OilPrices_WTI	Correlation Coefficient	,535**	1,000	,726**	,614**	,491**	,352*
		Sig. (2-tailed)	,000	.	,000	,000	,001	,022
		N	42	54	51	48	45	42
	Q1_lag_WTI	Correlation Coefficient	,312*	,726**	1,000	,726**	,614**	,491**
		Sig. (2-tailed)	,044	,000	.	,000	,000	,001
		N	42	51	54	51	48	45
	Q2_lag_WTI	Correlation Coefficient	,236	,614**	,726**	1,000	,733**	,621**
		Sig. (2-tailed)	,133	,000	,000	.	,000	,000
		N	42	48	51	53	50	47
	Q3_lag_WTI	Correlation Coefficient	,096	,491**	,614**	,733**	1,000	,758**
		Sig. (2-tailed)	,544	,001	,000	,000	.	,000
		N	42	45	48	50	50	47
	Q4_lag_WTI	Correlation Coefficient	,326*	,352*	,491**	,621**	,758**	1,000
		Sig. (2-tailed)	,035	,022	,001	,000	,000	.
		N	42	42	45	47	47	47

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix 6.

H2: Testing for assumption and Spearman's correlation test for crude oil production growth rate



Nonparametric Correlations

Correlations

			No_Deals	Production % Change
Spearman's rho	No_Deals	Correlation Coefficient	1,000	,343*
		Sig. (2-tailed)	.	,026
		N	42	42
	Production % Change	Correlation Coefficient	,343*	1,000
		Sig. (2-tailed)	,026	.
		N	42	42

*. Correlation is significant at the 0.05 level (2-tailed).