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ENGELSK TITTEL: Finances of US Shale Companies in the Period of Low Interest Rate and Low Oil Prices

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Preface

This work completes the Master's Degree in Applied Finance at the University of Stavanger in 2018 year.

The subject of finance has always been of great interest for me. I decided to apply knowledges accumulated during my studies to the analysis of the companies in the shale oil industry in the US, which I found quite fascinating.

Writing the master thesis was exciting and at the same time challenging goal. I would like to thank my advisor Klaus Mohn for his assistance and insight throughout the course of the work.

Stavanger, June 2018

Nastassia Dranevich

Summary

The recent significant tendencies in the oil industry was studied by many researchers. The shift of oil supply-demand equilibrium, consequent oil price plunge had a prolonged effect on the oil and gas sector all over the world. All the players in the industry were affected and experienced various impact levels. Weakened balance sheets, enormous restructuring programs, bankruptcy were the new reality of the most oil companies.

One of the determinative factors leading to the global change in the oil industry was the development of shale oil in the US. The phenomenon of “Shale Oil Boom” or “Shale Oil Revolution” is quite specific and has fascinated industry players.

The new technologies used, and financial characteristics of the shale oil projects lead to profitability gains and quick growth of production scope. Even the sharp drop in commodities prices didn't have a significant effect on the production volumes of the US exploration and production firms. The question of source of funding the constant growth in production of shale oil companies is a point of great interest. The recent researches have showed that the US oil companies have high gearing levels, meaning that the debt financing, accompanied by low interest rates set by the Fed, became the mode of survival for the most E&P companies.

We started our work with the look at the shale oil development and its major consequences. Further we focused on the analysis of two US E&P companies, Anadarko Petroleum and Eclipse Resources, differed by the scope of operations, level of reserves, the life-cycle stage, credit ratings, position in the market etc. to identify in more practical way the main trends in the oil sector for the last five years.

The analysis performed demonstrated the significant decrease in profitability measures and increase in the leverage ratios, as well as the strong deficit in free cash flows for the E&P companies in the last five years regardless of their size or life-cycle stage. The analysis indicated that the years with the strongest free cash flows deficit coincided with the largest increases in the total debt of both Anadarko Petroleum and Eclipse Resources, proving the strong demand for debt and the dependence of the US shale companies on the debt as the main source of financing. The sensitivity analysis identified the strong effect of the change in the interest rates level, which is more significant for the small shale companies with below investment grade ratings.

We believe our work to be informative and comparative tool for further researches.

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1. Introduction

The US shale oil phenomenon is the point of interest for many researchers. Its rise determined the development of the world oil and gas industry. The innovative oil production technologies helped the US Shale companies to significantly reduce their operational costs and increase the productivity per well and as the consequence to bring the drilling and pumping operations to a larger scale. The important increase in the production levels provoked the growth in the world oil and gas supply which outpaced expectations and changed the oil demand-supply equilibrium. The oil supply rise paired with the OPEC policy lead to the oil price plunge in 2014. The US exploration and production companies experienced the financial instability during the period of oil price shock in 2014-2016 years. A part of US Shale companies went bankrupt, another, having the access to the low-cost debt financing, which resulted from the US Federal Reserve policy, managed to maintain their production levels and even expand their exploration programs.

1.1 Research question and objectives

In our master thesis we would like to analyze the impact of shale oil boom and the consequent drop of oil prices on the financial position of exploration and production companies using example of Anadarko Petroleum and Eclipse Resources for the period of 2013-2017 years, taking into account their size, credit ratings and level of interest rates.

We considered to analyze two fundamentally different US shale companies. Anadarko Petroleum is a typical representative of the largest E&P firms in the US with stable position in the market, the large scale of activities and significant reserves of oil and gas. By contrast, Eclipse Resources is relatively young company in the shale oil industry. The differences in the adjustments of companies to the recent circumstances in the oil sector is one of the point of our interest.

Our aim is to evaluate connection between low interest rates and the level of debt financing of companies' growth and operating activities in the circumstances of cash flow deficit, to research the feasibility of the fact, that the availability of "cheap" loan helped the E&P companies to overcome the oil price shock. Moreover, we will perform sensitivity analysis with the respect of oil price and interest rate changes and their influence on Anadarko Petroleum and Eclipse Resources financial parameters and make sensitivity checks.

1.2 Layout

The Chapter 2 is focused on identifying and analyzing the main factors which affected the development of oil and gas industry. More specifically we will study the oil supply driving force, the influence of OPEC policy on supply-demand equilibrium and on oil price formation and the

effect of low interest rate on the functioning of US Shale companies in the environment of low oil price.

In the Chapter 3 we would like to introduce the oil shale technology characteristics, the properties of oil shale revolution. We will look in more details on the various consequences of shale oil development, including socio-economic, political and environmental issues. Further we will describe the main shale oil basins and exploration areas.

Chapter 4 is the presentation of Anadarko Petroleum and Eclipse Resources, two exploration and production companies, which will be the point of our financial analysis. Anadarko Petroleum is a large player, operating both domestically and internationally, having important oil and gas reserves and using hundreds of wells. Eclipse Resources is a small-size company, founded in 2011 year.

Chapter 5 describes the methodological approach and main analysis methods used in our master thesis.

Chapter 6 is dedicated to the financial analysis of Anadarko Petroleum and Eclipse Resources. The main points of research are the key profitability and leverage measures. In addition, we will examine the growth in borrowing cost with regard to total debt increase, credit ratings development and interest rates on the companies' secured and unsecured notes.

In Chapter 7 we will execute the sensitivity analysis, which will show in which extent the income and free cash flows of Anadarko Petroleum and Eclipse Resources are dependent on the oil price and interest rates fluctuations.

2. Change Factors within the Oil Industry

2.1 Market-related Shocks in the Oil and Gas Industry

An oil supply shock is a significant and unexpected change in the amount of the product delivered to the market, coming from a political or socio-economic event and resulting in the price readjustments. Supply shocks can be negative, causing decreased supply, or positive, resulting in increased supply.

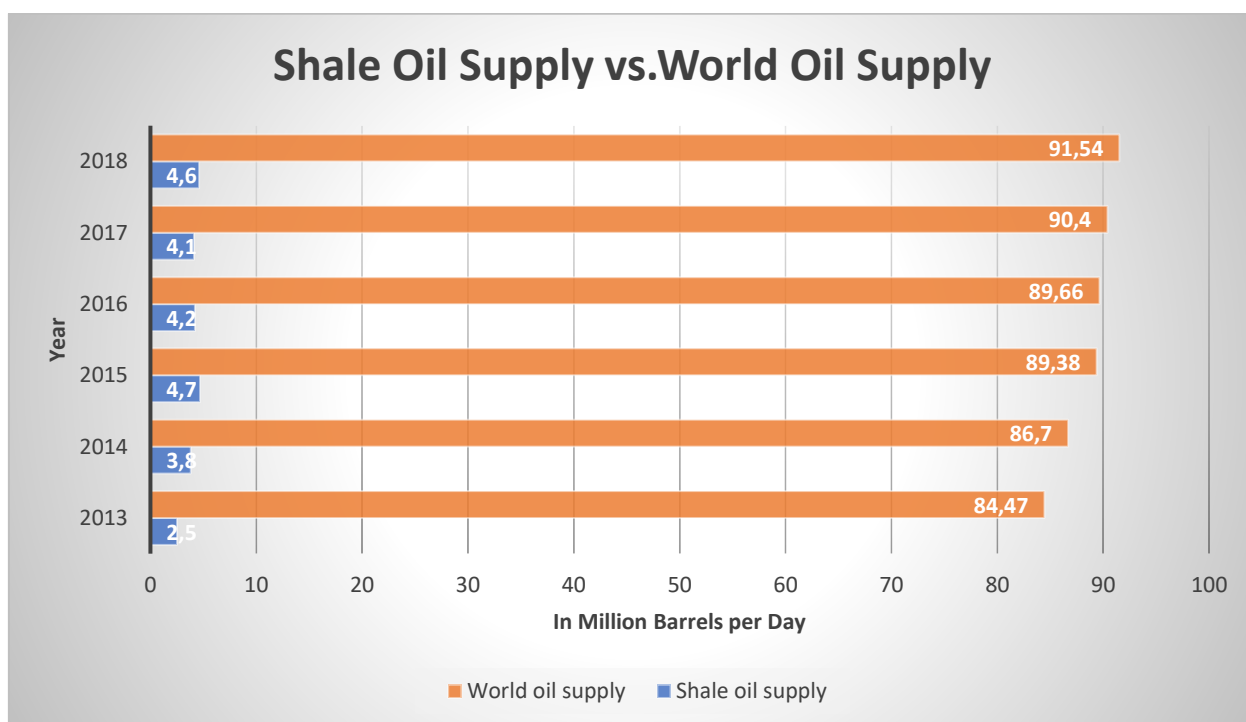
The total non-OPEC supply in the period between 2013 and 2017 years increased by 4,43 million barrels per day. On a regional basis, OECD Americas remains the region with the highest expected level of supply growth. The main reason of this supply growth is the development of shale oil production in the US, which remains the key driver of non-OPEC supply growth. The increase in oil supply of OPEC producers is about 2,64 million barrels per day. Consequently, the overall increase in the oil supply over the same period is 7,07 million barrels per day and is expected to grow further. (OPEC Oil Market Reports 2013-2017).

Table 2-1: The world oil supply

In million barrels/day	2013	2014	2015	2016	2017	2018
World Oil supply	84.47	86.7	89.38	89.66	90.4	91.54
NON-OPEC	54.11	56.2	57.7	57.02	57.67	58.54
OPEC	30.36	30.5	31.68	32.64	32.73	33
Shale Oil % of Global Supply	2.9%	4.4%	5.2%	4.7%	4.5%	5.0%
Global Demand	89.8	92	94	95.4	96.9	98.5

Source: Composed by author using data from OPEC Oil Market Reports 2013-2017

Figure 2-1.: Decomposition of shale oil supply and world oil supply



Source: Composed by author on the base of data retrieved from US Energy Information Administration, 2018 and OPEC Oil Market Reports 2013-2017

The supply shock directly reflects the total volume of the oil produced in the world. It is indirectly related to the exogenous political events in the oil-producing countries. The supply shocks in 1973-1974, 1980-1981 and 2002-2003 are developed from such exogenous factors. (Economou, 2016, p.2). The political events lying behind these supply shocks include: Yom Kippur War in 1973 accompanied by the Arab oil embargo in 1973-74, the Iranian Revolution of 1978-79 years, the Iran-Iraq War of 1980-1988, the Persian Gulf War of 1990-91, the Venezuelan crisis of 2002 and Iraq War of 2003, the Libyan uprising in 2011. According to Kilian, the exogenous reasons imply that the oil supply shock isn't related to the past or current state of the US economy (Kilian, 2008, p.2).

The most important concern about the supply shock of crude oil is connected to the creation of the consequent price shocks. The oil price is primarily influenced by the physical availability of the crude oil in the market. The oil price volatility in 2012-2016 years is impacted by the development of the aggregate supply shock series. The total supply shock lead to the price collapse in 2014 year (Economou, 2016, p.2).

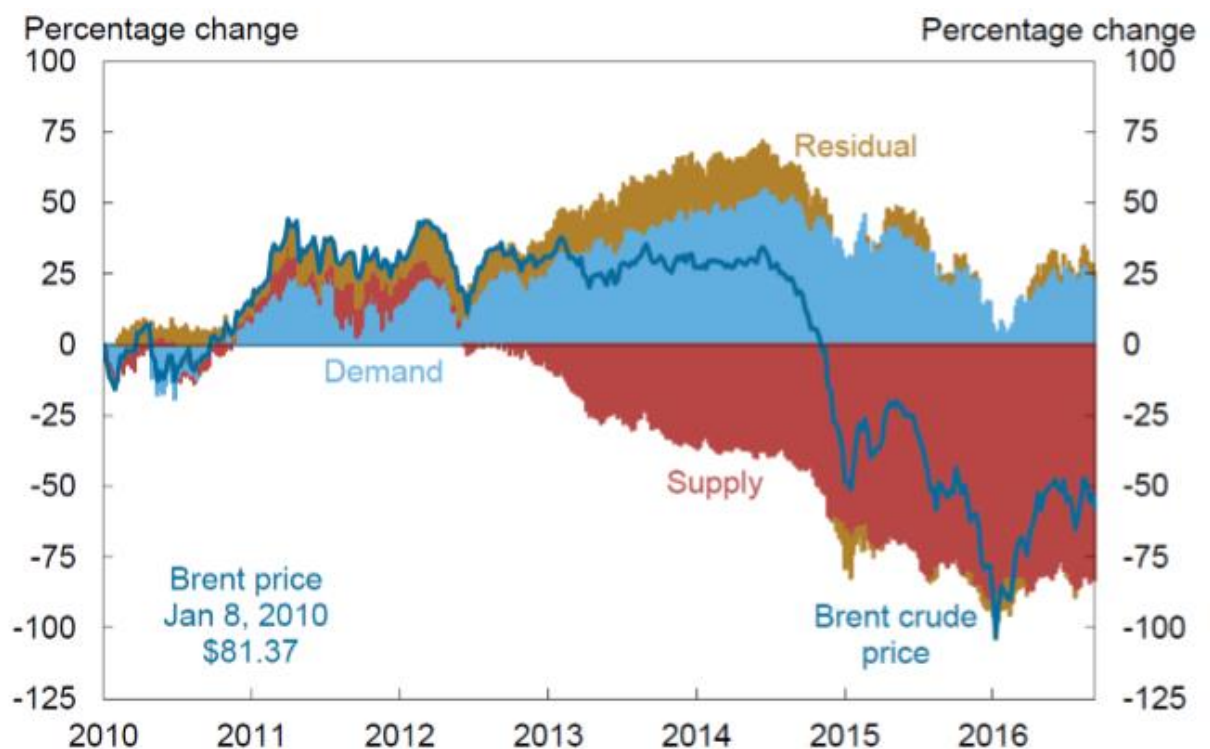
Historical analysis of fluctuations in the real price of oil reveals that oil price shocks typically have been affected in a greater degree by a combination of global aggregate demand shocks and expected future demand shocks, rather than oil supply shocks. (Kilian, 2008, p.2). Moreover, the

expected demand and supply levels influence the behaviour of oil prices (US Energy Information Administration,2018).

The main driver leading to the drop in oil prices in the late 80s and 90s however was the aggressive expansion of oil production by OPEC-countries and by Saudi Arabia in particular. By contrast the more recent period between 2001-2009 is characterized by lower demand, resulting in price shocks during recessions of 2000-2001 and 2007-2009 years. In 2012 the demand growth accelerated and drove the oil prices high until 2012. The 2012-2014 can be regarded as the period of excessive oil supply which have had a downward pressure on oil price. In 2014 the politics of the cartel pursuing the market share and avoiding reducing oil production is in origin of subsequent supply shock which was followed by the significant price fall in the second half of the year.

The Figure 2.2 represents the demand and supply impact on the Brent crude oil price change between 2010 and 2016 years.

Figure 2-2: The Brent crude oil price percentage change between 2011 and 2016 influenced by demand/supply factors



Source: New York Federal Reserve. Oil Price Dynamics Report, 2016

The crude oil supply was permanently growing starting from 2012 and reached its highest value in 2016. The excess supply and in 2014-2015 became the main factor leading to the overall oil price weakness.

According to Hamilton (2000), the oil shock reflecting in the plunge of oil price affects the oil production activity in that way that oil-companies start to increase their output levels with the aim to offset the costs which the companies incur. But he notes in this respect that it is unreasonable to expect that the oil price shocks can provoke an economic boom. The effect of the oil price fall is many-sided. It can lead to the shift in the rate of job loss and demand in some other sectors. (Hamilton, 2000, p.4).

The oil shock of 2014 had a huge impact on the oil and gas sector. The oil and gas producing companies cut about 350 000 jobs worldwide, while the oilfield services sector suffered the most with share of 43,2% of the global job loss after the price fall in mid-2014. The second and the third places are within exploration and production sector and drilling sector. According to the US statistics the level of layoffs was ca 100 000 in the sector of oil and gas extraction and supporting segment in the period between 2014 and 2016 years (Burgess, 2016).

The supply shocks cause a variety of consequences, as, for instance, oil price shock. The oil price shock in their turn can cause the shift in inflation, the change in the overall productivity, the fluctuation in real GDP etc.

The crude oil supply shock of 2014-2016 has had the following consequences for the US economy, decomposed for the periods before and after the year 2014.

Table 2.2. The impact of crude oil supply shock on the US economy before and after 2014 year

Factor	Impact before 2014 (-/+)	Impact after 2014 (+/-)
Oil productivity	+	-
Inflation	+	-
GDP	+	-
Oil prices	+	-
Rate of unemployment	-	+

Source: Composed by author, based on analysis of available data

2.2 OPEC Policy

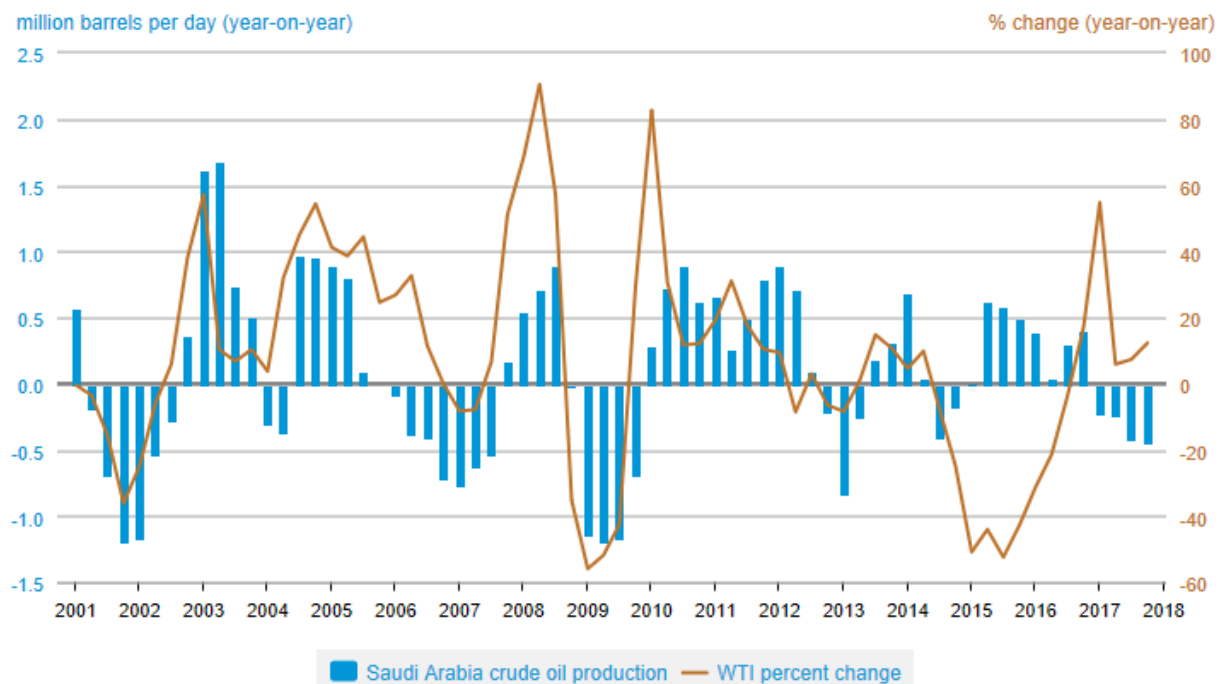
The role of the Organization of Petroleum Exporting Countries (OPEC) in the creation of oil-shock is difficult to overestimate. The organization is actively controlling oil price either directly or by regulating the level of oil output. The main aim of OPEC is to ensure the regular and efficient oil supply to consumer, steady income to producers and fair return on capital. (OPEC, 2018).

OPEC exercises strong market power with regard to the fluctuations of the oil prices. Historically, crude oil prices have seen increases in times when OPEC production targets were reduced. There are some key reasons for the cartel to stabilize oil price. It is important to OPEC to maintain the image of reliable supplier, to diminish the volatility in sales revenues and to reduce investments in other energy sources (Pierru, Smith, Zamrik, 2018, p.174).

The OPEC-members oil output represents 40% of the total production in the world, while 60% of the international oil export is OPEC's export share (US Energy Information Administration, 2018).

The most influential oil market participant within the cartel is Saudi Arabia. As one of the largest oil producers in the world and in fact the largest in the OPEC, the country often acted as a swing producer and impacted the change in oil prices by altering output level (Smith,2005):

Figure 2-3: Saudi Arabia oil production vs. oil prices



Source: US Energy Information Administration, Thomson Reuters, 2018

The group of swing producers includes in addition Kuwait, Qatar, UAE. The adjustment of production by those countries focused on mitigating the demand and supply shocks and to keep the balance in the oil market (Pierru, Smith, Zamrik, 2018, p.173).

One of the decisive factors that triggered the plunge in oil price was the reorientation of the cartel's strategy. The policy of OPEC starting from early 2010 was focused on controlling the oil price through reduced supply, which led to partial market share loss for OPEC-members. In 2014 as the supply, coming primarily from US shale oil development, overtook the demand for crude oil, the cartel strategy was centered toward gaining its market share (Baffes, Ayhan, Ohnsorge, Stocker, 2015, p.10).

In 2014 as the supply overtook the demand for crude oil, the cartel strategy was centered toward gaining its market share. Despite the decline in oil prices OPEC rejected the decision to reduce the output. The aim of these actions was to increase the market share by weakening the position of shale oil producers, whose capital expenditures became significantly high compared to the revenues. The strategy to cut production meant to increase the share of US oil-companies at the expense of the reduction of the market share of the cartel. The expansion of shale oil production drove the US share in the oil market from 7% to 12 % between 2011 and 2014 years (European Central Bank, Economic Bulletin, 2017). Behar and Ritz (2017) mention the following factors which are the source of this kind of OPEC's policy:

- The growth of US shale oil production
- The slowdown of the global demand for crude oil
- Internal problems within the cartel OPEC
- Costs reduction programs of the US shale oil producers
- The increase of the capacity level in other non-OPEC countries

(Behar, Ritz, 2017, p.1)

The production policy of OPEC cartel between 2014 and 2016 was targeted toward market share. At the same time the supply from the US and Russia continued to increase, while the global demand growth was slowing down. In this way, the production strategy of OPEC, that abandoned production quotas in 2014, coincided with those of non-OPEC countries, aggravating the effect of oil price shock. (European Central Bank, Economic Bulletin, 2017).

However, the strategy maintained by OPEC didn't damage further development of oil shale extraction to the extent the cartel has intended to, and the US competitors by large were not driven out of the market, despite individual bankruptcies of scores of smaller US E&P

companies. It was caused by the capacity of most of shale oil producers to restrain its production costs, stabilize its cash flows, the roots of which this research aims to understand and uncover, and to create more efficient extraction. Despite the extremely low oil prices the number of shale oil and gas onshore rigs spread in 2016. The shale oil producers implemented a range of technological improvements, such as new chemical composition of injection fluids to extend the life of the wells, which helped to maintain quite high level of competitiveness. The resilience of shale oil producers to low prices lead to the escalation of supply and demand disequilibrium, and as the result oil prices decreased below the levels necessary to cover exploration and production costs (European Central Bank, Economic Bulletin, 2017, p.70).

The shale oil sector survived also with the help of mergers and acquisitions (M&A). Small- and mid-sized companies, having large amounts of borrowings, were acquired by larger enterprises with greater financial resources and capable of operating in an environment of low oil prices using this period to consolidate assets at discounted acquisition costs (European Central Bank, Economic Bulletin, 2017, p.69).

The financial difficulties of several OPEC-members forced the cartel to switch from focusing in market share strategy to rebalancing the market in order to stop the oil price fall. In 2016 the global oil supply was reduced by 1,8 million barrels per day, with the exception of Libya and Nigeria which were given a free hand to restore its, pre-war in Libya and pre-militant shutdowns in Nigeria, outputs. This decision was supported by Russia and some other non-OPEC countries, with the exception of several large net exporters of oil and gas such as Canada, Brazil and Mexico. As the result the average oil price reached 50\$ per barrel in 2017 (European Central Bank, Economic Bulletin, 2017, p.69).

2.3 The Role of Low Interest Rates

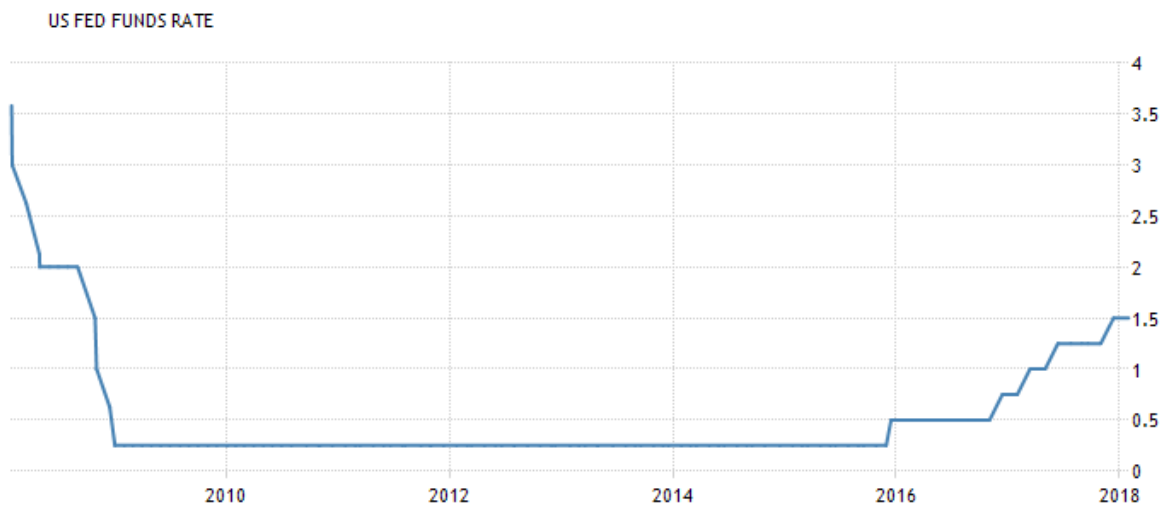
The main functions of the US Federal Reserve system, as the most influential market actor in the US and in the world, have historically been to conduct monetary policy, including the regulation of inflation level, the stabilization of prices, of unemployment rate and financial markets. The overall goal of the Federal Reserve is to ensure stable economic growth in the country.

The inflation is influenced by many factors, with oil prices playing a significant role impacting a wide range of consumer products. When prices for crude oil decline they pull down the inflation. Historically, the decrease in inflation levels resulted from previous oil price declines. However, this impact weakens as the oil prices stabilize in its US dollar equivalent in any direction. That's why the oil prices are the point of great interest for the US Central Bank, since monetary policy readjustments are often required (Baffes, Kose, Ohnsorge, Stocker, 2015, p.31).

In the period of 2011-2014 the sustained high level of oil prices, up to 113.93\$ per barrel, were combined with historically low interest rates. The average interest rates value in the US was approximately 0.25% at that time. The access to such a low-cost debt is in origin of many marginal and risky entrepreneurships including revolution in the oil shale industry. Even since mid-2014 when oil prices dramatically declined, the interest rates remained at the same depressed level. That kind of monetary policy pursued by the Fed for a long period since the 2008 financial crisis helped shale oil producers to adjust throughout the period of extremely low oil and gas prices, along with cost savings and productivity gains (Azar, 2017, p.4).

The graph of the change of US Fed Funds rate is presented below:

Figure 2-4: US Fed Funds Rate



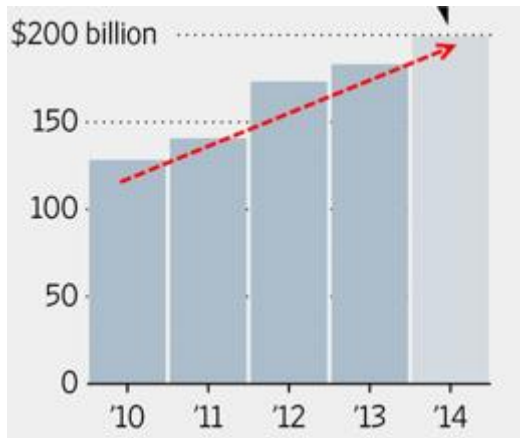
Source: Trading Economics, 2018

The shale oil and gas companies are vulnerable to the interest rates movements as it is related to how they are typically financed. Conventional oil and gas producers are traditionally self-financed, while the shale companies tend to be deeply leveraged (Azar, 2017, p.4). Debt levels for E&P US companies are presented in the Figure 2.5.

The low-cost debt financing made possible the expansion and growth of specifically midsize and small shale exploration and production companies (E&Ps), some of which might have otherwise been close to the bankruptcy. Small and midsize shale oil and gas exploration and production companies are in their majority rated below investment grade by the rating agencies. The credit ratings of the company determine its access to the debt markets. Below investment grade firms have relatively expensive access to the debt markets, compared to investment-grade companies.

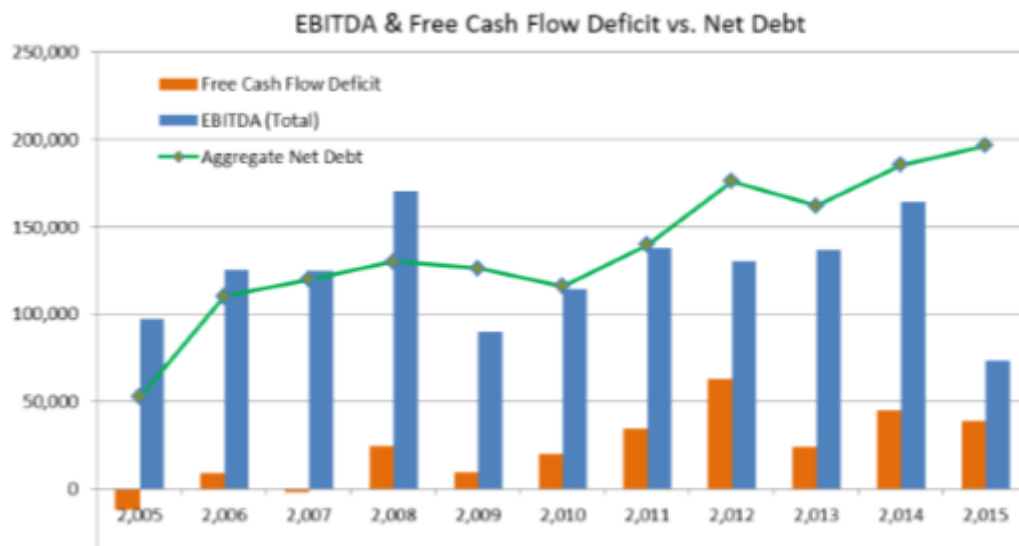
At the time of the decline of oil prices between the end of 2014 and mid-2017, E&Ps suffered from the free cash flows deficit, which was then funded by new debt (Azar, 2017, p.4).

Figure 2-5: Debt for US exploration and production (E&P) companies



Source: Wallstreet Journal, 2016

Figure 2-6: EBITDA & free cash flow deficit vs net debt for US E&P companies.



Source: Capital IQ, Financial Reporting, retrieved from Azar, 2017

3. The US Shale Revolution

3.1. US Shale. Innovation. Technology.

The Shale Oil is a type of oil found in shale formations. Shale oil is referred to two types of oil. The first is that is found within shale formations and the second is extracted from oil shale.

Geography

More than 70% of the world's oil shale resources are deposited in the United States. The largest fields are in the Green River Formation in Colorado, Utah and Wyoming. The total amount of shale oil contained by these deposits is about 1,5 trillion barrels (Bussell, p.10).

In 2016 the US Geological Survey announced that geologist discovered one of the largest deposits of the oil shale, the so-called Volfcamp formation. According to the estimates it can contain circa 20 billion barrels of oil with the total value of 900 billion dollars. It represents the sufficient supply for domestic use in the US for more than 100 years. (Burger, 2016).

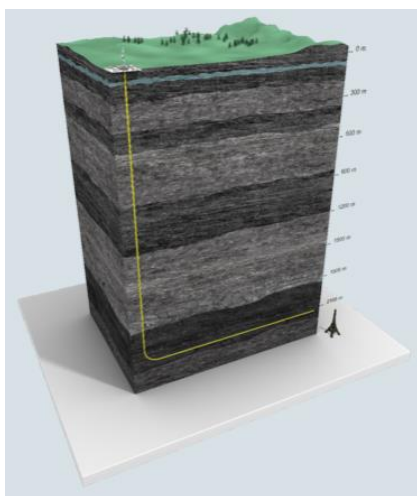
Moreover, the shale oil production is taking place in Brazil, China, Estonia and Russia. Currently, Israel, Australia and Morocco undertake the development of this type oil as well.

Technology

The Shale Oil Revolution became possible because of advances in technological capabilities such as horizontal drilling and hydraulic fracturing, which lead to the extraction of oil and gas deposits in economic scale directly from the source rocks (Statoil, 2018). To obtain oil from oil

shale it is necessary to heat the shale and capture the liquid created. The process is called retorting (Bartis, LaTourette, Lloyd, p.11).

Figure 3-1 Shale oil extraction

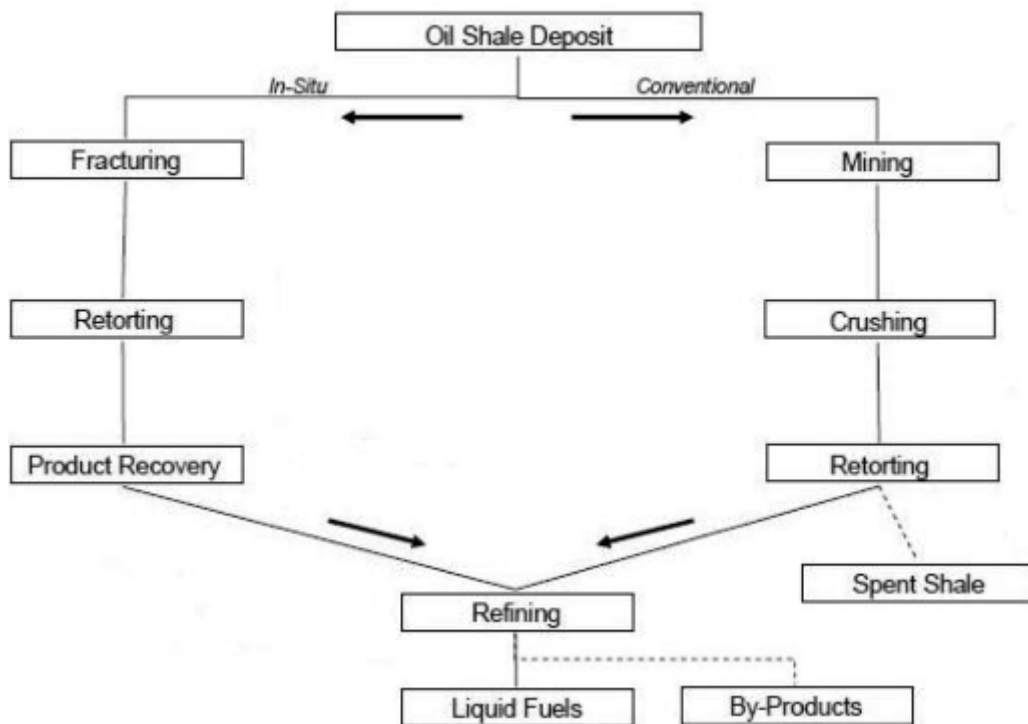


Shale oil production can be executed in one of two ways: mining followed by surface retorting or in-situ retorting. The mining occurs either by underground mining or by surface mining. Surface retorting is quite questionable method, since it is unprofitable unless the oil price lies between 70\$ and 95\$ per barrel. In situ retorting implies heating oil in place and transporting the liquid to refining facility. The cost estimates of this process suggest that in-situ method can be competitive

Source: Statoil, 2018

when crude-oil price is about 20\$ per barrel (Bartis, LaTourette, Lloyd, p.11). The methods of shale oil production are presented in the Figure 3.2.

Figure 3-2: Shale oil extraction process



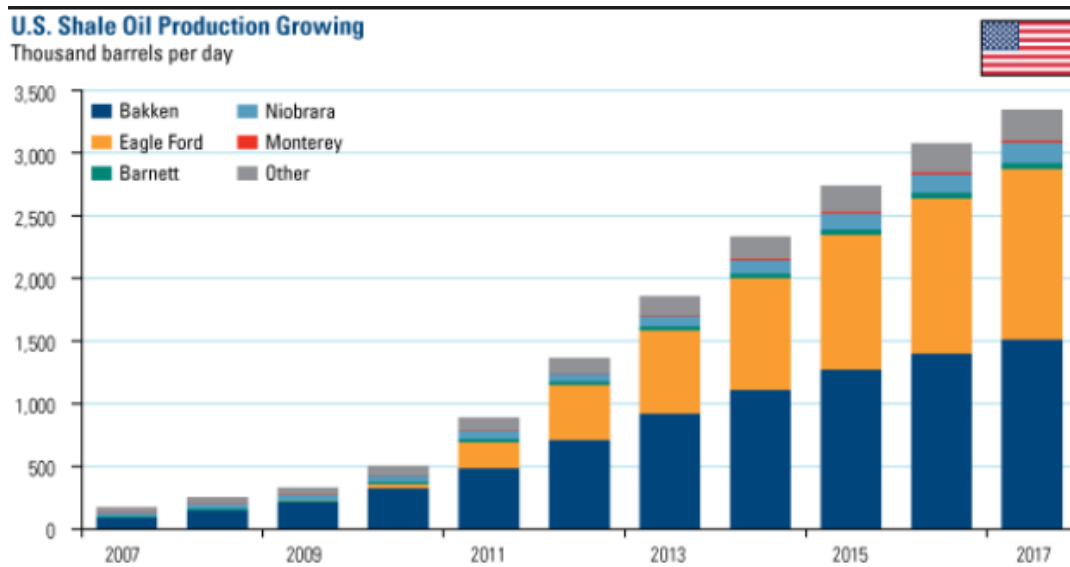
Source: Bunger, Johnson, Crawford, 2004

Growth

Oil and gas explorers in the US have been aware of large deposits of shale gas and oil since 1940. But the extraction process of this resource was cost-consuming. The first oil shale research center was established during World War II at Anvil Points, Colorado as an answer by the government to the military needs. After that time the national demand for crude oil started to increase and made the country increasingly dependent on the imported oil. In this respect, the oil shale became the largest domestic resource with significant potential to decrease the dependency of the country to foreign oil (Bussell, p.9).

The crude oil production in the US rose from 5 million barrels on average per day in 2008 to over 9,5 million on average per day in 2015. (Curtis, 2015). The Figure 3.3 below represents the movement of oil shale production in the different US regions between 2007 and 2017.

Figure 3-3: Shale oil production growth in the US regions.

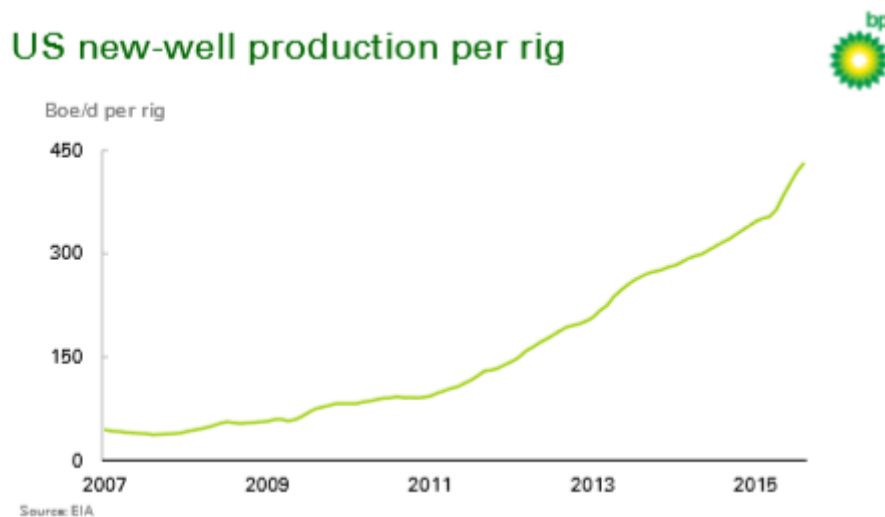


Source: Woodmac, IEA, EIA, Reuters, BofA Merrell Lynch Global Commodities Research, 2017

Financial characteristics

The shale oil production is characterized by the use of complex techniques which lead to the increase of cost reductions and gains in productivity levels. For instance, in the period between 2007 and 2014 years the productivity growth per rig in shale oil reached 30%. (Dale, 2015, p.7). See the Figure 3.4:

Figure 3-4 Average production per well within shale oil industry in 2007-2015



Source: US Energy Information Administration, retrieved from Dale, Society of Business Economists Annual Conference, 2015

The fracking technology implies that the time between investment decision and the start of oil production is shorter, compared to the conventional oil projects. In addition, for drilling several wells, the same rigs are utilized as well as the alike operational process are implemented for identical locations. At the same time, the life-cycle of the shale oil well is relatively short-term, leading to high decline rates in production per well. All these factors mean that the variable cost represent a significant part of total costs for the companies, while the fixed cost is relatively low. In this respect the prompt adjustment of output level is possible in the response to the oil price fluctuations (Dale, 2015, p.9-10).

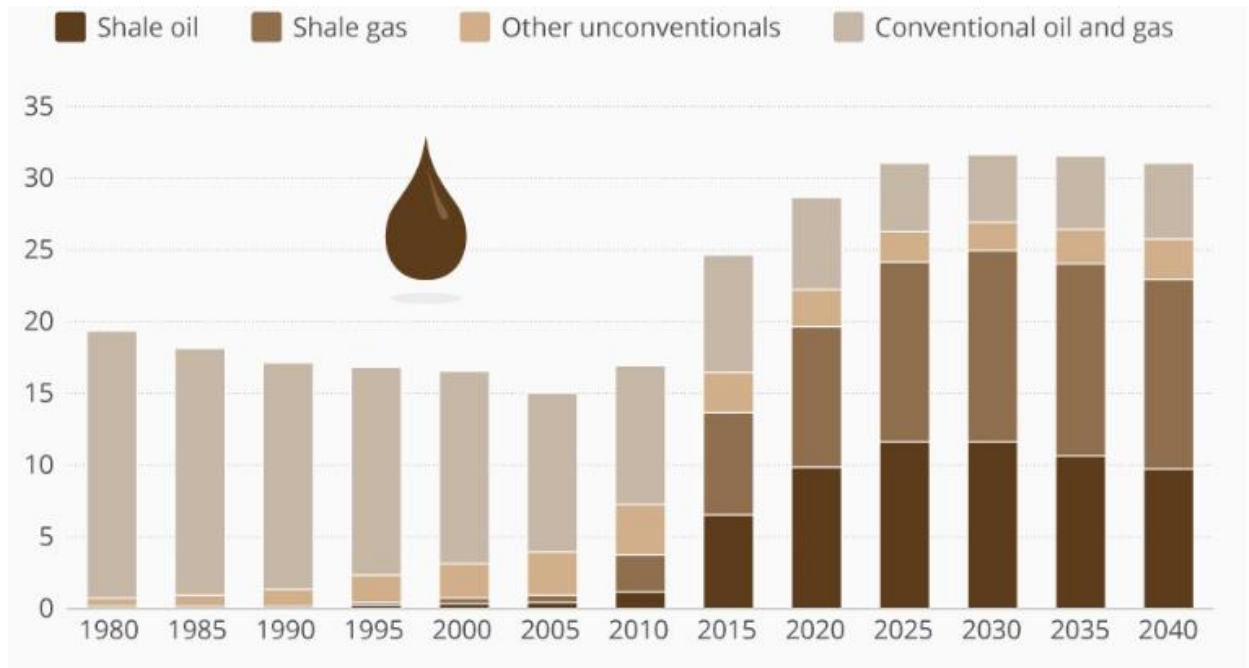
By contrast, the return from investment in the conventional oil production projects requires longer periods of time. Conventional operations are characterized by large fixed costs. Finally, the output level is less responsive in the short-run (Dale, 2015, p.9-10).

3.2. US Shale Boom. Non-Market Consequences.

The technology for extracting oil from unyielding shale rocks became one of the most important innovation of the century. Despite the quite long period of decline of the shale oil output until 2009, US unconventional oil production has proved to be more durable, than predicted initially, with new technologies maturing for both ex-situ and in-situ extraction. US Shale companies seem to survive notwithstanding the significant fall of oil prices and high costs of extraction process compared to that of conventional oil. US Shale companies even extended their production levels, though price per barrel dropped from \$114 in June 2014 to \$28 in January 2016 by actively implementing cost-reduction programs (Curtis, 2015).

US Shale oil boom resulted in US crude-oil production almost doubling between 2009 and 2015 and there is some forecast about the long-term growth of the production volumes in the future. See the Figure 3.5:

Figure 3-5: Shale oil boom and future forecasts



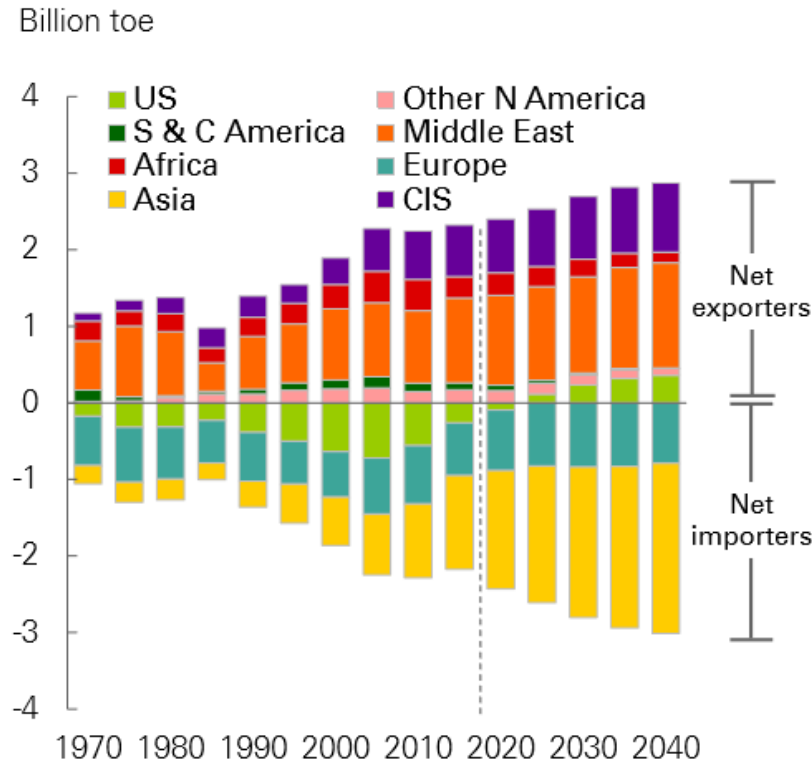
Source: IEA World Energy Outlook, 2017

The shale oil extraction constitutes a one-third of the whole crude-oil output in the US.

There are two factors which instigated the shale oil boom. First, the high oil prices between 2011 and 2014. The average oil price in this period was about 90\$ per barrel. This fact made the shale extraction and production sustainable enough to develop technology further. The second factor is low interest rate set by The Federal Reserve System and those proposed by private-equity investors. The total amount of funds loaned by the US Shale companies alone was in the range of 250 billion dollars in 2014 (Jensen, 2018).

The consequences of oil shale revolution had a great impact on the world oil industry. The balance of the supply and demand in the world crude-oil market shifted resulting in huge fluctuation of oil prices. The consequences of Shale boom reflected in the position of the US as oil producer and oil importer. The US currently exports between 1MMbpd and 2.5MMbpd (US Energy Information Administration, Weekly Status Reports,2018) stimulated by the lower price of WTI blend compared to Brent benchmark, yet at this stage the US still being the net oil importer.

Figure 3-6 Regional oil and gas import-export



Source: BP Energy Outlook, 2018

Table 3-1: US weekly petroleum supply

Petroleum Supply (Thousand Barrels per Day)	Current Week	Week Ago		Year Ago		Four-Week Averages Week Ending			Cumulative Daily Average		
	5/18/18	5/11/18	Difference	5/19/17	Difference	5/18/18	5/19/17	Percent Change	5/18/18	5/19/17	Percent Change
Crude Oil Supply											
(1) Domestic Production ⁵	10,725	10,723	2	9,320	1,405	10,693	9,308	14.9	10,348	9,123	13.4
(2) Alaska	480	502	-22	505	-25	498	518	-3.8	507	522	-2.9
(3) Lower 48	10,245	10,221	24	8,815	1,430	10,194	8,790	16.0	9,840	8,601	14.4
(4) Net imports (including SPR)	6,411	5,035	1,376	7,669	-1,258	5,823	7,457	-21.9	6,194	7,405	-16.4
(5) Imports	8,159	7,601	558	8,294	-135	7,908	8,192	-3.5	7,883	8,166	-3.5
(6) Commercial Crude Oil	8,159	7,601	558	8,294	-135	7,908	8,192	-3.5	7,883	8,166	-3.5
(7) Imports by SPR	0	0	0	0	0	0	0	---	0	0	---
(8) Imports into SPR by Others	0	0	0	0	0	0	0	---	0	0	---
(9) Exports	1,748	2,566	-818	625	1,123	2,085	736	183.4	1,688	761	122.0
(10) Stock Change (+/build; -/draw)	725	-418	1,143	-690	1,415	179	-554	---	98	208	---
(11) Commercial Stock Change	825	-201	1,026	-633	1,458	300	-442	---	115	262	---
(12) SPR Stock Change	-100	-217	117	-57	-43	-121	-113	---	-18	-54	---
(13) Adjustment ⁶	217	459	-242	-398	615	241	-234	---	93	-5	---
(14) Crude Oil Input to Refineries	16,628	16,635	-7	17,281	-653	16,578	17,085	-3.0	16,537	16,315	1.4

Source: US Energy Information Administration, 2018

The effects of the rapid acceleration of petroleum production fall into four main groups: socio-economic, political and environmental.

3.2.1 Socio-Economic Consequences

We can mention the following economic consequences of the shale oil boom:

- rise in the US oil sector productivity
- growth/boom of world oil supply
- market capitalization share gains

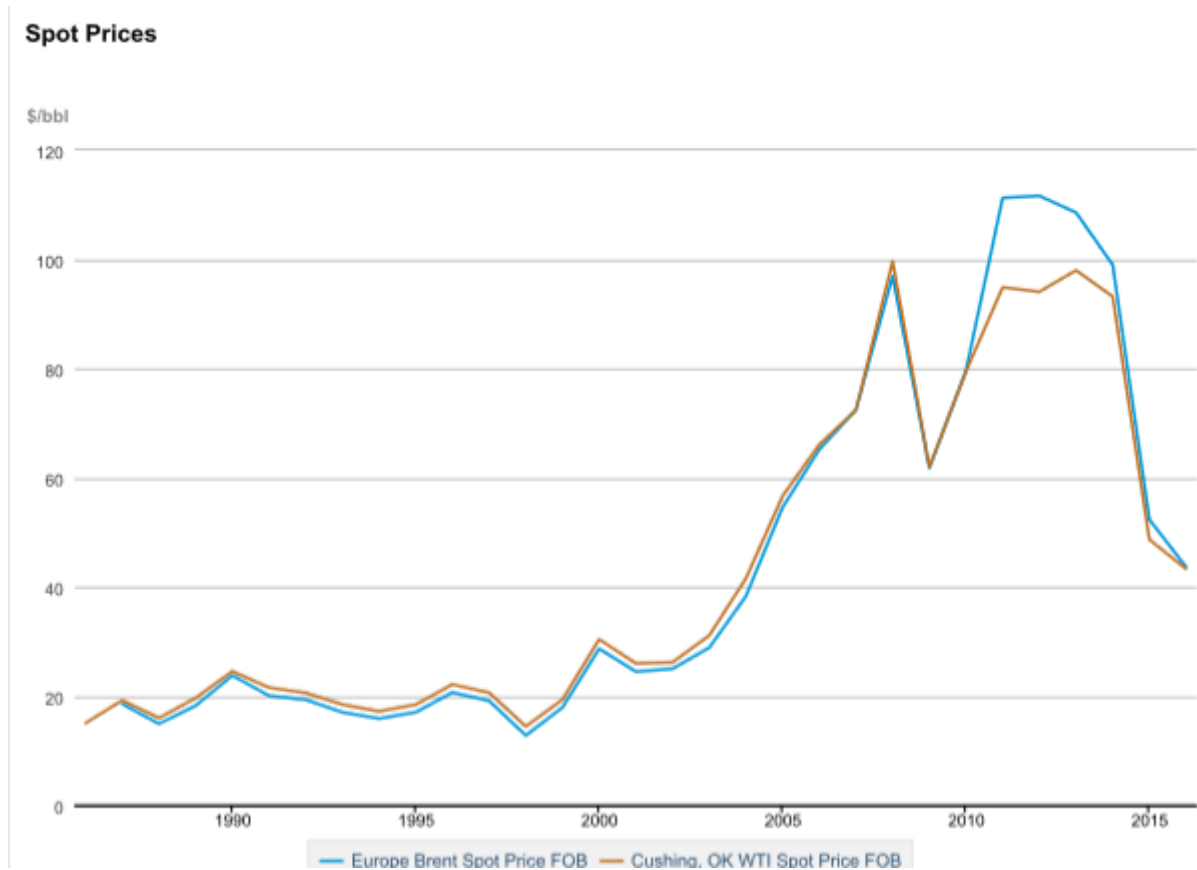
- global drop of crude-oil prices
- increase of employment in the US

One of the most significant results of the new established technology of the oil extraction from shale rocks was higher productivity of oil industry in the US. The innovative technology of retorting and the broader access to the oil fields lead to the huge increase of the oil and gas amount pulled from the ground. For instance, today, shale gas constitutes 47 per cent of US gas production and could rise to 50 % by 2030 (Statoil, 2018). In the period between 2012 and 2017 the US Shale oil production contributed average of 1% of the world oil supplies per year, including 2016 when shale oil production dropped by 1MMbpd, in the lieu of lower prices and cost cutting programmes with reduced number of acting oil rigs. The surging production of shale oil made the US the 3rd largest oil producer in the world after Saudi Arabia and Russia in 2017 (Salameh, p.28).

The entry of shale oil competitors in the world oil market provoked the sharp fall in oil prices. The supply of oil persistently outpaced the consumption level. At the same time OPEC policy was not to reduce the level of oil production with the aim to defend its market share and to drive high-cost non-OPEC producers, and specifically, US Shale companies, out of the market. Some specialist suggests that there were other reasons for this kind of OPEC's reaction such as the intention of OPEC to examine the performance of shale oil companies in circumstances of oil prices, because of uncertainty about the potential of the shale technology. In addition, the power of OPEC was weakened by the shale revolution and it had to accept low oil prices (Ansari, p.166). As the result, the oil price started to decline in mid-2014 and dropped by 50% in 2015 (Umekwe, Baek, p. 268).

Brent and WTI oil prices volatility in recent decades is presented in the Figure 3.7 below:

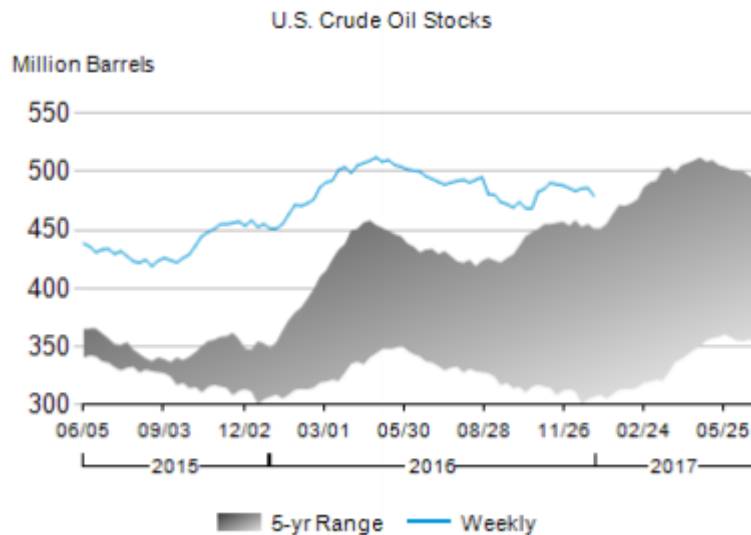
Figure 3-7: Brent and WTI spot prices



Source: International Energy Agency, 2016

Still, there existed other drivers of oil prices at that time, including decreased demand growth and geopolitical effects. Some other studies denote the influence of the US-dollar appreciation and of potential negative financial bubble or financial speculations and so on (Ansari, p. 167). But the shale oil revolution is widely believed to be the main influential factor of oil price developments as most market watchers follow on US production, supply, demand and storage volumes published openly, with the increase of domestic US production impacted both volumes of imported oil and increased amount of commercial stocks from circa 350 million barrels to more than 500 million barrels at the end of 2016.

Figure 3-8: US Commercial Crude Stock May 2015- January 2017



Source: US Energy Information Administration

Another noticeable economic consequence is the change in the world of investment and stock market in the US. According to some researches, the fracking boom led to the increase of the stock value in US between 2012 and 2014 by approximately 2,5 trillion dollars. The market capitalization almost doubled during the same period, despite generally slow growth in the US real economy of 1% to 3% annually (Wharton Media, 2016).

On the social side, the oil shale development has been connected to the growth of the employment rate in the US and specifically in the big fracking states such as Texas, South Dakota, Oklahoma, New Mexico and Colorado (Wharton Media, 2016). Since 2012 the level of employment growth in the companies, operating in the shale industry was 0,5% higher per year than in other American companies. Jobs are created in the industries which provide equipment, supplies and materials or services as well as transportation of water pre- and post- fracking and produced oil (Bartis, LaTourette, Lloyd, p.27).

Moreover, there were some benefits for households from the shale petroleum technology development, like decreased prices for gasoline, heating oil and other oil-related products. In total, the cut of oil prices caused by larger oil supplies in the US resulted in 131,4 billion dollars of savings for consumers and businesses per year (Wharton Media, 2016).

3.2.2 Political issues

The shale oil resources are an important strategic advantage for the US and its development has a potential to increase political, economic and energy security of the country (Bussel, p.14).

The US is currently one of the world's biggest net importers of oil, purchasing between 6 and 8 million barrels of oil per day for meeting national needs. It is however possible for the US to develop large two-way flows of crude oil with target markets in Europe and Asia, which has strong demand growth, which requires significant investment in the export infrastructure. In the future the country can potentially become one of the largest exporters of oil behind Saudi Arabia, Russia and Iraq. Since the first oil crisis in 1973 the issue of oil independency became of a great importance, which instigated creation of Strategic Petroleum Reserve which currently stores more than 600 000 000 barrels to provide a buffer in case of supply disruptions, yet the US has been the net importer for a long time banning new exploration acreages in the east and west coasts by legislation.

The development of domestic oil production lead to reduction of the oil imported from 13,7 million barrels per day in 2006 to 6,85 million barrels in January 2014. At the same time, the crude oil exportation increased from 10 000 barrels per day in 2003 to 418 000 barrels per day in October 2014 and to a range between 1 000 000 and 2 500 000 barrels per day in 2017 and 2018 (US Energy Information Administration, Weekly Status Reports,2018).

According to IEA, "the remarkable ability to unlock new plays cost-effectively pushes combined United States oil and gas output to a level 50% higher than any other country has ever managed; already a net exporter of gas, the US may become a net exporter of oil in the late 2020s" (International Energy Agency, The World Energy Outlook 2017). However, this would also require developing the oil transport and export infrastructure to avoid bottlenecks.

The largest oil-suppliers are now more concerned not about the access to energy resources, but about the market share at the global oil market. There is no longer well-defined division between countries-producers and countries-consumers of crude oil, the biggest oil market participants, like the US, EU and China are usually both (The World Economic Forum, 2016)

The local governments in oil-producing countries struggled with subsidies to their own populations, because of the lower incomes during slump in oil prices. This fact has generated the instability and repression in several of those countries. It concerns Venezuela, Angola, Brazil, Ecuador, Nigeria and central Asian producers, like Azerbaijan (The World Economic Forum, 2016).

The position of Saudi Arabia as a swing producer in the global oil market has changed. Its decisions about the levels of output were mostly dictated by political reasons and were relatively easily predictable. Quite elevated oil prices guaranteed sufficient streams of income to both low-cost and high-cost oil producers. Now, Saudi Arabia is more concentrated on their domestic

politics and local reforms. 70-80% percent of the GDP depends on oil production. With lower oil prices its budget revenue is reduced, regardless of its lowest production costs in the world and the country had to retrieve significant amount of cash from the sovereign investment fund to compensate for budget deficits. (The World Economic Forum, 2016).

3.2.3 Environmental issues

One of the most actual and important concern regarding the shale oil development is about its environmental impact. This impact concerns ecological problems, land use, air and water quality.

The shale oil as well as shale gas are not inexhaustible resources. As demand increase new wells must be drilled to maintain the equivalent supply. At the same time the productivity of existing wells is permanently decreasing during the life-cycle. For instance, the productivity of new wells in two main plays, Eagle Ford and Bakken, drops by 60% after one year and becomes less than 40% in the second year, less than 30% in the third year and so on (Hughes, p.308). The output of main shale oil basins depends on the number of wells available. Sufficient distance is required between the wells which are connected to same reservoir to be able to maintain commercially viable extractability when pumping oil from the same reservoir (Hughes, p. 308).

The land over shale oil basins is in use for various purposes, such as fishing, hunting, recreational hiking and fossil collecting. The greatest ecological impact comes from mining, surface retorting and spent shale disposal. The possible consequences of extraction activities are the continuous change in landscape topography and as the result the influence on the flora and fauna of each development site (Bartis, LaTourette, Dixon p. 36.). In addition, the extra demand on land connected to construction and creation of surface facilities, stores, power supply, transport system, goes together with oil shale expansion and has a huge impact on the whole ecosystem. Since the oil shale development entails the use of federal lands, the program, of Environmental Impact Statement in the US implies the program of leasing of lands for wells drilling and the planning of early development and implementation of an ecological research plan (Bartis, LaTourette, Dixon p. 37).

Oil shale operations result in emissions of such pollutants as nitrogen oxides, sulfur oxides, ozone precursors, carbon monoxide etc., which are defined as criteria pollutants by the US Environmental Protection Agency. The EPA is continuously performing the air quality modelling for defining the impact of numerous commercial operations, including the production of shale oil and gas. According to EPA, the extraction scale of a few hundred thousand of barrel per day can be efficiently controlled with the aim to meet the air quality requirements. But

further production growth makes the emission limits a questionable issue (Bartis, LaTourette, Dixon p. 40.)

The question of greenhouse effect is of great concern too. As an additional source of fossil fuel, shale gas and shale oil enhance global greenhouse-gas effect (Hill, p.757). The negative consequences of increasing level of greenhouse emissions is the point of discussion by numerous nongovernmental organizations, which stipulate that shale oil development will be opposed by global warming in the future, taking into account the absence of governmental strategy in the US regarding the reduction of greenhouse gas emissions. (Bartis, LaTourette, Dixon p. 40.)

The quality of the water is also influenced by the shale oil extraction operations. The potential sources of water pollution are: mine drainage, point-source discharges from surface operations. Several experiments have showed that the percentage of salt in the leachate is significantly higher in the processed shale from retorting than in the raw shale. There were developed and implemented some methods of reducing the salinity of leachate with the aim to reduce the contamination of water, but their all-around effectiveness and longevity is quite doubtful. (Bartis, LaTourette, Dixon p. 40.).

Thus, the shale oil extraction has substantial negative implications on the local environment and local health with non-negligible contribution to the general climate change. In its train, the problem of the environmental exposure lead to the prohibition of fracking in the UK and France.

3.3. US Shale main basins plays and producers

The top five shale oil companies are EOG Resources, Anadarko Petroleum, Apache Corporation, Chesapeake Energy, and Continental Resources. These producers pumped 10 percent of total U.S. crude production in 2014 (Amadeo, 2016).

It was discovered 20 shale oil plays on the territory of the US. Eight of these basins are divided into 2-3 different areas, resulting in 29 separate plays. The total reserve of shale resource is about 750 trillion cubic feet. (Energy Information Administration, 2018).

The main shale oil and gas basins are:

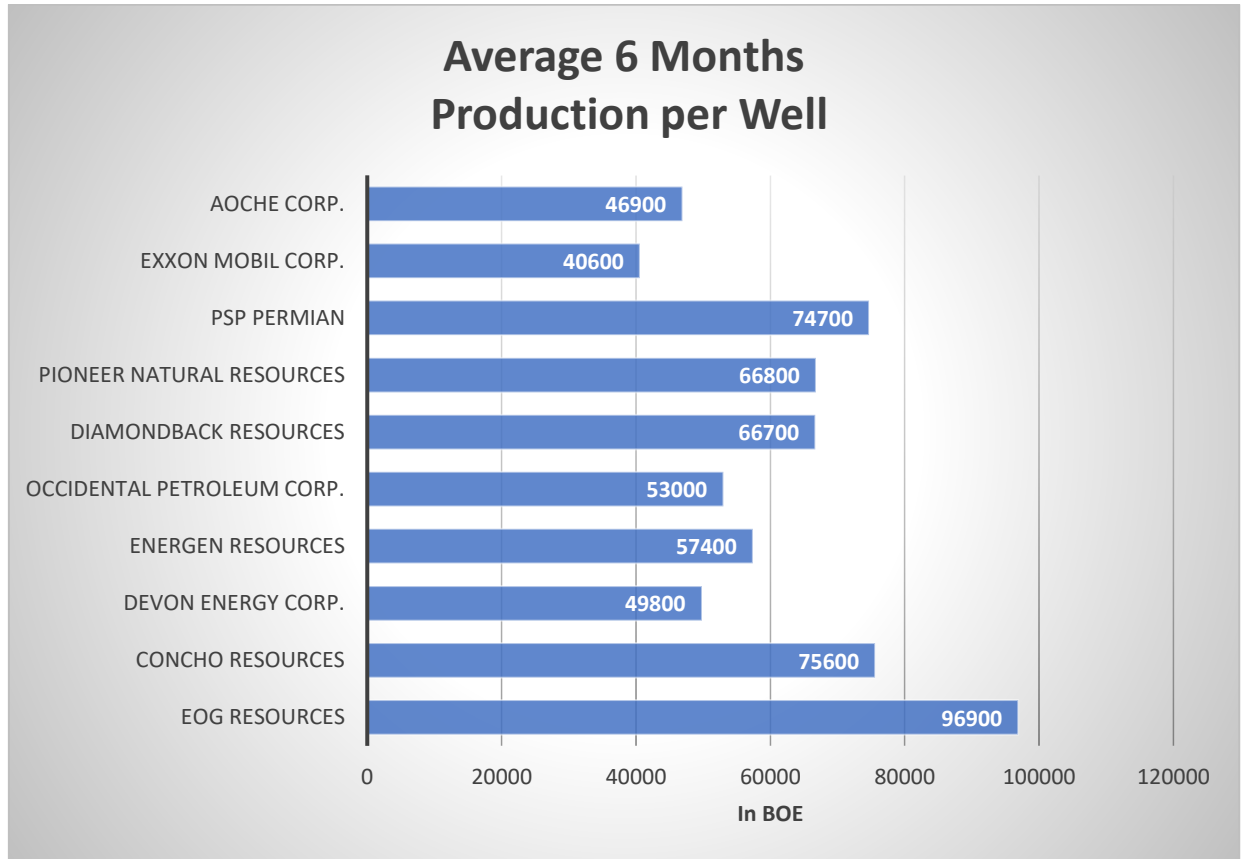
Table 3-2: The summary of mains shale oil and gas basins by state.

Basin (Play)	State
Permian	Western Texas, New Mexico
Eagle Ford	Southern Texas
Marcellus Appalachian Basin	Utica, Ohio
Niobrara	South Dakota, Colorado, Nebraska, Wyoming
Barnett	Texas
Maynesville	Louisiana, Arkansas, Texas
Bakken	Montana, North Dakota
Anadarko-Woodford	West-Central Oklahoma
Granite Wash	Texas, Oklahoma
Utica	New-York, Pennsylvania, Ohio, West Virginia

Source: Composed by author

The largest oil shale companies in the area are EOG Resources, Concho Resources Inc., RSP Permian Inc. The average total oil and gas production of the selected companies operating in the Permian Basin as of 2016 is summarized in the Figure 3.10.

Figure 3-10. Average 6-months production per well



Source: Composed by author on the base of data retrieved from MarketWatch, 2016

3.3.2. The Eagle Ford Oil and Gas Play

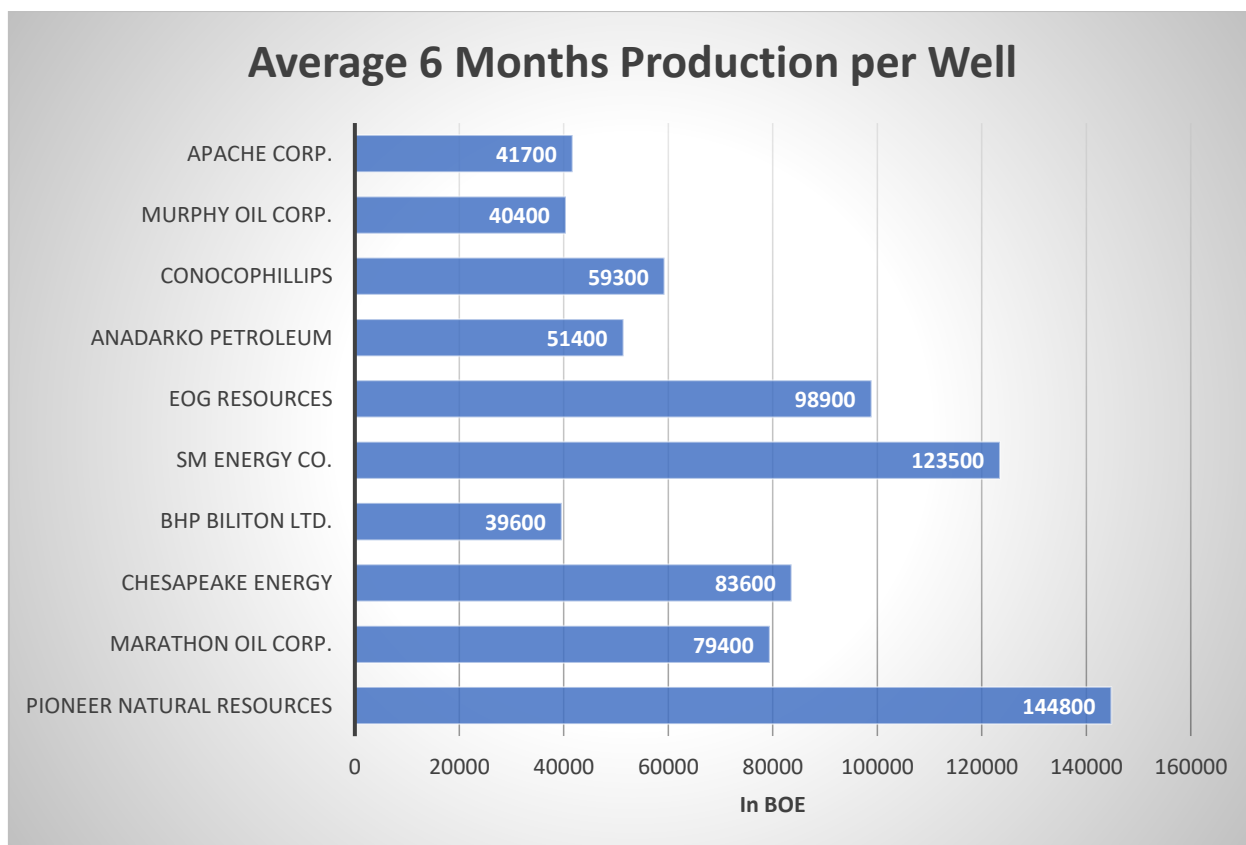
Eagle Ford oil and gas play is situated in Southern Texas. It was discovered in 2008. It is one of the three largest shale oil plays. Eagle Ford is the second extraction basin after the Bakken in terms of unconventional shale development. The territory contains three operational zones: oil zone (2233 square miles), condensate zone (890 square miles) and dry gas zone (200 square miles). The basin covers 400 miles in length and 7000 feet in depth. Its daily production capacity is about 1,3 million barrels of shale oil and more than 6 billion cubic feet of natural gas as of May 2018. The number of active rigs is circa 80 (US Energy Information Administration, 2018).

Circa 45% of drilling activities executed in this area is performed by five top shale gas and oil producers. At the same time, the top 10 companies have control over 75% of total shale oil and gas production (Curtis, p. 36).

According to EIA the average well cost lies between 4.0 and 6.5 million dollars per horizontal well (Energy Information Administration, 2018).

The main companies holding leases within the Eagle Ford shale play are: Pioneer Natural Resources Co., SM Energy Co., EOG Resources. The average production of oil and gas for the selected companies operating in the Eagle Ford region as of 2016 is illustrated in the Figure 3.11.

Figure 3-11 Average 6-months production per well



Source: Composed by author on the base of data retrieved from MarketWatch, 2016

3.3.3. The Bakken Shale Oil Play (Williston Basin).

The Bakken is one of the most voluminous shale oil plays, though it is smaller than the Eagle Ford Play). It is situated within the Williston Basin in Montana and North Dakota It has been considered one of the best and biggest oil discoveries in recent history (Curtis, p.9).

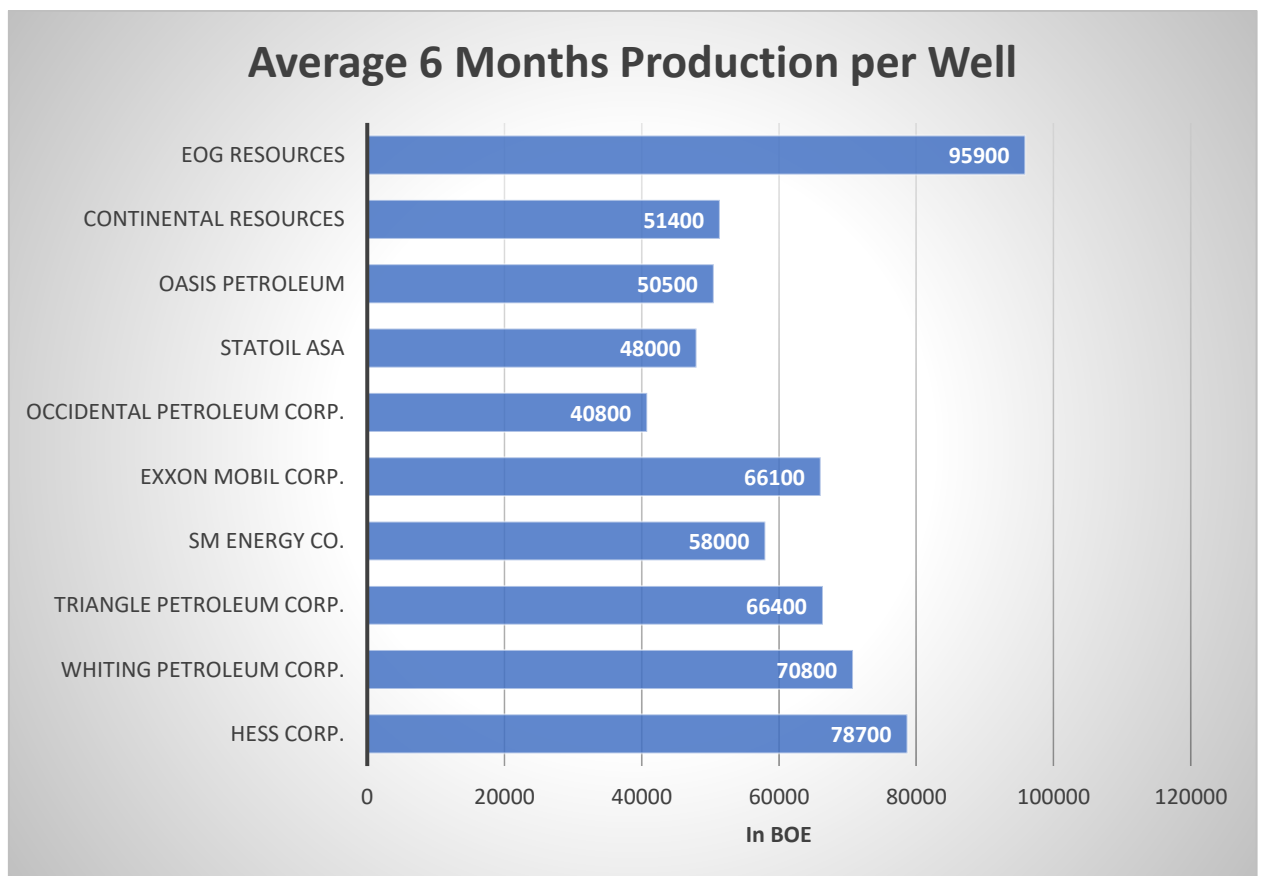
The production of oil is about 1.5 million barrels per day and of natural gas is only 1.5 billion cubic feet per day in 2018 (US Energy Information Administration, 2018). More than 90% of crude oil and natural gas extraction in North Dakota is realized in the Bakken Play. The part of

the play situated in the United States is ca. 6522 square miles. The depth of the Bakken shale varies between 4500 and 7500 feet. The well cost is about 5.5 – 8.5 million dollars. The total active rig count is approximately 60, according latest data provided by US EIA (US Energy Information Administration, 2018).

The natural gas production in the region increases faster than the oil production. But despite the increasing gas-oil ratio, the Bakken still produces more than three times as much energy from crude oil as from natural gas (US Energy Information Administration, 2018).

The drilling and extraction activities are quite extensive in the Williston Basin. Many of the oil companies operating in the area have significant investment programs. The largest shale producers are EOG resources, Hess Corporation, Whiting Petroleum Corporation, Triangle Petroleum Corporation etc. The average production of oil and gas of the selected companies operating in the Bakken Play as of 2016 is presented in the Figure 3.12.

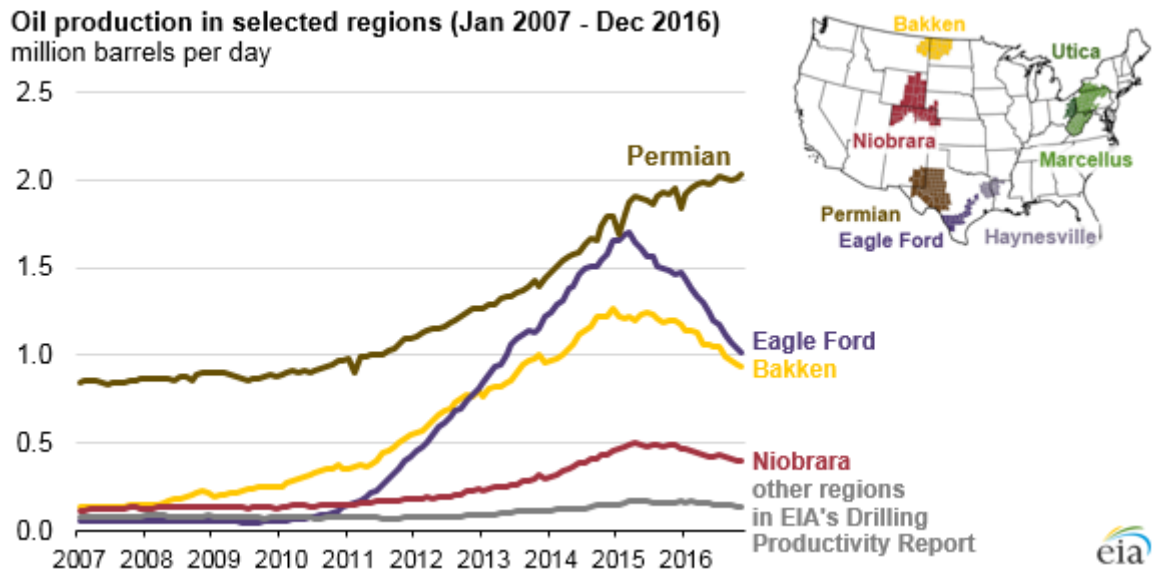
Figure 3-12 Average 6-months production per well



Source: Composed by author on the base of data retrieved from MarketWatch, 2016

The figure 3.13. below gives an overview of the shale oil production levels in the period 2007-2016 within different US basins with the Permian basin having the leading position.

Figure 3-13: Overview of the shale oil production levels by different US basins



Source: US Energy Information Administration, 2018

4. US Shale Companies.

In this section we would like to present two different US oil and gas E&P companies, operating within shale oil and gas sector. The selection is based on the insight of the differences between large and small shale oil producers. We anticipate variant levels of influence of crude oil price volatility and low interest rates on the functioning and financial position of large and small firms. Henceforward, we will analyze Anadarko Petroleum as one of the most important US Shale producers and Eclipse Resources as a small cap company.

4.1 Anadarko Petroleum

Figure 4-1: Anadarko Petroleum logo



Source: Anadarko Petroleum,2018

General Information

Anadarko Petroleum is one of the largest independent oil and natural gas E&P (Exploration and Production) companies in the world and enters the top 10 US Shale Oil producers with a large range of oil and gas resources.

The American company was founded in 1959. The Anadarko's creation is related to the discovery of the significant natural gas deposits in the Anadarko Basin (Anadarko Petroleum,2018).

On the date of 31 December 2017, the company had 4400 employees. The main competitors of Anadarko Petroleum are considered to be national oil companies, independent oil and gas companies, individual producers and pipeline companies, as well as companies delivering other types of energy resources (Anadarko, Annual Report, 2017).

Business Description

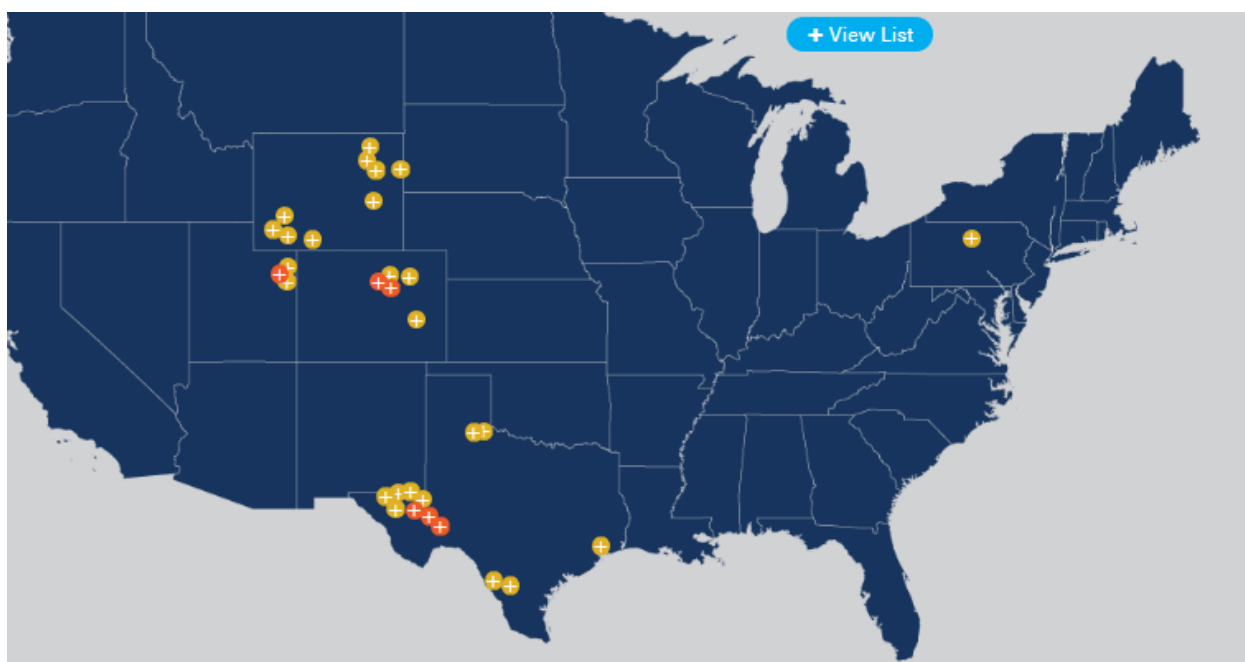
The firm operates both domestically and internationally. The headquarter is located in the Woodlands, Texas. The company possess a range of regional and international offices.

The operations of Anadarko Petroleum are oriented toward three main axes: upstream operations both in the US and other countries, midstream operations and marketing. The Upstream Operations imply the exploration and production of oil and natural gas. The American Upstream

operational regions are: Texas, Colorado, Utah, Gulf of Mexico and Wyoming. In addition, the company is present in South America, New Zealand and Africa. The Anadarko's Midstream Group executes the following services to its clients: gathering, compression, treating, dehydration and processing services, as well as the transportation of Anadarko's and third-party's oil, gathering and disposal of produced water. The Midstream energy assets are divided between Anadarko Petroleum and Western Gas Partners LP, which is a limited partnership formed by the company in 2008 with the aim to own, operate, acquire and develop midstream energy assets (Anadarko Petroleum,2018).

The Figure 4.2 represents an overview of midstream operational locations in the US:

Figure 4-2: The Anadarko Petroleum Midstream Group operational locations



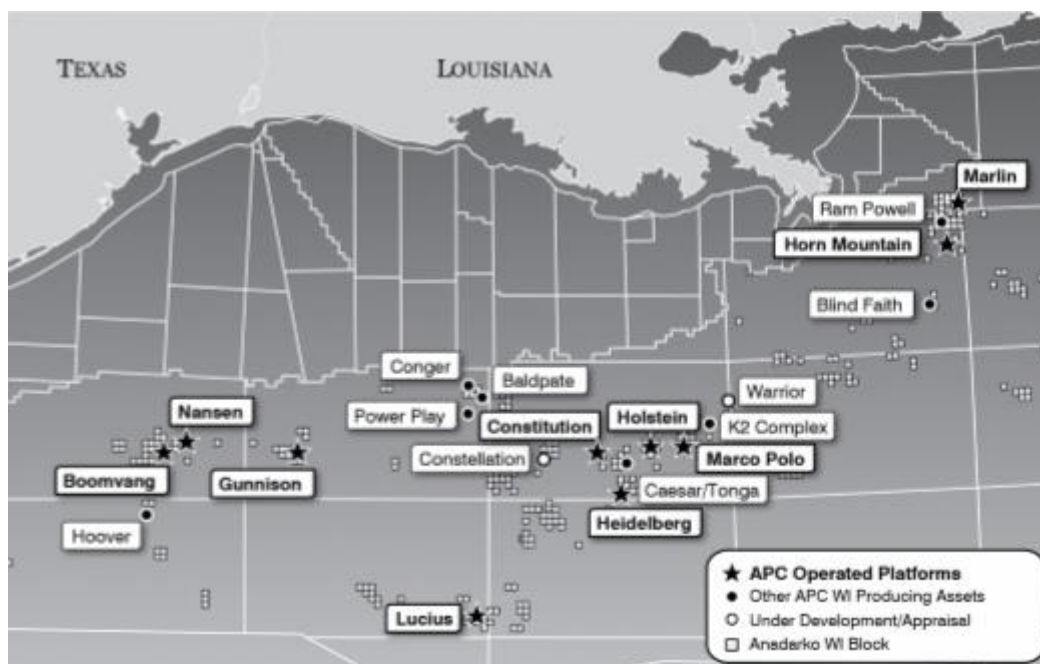
Source: Anadarko Petroleum, 2018

The marketing activity of Anadarko Petroleum consists on delivering the final commodities to the market and customers. The company's marketing is mostly focused on the supply of natural gas, natural gas liquids (NGLs), liquified natural gas (LNG) and crude oil, which is based on the Upstream expertise (Anadarko Petroleum,2018). Starting from 2018 the marketing sector is included into Midstream operations as Other Midstream (Anadarko Annual Report, 2018).

Oil and NGLs production is concentrated in the United States, Ghana and Algeria. The commodities are sold under different contracts with prices based on market indices. The prices are usually dependent on the quality and location of the products and adjusted to transportation mode. For instance, oil produced in regions mentioned above are sold as high-quality crudes: Saharan Blend, Jubilee crude oil and TEN Blend (Anadarko Annual Report, 2018).

The company's activities in the United States include the exploration and production of crude oil and natural gas, split into two segments: US onshore and deep-water Gulf of Mexico offshore. The US Onshore activities mostly consist on horizontal drilling. The focus is on the Delaware and DJ basins. Moreover, the firm owns 10 floating platforms in the Gulf of Mexico (Anadarko Petroleum,2018). Below you can find the map of oil and gas exploration and production in this area:

Figure 4-3: The map of Anadarko's exploration and production operations in the Gulf of Mexico



Source; Anadarko Annual Report 2018

The operations executed in the US provided 86% of sales amounts and 80% of sales revenues as to 2017. The company is developing a range of wells in the region (Anadarko Petroleum, Annual report, 2017).

The international operations are conducted in South America, New Zealand and Africa. These consist on production and development of oil, natural gas and NGLs. The company is also oriented toward exploration of new fields both onshore and offshore on the territory of Mozambique, Colombia, Cote D'Ivoire, Gabon, Canada, Peru and other countries. The international segment makes up quite important amount of sales volumes and sales revenues of the firm, 14% and 20% respectively in 2017. (Anadarko, Annual Report 2017).

The firm is actively engaged into environment, health and safety protection resolution problems. The company's operations are amenable to the US laws and regulations which primarily concern the restriction of air and water pollutants emission and disposal of contaminated oily water

Proved Reserves

Proved reserves are the reserves of oil, gas and NGLs possessed by the company and which can be extracted with certainty from reservoirs (Dale, 2015, p.5).

The total amount of proved reserves of the company is about 1439 million barrels of oil equivalent. The product mix of Anadarko's reserves in 2017 was as follows: 46% oil, 37% natural gas and 17% NGLs. The total volume of liquids reserved increased by 6% compared to 2016.

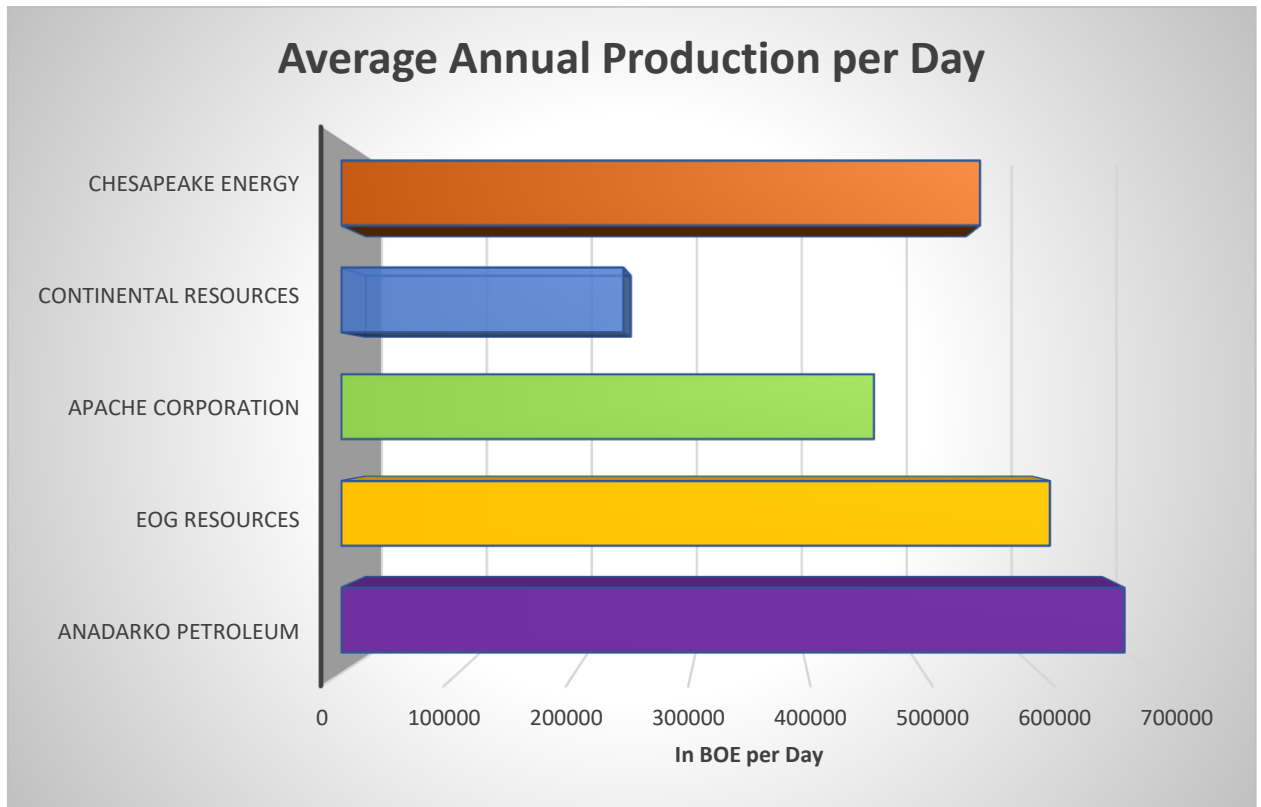
You can find the summarized information regarding the overall product mix distribution for the company in 2015, 2016 and 2017 in the Appendix 3. The data are retrieved from the company's Annual Report for 2017. MMBbls stands for Million Barrels, Bcf – billion cubic feet, MMBOE – million barrels of oil equivalent. One barrel is equivalent to 6000 cubic feet of natural gas.

Production Volumes

The total number of completed wells as of 2017 is circa 380. In addition, the number of wells which are in the process of drilling and waiting for completion is more than 500 (Anadarko Petroleum,2018).

Anadarko reported the average full 2017-year sales volume to be 628 000BOE/d, where shale oil sales stand for 367 000BOPD. As of February 6, 2018, the company is operating 15 rigs, 9 of which are in the Delaware Basin (Anadarko Operations Report, 4th quarter 2017).

Figure 4-4: Average daily production for largest US shale companies



Source: Composed by authors, using information from companies Annual Reports 2017

4.2 Eclipse Resources

Figure 4-5: Eclipse Resources logo



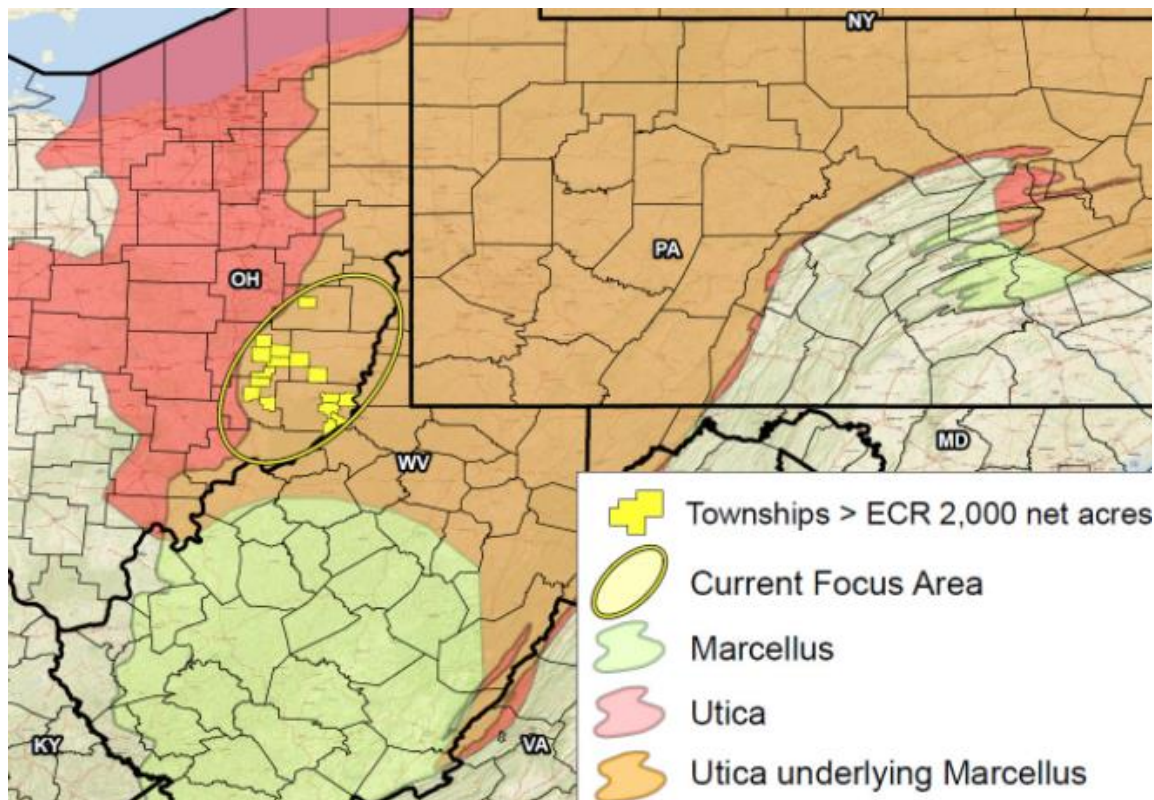
Source: Eclipse Resources, 2018

General Information

Eclipse Resources is an American independent oil and gas exploration and production company (E&P). It was founded in 2011 by Benjamin W. Hulburt and Christopher K. Hulburt, former senior executive officers of Rex Energy Corp. The headquarters are in State College, PA, United States.

The functioning of the company is focused on the development of unconventional resources in the Appalachian basin and more specifically on the Utica and Marcellus Shales of southeast Ohio (Eclipse Resources,2018). See the map below:

Figure 4-6: Eclipse Resources main operating areas



Source: Eclipse Resources,2018

Business Description

The main business activity of Eclipse Resources is lease acquisition and development of oil, gas and NGLs assets. The upstream segment operations are focused on drilling and completion for exploration and production of commodities. The midstream business consists on installation of pipelines, making the delivery to the customers more efficient (Morningstar,2018).

The company pioneered the technology of “Super-Lateral” drilling, which allows to increase the horizontal wells up to 10 kilometers (Eclipse Resources,2018).

The company’s net average daily production volume as to the end of 2017 was 239 464 cubic feet of natural gas (Mcf/day), 7435 NGLs Bbls/day and 4445 Bbls oil per day. It represents an increase of production rate by a 36% compared to 2016 full year production (Eclipse Resources, Annual Report 2017).

Proved Reserves

The reported total proved reserves of the company as of 2017 year lie at about 243,1 million barrels of oil equivalent. It represents an increase in proved reserves of 318% starting from 2015 year. The company recognized a 211% increase of total proved reserves compared to the volume of proved reserves as of December 31, 2016. Such an increase can be explained by the addition of developed proved reserves coming from the use of new wells in 2017 (Eclipse Resources, Proved Reserves, Operational and Financial Updates, 2018).

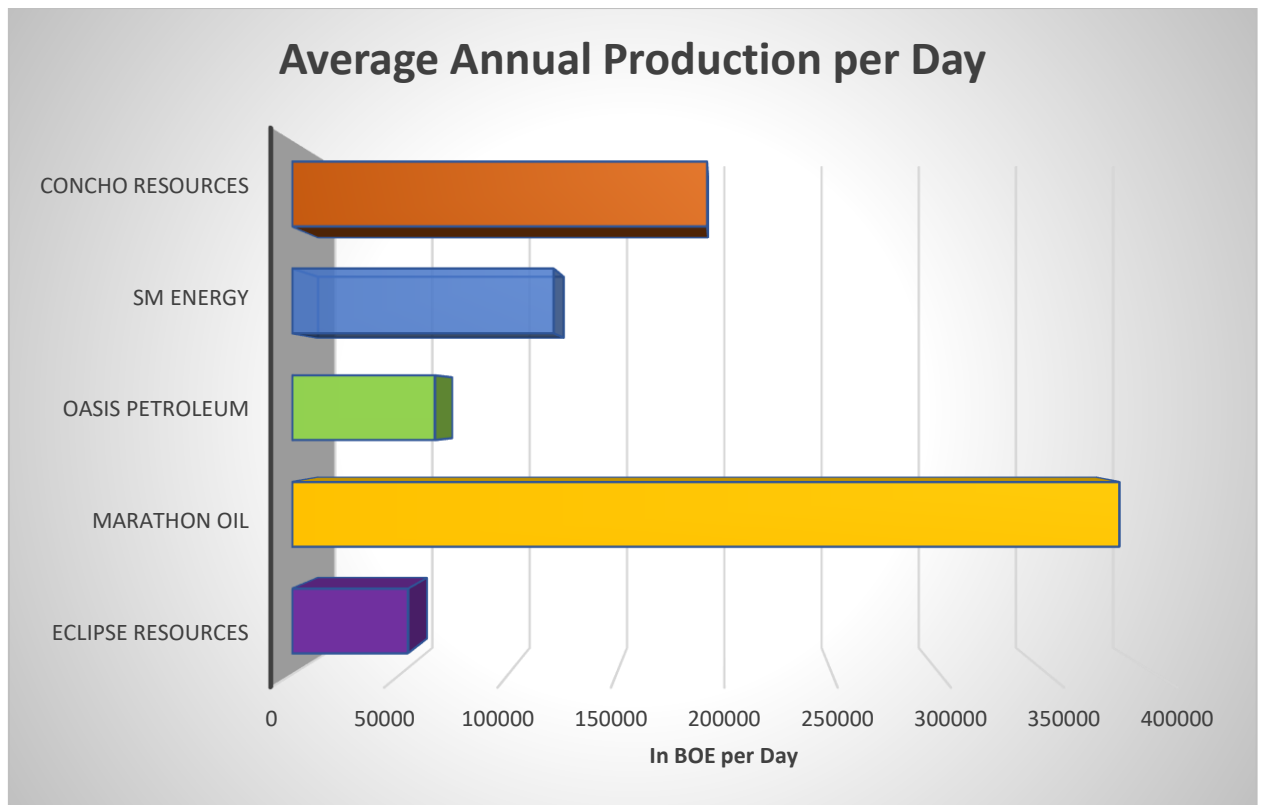
In the Appendix 4 you can find an overview of developed and undeveloped proved reserves of the Eclipse Resources for the period 2015-2017.

Production Volumes

The average production as for 2017 year is 53570 barrels of oil equivalent per day. The company operates 25 oil and gas wells with the average daily production volume of 2071.7 barrels per well. As of 2017 Eclipse Resources operates 2 horizontal rigs in the Utica Core Area.

The Figure 4.4 gives an overview of average annual production per day of Eclipse Resources, comparative to selected US Shale companies.

Figure 4-7 Average daily production for selected US shale companies



Source: Composed by authors, using information from companies Annual Reports 2017

5. Analytical Methods

In this Chapter we would like to present and to describe in more details the methodological tools used in our work. Moreover, we will give an overview of the main advantages and limitations of studied analytical methods.

5.1 Financial Statement Analysis

The financial evaluation of a company can be performed by implementing the financial statement analysis. It is a common analytical and comparative tool used by economists and investors. It consists on identifying the group of the representative financial ratios which give the possibility to assess the performance of the firm and make the valuation. The financial statement analysis helps to establish a benchmark within time-trend or peer group analysis. In other words, the data provided in financial statements can be used for evaluating the company's financial position over different periods of time or to compare it to the financial positions of similar firms and identify some financial trends in the industry. (Berk, DeMarzo, 2017, p.69).

There are four main financial statements issued by every public company: *the balance sheet or statement of financial position*, giving the insight into assets, liabilities and shareholders' equity description; *the income statement or statement of financial performance*, presenting the firm's revenues and expenses during some period of time; *the statement of cash flows*, providing the information regarding generation and allocation of cash; *the statement of stockholders' equity*, which the decomposition of the change in the equity available to shareholders during some period of time.

One of the main advantage of this analytical method is the availability of information. The companies release the financial data on the quarterly basis. It is a good way to communicate the financial information to investors. One of the weak sides of the financial statement analysis concerns the level of quality of provided financial data. Some companies can abuse or manipulate the information when reporting. In addition, the market circumstances can change very quickly, making the financial information less relevant. In this respect it is important to execute the quality check of the financial statements, with respect to generally accepted accounting principles (GAAP), audit quality, transaction timing and structure, and disclosure quality (Penman, 2013, p. 593-594).

5.2 Profitability Analysis

The profitability measures are one of the key performance indicators. They evaluate how companies organize their operational activities and deploy their assets with the aim to gain profit.

The most common profitability ratios are return on assets (ROA), return on equity (ROE), EBITDA and EBITDA-margin.

5.2.1. Return on Assets.

ROA shows how much profit the company gets per one dollar of assets used. It is a widely used measure of the profitability of the firm's operations. The more efficiently assets are used in operations by the company, the more sales it generates and the higher profitability level it can reach (Penman,2013, p.374).

ROA can be computed in different ways. First it can be represented as a fraction of EBIT to total assets:

$$ROA = EBIT / Total\ Assets$$

where EBIT represents the total operating income of the company. This formula neglects the return from the assets which are used to serve financial obligations (Bodie, Kane, Marcus, 2014, p. 641).

Alternatively, ROA can be calculated as:

$$ROA = [Net\ Income + Interest\ Expense\ (after\ tax)] / Average\ Total\ Assets$$

The main limitation of ROA calculations is that it doesn't separate operating and financing activities. Put differently, the ratio sets together the return on operations and the return from investing in financial items (Penman, 2013, p.371). At the same time, the measure is less sensitive to the change in leverage than ROE. (Berk, DeMarzo,2017, p. 77).

5.2.2. Return on Equity

ROE is an accounting rate of return, indicating the performance of the equity investments. A high ROE signifies that the company is able to find and deploy investment opportunities in the efficient manner (Berk, Demarzo,2017, p.76).

The measure is computed as follows:

$$ROE = Net\ Income / Book\ Value\ of\ Equity$$

In other words, the return on equity represents net income as the percentage of shareholders equity.

5.2.3. EBITDA and EBITDA-margin

EBITDA is a measure for earnings before interests, taxes, depreciation and amortization. EBITDA is a useful financial tool for valuation of the company. It is an indicator of actual operating performance of the firm. In other words, EBITDA is a measurement of the capability of the firm to produce earnings from its operational activities. Nevertheless, EBITDA says nothing about the quality of earnings or the ability of the company to cover interest expenses. It is relevant for calculating and forecasting free cash flows and is often used as part of different multiples.

EBITDA-margin is presented as the ratio of EBITDA to the sales of the company:

$$EBITDA\text{-margin} = EBITDA / Sales$$

Both EBITDA and EBITDA-margin are used for comparing the companies across the same industry, having different production scopes, sales volumes and expenditures.

5.3 Leverage Analysis

Leverage measures characterize the long-term solvency of the firm or its ability to meet financial obligations in the long run (Ross, Westerfield, Jordan, 2011, p.58). The firm's leverage indicates the level of the debt financing. The most commonly used financial leverage ratios are:

$$Total\ Debt\ Ratio = (Total\ Assets - Total\ Equity) / Total\ Assets$$

$$Debt\text{-to}\text{-Equity}\ Ratio = Total\ Debt / Total\ Equity$$

$$Cash\ Coverage = (EBIT + Depreciation) / Interest$$

Since the company often holds some cash reserves which can be used to repay the debt outstanding, what reduces company's credit risk, it is quite informative, in addition, to analyse the net debt of the company:

$$Net\ Debt = Total\ Debt - (Excess\ Cash + Short\text{-}Term\ Investments)$$

5.3.1. Capital Structure

Capital structure is the proportional mix of financing sources, such as equity and debt. The equity-debt balance is the reflection of the company's decision regarding borrowing policy and overall capital structure (Ross, Westerfield, Jordan, 2011, p.407). Capital restructuring consists on reducing or increasing the debt-equity ratio. The optimal or target capital structure should

lead to the lowest possible weighted average cost of capital (WACC) and the maximized value of the whole firm. According to the pecking order hypothesis the companies first rely on the retained earnings, as the source of funding, then on debt and finally on equity (Berk, DeMarzo, 2017, p. 615). But higher weight of equity as the type of capital used, makes the firm more attractive for investors, signaling about its financial stability and low default risk.

There exists a variety of capital structure drivers. One of the most common factors is the tax advantage of debt. The interest tax shield gives the possibility to avoid the payment of corporate tax. In this respect, the balance between the level of leverage and tax benefits is necessary, since too high indebtedness can lead to financial distress or default. (Berk, DeMarzo, 2017, p. 617).

5.3.2. Cost of Capital

The cost of capital is the minimum required return on the investment, compensating for both time-value of money and implied risk, connected to the investment. The firm uses two main sources for financing its investments, equity and debt. The alternative source is preferred stocks (Damodaran, 2012, p.220).

The cost of capital consists on *cost of equity* and *cost of debt* depending on the source of funding a company uses. The combination of financing modes varies from company to company.

The cost of equity is often identified under the Capital Asset Pricing Model (CAPM), which relates expected return and expected risk of the investment. The risk of the investment is reflected in its responsiveness to the market risk and is measured by the β -coefficient. Under the CAPM the required rate of return on equity is expressed as the sum of the risk-free rate and the current risk premium for an investment in the firm's stock.

$$rE = rf + (E(rm) - rf) * \beta i$$

The cost of debt represents the borrowing cost for the firm or the cost of bearing all the financial obligations used as funding source for its operations (Penman, 2013, p.447). The cost of debt is calculated on the after-tax basis, since the interests are tax deductible. Thus, the after-tax cost of debt is lower than pretax cost of debt, due to the tax benefit, related to the payment of interests (Damodaran, 2012, p.211).

$$\text{After-tax Cost of Debt} = \text{Pretax Cost of Debt} (1 - \text{Tax Rate})$$

Most companies use the combination of equity and debt for funding investments. In this respect it is logical to talk about the weighted average cost of capital for companies, which include both cost of equity and cost of debt depending on the capital structure:

$$WACC = (D/D+E) * rD * (1-T) + (E/E+D) * rE$$

5.4 Free Cash Flows Management

Free cash flows determination plays a significant role in liquidity analysis of the firm, future cash flows forecasting and valuation of the company through dividend discount model.

Free cash flows or cash flows from assets represent the difference between cash coming from operations and cash which are invested in operational activity of the company.

In general terms, three types of cash flows are generated by a firm: cash flows from operations, cash flow from investing activities in operations and cash flows from financing activities. Financing activities imply relationship between the company and its investors, debtholders and shareholders. Three types of cash flows are linked together by the equation which is called *conservation equation* (Penman, 2013, p.345):

$$\text{Free Cash Flows} = \text{Net payments to shareholders} + \text{Net payments to debtholders and issuers}$$

Cash flows to creditors is interest paid less net new borrowing and cash flows to shareholders is dividends paid less net new equity raised (Ross, Westerfield, Jordan, 2011, p.37).

Positive free cash flows indicate strong financial position of the company, its ability to generate cash flows from their operating activities and to pay its creditors and stockholders.

Free cash flows can be computed in two ways, as free cash flows to the firm which are after-tax cash flow created by the company net of capital spending and change in working capital, or as free cash flows to equity, which are adjusted with respect to after-tax interest expenses and change in net debt (Ross, Westerfield, Jordan, 2011, p. 34).

EBIT
-Tax
=Net Operating Profit After Tax
+Depreciation
-Change in working capital
-CAPEX
=FCFF
-Interest expenditures(1-t)
+New debt

-Debt repayments
=FCFE

The main constituent elements of free cash flows are operating cash flows, capital expenditures and change in working capital.

5.4.1. Operating Cash Flow

Operating cash flow is an indicator of the level of success of business operations of the company. It is simply the difference between revenues and costs on the after-tax basis. Operating cash flow calculations include taxes since it is paid in cash, but excludes depreciation and interest expenses, because the first one is a non-cash item and the second one is a part of financing expenses (Ross, Westerfield, Jordan, 2011, p. 34-35).

A positive operating cash flow signifies that the firm gets enough revenues from its business to cover costs related to operating activities.

Earnings before interest and taxes
-Taxes
= Operating Cash Flow

5.4.2. Capital Spending

Capital spending or CAPEX is cash which are used for investment activities. It is investments in physical assets such as property and equipment. Capital expenditures are necessary to develop new projects and enlarge the scope of operations. Capital expenditures are usually capitalized and recognized over time (Berk, DeMarzo, 2017, p.66).

CAPEX can significantly vary across the industries and companies operating in the same sector. It depends on the size and life-cycle of the company, the number of undertaken projects, the scope of operations etc.

Net capital spending represents cash spent on acquiring and maintenance of fixed assets minus proceeds from the sale of fixed assets. In some cases, CAPEX can be negative if the firm sells more assets than it acquires. (Ross, Westerfield, Jordan, 2011, p.35).

Ending net fixed assets
-Beginning net fixed assets
= Net investment in fixed asset

5.4.3. Working Capital

Working capital is a measure of short-term liquidity and financial stability of the company.

$$\text{Working capital} = \text{Current Assets} - \text{Current Liabilities.}$$

The working capital changes as the result of reduction or increase of investments in current assets, which induces the change in current liabilities (Ross, Westerfield, Jordan, 2011, p.36). Current liabilities represent financial obligations with maturity date within one year. Current assets are all assets which can be converted into cash within one year. Positive working capital means that the firm has enough liquidity to meet obligations which are due in the short run. It also signalises the potential ability of the company to maintain healthy financial position in the longer term.

Ending NWC
-Beginning NWC
= Change in NWC

6. Financial Analysis

Financial analysis is the method to assess the overall financial position of a company, its performance and stability. Financial analysis is based on the research of the information provided by financial statements: income statements, balance sheets, shareholders equity statements and cash flow statements. One of the most traditional ways to examine financial information of any company, including E&P, is to compute ratios and compare it against historical data. The calculations of the ratios can, in addition, be a part of a larger analysis of the whole shale oil and gas sector, giving the insight into general economic trends.

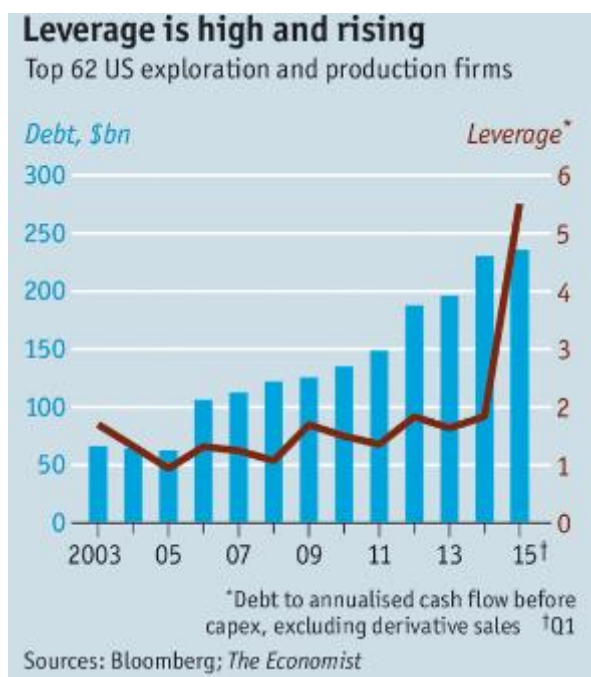
Financial statement analysis is an important part of the fundamental analysis and helps to create a framework for analysts' forecasts (Penman, 2013, p.86). With the use of financial data examinations, we expect to retrieve a pattern of how specific factors, like change in commodity prices or availability of financing, can affect the financial indicators of Anadarko Petroleum and Eclipse Resources and to make the sensitivity analysis.

6.1 US Shale Oil and Gas Companies and Debt Financing

In this chapter we would like to perform an analysis of some financial metrics of Anadarko Petroleum and Eclipse Resources. We will focus our attention on how the profitability, solvency and liquidity positions of the US shale companies developed in the circumstances of oil price change and low interest rates set by the Fed. We are mostly interested in debt and leverage parameters and cash flows.

Using the example of the shale oil producers mentioned above, we would like to see how the industry succeed in handling the plunge in oil prices by raising debt. Some specialists believe that debt financing supported US oil boom, when the E&P companies turned to low-interest debt to sustain levels of production and finance their growth. As we can see in the Graph 6.1. the E&P companies have already had quite significant aggregate leverage when the price fall in the industry started. The debt level increased from circa 75 billion dollars in 2011 to approximately 100 billion dollars in 2014 and to almost 300 billion dollars in 2016 and continues to take off. It is worth mentioning that almost one third of this debt mature in 2019. Thus, the debt is an important financing source for many oil and gas producers, considering that net profit and cash flows dramatically lowered in recent years. (The Economist, 2015).

Figure 6-1: Leverage level of E&P companies in US



Source: The Economist, 2015

We will base our research on the analysis of financial annual reports and financial statements of the Anadarko and Eclipse Resources which are available on their official web-sites and are regularly updated. We will use the financial information for the last 5 years, and more precisely for the period of 2013-2017 years, which refers to the breaking point in the oil and gas industry. We consider this period to be most relevant for our research.

6.2 Profitability Measures

We will start with looking at the profitability measures of Anadarko Petroleum and Eclipse Resources. The profitability parameters show how efficiently the firms invest in their assets and how profitable are their sales. In other words, the profitably ratios are an important indicator of the capability of the companies to generate earnings over the costs they incurred. (Bodie, Kane, Marcus, 2014, p.640).

We will specifically research the change of return on assets, EBITDA and EBITDA-margin in the period 2013-2017 years. In our analysis we will use the income statements of Anadarko and Eclipse Resources.

It is quite useful to look at the development of profitability measures during the oil industry downturn of 2014 and how the firms' performance was affected by the drop of oil prices in subsequent years. The benchmark can be established as the previous years' indicators of the same company, as well as the whole industry measures.

6.2.1. Return on Assets

Return on assets or ROA is a common measure of the companies' performance. It measures the efficiency of the firm in generating profit from the investment in assets and delivering high returns to investors (Penman, 2013, p.371).

$$\text{ROA} = [\text{Net income} + \text{Interest expense (after tax)}] / \text{Average total assets}$$

The Table 6.1 summarizes the results of calculations of ROA for Anadarko Petroleum and Eclipse Resources. Total assets are the average of the quarterly values for every year. The statutory tax rate for both firms is 35%.

Table 6-1: Anadarko Petroleum and Eclipse Resources ROA ratio

	2013	2014	2015	2016	2017
In million \$	Anadarko				
	Petroleum				
Net Income/Loss	941	(1563)	(6812)	(2808)	(211)
Interest Expenses	686	772	825	890	932
Total Assets	55781	61689	46331	45564	42086
ROA	2.49%	-1.72%	-13.5%	-4.9%	0.94%
	Eclipse				
	Resources				
Net Income/Loss	(43.5)	(183.2)	(971.4)	(203.8)	8.5
Interest Expenses	20.9	48.4	53.4	50.8	49.5
Total Assets	1143.5	1885	1266	1198	1224
ROA	-2.6%	-8%	-73.9%	-14.3%	3.3%

Source: Calculations made by author on the base of the values in Anadarko Petroleum and Eclipse Resources AR 2013-2017

As we can see from the table, all the values of ROA for both Anadarko Petroleum and Eclipse Resources are negative. The highest ROA for two companies was in 2013. A negative return on the assets means that the companies invested more capital in operations compared to the income they received in the same period. Moreover, the effect of negative ROA is stronger, considering high levels of debt holding by the companies. For instance, in 2015, when ROA reaches its lowest level, the total long-term debt of Anadarko Petroleum and Eclipse Resources was

respectively 15 636 million USD and 492 million USD. The decrease of ROA is directly connected to a sharp fall of the commodities prices in the second half of 2014. The commodities prices are the main factors affecting financial position of the E&Ps. The level of interest expenses rises from year to year as well, this fact is connected to the increase of the total debt outstanding.

6.2.2. EBITDA and EBITDA-margin

EBITDA is a useful tool in defining the level of financial stability of a firm as it measures the actual operating performance of a company which is not yet affected by difference in interest expenses, tax allocations and depreciation and amortization deductions (Schmidlin, 2014, p.108). Put differently, EBITDA shows actual operating cash flows by excluding the effect of non-operating expenses, which is an important indicator for both investors and creditors. EBITDA-margin is simply the relation between total revenue of a firm and EBITDA value. It makes possible the comparison of E&P of different size companies across the industry.

We've got the following numbers for EBITDA and EBITDA-margin for companies in question:

Table 6-2: EBITDA and EBITDA-margin of Anadarko Petroleum and Eclipse Resources

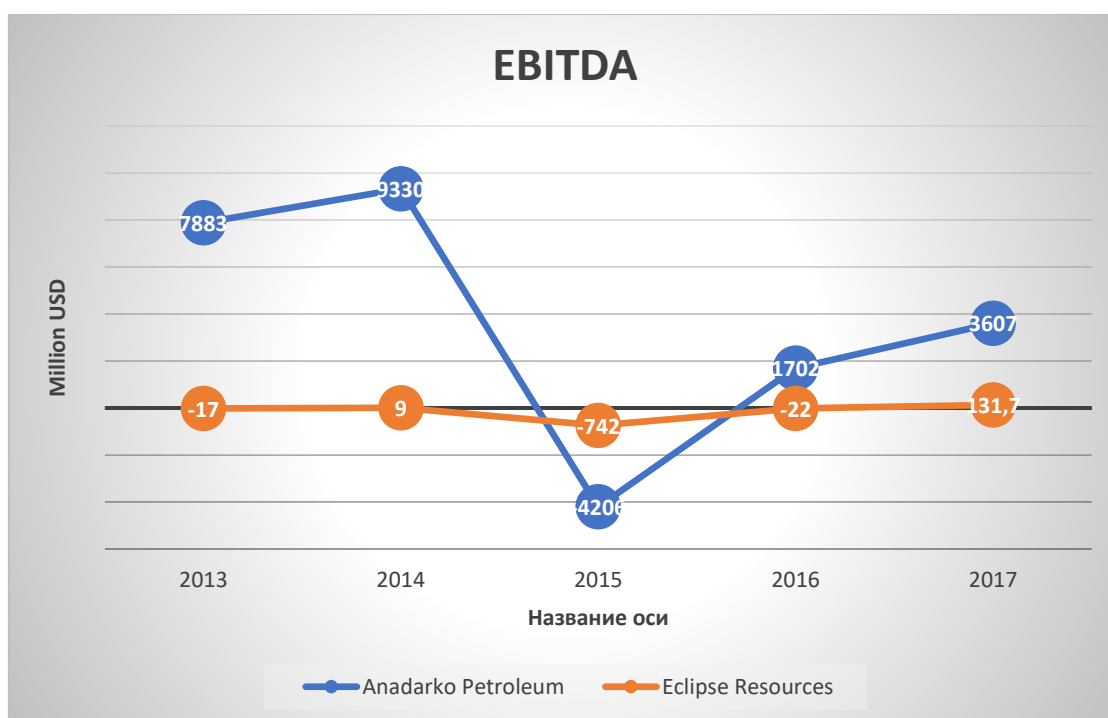
	2013	2014	2015	2016	2017
In million \$	Anadarko				
	Petroleum				
Operating Income/Loss	3333	5403	(8809)	(2599)	(672)
Depreciation and Amortization	4550	3927	4603	4301	4279
EBITDA	7883	9330	-4206	1702	3607
EBITDA-margin	54%	50.5%	N/A	21.6%	30.2%
	Eclipse				
	Resources				
Operating Income/Loss	(23)	(84)	(987)	(115)	12,7
Depreciation and Amortization	6	93	245	93	119
EBITDA	-17	9	-742	-22	131.7
EBITDA-margin	N/A	6.5%	N/A	N/A	34.3%

Source: Calculations made by author on the base of the values in Anadarko Petroleum and Eclipse Resources AR 2013-2017

The results provided in the Table 6.2. show that Anadarko Petroleum and Eclipse Resources were incapable to cover its operating costs summed with interest expenses on issued debt necessary to finance further drilling and pumping.

We can notice a general trend of EBITDA to move in the same direction with the commodities prices and have common pattern for both studied companies (see the Graph 6.2. for more details). As oil prices started to decline in 2014 because of global oversupply and reduced growth in demand and continued to decrease through 2015 and 2016 due to continued high petroleum inventories and further supply growth from OPEC, EBITDA fell as well, even reaching negative values in 2015 (Anadarko Petroleum and Eclipse Resources) and 2016 (only Eclipse Resources). At the same time, in 2016 and 2017 years oil prices increased, that is connected to OPEC’s decision to cut production through the end of 2018 leading to reduction of global supply. As we can see from the Table 6.2. EBITDA started to stabilize.

Figure 6-2: Anadarko Petroleum and Eclipse Resources EBITDA in 2013-2017 years



Sources: Composed by author on the base of data from companies’ AR 2013-2017

Key factors affecting the earnings level as well as growth of E&P companies are oil, natural gas and NGLs prices, sales and production volumes and costs of exploration and of drilling development (Anadarko AR 2013-2017). But as we look at the data provided in AR reports of both companies we can conclude that the most influential factor leading to the huge reduction of earnings are commodities’ prices, as production volumes are not only reduced, but have the tendency to grow during studied period.

Eclipse Resources' values for EBITDA are constantly negative, except 2014 year. Due to high leverage level the company's earnings are partly wiped out by high interest expenses. On average, through the period of 2013-2017 the total amount of interest expenses represented 47,6% of total revenues of the company with the extreme value of 160% in 2013, connected to the miniscule revenues in early phase of lifecycle of the E&P firm.

These two companies are likely showing the cross-section of the whole shale industry, affected by the plunge in commodities prices and leading to weakening of the firms' balance sheets, with worse measures recorded in 2015 year. It is clearly that starting from 2016 onwards the companies in the industry started to cut operational and capital expenses improving EBITDA and returns.

Despite the overall economic weakness of the shale oil industry production volumes of crude oil of the firm increased through 2013-2015 years and started to decline only in 2016. This curtailment can be explained by several reasons: rating downgrade in 2016 by Moody's, difficulties with generating cash flows from operations, low oil and natural gas prices and as the consequence problems with financing operating activities.

Table 6-3: Production volumes of crude oil by Eclipse Resources in 2013-2017 years.

	2013	2014	2015	2016	2017
In Mbbls	Eclipse Resources				
Production Volumes	87.2	594.9	1950.5	1343.8	1622.4
Change %		+582%	+228%	-31%	+20.7%

Source: Eclipse Resources AR 2013-2017

Big-size Anadarko Petroleum has in general much higher values for both EBITDA and EBITDA-margin compared to Eclipse Resources, though they are quite volatile. In 2015 the company experienced a negative EBITDA, connected to the plunge in oil prices and quite significant income loss of 8809 million \$. But despite low EBITDA after 2015 the firm is highly valued and has high market capitalization and enterprise value. (Anadarko Petroleum AR 2015-2017).

The negative change in revenues is mostly explained by the decline in commodities prices, same as with Eclipse Resources. Sales volumes of crude oil of Anadarko Petroleum are quite stable

through the period of industry downturn. Sales volumes represent actual production volumes adjusted for changes in commodity inventories and are presented in the Table 6.4. below (Anadarko Petroleum AR 2013-2017):

Table 6-4: Production volumes of crude oil by Anadarko Petroleum in 2013-2017 years

	2013	2014	2015	2016	2017
In MMbbls	Anadarko Petroleum				
Production Volumes	91	106	116	116	129
Change %		+18%	+9%	0%	+12%

Source: Anadarko Petroleum AR 2013-2017

According to the data presented in Annual Reports of Anadarko Petroleum the percentage distribution of the impact of key revenue drivers is as follows:

Table 6-5: Change in oil sales revenues distribution of Anadarko Petroleum

	2017vs2016	2016vs2015	2015vs2014	2014vs2013
In million \$	Anadarko Petroleum			
Change in Oil Sales Revenue	1884	(752)	(4328)	(570)
Due to Change in Oil Prices	1334	(745)	(5189)	(1046)
Due to Change in Volumes	550	(7)	861	1616

Source: Anadarko Petroleum AR 2013-2017

We can conclude that during the oil price shock period both Anadarko Petroleum and Eclipse Resources used the strategy of increasing production volumes for compensating for extreme low oil prices. The oil price decline affected the revenue level while operating expenses remained on quite high level despite several capex reductions. In other words, most E&P companies in the shale sector produced more in order to stabilize revenues and cover costs.

6.3 Financial Leverage Measures

The term leverage refers to the total sum of debt a company issues for financing its assets. Leverage can be divided into two types, operational and financial leverage. The first concerns obligations created in the operational process, the second applies to financial liabilities necessary

to finance it. A highly levered firm finances its investment in operating assets mostly by debt rather than equity. (Penman, 2013, p.368). Before proceeding with financial leverage analysis, we need to examine credit ratings assigned to Anadarko Petroleum and Eclipse Resources.

6.3.1. Credit ratings

Credit rating is a measure of creditworthiness of a debt issuer. It reflects the level of default risk on the debt and interests repayment (Hull, 2012, p.521). The main agencies assessing the credit risk of a firm are Moody's, Standard and Poor's (S&P) and Fitch, which assign various letter grades. AAA or aaa as the best rating levels implying very strong safety with respect of repaying principal and interest on debt. The companies with this rating are supposed to have no default risk on liabilities. S&P and Moody's use some additional settlements for their ratings, +/- and 1,2,3 respectively, where + and 1 are the strongest ratings (Bodie, Kane, Marcus, 2014, p.469).

Credit rating is one of the most important factors within financing activities of any company. The level of credit rating influences the access to debt financing as the company should be approved for the loan. The terms of borrowing depend on credit rating as well, with companies measured to have good ratings getting favorable interest rates.

Rating agencies examine different factors to which a firm can be subject to. According to S&P the following factors play fundamental role in assigning rating grades to firms: history of debt repayment, relationship of cash flows to leverage, potential for economic growth, competitive position, industry risk etc. (S&Ps, Credit Ratings, 2018)

Thus, E&P companies are contingent on their creditworthiness assessment. This fact became more obvious during the period of commodities prices weakness. At this time companies suffered from insufficient cash flows and liquidity relying on the debt financing for supporting their production. E&P companies were totally dependent on loans for paying their operational expenses. In such circumstances the impossibility to take loan due to poor credit rating could be a disaster for US shale companies. At the same time high interest rates are very difficult to repay. As a result, E&P firms were forced to constantly seek for debt refinancing. In 2015-2016 years more than 200 US oil and gas companies announced bankruptcy, having together more than 85\$ billion of debt. (Hunn, 2016).

Consequently, we consider it to be quite useful to look in more details on the credit rating changes of Anadarko Petroleum and Eclipse Resources through 2013-2017 years. The following

information is summarized on the base of articles available on Moody's web site and annual reports of the companies.

Anadarko Petroleum

In 2012 the company was assigned Baa3 grade, due to sufficient liquidity and marketable assets. Moody's decision was explained by the presence of significant proved reserves of the firm, large production volumes sufficient for supporting positive cash flows. The amount of Anadarko Petroleum's debt as to 2012 was 14 billion dollars.

In 2013-2015 the rating agency confirmed the same rating level and positive developments in the company's financial position.

In 2016 Moody's recalibrated ratings of a group of energy companies by downgrading some of E&P firms. Under Moody's commodities price estimates, Anadarko Petroleum was forecasted to generate substantially lower cash flows. The new rating was Ba1 with a negative outlook. Later in September 2016 the company's rating outlook changed from negative to stable due to lower refinancing requirements for 2016-2017 years. The reason is that Anadarko Petroleum undertook considerable asset sales and refinancing transactions, which allow to fund negative cash flows and repay debt outstanding.

The metrics of credit ratings of Anadarko Petroleum improved with stabilized oil prices but remained lower than in 2013-2015 years.

Eclipse Resources

The company received its first credit rating in 2015 having at this time 650 million dollars of debt. According to Moody's analysis the firm had quite significant risk of funding connected to the oil and gas reserves increase and production growth. The company outspent cash flows by more than 1 300 million dollars in 2015 and almost 400 million dollars in 2016. The gap between expenditures and free cash flows was financed by increasing borrowings. At the same time, Eclipse Resources had satisfactory liquidity and good operating performance. The credit grade was Caa1.

The firm was downgraded in 2016 to Caa2 with negative outlook from rating agency. Because of low oil and gas prices and production curtailments, Eclipse Resources couldn't generate sufficient cash flows and cover interest expenses. The level of leverage was very high.

In 2017 the rating outlook for the company was characterized as stable. Eclipse Resources raised its cash flows and reduced leverage due to robust drilling program.

Credit ratings for both companies are summarized in the Table 6.6.

Table 6-6: Anadarko Petroleum and Eclipse Resources credit ratings summary

	2013	2014	2015	2016	2017
	Anadarko				
	Petroleum				
Moody's	Baa3	Baa3	Baa3	Ba1	Ba1
S&P				BBB	BBB-
Fitch				BBB	BBB
	Eclipse				
	Resources				
Moody's	N/A	N/A	Caa1	Caa2	Caa1
S&P	N/A	N/A			B-
Fitch	N/A	N/A			-

Source: Composed by author on the base of the data available on Moody's, S&P and Fitch web-sites

6.3.2. Debt-to-Equity Ratio

Debt-to-equity is one of the most representative leverage ratios. It is a measure of the total debt percentage referring to the total equity in the company. It indicates the level of the firm's overall indebtedness and its capability to fulfil financial commitments. It is also useful tool in understanding capital structure of E&P companies. (Bodie, Kane, Marcus, 2014, p. 470).

Table 6-7: Anadarko Petroleum and Eclipse Resources debt-to-equity measures

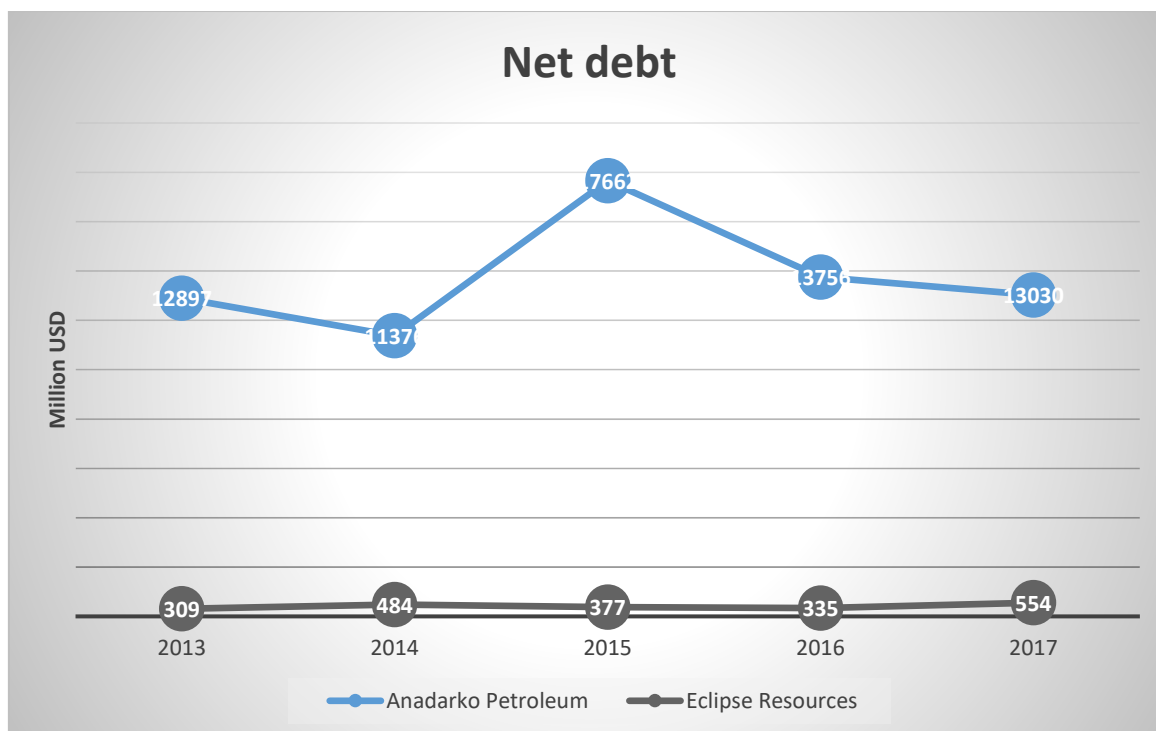
	2013	2014	2015	2016	2017
In million \$	Anadarko				
	Petroleum				
Total Equity	23650	22318	15457	15427	13790
Total Debt	13565	15092	15751	15323	15689
Debt-to-Equity	57.36%	67.6%	101.9%	99.3%	113.8%
	Eclipse				
	Resources				
Total Equity	667.9	1152.7	620.6	656.6	572.4
Total Debt	400	422.5	550	510.5	510.5
Debt-to-Equity	59.9%	36.7%	88.6%	77.7%	89.2%

Source: Composed and calculated by author on the base of information from the companies AR 2013-2017

The quite high value of debt-to-equity ratio signifies that Anadarko Petroleum and Eclipse Resources actively financed their operations with debt. For instance, in 2015 Anadarko Petroleum and Eclipse Resources had respectively 1.109 \$million and 0.886 \$ million dollars in debt for every million of equity. In 2017 debt-to-equity ratios for companies were 113.8% and 89.2 %. While extreme debt amount in 2015 is related to the necessity of financing growth during the US Shale Boom, high ratios in 2016-2017 reflects the intention to compensate for weak equity position, resulting from low commodities prices and revenues. It is interesting to mention that the average debt-to-equity value as to January 2018 was about 40% for the whole Oil Exploration and Production Industry in the US, meaning that companies started to stabilize their equity financing with the growth of oil prices (Damodaran Online,2018).

You can see how the net debt of both companies has changed through the period of 2013-2017 years in the Figure 6.3 below:

Figure 6-3: Anadarko Petroleum and Eclipse Resources net debt in 2013-2017 years



Source: Composed by author on the base of data from companies' AR 2013-2017

6.3.3. Borrowing cost

Borrowing cost is total costs occurring in connection with issuing and bearing debt. Borrowing cost can include interest expenses, any adjustments on exchange rates changes for foreign currency borrowings. Borrowing cost is in origin of financial risk for the company, as firms with unstable interest rates have higher borrowing risk than firms with fixed interest rates (Penman, 2013, p.654).

After the economic crisis of 2008 the general tendency for oil and gas industry was characterized by the overall increase in debt level and borrowing cost. At the same time the pace of interest expenses' raise has decreased relatively to the debt increase (Azar, p.11).

The total interest expenses of Anadarko Petroleum and Eclipse Resources include interest expenses on current and long-term debt and net of capitalized interests. Capitalized interests represent a capitalized cost of a long-term asset. Exploration and development projects which are not yet started and significant oil and gas investments in unproved properties are subject to interest capitalization depending on jurisdiction. Interest is capitalized until the asset is ready for service. Capitalized interest is determined by multiplying the company's weighted-average borrowing cost on debt by the average amount of qualifying costs incurred. Capitalized interest is expensed through depreciation and impairment. (Anadarko Petroleum AR, 2017).

The Table 6.8. regroups the value for interest expenses and capitalized interests of Anadarko Petroleum and Eclipse Resources incurred in 2013-2017 years and collected from the companies' annual reports.

Table 6-8: Anadarko Petroleum and Eclipse Resources borrowing cost

	2013	2014	2015	2016	2017
In million \$	Anadarko				
	Petroleum				
Interest Expenses on current and long-term debt	686	772	825	890	932
Capitalized interest	263	201	164	132	71
	Eclipse				
	Resources				
Interest Expenses on current and long-term debt	20,9	48,4	53.4	50.8	49.5
Capitalized interest	1.5	9.1	2.8	1.1	2.3

Source: Composed and calculated by author on the base of information from the companies AR 2013

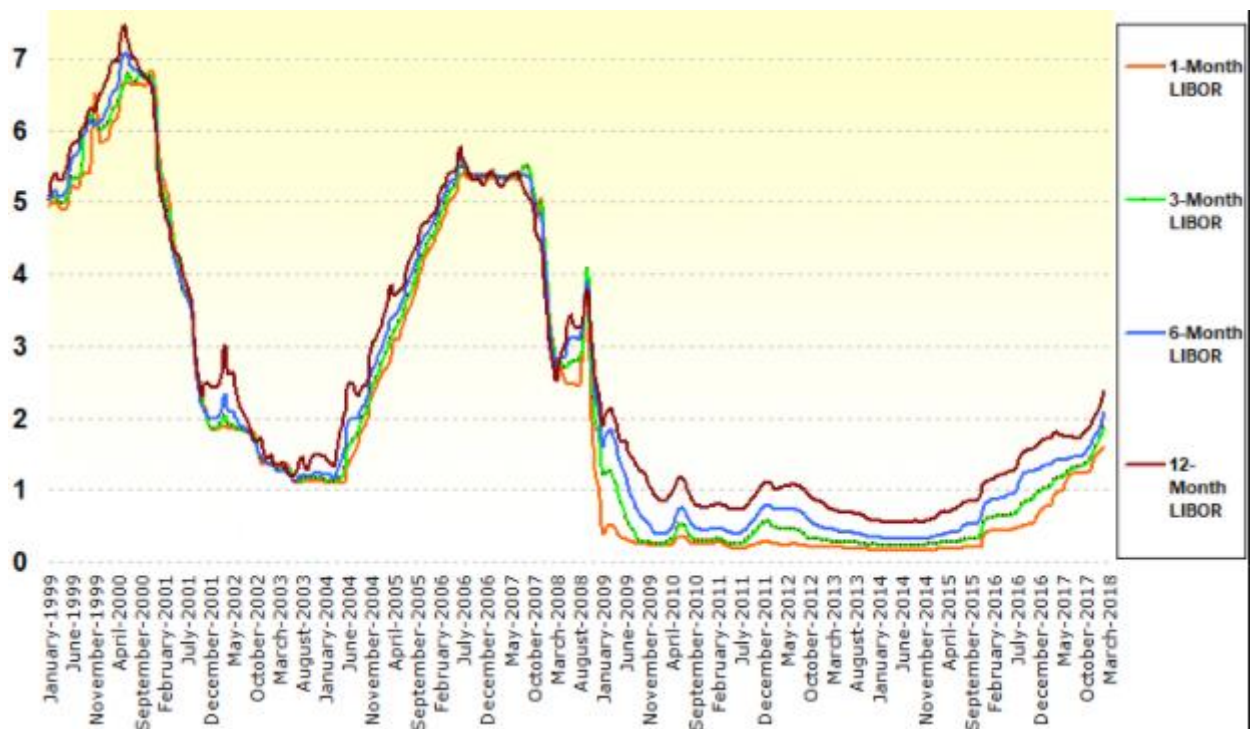
The total borrowing cost recognized by Anadarko Petroleum was characterized by steady increase in value. But we can see that the increase was not substantial. The average change in borrowing cost between 2013 and 2017 lies at about 7.7 %. This fact coincides with the phenomena experienced by the whole shale oil industry in the US in the same period, which is

explained by low interest rates on obligations. The financial obligations issued by the company are subject to variable interest rate, which is equivalent LIBOR (London Interbank Offered Rate) plus a spread which is dependent on Anadarko Petroleum’s credit ratings. An applicable margin for the firm ranges from 0.975% to 1.45% (Anadarko Petroleum, AR 2013-2017).

At the same time, Eclipse Resources’ total borrowing cost rocketed by more than 100% between 2013 and 2014. Such a sharp increase is primarily due to the total credit issuance of total 381.2 million USD in June and December 2013. In addition, this is related to the capital-intensive development period of the firm and unstable credit ratings position. Further interest expenses of Eclipse Resources stabilized and were apt to insignificant fluctuations. Opposite to Anadarko, Eclipse Resources interests on outstanding borrowings have two optional bases, LIBOR or an alternate base rate, plus the credit ratings spread in each case (Eclipse Resources, AR 2013-2017).

The Figure 6.4 represents the history of 1-month, 3-months, 6-months and 12-months Eurodollar LIBOR interest rates between 1999 and 2018 years.

Figure 6-4: Eurodollar LIBOR rates



Source: Fed. Prime Rate, LIBOR Historical Interest Rates, 2018

As visible from the graph, LIBOR interest rate sharply declined after 2008 and remained under 1% until 2017. Being a global interest rate benchmark, low LIBOR positively affected the change in interest expenses of companies in the shale oil industry.

We summarized average interest rates on different types of financial obligations of the companies in the Table 6.9 below:

Table 6-9: Eclipse Resources and Anadarko Petroleum average interest rates per year

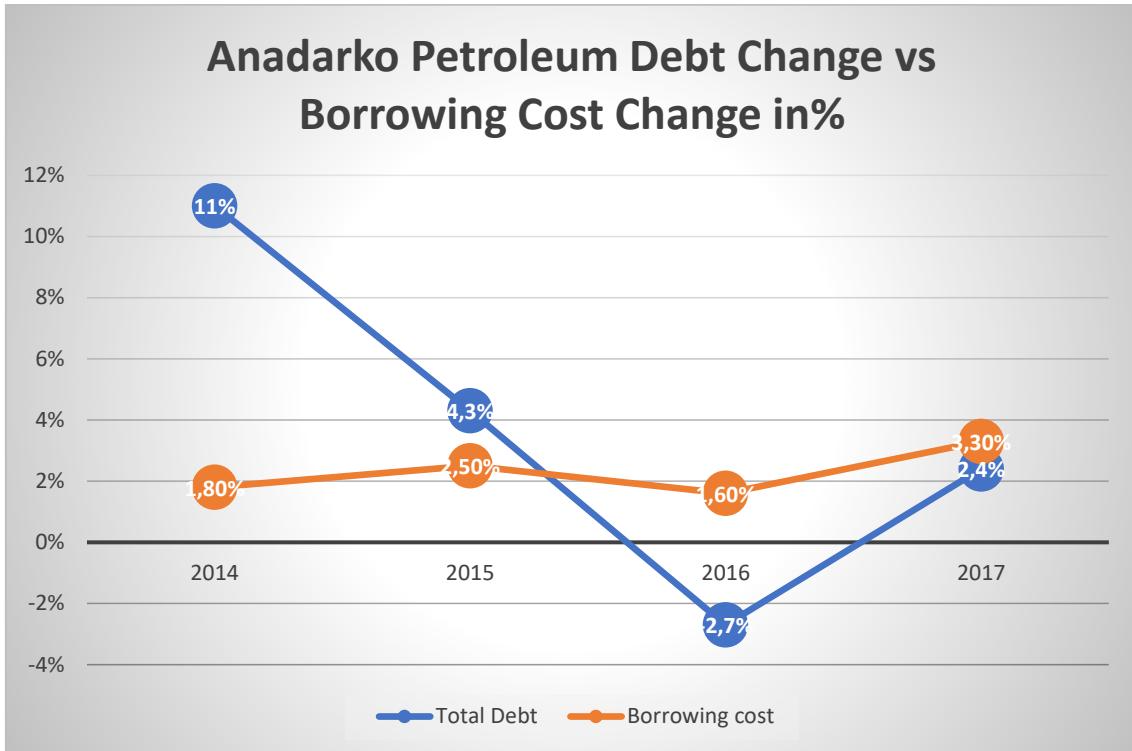
	2013	2014	2015	2016	2017
On total debt outstanding including capital lease obligation	Anadarko Petroleum				
Average interest rate	6.78%	6.55%	6.44%	6.32%	6.14%
On senior unsecured notes	Eclipse Resources				
Average interest rate	N/A	12.5%	8.875%	8.875%	8.875%

Source: Composed by author on the base of data from companies' AR 2013-2017

The difference between average interest rates of two companies lies at about 3.4%. It can be explained by the fact that Eclipse Resources was established in 2012 and was quite new E&P firm with low credit ratings assignments and couldn't get same interest rates conditions for debt issuing as mature Anadarko Petroleum. Nevertheless, both companies had access to low-cost debt financing in general terms.

Figures 6.5 and 6.6 below show that the change in borrowing cost for both companies was much more "smooth" than the change in total debt, due to quite stable interest rates during last five years.

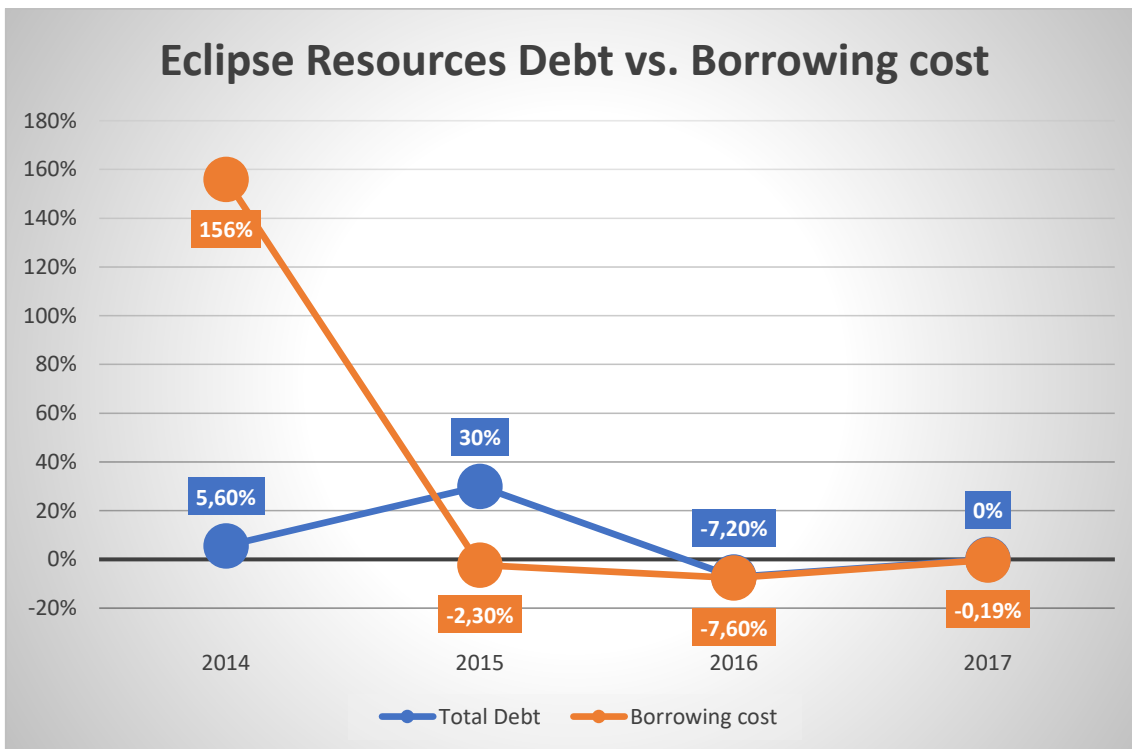
Figure 6-5: Anadarko Petroleum total debt vs. borrowing cost



Source:

Composed by author on the base of data from company's AR 2013-2017

Figure 6-6: Eclipse Resources total debt vs. borrowing cost



Source:

Source: composed by author on the base of data from company's AR 2013-2017

In 2016 Eclipse Resources experienced reduction in total debt, since the company was not able to access adequate funding. It was a result of a decrease in borrowing base due to the issuance of new indebtedness, the outcome of a subsequent borrowing base redetermination, unwillingness of the lenders to increase their aggregate commitment up to an increased borrowing base amount and deterioration of credit ratings. The borrowing base is a limit for loan amount against the offered collateral. In addition, lower borrowing base was dictated by the decline in commodity prices, which also explains the determination of the firm to keep the same borrowing base in 2017. The decrease of borrowing base implies some risk for Eclipse Resources, because the company is required to repay any debt in excess of the adjusted borrowing base. As a result, it may be unable to implement the drilling and development plan, make acquisitions or otherwise carry out business plans, which would have a material adverse effect on the overall financial condition and results of operations and impair the company's ability to service its indebtedness (Eclipse Resources, AR 2016,2017).

The same tendency was inherent to Anadarko Petroleum in 2016. As a result of Moody's below-investment-grade rating of the long-term debt in February 2016, the company's credit thresholds with certain derivative counterparties were reduced and, in some cases, eliminated, which required the company to increase the amount of collateral (Anadarko Petroleum AR 2016).

We can conclude that the period of oil price shock resulted in significant increase in gearing levels for most of the US independent shale companies. They relied on the debt rather than equity as the main source of financing. The years with highest values for borrowings coincided with the periods of lowest oil prices. Low LIBOR positively affected the relative stability of interest expenses of companies in the whole shale oil industry.

6.4 Free Cash Flows

Free cash flows (FCF) of the firm represent the cash flows created by the firm within its operating activities, adjusted to investment in capital and change in working capital. FCF includes cash flows available to both equity and debt holders. It is a very important indicator of financial stability of any company, since FCF are used to finance future growth and operations, execution of new programs, debt repayment and so on.

The most significant market risk influencing cash flows from operations, as well as revenues and operating results, is the volatility of oil, natural gas and NGLs prices. The prolonged decline of commodities prices leads to significant revenue loss, deficit of FCF and struggling with financial

commitments. This kind of risk can be partially eliminated by entering into commodities derivatives (Anadarko Petroleum, AR 2016).

Moreover, the FCF values are subject to such variable factors as actual and estimated production, effects of government regulations, including changes in tax rate and interest rates, reorganization of capital expenditures, change in relative value of US dollar etc.

We summarized the results of our FCF calculations for Anadarko Petroleum and Eclipse Resources in the Table 6.10.

Table 6-10: Anadarko Petroleum and Eclipse Resources free cash flows

	2013	2014	2015	2016	2017
In million \$	Anadarko Petroleum				
Net income (after tax)	941	(1563)	(6812)	(2808)	(211)
Interest (after tax)	445.9	501.8	536.25	578.5	605.8
NOPAT	1386.9	(1061.2)	(6275.5)	(2229.5)	394.8
Depreciation	4550	3927	4603	4301	4279
ΔWorking Capital	(1396)	(418)	(1186)	2137	918
CAPEX	8523	9256	5888	3314	5300
FCFF	(2586.1)	(5972.2)	(6374.5)	(3379.5)	(1544.2)
FCFE	(2744)	(4960)	(6250.8)	(4528)	(1770)
	Eclipse Resources				
Net income (after tax)	(43.5)	(183.2)	(971.4)	(203.8)	8.5
Interest (after tax)	13.6	31.5	34.7	33.0	32.2
NOPAT	(29.9)	(214.7)	(936.7)	(170.8)	40.7
Depreciation	6	93	245	93	119
ΔWorking Capital	43	(73.3)	155.5	118.9	(42.5)
CAPEX	250	731	475.7	167.4	291.8
FCFF	(316.9)	(779.4)	(1322.9)	(364.1)	(89.6)
FCFE	N/A	(788.4)	(1230.1)	(436.6)	(21.8)

Source: Composed by author on the base of calculation performed using data from companies' AR 2013-2017

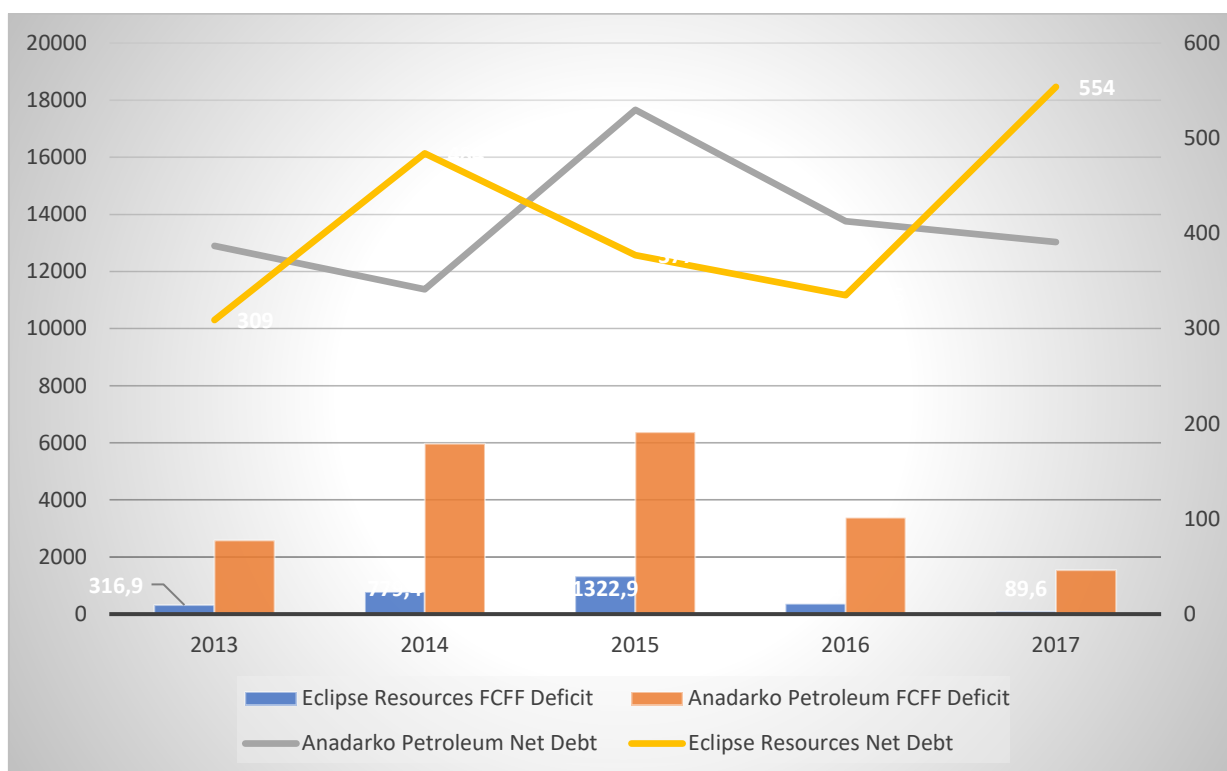
In the past five years the free cash flows of both companies have been negative. It means that cash inflows coming primarily from operating activities were lower than cash outflows needed to fund capital expenditures, debt obligations, dividend payments and operational programs.

The operating income and cash flows of the E&P companies are largely dependent on the commodities prices which are one of the risk factors for the firms. The prices for oil, natural gas and NGLs fluctuated widely in the last five years, experiencing significant decrease in 2014 to 2016 years, leading to quite important loss in revenues. The plunge of commodities prices is mirrored in the most negative values of free cash flows for Anadarko Petroleum and Eclipse resources in these years. The deficit of FCFE of Anadarko Petroleum and Eclipse Resources in 2015 lies at more than 6 billion US dollars and 1 billion US dollars respectively.

The fund of growth project and general maintenance in the situation of cash flows outspending can be realized through capital expenditures reduction, dividend payments reduction, asset divestitures and new debt intake. In the period of 2005-2015 years the US E&P companies, having the access to low-cost debt, financed their growth and operational activities mostly by new debt issuance rather than equity transactions, leading to unbalanced capital structure, which is reflected by quite high debt-to-equity ratios presented earlier (see Table 6.7).

If we look at the Figure 6.7 we can notice that in 2016, when the FCFE deficit of Anadarko Petroleum reached its maximum, the net debt of the company increased from 11 376 million USD to 17 662 million USD or by more than 50%. The same trend is noticed in 2014 and 2015 for Eclipse Resources, having at this time steadily raising total borrowings.

Figure 6-7: Anadarko Petroleum and Eclipse Resources FCFF deficit vs. net debt



Source: Composed by author in the base of data from companies' AR 2013-2017

In general, the scope of operations of US shale producers is smaller, compared to conventional oil producers, which implies that shale companies often struggle with producing enough cash flows to cover investment needs. That's why one of the main financial characteristics of the independent E&P firms is negative cash flows, paired with high leverage levels (Dale, 2015, p.11).

The level of impact of negative cash flows is often determined by the life-cycle stage of the E&P firms. Young companies, such as Eclipse Resources, are more contingent on the situation when the earnings and generated cash flows are negative. Lower cash reserves combined with significant capital expenditures and reinvestments can lead to financial distress. (Damodaran, 2012, p. 318).

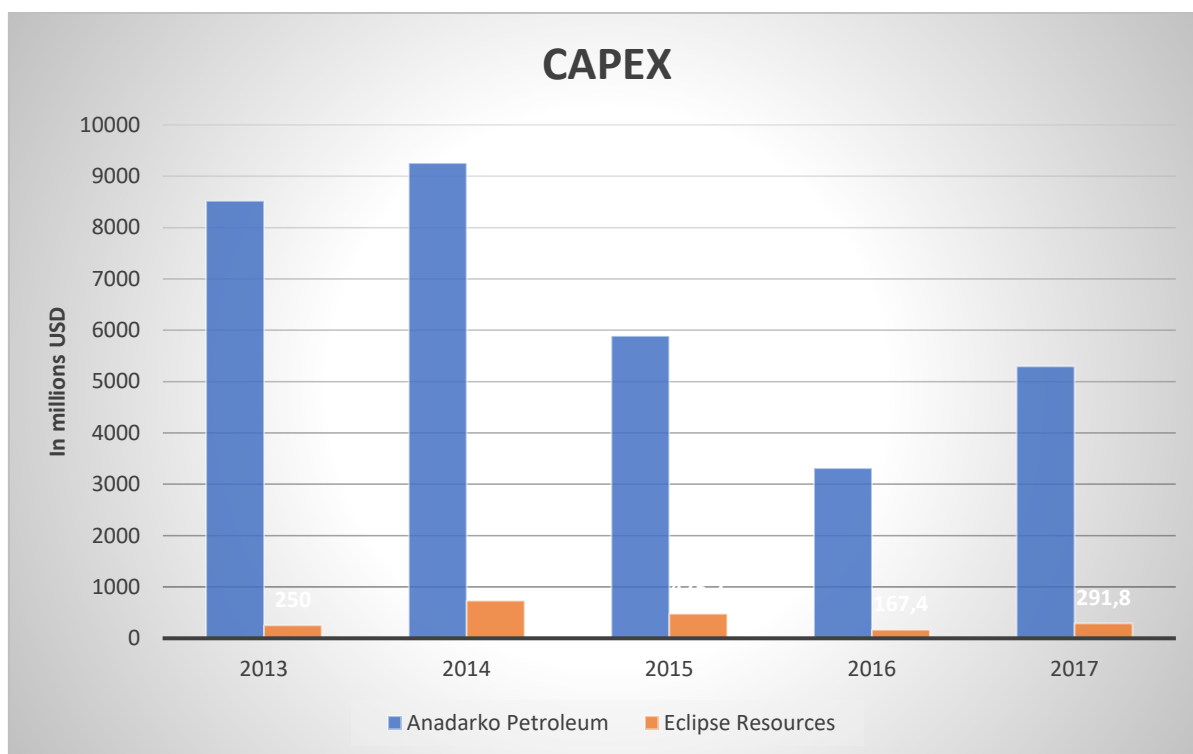
The decisive factor in this respect for the whole shale oil industry in US is the availability of additional capital, equity or debt, helping to meet the companies' financing needs. As our analysis proved, the external financing is thus the mode of survival for the most US E&P companies, regardless of the companies' size or life-cycle stage.

Let's look on other factors impacting the cash flows of the studied companies.

6.4.1. CAPEX reduction

Let's look at the CAPEX change in the same period. The common capital expenditures of Anadarko Petroleum and Eclipse Resources include property acquisitions, exploration and development expenditures, gathering and processing of oil and natural gas, marketing etc. The reduction of realized commodities prices resulted in the decrease of capital spending:

Figure 6-8: Anadarko Petroleum and Eclipse Resources CAPEX



Source: Composed by author in the base of data from companies' AR 2013-2017

In 2015 the capital spending of Anadarko Petroleum decreased by 36% due to reduced development and exploration activities, which lead to decreased development costs in the Rockies and Appalachian regions, lower exploration costs in Appalachian and Gulf of Mexico regions, lower expenditures for plants. In 2016 the aim of the firm in accordance with CAPEX reduction program, initiated as the response to the commodities prices decline, was to reduce capital spending by 50%. As the result the CAPEX was reduced by 44%. (Anadarko Petroleum AR 2015,2016). As for Eclipse Resources, its capital expenditures were reduced by 34.9% and 64.8% in 2015 and 2016 years respectively. The reduction was a result of lower realized commodities prices and was mostly accomplished by mitigation of development and acquisition of oil and natural gas reserves (Eclipse Resources AR 2015,2016).

6.4.2. Dividend Policy and Assets Divestitures

The dividend to common stockholders of Anadarko Petroleum were subject to a sharp decline in 2016 year from 553 million USD to 105 million USD. The dividend policy of Eclipse Resources doesn't imply the repayment of cash dividend on common stock starting from its inception. The aim is to retain earnings for financing the business growth and development. In addition, the firm's credit agreement puts certain restrictions on its ability to pay dividends.

The table 6.11 summarizes the gain/losses from asset divestiture for two companies:

Table 6-11: Gain/loss from the sale of assets

	2013	2014	2015	2016	2017
In million USD	Anadarko				
	Petroleum				
Gain/loss on asset divestitures	(470)	1891	(1022)	(757)	674
	Eclipse				
	Resources				
Gain/loss on asset divestitures	N/A	(0.96)	(4.7)	6.9	(0.179)

Source: Composed by author on the base of data from companies' AR 2013-2017

6.5 Summary Financial Analysis

The aim of the financial analysis performed in this chapter was to evaluate the financial position of two different exploration and production companies: mature and big-size Anadarko Petroleum and young small-size Eclipse Resources. The points of interest were profitability metrics, debt and leverage and cash flows.

The sharp oil price decline since mid-2014, resulting from the shift in OPEC policy and rapid growth of the oil supply, entailed the downward movement of other commodities prices, such as natural gas and NGLs. Anadarko Petroleum and Eclipse Resources, like other US E&P companies, having large production costs from expensive and capital-intensive drilling operations, experienced significant shift in the oil-related income. Starting from 2014 the revenue of both companies was reduced on the essence leading to net loss between 2014-2017 years. The loss incurred by the firms mirrors the drop in oil price from 120 USD to 45-55 USD in the same period.

The profitability indicators were affected by commodities price fluctuations as well, reflecting the companies' difficulties with generating earnings above the operational costs. The return on assets ratios of both companies reached negative values in the period between 2014 and 2016 years, meaning that Eclipse Resources and Anadarko Petroleum capital investments exceeded the income from operations. The EBITDA parameters are also very dependent on the change in oil prices and showed the tendency to move in the same direction with the price. Thus, EBITDA values started to decline in 2014 and became negative in 2015.

Despite the loss in the total revenue, the production volumes of Anadarko Petroleum remained stable in the period of oil price reduction. At the same time the production volumes of Eclipse Resources increased by more than 500% in 2014 and more than 200% in 2015. The production growth became possible with the increase of total leverage of the E&P firms which financed further exploration and drilling programs and operations, as a compensation for the loss in earnings. The total debt of Anadarko Petroleum and Eclipse Resources was steadily increasing between 2014 and 2016 years and started to decline in 2016, which is linked to the credit ratings downgrade by Moody's of both companies. Nevertheless, the growth in total debt outpaced the increase in the borrowing cost of companies, which signifies that the average interest rates proposed by the Fed were quite low and were relatively stable. For instance, the aggregate interest rates for the last five years for Anadarko Petroleum and Eclipse Resources were 6.45% and 9.78% respectively. Eclipse Resources, being a new-created and small developing company with quite high level of leverage, was rated below-investment grade and had less favourable borrowing conditions compared to Anadarko Petroleum, which resulted in reduction of total borrowing base of the company and higher interest rates on debt outstanding.

The period of the last five years for Anadarko Petroleum and Eclipse Resources was characterized by the deficit in free cash flows with the peak between 2014 and 2016 years, reflecting the plunge of commodities prices. According to the results of our research in chapter 5, the years with the maximum cash flows deficit of the companies coincide with the obvious increase in the amount of net debt. It leads us to the conclusion that the cash flows outspending was mostly compensated by the issuance of additional financial obligations and old debt refinancing, which together with the reduction of capital expenditures started in 2015-2016, made possible the further development of operational projects of exploration and drilling and helped the firms to get through the period oil price shock.

The analysis performed gives us the base for further research concerning the sensitivity of financial metrics of Anadarko Petroleum and Eclipse Resources on the change of such factors as oil price and the US Fed Funds interest rates.

7. Sensitivity Analysis

The last five years was the period of important volatility in commodities prices. The crude oil price being almost 120 USD in 2013 fell to almost 30USD in 2015 and remained under 70 USD until 2017. This fact negatively affected the financial position of all E&P companies in the US, their financial ratios and cash flows. The US Federal Reserve effective interest rates was only 0.25% in 2013-2016. The increase in federal funds target rates started in 2016 and between 2017 and 2018 it raised from 1% to 1.25-1.5%. The Fed estimates that the rate will be around 2.7% at the end of 2019 (USA Today, 2018). The access to low-cost debt financing helped the E&P companies to survive in the period of plunge in oil prices, while they incurred significant losses.

The risks and uncertainties which the E&P companies can be subject to include but are not limited to:

- conditions of energy markets
- production and sales volumes levels
- levels of oil, natural gas and NGLs reserves
- competitive conditions
- technology
- levels of capital expenditures
- supply/demand for oil, natural gas and NGLs
- the price if oil, natural gas and NGLs
- interest rates risk
- inflation
- weather
- general economic conditions
- legislative and regulatory levels

All the financial metrics can vary over time if some independent variables change.

The variables we would like to research in this chapter are: oil price and interest rates. It is interesting in this respect to look at the situation where interest rates suddenly increase or the oil price experiences further fluctuations. We would like to test the dependence of some financial indicators such as net income and free cash flows by setting different values for oil price and interest rates. The method we will use in the determination of the level of impact of variables in question on cash flows and net income of Anadarko Petroleum and Eclipse Resources is sensitivity analysis. The sensitivity analysis implies varying forecast of different independent

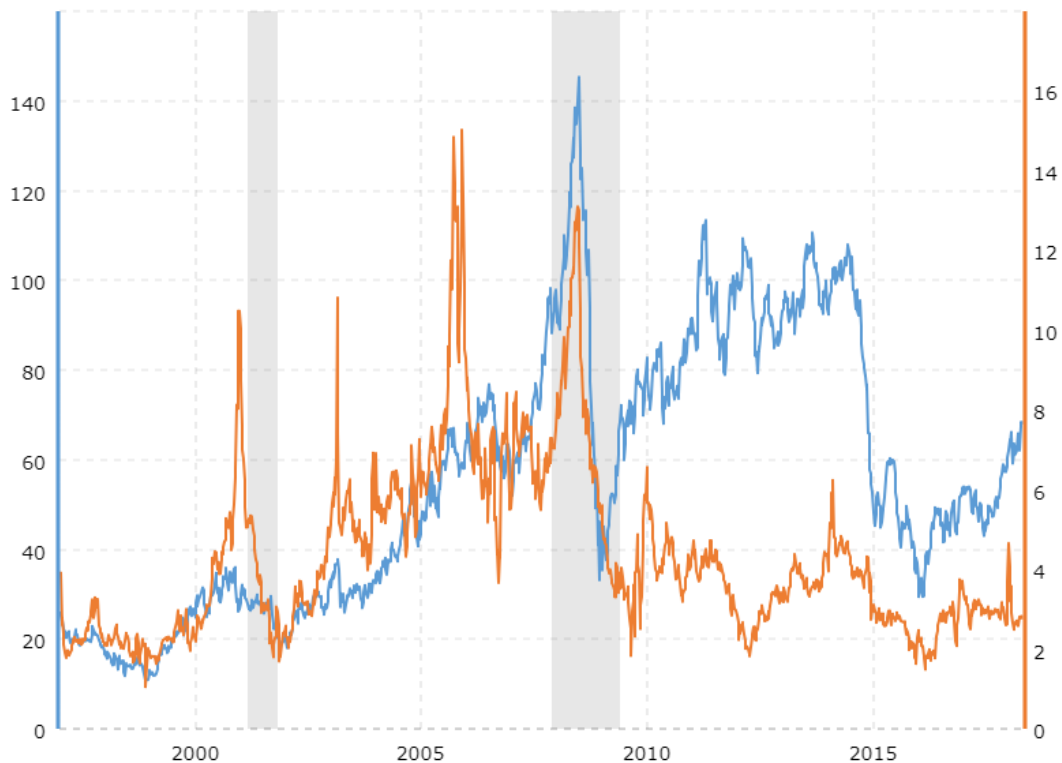
factors and observing the influence on the financial parameters (Penman, 2013, p.491). The sensitivity analysis will help us to determine which factors are the most influential and are able cause actual results to differ from the expectations and to make forecasts for the future.

7.1 Change in Oil Price

The average oil price realized by Anadarko Petroleum and Eclipse Resources in 2017 was 50.79 USD and 46.14 USD respectively. The average natural gas price was 2.82 USD for Anadarko Petroleum and 2.34 USD for Eclipse Resources and the average price for NGLs was 29.69 USD and 21.96 USD respectively. The difference in prices realized by the E&P firms can be explained by various commodities grades and types of contracts. The oil prices realized by Anadarko Petroleum and Eclipse Resources in 2017 will be used as the reference prices in our analysis. The reference values for net income and free cash flows are presented by the numbers from 2017 as well.

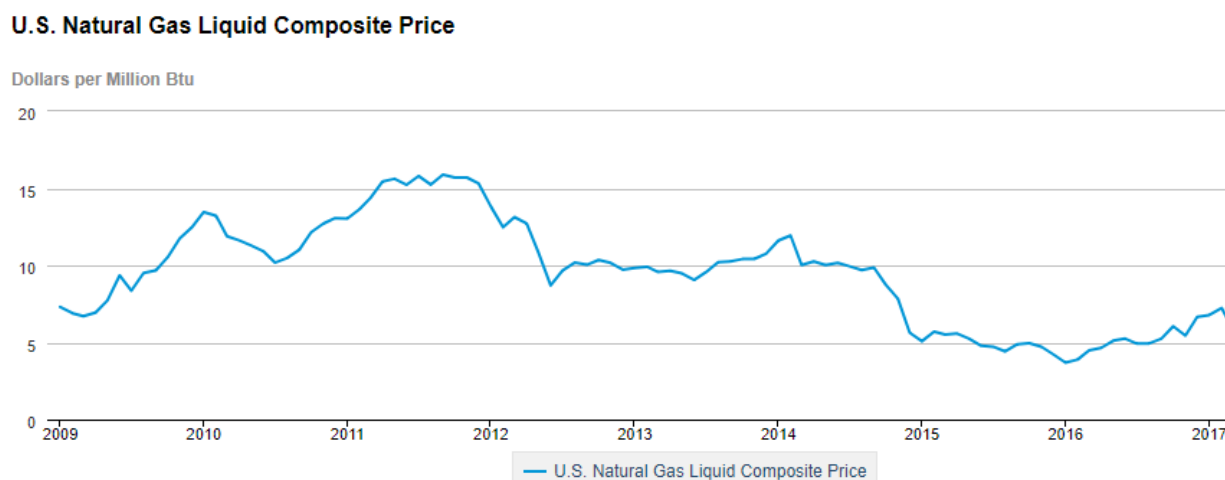
While studying the impact of the change in oil prices in financial parameters of the companies it is important to understand in what extend the oil prices are correlated to other commodities prices, as natural gas and natural gas liquids, which are the part of firms' sales. The Figure 7.1. and 7.2. demonstrate the historical spot prices for oil, natural gas and NGLs for the past decade.

Figure 7-1: Historical oil prices vs. natural gas prices



Source: Macrotrends, Historical Charts, 2018

Figure 7-2: Historical NGLs prices



Source: US Energy Information Administration, 2018

As we can see from the graphs the commodities prices not always move together. The oil and natural gas prices follow quite same pattern between 2005 and 2010 years, but after 2010 in some periods the fall in oil price coincides with the increase in natural gas price and vice versa, that indicates that the correlation between oil price and natural gas price is not constantly positive. What concerns NGLs price it is positively correlated with oil price, but the amplitude of the volatility is much greater for NGLs price than for oil price or natural gas price. Taking into account these facts, we decided to keep natural gas and natural gas liquids prices constant in order to isolate the influence of the oil price fluctuations.

The results of our forecasts for Anadarko Petroleum and Eclipse Resources are presented in Table 7.1. and Table 7.2. We used the interval in oil prices between -30% and +30%. You can see Appendix 1 and Appendix 2 for more details.

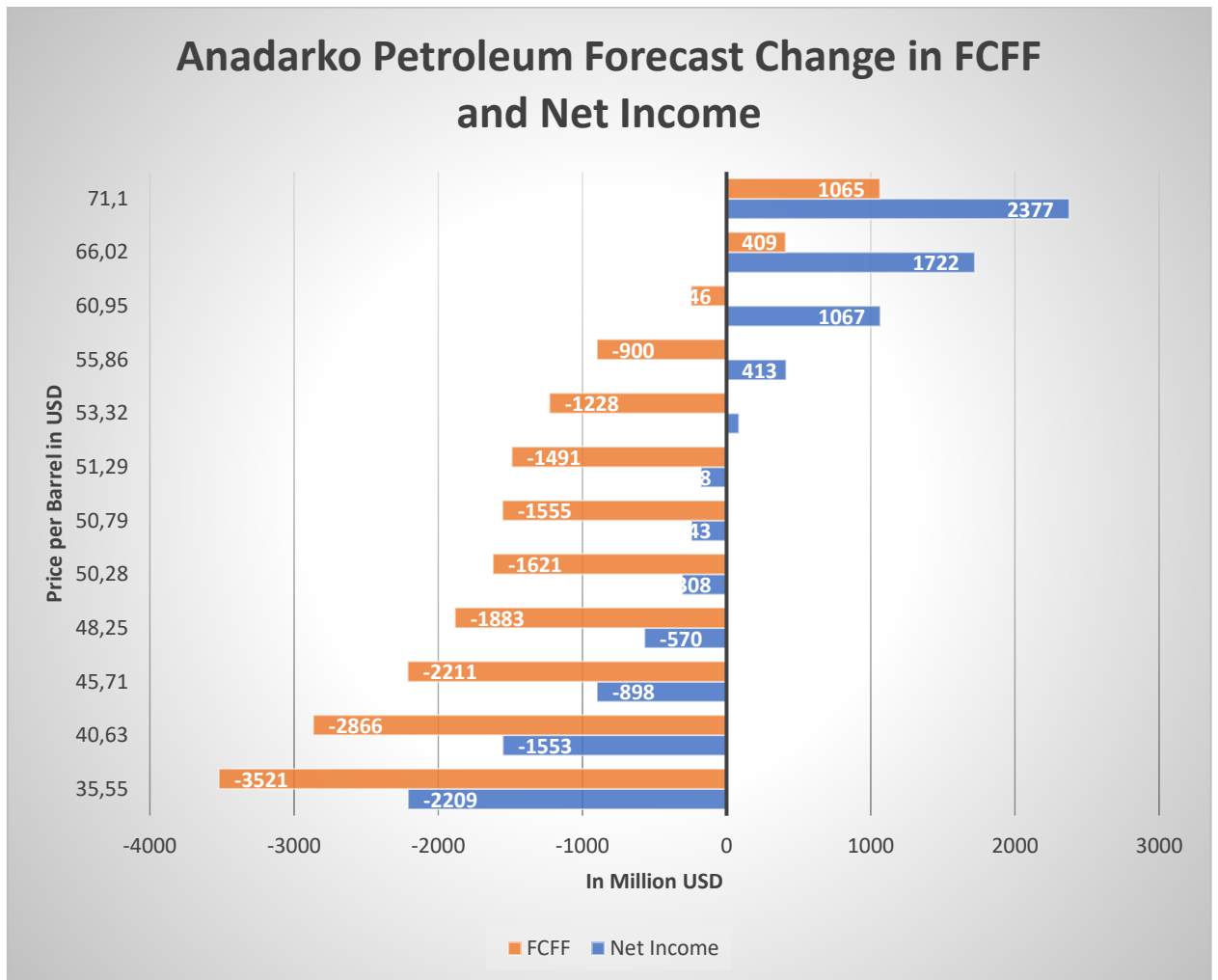
Table 7-1: The sensitivity of net income and FCFF with the change of oil prices for Anadarko Petroleum in million USD

Change in oil price	Net Income	FCFF
%		
+30%	1722	409
+20%	1067	-246
+10%	413	-900
+5%	85	-1228
+1%	-178	-1491
Reference value	-243	-1555
(50,79USD)		
-1%	-308	-1621
-5%	-570	-1883
-10%	-898	-2211
-20%	-1553	-2866
-30%	-2209	-3521

Source: Composed by authors.

The Figure 7.3. and Figure 7.4. illustrate the dependence of net income and free cash flows of Anadarko Petroleum and Eclipse Resources of the change in oil price.

Figure 7-3: Anadarko Petroleum forecast change in FCFF and net income with the change of oil price



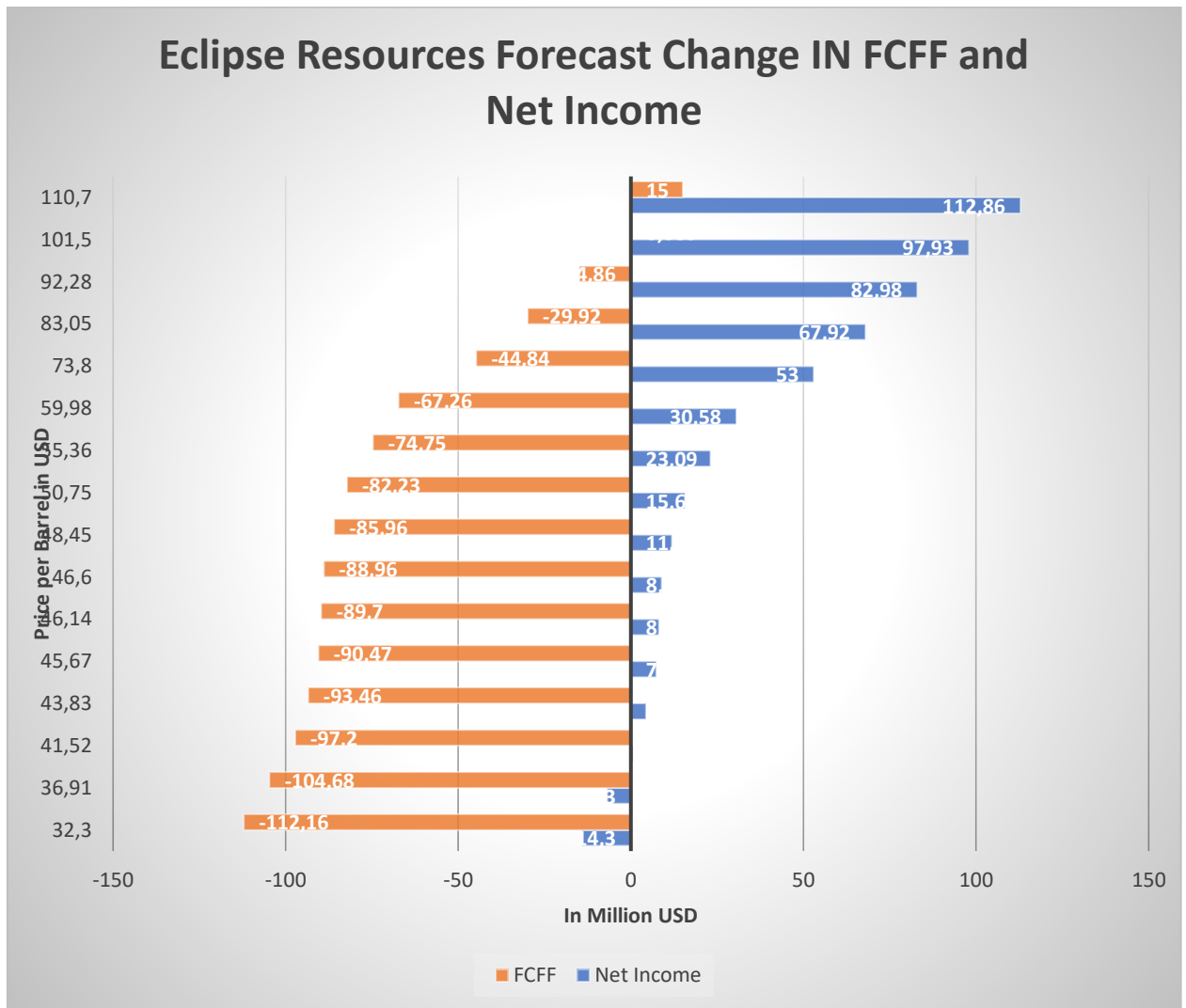
Source: Composed on the base of authors own calculations

Table 7-2: The sensitivity of net income and FCFF with the change of oil prices for Eclipse Resources

Change in oil price	Net Income	FCFF
%		
+120%	97.93	0.085
+30%	30.59	-67.26
+20%	23.09	-74.75
+10%	15.62	-82.23
+5%	11.89	-85.96
+1%	8.88	-88.96
Reference value	8.13	-89.7
(46,14USD)		
-1%	7.37	-90.47
-5%	4.39	-93.46
-10%	0.64	-97.2
-20%	-6.83	-104.68
-30%	-14.3	-112.16

Source: Composed by authors.

Figure 7-4: Eclipse Resources forecast change in FCFF and net income with the change of oil price



Source: Composed on the base of authors own calculations

The calculations performed show that the percentage change in oil price leads to the much greater change in both net income and FCFF for Anadarko Petroleum. For instance, the 10% increase in oil price with regard to reference value results in 269% increase in net income and 42% positive change in free cash flows values. The same price movement gives 92% increase in net income for Anadarko Petroleum, but only 8.3% increase in free cash flows values. It can account for the fact that the important part of sales volumes of the company is presented by sales of oil as well as natural gas sales and the ineffective capex reduction program which resulted in quite high capital costs compared to the net income.

The break-even price is 41\$ for Eclipse Resources and 52\$ for Anadarko Petroleum. On the one hand, it can be explained by the much higher operating expenses incurred by Anadarko Petroleum, having larger reserves, large-scope exploration and production programs. On the

other hand, the productivity per well is higher for small-size Eclipse Resources than for Anadarko Petroleum. The average daily production per well for Anadarko Petroleum is 1638,5 barrels and for Eclipse Resources is 2071,7 barrels. At the same time, Anadarko Petroleum, operating 379 productive wells in 2017, compared to 25 wells exploited by Eclipse Resources, incurred much higher operating expenses to maintain wells, related equipment, supporting facilities, including cost of labor, well service and repair, location maintenance, gathering, processing and transportation (Anadarko Petroleum, Eclipse Resources, Annual Reports 2017).

We can conclude that the net income of both companies and free cash flows values of Anadarko Petroleum are very sensitive with regard to the change in oil price. At the same time the free cash flows of Eclipse Resources are less responsive to the oil price fluctuations.

Thus, the US independent E&P companies are likely to be quite responsive to the commodities price fluctuations. The sensitivity level depends on the operational scope, the amount of capital expenditures and productivity gains.

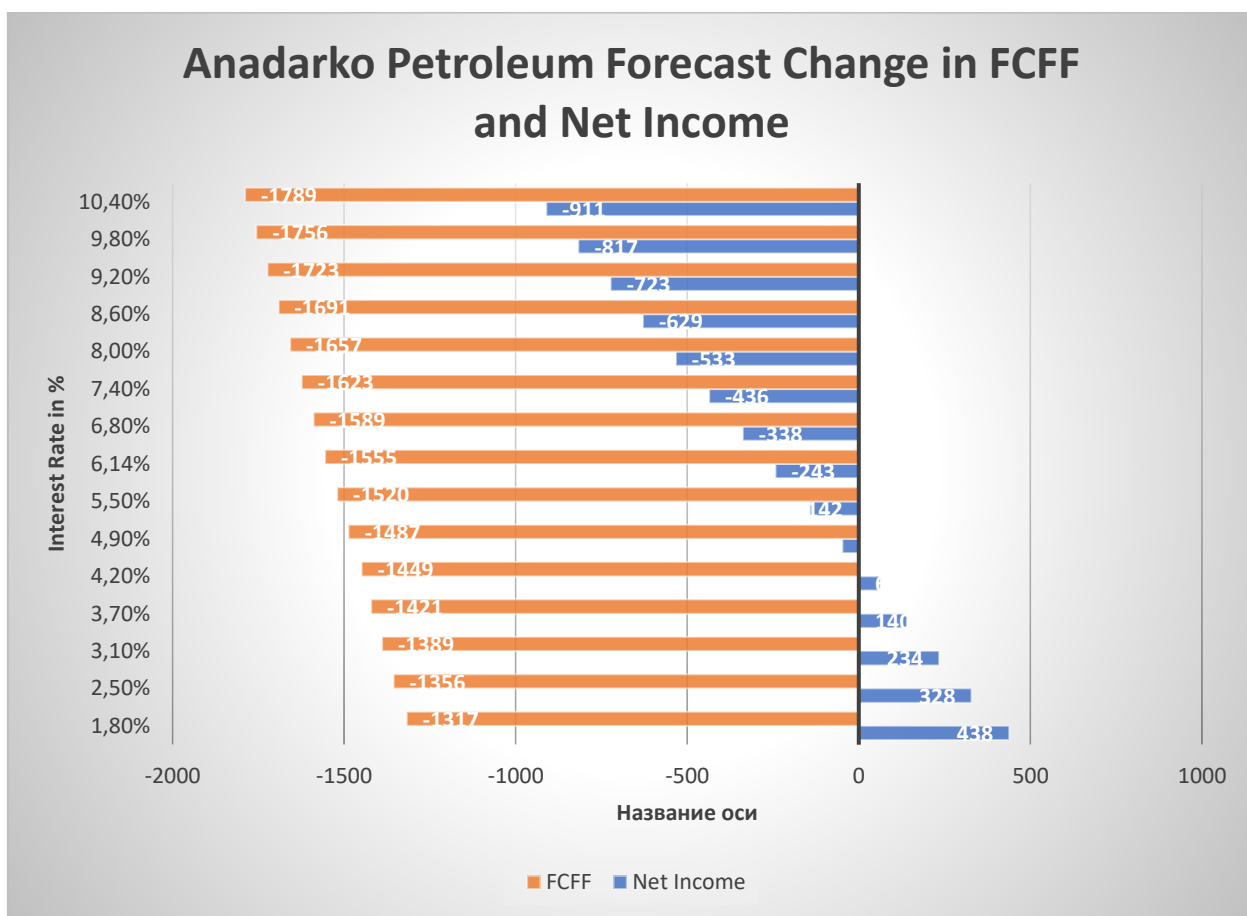
7.2 Change in Interest Rate

The financial position of many E&P companies depends on the current level of interest rates and especially in the circumstances of low oil price. The interest rate of Anadarko Petroleum and Eclipse Resources is composed of LIBOR interest rate and the companies' risk premiums, reflecting their credit rating position. The average LIBOR interest rate started to increase in 2016 and averaged to 1% in 2017. The growing demand for low-cost debt can lead to the further increase in both the Fed's interest rate and credit ratings spread for the E&P companies, leading to the higher overall borrowing cost and the firms' cost of capital.

The weighted average interest rate on secured and unsecured notes for Anadarko Petroleum and Eclipse Resources for the last five years was 6.14% and 9.78% respectively. These numbers will be used as the reference values in our analysis. We will use the interval from -70% to +70% change in the total companies' interest rate.

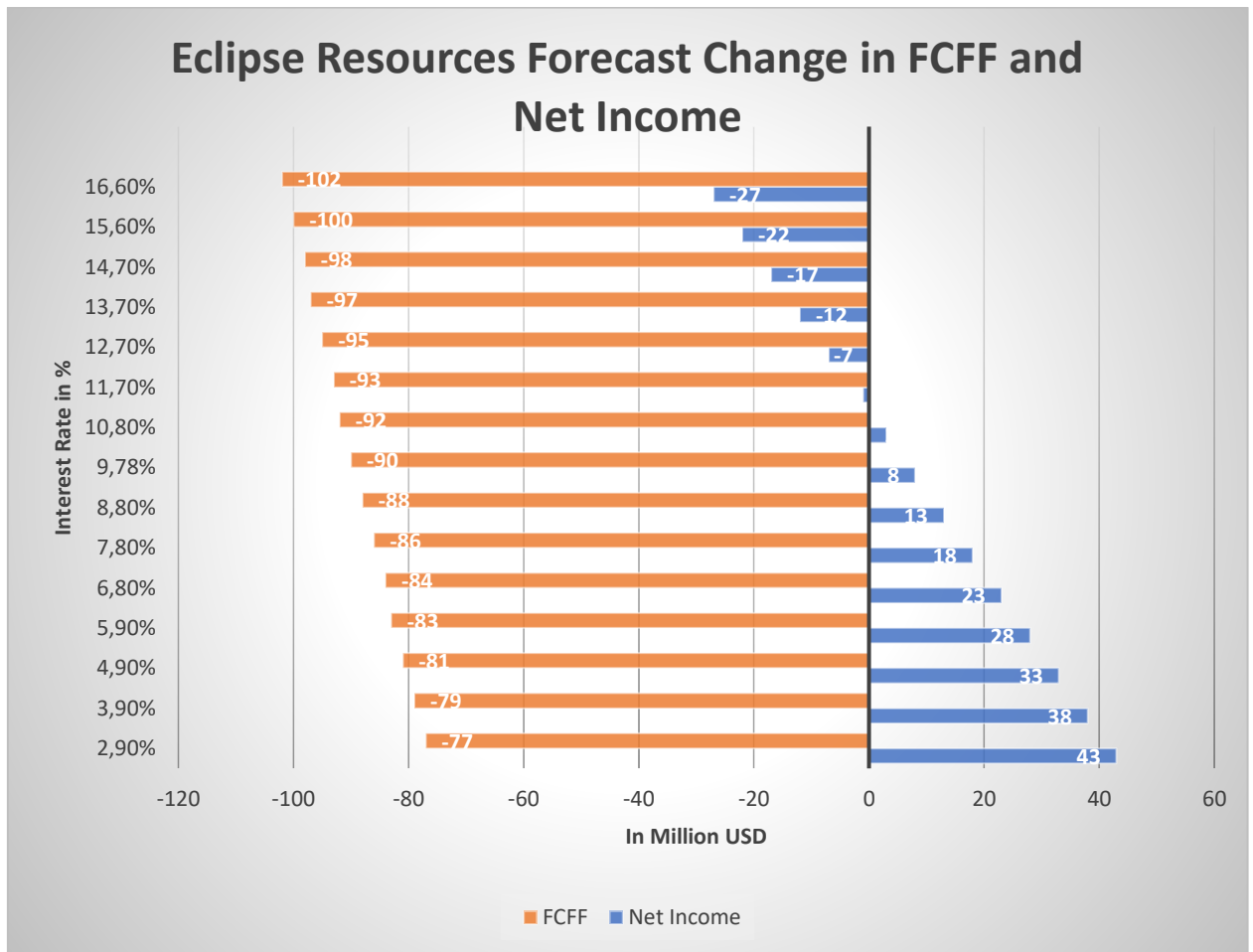
The results of our sensitivity analysis are presented in the Figure 7.5. and the Figure 7.6.

Figure 7-5: Anadarko Petroleum forecast change in FCFF and net income with the change of interest rate



Source: Composed on the base of authors own calculations

Figure 7-6: Eclipse Resources forecast change in FCFF and net income with the change of interest rate



Source: Composed on the base of authors own calculations

The calculations performed showed that the companies’ net income is vulnerable to the increase in interest rate. For example, the 30% raise in interest expenses results in 119% reduction in net income for Anadarko Petroleum and 186% reduction in net income for Eclipse Resources. At the same time higher borrowing cost leads to the more significant free cash flows deficit.

Higher cost of debt can induce difficulties with debt refinancing, further reduction of borrowing base, struggling with capital expenditures funding and probable credit rating downgrade. The effect of interest rate increase is linked to the oil price change. In the circumstances of low oil price and reduced revenues, the higher interest rates can become unsustainable for some E&P companies and even lead to the bankruptcy. The graduate increase of cost of debt can be wiped out by the commodities price growth. For instance, within the 50% increase in interest rate the break-even oil price for Anadarko Petroleum raise to 57 USD per barrel. The same change in interest rate for Eclipse Resources moves the break-even oil price to the level of 57 USD as well.

The same break-even price can be explained by the higher initial cost of debt for Eclipse Resources.

The highly-levered firms as the E&P companies in question are quite sensitive to the interest rate fluctuations. For small-size companies with worse borrowing conditions the change in interest rate can be a crucial point.

We consider the sensitivity analysis to be an effective tool for researching the influence of the variability of independent factors on the parameters in question, which is relatively easy to implement. But it is unrealistic to believe that the development of financial and economic circumstances in the shale oil sector will lead to the shift in single variables, such as oil price or interest rate, rather than the simultaneous or gradual series of changes in multiple indicators.

8. Conclusions and Discussions

The US Shale boom has had a determinative impact on the situation within oil and gas industry and market. The shift in the world supply-demand equilibrium, provoked by the development of shale oil production, lead to the steep fall in oil, gas and natural gas liquids prices. This kind of price shock was mirrored in the financial position of all the companies operating in the oil and gas industry.

In our master thesis we wanted to show how exactly the main financial indicators, such as profitability and leverage ratios, was affected by the latest perturbations in the oil and gas world. By analysing two fundamentally different US exploration and production companies, big-size Anadarko Petroleum and relatively young and small-size Eclipse Resources we tried to show which methods the US Shale firms exploited to overcome the low oil price period and identify the patterns which are characteristic for the whole oil and gas sector, to determine the extent of dependence of companies' functioning and performance on such factors, as commodities prices volatility and availability of operations financing through debt intake.

The financial analysis of two companies was aimed toward evaluating their overall financial health, their performance and stability, by examining main profitability, solvency, liquidity and leverage metrics in the period of the last 5 years, translating the impact of the last trends in the oil and gas industry. The research showed that the main profitability measures decreased significantly reaching negative values between 2014 and 2016 years. The profitability indicators were impacted by the commodities price fall and reflected the problems with generating revenues in excess of the large operational expenses incurred by the E&P firms, which resulted in the constant net loss between 2014 and 2016 years. At the same time the overall strategy of Anadarko Pteroleum and Eclipse Resources, despite the significant loss in revenues, was to increase production, undertake new wells exploration programs, enlarge drilling and production operations, regardless of the oil price. The leverage ratios raised in their turn. The 2014-2017 years is the period of the strong demand for debt. The total debt of the firms increased from year to year or remained on the relatively high level. Nevertheless, the borrowing cost raised much slower, signifying that interest rates on the debt was quite low. The level of indebtedness of the firms is directly related to their free cash flows generation. The analysis indicated that the years with the strongest free cash flows deficit coincided with the largest increases in the total debt of both Anadarko Petroleum and Eclipse Resources. The issue of new debt was necessary for maintaining operational and financial activities.

In addition, in our work we performed the sensitivity check of Anadarko Petroleum and Eclipse Resources net income and free cash flows with regard to the change in oil price and interest rates, including both the rate, established by the Federal Reserves and the specific companies' risk premium. The sensitivity analysis showed that both companies are quite sensitive to the change of commodities prices. The break-even oil price differs for two companies, depending not only on the firm's size or the growth of sales volumes, but also on the effectivity of production per well. The change in interest rate is a quite influential factor as well. The effect of the interest rate volatility is stronger for the companies with the below-investment grade credit rating and can be wiped out by the adequate shift in oil price.

Our research focused on two different US Shale companies proved the development of some trends in the oil and gas industry, driven by the major changes in shale oil sector, which influenced the financial position of exploration and production companies in the US and other countries. Our analysis can be useful as an informative and comparative tool for the further studies, for establishing future time patterns for selected companies or for the whole industry.

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Appendix 1 - Sensitivity Check Model Anadarko Petroleum

Anadarko Petroleum FCFF forecast based on the reference values of 2017 year

The model includes two variables: interest rate and oil price, other parameters being constant

Average oil price realized per Bbl	Sales volume
50,79 USD	129 MMBbls
Average natural gas price realized per Mcf	
2,82 USD	478 Bcf
Average NGLs price realized per Bbl	
29,69 USD	36 MMBbls

Average interest rate on total debt	Total debt
6,14%	15689 MUSD

Effective tax rate
0,35

Sensitivity Checks - All values are in Million USD

Oil sales	6551,91
Natural gas	1347,96
NGLs	1068,84
Gathering processing,marketing sales	2000
Gain/Loss on divestitures	939
Total Revenue	11907,71
Oil and gas operating costs total	7090
Depreciation and Amortization	4279
Impairments and other expenses	1211
Operating and other expenses total	12580
Operating Income/Loss	-672,29
Interest expenses	963
Other Income (Expenses), net	84
Total Other Expenses	1047
Tax Expense/Benefit	-1477
Net Income	-243
Interest expenses (1-t)	626,14799
Depreciation	4279
Change in WC	918
CAPEX	5300
FCFF	-1555

Appendix 2 - Sensitivity Check Model Eclipse Resources

Eclipse Resources FCFF forecast based on the reference values of 2017 year

The model includes two variables: interest rate and oil price, other parameters being constant

Average oil price per Bbl	Sales volume
46,14 USD	1,622 MBbls
Average natural gas price per Mcf	
2,34 USD	87,41 Bcf
Average NGLs price per Bbl	
21,96 USD	2,713 MBbls
Average interest rate on total debt	Total debt
0,0978	510,5 MUSD
Effective tax rate	
0,35	

Sensitivity Checks - All values are in Million USD

Oil sales	74,83908
Natural gas	204,5394
NGLs	59,57748
Gathering processing,marketing sales	44,7
Gain/Loss on divestitures	N/A
Total Revenue	383,65596
Oil and gas operating costs total	
Depreciation and Amortization	
Impairments and other expenses	
Operating and other expenses total	370,99
Operating Income/Loss	12,66596
Interest expenses	49,9269
Other Income (Expenses), net	45,4
Total Other Expenses	4,5269
Tax Expense/Benefit	-
Net Income	8,13906
Interest expenses (1-t)	32,452485
Depreciation	119
Change in WC	-42,5
CAPEX	291,8
FCFF	-89,708455

Appendix 3 - Anadarko Petroleum Proved Reserves for 2015-2017 years

	Oil (MMBbls)	Natural Gas (Bcf)	NGLs (MMBbls)	Total (MMBOE)
December 2017				
Developed				
United States	361	2640	176	977
International	136	24	10	150
Undeveloped				
United States	140	553	56	288
International	21	13	1	24
Total proved reserve 2017	658	3230	243	1439
December 2016				
Developed				
United States	360	3637	193	1159
International	147	25	15	166
Undeveloped				
United States	181	726	75	383
International	14	-	-	14
Total proved reserve 2016	702	4424	283	1722
December 2015				
Developed				
United States	332	5184	257	1453
International	159	30	15	179
Undeveloped				
United States	193	807	68	396
International	29	-	-	29
Total proved reserve 2015	713	6021	340	2057

Appendix 4 - Eclipse Resources Proved Reserves for 2015-2017 years

	Oil (MMBbls)	Natural Gas (Bcf)	NGLs (MMBbls)	Total (MMBOE)
December 2017				
Developed	6.4	334.6	13.8	
Undeveloped	13	755.5	28.1	
Total proved reserve 2017	19.4	1090	41.9	243.1
December 2016				
Developed	4.4	226.1	7.5	
Undeveloped	0.72	160.4	1.2	
Total proved reserve 2016	5.2	386.4	8.7	78.2
December 2015				
Developed	4.2	209.5	7.3	
Undeveloped	0.45	64.5	0.5	
Total proved reserve 2015	4.7	274.1	7.8	58.1