

**Czech University of Life Sciences Prague**

**Faculty of Economics and Management**

**Department of Economics**



**Bachelor Thesis**

**Crude oil price fluctuations and their impact on economic  
performance - Case study of Saudi Arabia**

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**Supervisor: Ing. Jiří Mach, Ph.D.**

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# CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

## BACHELOR THESIS ASSIGNMENT

Kamil Maitah

Economics and Management

Thesis title

**Crude oil price fluctuations and their impact on performance – Case study of Saudi Arabia**

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### **Objectives of thesis**

In many countries crude oil plays crucial role and presents the main determinant of economic performance of these countries. Such an economy is the economy of Saudi Arabia. The main objective of this thesis is to analyze the impact of crude oil price volatility on the economic performance of Saudi Arabia. The thesis will investigate the links between oil prices and various macroeconomic and financial variables (mainly GDP) for Saudi Arabia.

### **Methodology**

The thesis will be divided into two parts. The first part will be theoretical and the second part will be analytical. To achieve its aims the thesis will mainly use descriptive and comparative methods. Time series analysis will be conducted for analyzing time series data in order to extract meaningful statistics and other characteristics of the data (mainly GDP data).

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**The proposed extent of the thesis**

40 – 60 pages

**Keywords**

price volatility, crude oil, GDP, Saudi Arabia

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**Recommended information sources**

- Borenstein, Severin (2008) Cost, Conflict and Climate: U.S. Challenges in the World Oil Market. University of California Energy Institut
- British Petroleum (BP) (2008) Statistical review of World Energy 2008
- Bureau of Labor Statistics (2009) Consumer Price Index History Table
- James D. Hamilton (2009) Understanding Crude Oil Prices, The Energy Journal, International Association for Energy Economics, vol. 30(2), pages 179-206
- Salvatore Carollo: Understanding Oil Prices: A Guide to What Drives the Price of Oil in Today's Markets Hardcover, 2011
- Twitchell, K. S. Jurji, Edward Jabra: Saudi Arabia, with an account of the development of its natural resource, 1947

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## **Declaration**

I declare that the diploma thesis on the topic: “**Crude oil price fluctuations and their impact on economic performance - Case study of Saudi Arabia**“ was written by me, by the help of specific literature and other sources which are included in the review of the used material, and by the help of consultations and advices with my supervisor Ing. Jiří Mach, Ph.D.

In Prague 14th of March 2016

Signature.....

## **Acknowledgement**

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# **Crude oil price fluctuations and their impact on economic performance - Case study of Saudi Arabia**

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## **Fluktuace ceny ropy a její vliv na výkon ekonomiky Saúdské Arábie**

### **Souhrn**

V mnoha zemích hraje ropa klíčovou roli a představuje hlavní faktor ekonomické výkonnosti. Takovou ekonomikou je i ekonomika Saúdské Arábie. Hlavním cílem této práce je provést analýzu dopadu fluktuace ceny ropy na ekonomickou výkonnost Saúdské Arábie. Práce je rozdělena do dvou částí. První část je teoretická a druhá analytická. K dosažení vytýčených cílů je v práci především použita regresivní analýza za účelem získání statistických a dalších charakteristických dat. V práci bylo zjištěno, že ropa má hraje významnou roli v ekonomice Saúdská Arábie. Ropa v této zemi určuje jak vnitřní ekonomický vývoj, tak i pozici země v mezinárodních ekonomických vztahů. Ze závislosti Saúdské Arábie na ropě vyplývá jak výhody, tak i zranitelnost této ekonomiky. To znamená, že jakákoliv fluktuace ceny nebo kvantity těžené ropy ovlivní mezinárodní ekonomické postavení země a její politický a socio-ekonomický vývoj. Saúdská Arábie představuje významnou zemi rozvojového světa a s ohledem na vysoké zásoby ropy a její těžby zaujímá nezastupitelné místo v globální ekonomice. Ropa též určuje význam Saúdské Arábie v geopolitických přístupech k významným světovým politickým a ekonomickým silám. Vzhledem k tomu, že ropa i nadále zůstane strategickým zdrojem energie a důležitou surovinou pro rozvoj chemického průmyslu v dohledné budoucnosti, Saúdská Arábie stojí v popředí politických a ekonomických zájmů všech hlavních center vyspělého světa.

**Klíčová slova:** cenová volatilita, ropa, HDP, Saúdská Arábie

## **Summary**

In many countries crude oil plays a crucial role and presents the main determinant of economic performance of these countries. Such an economy is the economy of Saudi Arabia. The main objective of this thesis is to analyze the impact of crude oil price volatility on the economic performance of Saudi Arabia. The thesis is divided into two parts. The first part is theoretical and the second part is analytical. To achieve its aims the thesis has mainly used regression analysis in order to extract meaningful statistics and other characteristics of the data. It has been found that crude oil has a dominant role in the economy of Saudi Arabia. It determines both internal economic development and its position in international economic relations. From this the advantages and vulnerabilities of the economy of this country emerge. This means that any fluctuation in price or quantity of extracted crude oil will affect the international economic position of this country and its political and socio-economic development. Saudi Arabia represents a significant country of the developing world. With regard to the high crude oil reserves and its extraction it occupies an irreplaceable place in the global economy. Crude oil also identifies its key importance in geopolitical approaches to major world political and economic forces. Given that crude oil will remain number one strategic source of energy and very important raw material for the development of the chemical industry for the foreseeable future, Saudi Arabia stands at the forefront of political and economic interests of all the major centers of the developed world.

**Keywords:** price volatility, crude oil, GDP, Saudi Arabia

# Table of contents

<b>INTRODUCTION .....</b>	<b>10</b>
<b>1. CRUDE OIL CHARACTERISTICS .....</b>	<b>12</b>
1.1. FORMATION OF CRUDE OIL .....	12
1.2. MEASUREMENT OF CRUDE OIL.....	13
1.3. CRUDE OIL DENSITY .....	13
1.4. SULFUR CONTENT IN CRUDE OIL .....	14
1.5. CRUDE OIL STANDARDS .....	15
1.6. EXTRACTION OF CRUDE OIL .....	16
<b>2. CRUDE OIL RESERVES, SUPPLY AND DEMAND .....</b>	<b>18</b>
2.1. CRUDE OIL WORLD RESERVES.....	18
2.2. PRODUCTION AND CONSUMPTION OF CRUDE OIL.....	22
2.3. THE WORLD'S MOST IMPORTANT CRUDE OIL FIELDS .....	23
2.3.1. Ghawar, Saudi Arabia .....	23
2.3.2. Burgan, Kuwait.....	24
2.3.3. Rumaila, Iraq.....	24
2.3.4. Bolivar, Venezuela.....	25
2.3.5. Cantarell, Mexico .....	25
<b>3. CRUDE OIL PRICE DEVELOPMENT AND ITS DETERMINANTS .....</b>	<b>27</b>
3.1. DETERMINANTS OF CRUDE OIL PRICE.....	27
3.1.1. The main consumers and producers .....	27
3.1.2. World's demand and supply.....	29
3.1.3. The foreign exchange rate of USD.....	30
3.2. OPEC POLICIES .....	30
3.2.1. OPEC basket price .....	32
3.2.2. Non-OPEC producers.....	33
3.3. CRUDE OIL PRICE SHOCKS.....	33
3.3.1. OPEC oil export embargo shock .....	34
3.3.2. The Iranian revolution shock.....	35
3.3.3. The Gulf War shock .....	36
3.3.4. Crude oil prices shocks after 2000.....	37
3.4. THE CURRENT INFLUENCE OF CRUDE OIL ON ITS PRODUCERS ECONOMIES.....	38
3.5. CRUDE OIL AND WORLD GDP .....	42



<b>4.</b>	<b>SAUDI ARABIA OVERVIEW.....</b>	<b>44</b>
4.1.	THE POLITICAL SYSTEM OF SAUDI ARABIA .....	45
4.2.	THE ECONOMY OF SAUDI ARABIA.....	46
4.3.	TAXATION IN SAUDI ARABIA.....	47
4.4.	ARAMCO AND ITS ROLE .....	48
<b>5.</b>	<b>THE ROLE OF CRUDE OIL IN SAUDI ARABIAN ECONOMY.....</b>	<b>50</b>
5.1.	THE DISCOVERY OF CRUDE OIL .....	50
5.2.	THE RESERVES OF CRUDE OIL .....	52
5.3.	THE PRODUCTION OF CRUDE OIL .....	54
5.4.	THE CONSUMPTION OF CRUDE OIL.....	57
5.5.	THE EXPORT OF CRUDE OIL.....	59
5.6.	THE PRICE OF CRUDE OIL.....	59
<b>6.</b>	<b>THE IMPACT OF CRUDE OIL PRICE FLUCTUATIONS ON SAUDI ARABIAN ECONOMY.....</b>	<b>61</b>
6.1.	THE DATA.....	62
6.1.1.	<i>The development of OPEC basket price.....</i>	<i>62</i>
6.1.2.	<i>The development of GDP.....</i>	<i>63</i>
6.1.3.	<i>The development of inflation .....</i>	<i>64</i>
6.1.4.	<i>The development of current account .....</i>	<i>65</i>
6.1.5.	<i>The development of money supply .....</i>	<i>66</i>
6.1.6.	<i>The development of exchange rate SAR/EUR .....</i>	<i>67</i>
6.2.	MODELLING THE IMPACT OF CRUDE OIL PRICES ON MACROECONOMIC VARIABLES .....	69
6.2.1.	<i>The interdependence between crude oil prices and GDP.....</i>	<i>69</i>
6.2.2.	<i>The interdependence between crude oil prices and inflation .....</i>	<i>71</i>
6.2.3.	<i>The interdependence between crude oil prices and current account.....</i>	<i>72</i>
6.2.4.	<i>The interdependence between crude oil prices and money supply.....</i>	<i>73</i>
6.2.5.	<i>The interdependence between crude oil prices and exchange rate .....</i>	<i>75</i>
	<b>CONCLUSIONS .....</b>	<b>77</b>
	<b>REFERENCES .....</b>	<b>79</b>
	INTERNET RESOURCES .....	80
	<b>LIST OF FIGURES .....</b>	<b>93</b>
	<b>LIST OF TABLES .....</b>	<b>93</b>

## **Introduction**

Crude oil is a yellow-to-black flammable mixture, naturally occurring, which contains gaseous and liquid hydrocarbons. That is a brief description of the substance, nowadays one of the most important in the world, that is used in order to produce fuels for transport, heating oil, and other petroleum products contained in many cosmetic commodities, paints, medicines, fertilizers, plastics etc. Contemporary society has been built on crude oil. From this perspective, daily world's crude oil consumption in 2014 was 92.08 million barrels, it may be said without a doubt that human civilization is dependent on crude oil. Since modern history of crude oil the commodity has been essentially vital to the world economy. Its impact is also seen in politics, thus it is not just the non-renewable resource, but as well the "strategic resource" as the matter of concern for many groups, what many times leads to the various conflicts. Politics is a significant factor that drives crude oil price, one of the most important. Supply and demand increase or reduce its price as well as for other commodities and products, but with politics is also related military conflicts and various government regulations and restrictions which have the extensive effects on crude oil price.

Development of world's crude oil consumption continues to grow, which is probably due to an increase in human population and a high consumption rate in the economically-developed countries. The biggest producers not only face the increase in consumption and thus also production, but also their GDP rapidly grows. Hence the increase of crude oil consumption in the world may have a positive impact on GDP of certain countries. This thesis will be focused on linkages between crude oil production, crude oil price and GDP and other macroeconomic indicators and exploration of their interaction.

The thesis' aims are to find out the impact of crude oil price volatility on the economic performance of Saudi Arabia as one of the world's largest producer in the long term. Therefore, the position of this country considering global economy is very important. A significant position Saudi Arabia has also in the world politics as the leading member of the Organization of the Petroleum Exporting Countries (OPEC) which represents the major influence on global crude oil prices.

## **The objectives**

In many countries crude oil plays crucial role and presents the main determinant of economic performance of these countries. Such an economy is the economy of Saudi Arabia. The main objective of this thesis is to analyze the impact of crude oil price volatility on the economic performance of Saudi Arabia. The thesis will investigate the links between oil prices and various macroeconomic and financial variables of Saudi Arabia. To achieve this objective the main of macroeconomic indicators will be examined.

## **The Methodology**

The thesis will be divided into two parts. The first part will be theoretical and the second part will be analytical. To achieve its aims the thesis will mainly use descriptive and comparative methods. Time series analysis will be conducted for analyzing time series data in order to extract meaningful statistics and other characteristics of the data. To analyze the impact of crude oil price fluctuations on the Saudi Arabian economy linear regression modelling will be conducted. In this modelling, the relationship of GDP and crude oil price will be examined. To conduct the analysis properly, the relationship of the main macroeconomic indicators will be tested. Mainly the influence of nominal GDP, inflation, current account, money supply and foreign exchange rate.

# 1. Crude oil characteristics

## 1.1. Formation of crude oil

Crucial for the thesis is understood what even crude oil is. In this thesis it is needed to know the basics about crude oil, what it consists of and how it has been created, as well as energetic properties of crude oil. Furthermore, it will be looked at the units in which the crude oil is measured in order to imagine how much of crude oil we get for a certain amount of money. The basic properties are density and whether the crude oil is sweet or sour. In each part of the world, there are different types of crude oil, which have different characteristics; therefore it is divided into crude oil standards. Particular standards are often characterized by density and content of sulfur.

Crude oil is a liquid mixture of solid, liquid and gaseous hydrocarbons of natural origin.<sup>1</sup> All views on the creation of crude oil can be summarized in two theories that contradict each other.<sup>2</sup> Inorganic and organic theory. Inorganic one assumes that hydrogen and carbon gathered together under great temperature and pressure and transformed to crude oil and gas.<sup>3</sup> Most scientists acknowledge the organic theory which assumes that crude oil originated from the prehistoric organisms, animal and plant remains, which have been decomposed. Remains of plants have been turned to coal and animals' to crude oil and gas. Crude oil mostly comes from the remains of prehistoric algae and zooplankton.<sup>4</sup> However, only a small amount of organic matter is converted to crude oil. Most organisms undergo decomposition in the presence of oxygen, what causes the final decomposition to CO<sub>2</sub> and water. Hence, in order to convert the organic matter to crude oil, an influence of heat, an absence of oxygen and a long period in time

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<sup>1</sup> Václav Cílek: "Nejistý plamen - Průvodce ropným světem." 2007. ISBN 978-80-7363-122-2. p. 20

<sup>2</sup> DiVA [online]: Development of oil formation theories and their importance for peak oil. 2010. WWW: <<https://uu.diva-portal.org/smash/get/diva2:338107/FULLTEXT01.pdf>>. p. 2

<sup>3</sup> C. J. R. Braithwaite, G. Rizzi, G. Darke: "The Geometry and Petrogenesis of Dolomite Hydrocarbon Reservoirs." 2004. ISBN 1-86239-166-1. p. 18

<sup>4</sup> Oil & Gas Leaks [online]: Fossil Fuel Theory for the Origin of Oil and Gas Debunked. 2010. WWW: <<https://oilandgasleaks.wordpress.com/2010/12/28/fossil-fuel-theory-for-oil-gas-debunked/>>

are needed. The organic material under the influence of heat and pressure has over time changed to kerogen, then to bitumen, and finally to crude oil.<sup>5</sup>

## **1.2.Measurement of crude oil**

The unit of measurement of crude oil is a barrel. The barrel contains 42 gallons, which is 158.76 liters.<sup>6</sup> Prices in US dollar per barrel are usually used. The origin comes from a Pennsylvanian wooden barrel. In business practice shortened to “bbl” (blue barrel), because previously blue color labeled barrels that contained crude oil from refinery, in that way it was distinguished from yet unprocessed ones.<sup>7</sup> Other sources state that the blue barrels belonged to Standard Oil Co., the American company established in 1870 by John D. Rockefeller. Currently, such a measure is useless, as the global production and reserves are measured in millions or billions of barrels. There are likewise shortcuts as “bd” or “by”, these are bound to time.<sup>8</sup> “Bd” represents daily production and consumption (barrel/day) and “by” represents annual production and consumption (barrel/year).

## **1.3.Crude oil density**

Crude oil density is expressed by API gravity (American Petroleum Institute), it is a measure of how heavy or light certain type of crude oil is compared to water. If the gravity is greater than 10, it is lighter. If less than 10, it is heavier.<sup>9</sup> Light liquid types are considered to be very valuable, as from such a type you get a large amount of gasoline. Whereas from heavy types you can obtain only a small amount of gasoline, but a large amount of asphalt.<sup>10</sup>

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<sup>5</sup> Electric Universe Geology [online]: Development of petroleum. 2010. WWW: <[http://www.eu-geology.com/?page\\_id=321](http://www.eu-geology.com/?page_id=321)>

<sup>6</sup> John Husher: “Facts & Myths Facing Today's World - Paints a realistic picture on the key topics of today.” 2008. ISBN 0595504795. p. 92

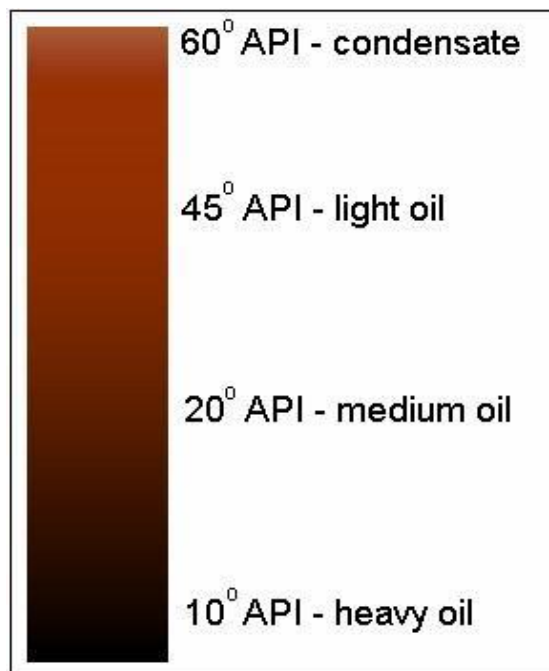
<sup>7</sup> Václav Cílek: “Nejistý plamen - Průvodce ropným světem.” 2007. ISBN 978-80-7363-122-2. p. 21

<sup>8</sup> Today I Found Out [online]: How Large is a Barrel of Oil and Why Do We Measure It That Way. 2014. WWW: <<http://www.todayifoundout.com/index.php/2014/04/large-barrel-oil-measure-way>>

<sup>9</sup> Index Mundi [online]: Light vs Heavy Crude Oil. 2016. WWW: <<http://www.indexmundi.com/commodities/glossary/light-vs-heavy-crude-oil>>

<sup>10</sup> Václav Cílek: “Nejistý plamen - Průvodce ropným světem.” 2007. ISBN 978-80-7363-122-2. p. 22

**Figure No. 1: Crude oil density according to American Petroleum Institute scale**



**Source:** Fekete Associates Inc. [online]: API. 2012. WWW:  
<[www.fekete.com/SAN/TheoryAndEquations/FieldNotesTheoryAndEquations/API.htm](http://www.fekete.com/SAN/TheoryAndEquations/FieldNotesTheoryAndEquations/API.htm)>

#### **1.4.Sulfur content in crude oil**

Crude oil is divided into sweet and sour according to amount of sulfur. Sweet crude oil can be described as the type that has less than 0.42 % of sulfur. Low level of sulfur is highly demanded, it is commonly refined into gasoline. Sour crude oil has more than 0.5 % of sulfur.<sup>11</sup> Sulfur in crude oil is undesirable because it causes corrosion, it represents lower-quality. During processing of crude oil in oil refineries it is removed before refining into gasoline, so in the end such gasoline costs more than that made from the sweet type of crude oil.<sup>12</sup> Also oil worker receives a bonus from refinery 1-3 US dollars per barrel of light crude oil. Light crude oil tends to be sweet, whereas heavy type tends to be sour.<sup>13</sup>

<sup>11</sup> “Václav Cílek: Nejistý plamen - Průvodce ropným světem.” 2007. ISBN 978-80-7363-122-2. p. 23

<sup>12</sup> Index Mundi [online]: Sweet vs Sour Crude Oil. 2016. WWW:  
<<http://www.indexmundi.com/commodities/glossary/sweet-vs-sour-crude-oil>>

<sup>13</sup> Econbrowser [online]: Sweet and sour crude. 2005. WWW:  
<[http://econbrowser.com/archives/2005/08/sweet\\_and\\_sour](http://econbrowser.com/archives/2005/08/sweet_and_sour)>

## 1.5. Crude oil standards

Crude oil standards are regional benchmarks in order to compare and determine the price of crude oil. It is classified according to crude oil origin, density and content of sulfur.<sup>14</sup> A method so as to evaluate quality of crude oil is similar to “wine” method, rolling in a jar and evaluation of its aroma. Sulfur diesel stinks, the sweet has a nice smell.<sup>15</sup> Among these standards we find:<sup>16</sup>

WTI (West Texas Intermediate) - USA, 38,7 °API, sulfur content 0.45 %

Brent - North Sea, almost equal to WTI, 37,9°API, sulfur content 0.45 %

+ Light sweet crude oil (less than WTI)

Dubai - Middle East, 30,4 °API, sulfur content 2,13 %

+ More liquid, although heavier and contains more sulfur than WTI

These standards above are basic ones. There are countless crude oil standards. Below you can see some more of them, randomly selected standards for Nigeria, Norway, Malaysia and selected standards from an OPEC basket.

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<sup>14</sup> Robert Mayes, James Myers: “Quantitative Reasoning in the Context of Energy and Environment.” 2014. ISBN 978-94-6209-527-4. p. 252

<sup>15</sup> Sonia Shah: “Crude - The Story of Oil.” 2004. ISBN 1583226257. p. 34

<sup>16</sup> Energy Intelligence [online]: The Crude Oils and their Key Characteristics. 2007. WWW: <[http://www.energyintel.com/pages/eig\\_article.aspx?DocId=200017](http://www.energyintel.com/pages/eig_article.aspx?DocId=200017)>

**Table No. 1: Selected crude oil standards**

Type	Region	°API	sulfur %
Brass River	Nigeria	34,6	0,22
Ekofisk	Norway	37,7	0,21
Tapis	Malaysia	45,2	0,03
Arab Light (OPEC)	Saudi Arabia	32,7	1,8
Minas (OPEC)	Indonesia	35,3	0,09
Saharan Blend (OPEC)	Algeria	45,7	0,1

**Source:** Energy Intelligence [online]: The Crude Oils and their Key Characteristics. 2007.

<[http://www.energyintel.com/DocumentDetail.asp?document\\_id=200017](http://www.energyintel.com/DocumentDetail.asp?document_id=200017)>

Crude oil from Europe, Africa and the Middle East is sold for a purpose of consumption in the West, most of the time at a Brent's price. Crude oil from North America is sold at a price of WTI. Crude oil destined for the Asia-Pacific region, whose production is located in the Middle East is sold for a price of Dubai.<sup>17</sup> The OPEC basket has both light crude oil as well as the heavy type.

## **1.6.Extraction of crude oil**

In the past, there had been localities where crude oil spontaneously springs to surface. At present this phenomenon does not occur anymore and crude oil must be obtained from deposits via drilling.<sup>18</sup> This gas plays an important role during extraction. After drilling to a depth in which is located crude oil, nature gas pressure causes an injection of crude oil into a well and thus it can spontaneously flow out. This extraction method is known as the primary and usually in that way can be extracted about 20 % of crude oil contained in the deposit.<sup>19</sup> The pressure of natural

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<sup>17</sup> Tushar Ghosh: "Energy Resources and Systems - Fundamentals and Non-Renewable Resources." 2009. ISBN 9048123828. p. 401

<sup>18</sup> Science Clarified [online]: Oil drilling. 2007. WWW: <<http://www.scienceclarified.com/Mu-Oi/Oil-Drilling.html>>

<sup>19</sup> National Geographic [online]: Petroleum. 2015. WWW: <<http://education.nationalgeographic.org/encyclopedia/petroleum>>



gas gradually diminishes up until a moment when it does not push crude oil out anymore. At this stage are used the secondary methods, including pumping crude oil through a pump, maintaining the pressure via water injection and reverse blowing of natural gas.<sup>20</sup> Together the primary and secondary method can extract 25-35 % of the total quantity of crude oil. If even the secondary methods do not help in extraction, assuming that extract is still profitable, then come the tertiary methods. A principle of tertiary methods is reduction of viscosity of remaining crude oil by injection of hot steam. These methods allow to obtain additional 5-15 % of crude oil from the deposits.<sup>21</sup>

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<sup>20</sup> Jeanne Mager Stellman: "Encyclopaedia of Occupational Health and Safety." 1998. ISBN 9221092038. p. 128

<sup>21</sup> Petroleum [online]: Location and Extraction. 2015. WWW: <<http://www.petroleum.co.uk/location-and-extraction>>

## 2. Crude oil reserves, supply and demand

The problem with the world's crude oil reserves is that it is not known exactly how much crude oil remain. Various statistics state different numbers depending on a methodology that was used during a calculation. Some statistics have been based on data received from crude oil companies or directly from the states. These data may be intentionally modified, whether for business manipulation or because of state or corporate secrets. Finally, the attention must be paid to the annual changes in reserves of crude oil, since old reserves may be consumed, new reserves and technologies may be discovered. Usually we distinguish between three types of crude oil reserves: proved reserves, probable reserves and possible reserves.<sup>22</sup>

Arab countries play a primary role in crude oil production since 50s of the 20th century.<sup>23</sup> Until then this role played the United States. It was a shift of production center into relatively not very experienced economies and often newly set up states. If we look at the current proven crude oil reserves of individual countries in the world, out of the 10 top countries with the largest reserves are 5 Arab ones. The significant crude oil state is also Canada, which holds large reserves in the oil sands, therefore Canada is on the third place in world's reserves behind Saudi Arabia and Venezuela.<sup>24</sup>

### 2.1. Crude oil world reserves

The basic division of crude oil knows conventional and unconventional crude oil.<sup>25</sup> Conventional crude oil is extracted from deposits in liquid form. Unconventional crude oil is extracted, for example, from oil shale and oil sands. Unconventional crude oil needs other procedures and methods of extraction and currently it is a very costly process, its share of the crude oil market amounts to less than 5 %. But this share is expected to increase in the near

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<sup>22</sup> Charlotte J. Wright: "Fundamentals of Oil & Gas Accounting." 2008. ISBN 1593701373. p. 183

<sup>23</sup> ChartsBin [online]: Historical Oil Production by Region, 1965 to Present. 2008. WWW: <<http://chartsbin.com/view/wyw>>

<sup>24</sup> Václav Cílek: "Nejistý plamen - Průvodce ropným světem." 2007. ISBN 978-80-7363-122-2. p. 108

<sup>25</sup> Deborah Gordon [online]: Understanding unconventional oil. 2012. WWW: <[http://carnegieendowment.org/files/unconventional\\_oil.pdf](http://carnegieendowment.org/files/unconventional_oil.pdf)>. p. 7

future due to rapid development of technology.<sup>26</sup> In the short history of crude oil production was produced and consumed almost trillion barrels. Currently proven world's crude oil reserves amount to 1700 billion barrels.<sup>27</sup> If it is considered also the deposits of oil sands in Canada, the number will be higher. There are estimates arguing that crude oil reserves may reach 2200 billion barrels. Even this may not be the final number.<sup>28</sup> These estimates are supported by the theories about huge reserves of crude oil in the sea, or possible further discoveries of unconventional crude oil, such as the discovery of oil sands.<sup>29</sup>

Other voices argue that many years have not been found any new significant deposits and therefore will soon come so-called peak oil. Peak oil is the point in time when the maximum of extraction is reached, after that it is expected to decline.<sup>30</sup> The theory is based on the observations conducted by M. King Hubbert. It says that crude oil production from beginning rises, then it reaches its peak and begins declining. In 1956 he predicted that the peak oil in the continental part of the United States will take place in the years 1966-1972. This prediction had faced big opposition, but then it became a reality. Crude oil production in the US reached peak in 1970.<sup>31</sup> Some recent estimates predicts global peak oil within next 10-15 years.

The largest crude oil reserves has Venezuela in 2015, estimated to be 299 953 billion barrels.<sup>32</sup> Then it is Saudi Arabia with 267 billion barrels. And the third one is Canada with 172.9 billion barrels.<sup>33</sup> But most important is to able extract that reserves. As already mentioned the largest reserves in the world are in Venezuela, however, due lack of adequate technology and investment, regarding production it is not even in the top ten.

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<sup>26</sup> The New Yorker [online]: Unconventional Crude. 2007. WWW:

<<http://www.newyorker.com/magazine/2007/11/12/unconventional-crude>>

<sup>27</sup> BP [online]: Statistical Review of World Energy. 2015. WWW:

<<https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf>>. p. 6

<sup>28</sup> Václav Čílek: „Nejistý plamen - Průvodce ropným světem.“ 2007. ISBN 978-80-7363-122-2. p. 191

<sup>29</sup> Canada's Oil Sands [online]: Oil Sands History and Milestones. 2013. WWW:

<<http://www.canadasoilsands.ca/en/what-are-the-oil-sands/oil-sands-history-and-milestones>>

<sup>30</sup> Peak Oil Barrel [online]: What is Peak Oil. 2013. WWW: <<http://peakoilbarrel.com/what-is-peak-oil>>

<sup>31</sup> The Economist [online]: Peak oil. 2013. WWW:

<<http://www.economist.com/blogs/graphicdetail/2013/03/focus-0>>

<sup>32</sup> OPEC [online]: Venezuela facts and figures. 2015. WWW:

<[http://www.opec.org/opec\\_web/en/about\\_us/171.htm](http://www.opec.org/opec_web/en/about_us/171.htm)>

<sup>33</sup> World Atlas [online]: The World's Largest Oil Reserves By Country. 2015. WWW:

<<http://www.worldatlas.com/articles/the-world-s-largest-oil-reserves-by-country.html>>

**Figure No. 2: The world top proven crude oil reserves in 2000-2013**

**The World Top 10 Reserves Holders (\*)**

(million barrels as at 31<sup>st</sup> December)

	2000	2005	2010	2012	2013
Venezuela	76,848	80,012	296,501	297,570	297,740
Saudi Arabia	261,700	266,810	262,600	267,910	268,350
Canada	181,200	178,792	175,214	173,105	173,200
Iran	89,700	132,460	137,010	154,580	157,300
Iraq	112,500	115,000	115,000	141,350	140,300
Kuwait	96,500	104,000	104,000	104,000	104,000
United Arab Emirates	97,800	97,800	97,800	97,800	97,800
Russia	48,573	60,000	60,000	80,000	80,000
Libya	29,500	39,126	46,420	48,010	48,470
Nigeria	22,500	35,876	37,200	37,200	37,140
<b>The World Top 10</b>	<b>1,016,821</b>	<b>1,109,876</b>	<b>1,331,745</b>	<b>1,401,525</b>	<b>1,404,300</b>
Rest of the World	193,532	190,025	233,455	249,306	253,806
<b>World</b>	<b>1,210,353</b>	<b>1,299,901</b>	<b>1,565,200</b>	<b>1,650,831</b>	<b>1,658,106</b>

**Source:** Eni [online]: World Oil and Gas Review. 2014. WWW: <<https://www.eni.com/world-oil-gas-review-2014/sfogliabile/O-G-2014.pdf>> p. 5

World's crude oil reserves increased from 643.34 billion barrels in 1980 to 1655.56 billion barrels in 2014, it represents an increase approximately by 157.3 %. In 2011 there was an increase by 8.7 %, in 2012 by 3.6 %, in 2013 by 7.9 % and in 2014 by only 0.004 %.<sup>34</sup> This increase is very small compared to other years. The volume of newly discovered crude oil in 2014 represents the lowest level since 1995. The discovery of new reserves has a long-term

<sup>34</sup> EIA [online]: International Energy Statistics - Consumption. 2014. WWW: <<http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=5&pid=5&aid=2&cid=regions&syid=1980&eyid=2014&unit=TBPD>>

slowing trend. In addition, it usually takes several years before the new deposits are ready for extraction, so the new discoveries will not have an immediate effect on the global market of crude oil, but they will have an effect in the period 2020-2025.<sup>35</sup>

By region the largest crude oil reserves are in the Middle East, where the share of world's crude oil reserves was 47.9 % in 2014. The most important state in the region is Saudi Arabia with 267 billion barrels, Saudi is followed by Iran which has 158 billion barrels and Iraq with 144 billion barrels.<sup>36</sup> The second biggest share of 19.4 % had countries of South and Central America. With 13.7 % North America was on third place. A proportion of reserves in Europe and Eurasia amounted to 9.1 %, in Africa 7.6 % and in the Asia-Pacific region 2.5 %.<sup>37</sup> OPEC estimated the world's proven crude oil reserves at 1 489 billion barrels in 2013.<sup>38</sup> Another estimate is from the CIA. Its database The World Factbook states that world's proven crude oil reserves are 1,532 billion barrels at the beginning of 2012.<sup>39</sup> With current daily consumption these reserves would last at the longest 53 years.

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<sup>35</sup> The Financial Times [online]: Discoveries of new oil and gas reserves drop to 20-year low. 2015. WWW: <<http://www.ft.com/cms/s/0/def8d8f4-b532-11e4-b186-00144feab7de.html#axzz41VUE6jJg>>

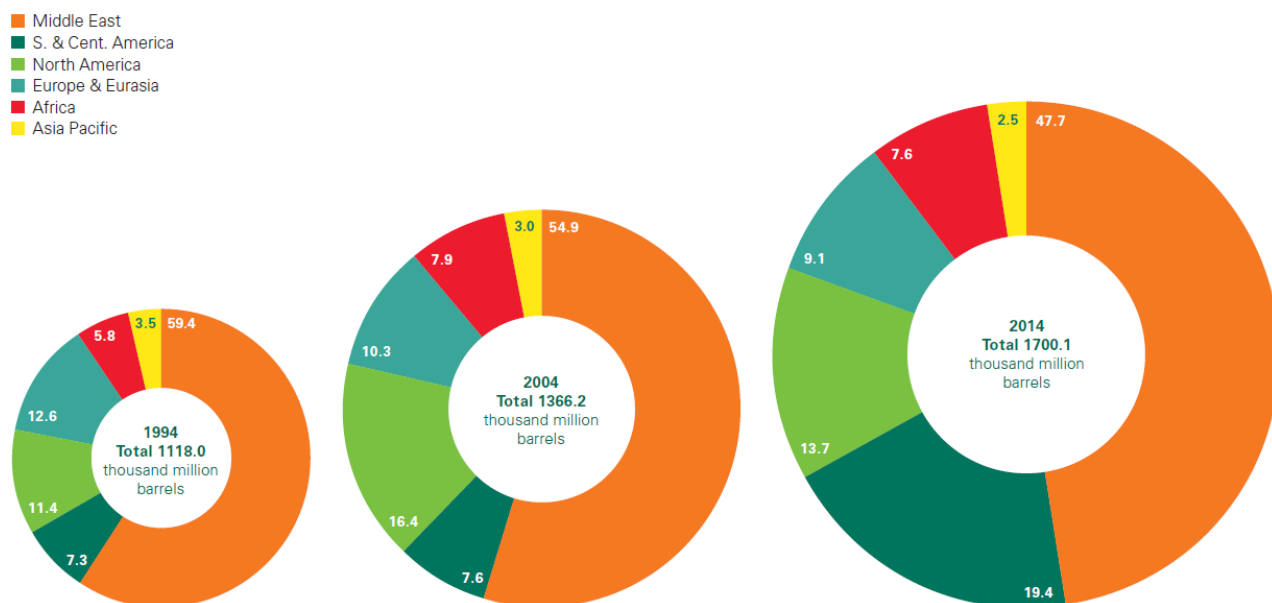
<sup>36</sup> OPEC [online]: OPEC Share of World Crude Oil Reserves. 2015. WWW: <[http://www.opec.org/opec\\_web/en/data\\_graphs/330.htm](http://www.opec.org/opec_web/en/data_graphs/330.htm)>

<sup>37</sup> BP [online]: Statistical Review of World Energy. 2015. WWW: <<https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf>>. p. 6

<sup>38</sup> OPEC [online]: Crude oil - proved reserves. 2015. WWW: <[http://www.opec.org/opec\\_web/static\\_files\\_project/media/downloads/publications/ASB2014.pdf](http://www.opec.org/opec_web/static_files_project/media/downloads/publications/ASB2014.pdf) html>. p. 22

<sup>39</sup> CIA [online]: Crude oil - proved reserves. 2015. WWW: <<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2244rank.html>>

**Figure No. 3: World's proven crude oil reserves in 1994, 2004 and 2014**



Source: BP [online]: Statistical Review of World Energy. 2015. WWW: <<https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf>>. p. 7

## 2.2. Production and consumption of crude oil

In the years 1980-1983 world's crude oil production had dropped by about 9.5 %. Production also declined by 1.1 % in 1999. Next declines occurred, for instance, in 2002 and 2009. In 2014 production has started increasing.<sup>40</sup> U.S. crude oil production growth in 2014 was the largest in more than 100 years. This trend continues till 2016. Crude oil consumption has increased from 63.12 million barrels per day in 1980 to 91.19 million barrels per day in 2013, thus consumption exceeded production in 2013. From 1980 to 1983 there was a decrease in crude oil consumption by 6.9 %. Further significant decline occurred in 2009. Thereafter it continues increasing, the consumption increased by 1.6 % in 2013.<sup>41</sup>

Middle East countries mostly participate in crude oil production with a production share amounting to 31.7 % in 2014. A production share in Europe and Eurasia amounted to 19.8 %.

<sup>40</sup> OECD [online]: Crude oil production. 2014. WWW: <<https://data.oecd.org/energy/crude-oil-production.htm>>

<sup>41</sup> EIA [online]: International Energy Statistics - Consumption. 2014. WWW: <<http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=5&pid=5&aid=2&cid=regions&syid=1980&eyid=2014&unit=TBPD>>

North America's share was 20.5 %. The Asia-Pacific region contributed with 9.3 %, Africa with 9.4 % and South and Central America with 9.3 %. At the world's crude oil consumption in 2014 mostly participated countries of the Asia-Pacific region with 33.9 %, followed by North America with 24.3 %, Europe and Eurasia with 20.4 %, Middle East with 9.3 %, South and Central America with 7.8 % and Africa with 4.3 %. Half of the countries from a list 10 world's top crude oil producers are OPEC members. Among the largest consumers is only Saudi Arabia member of OPEC.

### **2.3.The World's most important crude oil fields**

There are certain main crude oil fields on which whole demand is dependent. In the 20th century there was a huge expansion of the crude oil companies all over the world. The largest fields according size are located in Saudi Arabia, Iran, Iraq, Russia, Kuwait, USA, Brazil, Venezuela, Mexico, Kazakhstan, United Arab Emirates and Libya.<sup>42</sup>

#### **2.3.1. Ghawar, Saudi Arabia**

The world's largest oil field with estimated reserves 70 billion barrels and current production about 5 million barrels a day. The Ghawar field was founded in 1948 and started extraction in 1951.<sup>43</sup> Drilling opened Standard Oil of California which became the Chevron Corp. Then, many times it has changed ownership, now operated by Saudi Aramco, formerly Arabian-American Oil Company, state-owned enterprise.<sup>44</sup> Field accounts for more than half of the crude oil production of Saudi Arabia and about 6-8 % of the world's oil production.<sup>45</sup> The field had reached peak around 2005. Production decreases 8 % per annum, as it threatens global demand.

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<sup>42</sup> World Atlas [online]: The World's Largest Oil Reserves By Country. 2015. WWW:  
<<http://www.worldatlas.com/articles/the-world-s-largest-oil-reserves-by-country.html>>

<sup>43</sup> Greg Croft Inc [online]: The Ghawar Oil Field, Saudi Arabia. 2016. WWW:  
<<http://www.gregcroft.com/ghawar.ivnu>>

<sup>44</sup> Matthew R. Simmons: "Twilight in the Desert - The Coming Saudi Oil Shock and the World Economy." 2006. ISBN 0471790184. p. 26

<sup>45</sup> Tiger General LLC [online]: The Ghawar Field: The World's Largest Oil Field. 2014. WWW:  
<<http://www.tigergeneral.com/ghawar-field-worlds-largest-oil-field>>

### **2.3.2. Burgan, Kuwait**

The Burgan field is situated in the desert and it is part group of three closely spaced fields called Greater Burgan, which is the second world's largest oil field. Current production 1,200,000 barrels per day and estimated reserves 66-75 billion barrels. It was discovered in 1938. Drilling started US-British company Gulf Oil Corporation in 1948.<sup>46</sup> Oil field was from the beginning under incredible pressure, which allows easy extraction. The field has 80 % share of the total production of Kuwait. In 1991 withdrawing Iraqi soldiers set the oil field on fire.<sup>47</sup> It took two years of US military oil workers and fire fighters doused the flames. Since that moment the production slowly but surely decreased. Extraction reached its peak production in 2004. Kuwaiti resources will be dry in the range 30-40 years.<sup>48</sup>

### **2.3.3. Rumaila, Iraq**

The Rumaila field located in southern Iraq approximately 30 km from Basra. The field is considered as the third largest field in the world. Current production 960,000 barrels per day and estimated reserves 17 billion barrels.<sup>49</sup> It was discovered in 1953 by the Basrah Petroleum Company.<sup>50</sup> Later extraction in this area was nationalized by Saddam Hussein. Disputes between Iraq and Kuwait regarding drilling method were one of reasons for Iraqi invasion to Kuwait in 1990. Withdrawing Iraqi soldiers set the oil field on fire as well as in Kuwait. After the war the restoration was a very hard task, because next war has begun in 2003. After all the reconstruction efforts which led to the improved of security and restoration of extraction. However, until final stabilization of Iraq, the Rumaila field will not be able to produce as much crude oil as was able in the pre-war period. Paradoxically, the war had a positive impact on the

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<sup>46</sup> GEO ExPro [online]: The Great Burgan Field, Kuwait. 2012. WWW: <<http://www.geoexpro.com/articles/2012/05/the-great-burgan-field-kuwait>>

<sup>47</sup> The Noise [online]: On The Greater Burgan Oil Field. 2013. WWW: <<https://wilsb8.wordpress.com/2013/12/18/on-the-greater-burgan-oil-field>>

<sup>48</sup> World Public Library [online]: Burgan field. 2002. WWW: <<http://ebooklibrary.org/article/whebn0000947550/burgan%20field>>

<sup>49</sup> A Barrel Full [online]: Rumaila Oil Field. 2014. WWW: <<http://abarrelfull.wikidot.com/rumaila-oil-field>>

<sup>50</sup> BP [online]: Five years, five facts about Iraq's Rumaila. 2015. WWW: <<http://www.bp.com/en/global/corporate/bp-magazine/locations/five-years-on-five-facts-about-Iraqs-rumaila.html>>



slowdown of drilling and thus the peak of production has been shifted. In 2014 Iraqi oil minister Adel Abdul-Mehdi said: “A 50 percent increase in production by 2020 is a major undertaking but thanks to the technical expertise and support of BP and Petro China, we are ready for the challenge ahead.”<sup>51</sup>

#### **2.3.4. Bolivar, Venezuela**

The Bolivar Coastal field is the largest crude oil field in South America and consists almost 7000 wells. Current production approximately 2.6 million barrels per day and estimated reserves 30-32 billion barrels. The field was discovered in 1917 and production has started in 1922.<sup>52</sup> Strikes of oil workers are there very frequent, often it influences production. Supplies are very unreliable. Problems with extraction caused also President Hugo Chavez. He nationalized the oil industry and expelled foreign experts and managers. Lack of technical knowledge and management skills brought about huge losses.<sup>53</sup> Thus the risk of industrial accident increased. “Venezuela's oil wealth fueled Hugo Chavez's socialist programs at home and policies abroad, but the world's largest petroleum reserves were never enough to deliver prosperity in his 14-year rule.”<sup>54</sup> Presently Venezuela's oil production has declined 25 % since 2001.

#### **2.3.5. Cantarell, Mexico**

The complex consists four major fields at a distance 80 km from the coast of Mexico. Current production 340 000 barrels per day and estimated reserves 10.3 billion barrels.<sup>55</sup> It was discovered by fisherman Rudesindo Cantarell Jimenez in 1976. Drilling was started in 1981.

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<sup>51</sup> BP [online]: Rumaila to increase production by 50 percent by the end of the decade. 2014. WWW: <<http://www.bp.com/en/global/corporate/press/press-releases/rumaila-to-increase-production-by-50-percent.html>>

<sup>52</sup> LLC Books: “Oil Fields of Venezuel - Orinoco Belt, Boscán Field, Maracaibo Basin, Bolivar Coastal Field.” 2010. ISBN 1158441207. p. 8

<sup>53</sup> CNBC [online]: Venezuela, Oil and Chavez: a Tangled Tale. 2013. WWW: <<http://www.cnbc.com/id/100373746>>

<sup>54</sup> National Geographic [online]: Hugo Chavez Leaves Venezuela Rich in Oil, But Ailing. 2013. WWW: <[news.nationalgeographic.com/news/energy/2013/03/130306-hugo-chavez-venezuela-oil](http://news.nationalgeographic.com/news/energy/2013/03/130306-hugo-chavez-venezuela-oil)>

<sup>55</sup> E&P [online]: Meteoric History Of Cantarell Field Continues For Pemex. 2015. WWW: <<http://www.epmag.com/meteoric-history-cantarell-field-continues-pemex-792716>>

Drove by state-owned enterprise Petróleos Mexicanos. Production of this field peaked at 2.1 million barrels per day in 2003 and ranked second place in the ranking fastest-producing field right behind the Ghawar field.<sup>56</sup> Such a high tempo did not last long. In 2006 the decline in production has reached 14 %. In 2008 a further record decline by 36 %. Production continues to decline and the shortfall is having a huge negative effect on Mexico's economy.<sup>57</sup>

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<sup>56</sup> Offshore Technology [online]: Cantarell Oilfield, Gulf of Mexico, Mexico. 2013. WWW: <<http://www.offshore-technology.com/projects/cantarell>>

<sup>57</sup> ABO [online]: Mexico - government to cut 25,000 jobs due to the oil crisis. 2016. WWW: <[http://www.abo.net/oilportal/articles/view.do?locale=en\\_IT&contentId=2564492](http://www.abo.net/oilportal/articles/view.do?locale=en_IT&contentId=2564492)>

## **3. Crude oil price development and its determinants**

### **3.1. Determinants of crude oil price**

There are many factors affecting the price of crude oil. Supply and demand increase or decrease its price as all commodities and products.<sup>58</sup> Without crude oil and petroleum products we cannot imagine the daily running of any society. It is obvious that the price of crude oil affects the economy of all countries all over the world. For this reason politics is considerable factor of determining crude oil price.<sup>59</sup> Then environmental accidents, crude oil reserves and the organizations controlling market highly affect crude oil price as well. Also depends on crude oil quality, availability, refinery location and geographic and seasonal differences between supplied markets.<sup>60</sup> That is why to estimate crude oil price is very difficult, if not impossible.

In the short term crude oil price depends mostly on supplies to the world market what is very inflexible and unable to respond quickly to increased demand.<sup>61</sup> Possible interruption of supplies is well monitored. It is mainly geopolitical tensions, disturbances, and wars what would drive up the price in one day. In addition, there are seasonal factors. For example, in summer demand for fuels is higher due motoring season. The development of crude oil price during the modern history is in the following table.

#### **3.1.1. The main consumers and producers**

In the long term crude oil price depends mostly on the size of supply and demand. Therefore is important to know the biggest producers and the biggest consumers. The biggest crude oil producer is the United States, then Saudi Arabia and Russia.<sup>62</sup> Among the biggest consumers of

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<sup>58</sup> Salvatore Carollo: "Understanding Oil Prices - A Guide to What Drives the Price of Oil in Today's Markets." 2011. ISBN 1119962722. p. 10

<sup>59</sup> Sonia Shah: Crude - The Story of Oil. 2004. ISBN 1583226257. p. 20

<sup>60</sup> EIA [online]: What Drives Crude Oil Prices. 2016. WWW: <<https://www.eia.gov/finance/markets>>

<sup>61</sup> IEA [online]: Emergency stocks: oil that limits supply disruptions. 2014. WWW: <<http://www.iea.org/ieaenergy/issue7/emergency-stocks-oil-that-limits-supply-disruptions.html>>

<sup>62</sup> CNN [online]: World's top oil producers. 2015. WWW: <<http://money.cnn.com/interactive/news/economy/worlds-biggest-oil-producers>>

crude oil belong the United States, China and Japan.<sup>63</sup> The biggest exporter is Saudi Arabia, followed by Russia and Canada.<sup>64</sup> The biggest importers are European Union, U.S and China.<sup>65</sup>

**Figure No. 4: The biggest crude oil producers in 2013**

**The World Top 10 Producers (\*)**

Crude and non conventional oil, natural gas liquids  
(thousand barrels/day)

	2000	2005	2010	2012	2013
Saudi Arabia	9,348	10,893	9,972	11,663	11,566
Russia	6,527	9,636	10,456	10,728	10,877
United States	8,016	7,081	7,774	9,175	10,297
China	3,261	3,638	4,078	4,175	4,177
Canada	2,729	3,041	3,333	3,751	3,962
United Arab Emirates	2,622	2,995	2,846	3,398	3,570
Iran	3,760	4,225	4,240	3,541	3,194
Iraq	2,582	1,833	2,430	3,031	3,161
Kuwait	2,160	2,548	2,498	2,985	3,109
Mexico	3,452	3,768	2,960	2,920	2,889
<b>The World Top 10</b>	<b>44,457</b>	<b>49,660</b>	<b>50,587</b>	<b>55,367</b>	<b>56,802</b>
Rest of the World	30,748	32,512	32,898	31,574	30,540
<b>World</b>	<b>75,205</b>	<b>82,172</b>	<b>83,485</b>	<b>86,941</b>	<b>87,342</b>

Source: Eni [online]: World Oil and Gas Review. 2014. WWW: <<https://www.eni.com/world-oil-gas-review-2014/sfogliabile/O-G-2014.pdf>> p. 5

<sup>63</sup> Infoplease [online]: Top Oil Consumers. 2004. WWW: <<http://www.infoplease.com/toptens/oilconsumers.html>>

<sup>64</sup> CIA [online]: Crude oil - exports. 2013. WWW: <<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2242rank.html>>

<sup>65</sup> Index Mundi [online]: Oil - imports. 2014. WWW: <<http://www.indexmundi.com/g/r.aspx?v=93&t=10>>

**Figure No. 5: The biggest crude oil consumers in 2013**

**The World Top 10 Consumers (\*)**

[thousand barrels/day]

	2000	2005	2010	2012	2013
United States	19,999	21,168	19,476	18,843	19,242
China	4,642	6,748	8,930	9,820	10,099
Japan	5,515	5,328	4,455	4,726	4,563
Russia	2,702	2,730	2,983	3,299	3,431
India	2,350	2,573	3,119	3,350	3,368
Brazil	2,135	2,173	2,774	2,986	3,105
Saudi Arabia	1,571	1,941	2,687	2,922	2,983
Germany	2,767	2,621	2,470	2,388	2,405
South Korea	2,135	2,191	2,269	2,301	2,305
Canada	2,014	2,315	2,265	2,278	2,289
<b>The World Top 10</b>	<b>45,830</b>	<b>49,788</b>	<b>51,427</b>	<b>52,913</b>	<b>53,791</b>
Rest of the World	31,445	34,953	36,976	37,146	37,539
<b>World</b>	<b>77,275</b>	<b>84,741</b>	<b>88,403</b>	<b>90,059</b>	<b>91,330</b>

Source: Eni [online]: World Oil and Gas Review. 2014. WWW: <<https://www.eni.com/world-oil-gas-review-2014/sfogliabile/O-G-2014.pdf>> p. 5

### 3.1.2. World's demand and supply

Demand for crude oil in the long run develops according to world economic growth. Decline of world's economic growth reduces demand for oil. Total demand for oil is growing due to economic growth in countries like China, Brazil, India and Russia. On the supply side of the

market OPEC plays an important role, it affects approximately 40 % of global crude oil supply.<sup>66</sup> The agreement between countries determines mandatory quotas in the long term limiting production volume of member states in order to ensure the stabilization of crude oil markets. Therefore, the price of crude oil may be affected because of an announcement from OPEC that members will increase or decrease extraction. It should be noted that OPEC controls about 75 % of global reserves, so its role will for sure increase.<sup>67</sup>

### **3.1.3. The foreign exchange rate of USD**

The price of crude oil and US Dollar exchange rate are very closely linked. Crude oil is a dollar commodity. The stronger dollar, the fewer dollars are required to buy a given quantity of crude oil. If the dollar falls, crude oil becomes more affordable for people in countries where they do not pay with dollars, so the decline of the dollar exchange rate usually means that the price of crude oil will increase.<sup>68</sup>

## **3.2.OPEC policies**

Organization of Petroleum Exporting Countries was founded by five oil exporting nations at a conference in Baghdad in 1960. A year later it has approved its statutes in Caracas. The five founding members were Iraq, Iran, Kuwait, Saudi Arabia and Venezuela.<sup>69</sup> Nowadays OPEC includes 13 members: Algeria, Angola, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela. A leading position has Saudi Arabia. In the organization was likewise Gabon, but the country left it in 1995 because of disagreement with the extraction limits.<sup>70</sup> The organization, actually it acts as a cartel, controls approximately three-quarters of the world's oil reserves. Two-thirds of OPEC's crude oil

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<sup>66</sup> EIA [online]: What Drives Crude Oil Prices – Supply OPEC. 2016. WWW: <<https://www.eia.gov/finance/markets/supply-opec.cfm>>

<sup>67</sup> Value Walk [online]: The Balance Between Crude Oil Supply And Demand. 2015. WWW: <<http://www.valuwalk.com/2015/08/the-balance-between-crude-oil-supply-and-demand>>

<sup>68</sup> Investopedia [online]: Oil & Currencies: Understanding Their Correlation (USD, UUP). 2015. WWW: <<http://www.investopedia.com/articles/forex/092415/oil-currencies-understanding-their-correlation.asp>>

<sup>69</sup> OPEC [online]: Brief History. 2015. WWW: <[http://www.opec.org/opec\\_web/en/about\\_us/24.htm](http://www.opec.org/opec_web/en/about_us/24.htm)>

<sup>70</sup> Francisco Parra: “Oil Politics - A Modern History of Petroleum.” 2009. ISBN 1848851294. p. 44

production and reserves are located in the Middle East. Overall OPEC members provide one-third of the production and almost half of the export volumes.<sup>71</sup>

OPEC's mission is “to coordinate and unify the petroleum policies of its member countries and ensure the stabilization of oil markets, in order to secure an efficient, economic and regular supply of petroleum to consumers, a steady income to producers, and a fair return on capital for those investing in the petroleum industry.”<sup>72</sup> Due to its strength the cartel may set quotas how much crude oil will be extracted in a certain year and in that way it influences the world's crude oil market. It is a major influence on crude oil prices. OPEC, like most cartels, faces problems with lack of discipline among its members, which tend to extract more than they supposed according the quotas. In this case Saudi Arabia, which provides nearly 30 % of OPEC extraction, works as regulator of the price.<sup>73</sup> In the past in cases of falling of crude oil prices due to over-limit extraction, KSA cut its production to keep prices at the desired level. For example, in 1983 and 1984 the production was reduced to 3.5 million barrels per day, despite the extraction capacity was almost 3x times higher.<sup>74</sup>

The establishment of the organization is associated with a period of great global economic and political changes in the 1960s, especially with extensive decolonization and the emergence of new states. OPEC was founded in response to dissatisfaction with the practices of the world's biggest oil companies and their governance over the market. The purpose was to suppress cartel the Seven Sisters. OPEC's headquarters was set up in Geneva in 1960. Five years later headquarters moved to Vienna, where operates till now.<sup>75</sup> In the seventies the cartel showed its power after the Yom Kippur War in which Israel defeated a coalition of Arab states. OPEC in revenge declared a crude oil embargo on the United States and Western Europe for supporting Israel. Followed biggest crude oil shock in history, the prices had risen four times.<sup>76</sup>

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<sup>71</sup> Al Jazeera [online]. 2015. Why is OPEC refusing to cut oil production. WWW: <<http://www.aljazeera.com/programmes/countingthecost/2015/12/opec-refusing-cut-oil-production-151213090410559.html>>

<sup>72</sup> OPEC [online]: Our Mission. 2013. WWW: <[http://www.opec.org/opec\\_web/en/about\\_us/23.htm](http://www.opec.org/opec_web/en/about_us/23.htm)>

<sup>73</sup> Forbes [online]: OPEC's Trillion-Dollar Miscalculation. 2016. WWW: <<http://www.forbes.com/sites/rpapier/2016/01/08/opecs-trillion-dollar-miscalculation/#41e81e2273c1>>

<sup>74</sup> Robert E. Looney: “Handbook of Oil Politics.” 2011. ISBN 1857435834. p. 289

<sup>75</sup> Encyclopædia Britannica [online]: OPEC. 2014. WWW: <<http://www.britannica.com/topic/OPEC>>

<sup>76</sup> Foreign Affairs [online]: How the 1973 Oil Embargo Saved the Planet. 2013. WWW: <<https://www.foreignaffairs.com/articles/north-america/2013-10-15/how-1973-oil-embargo-saved-planet>>

A big part of its influence and revenues the organization lost in the 80's when the United States, Mexico, Canada and other countries have found new deposits of crude oil.<sup>77</sup> However the dominant position remained. On the second and third summit in Caracas and Riyadh in 2000 and 2007 OPEC submitted a long-term strategy for sustainable development, stable energy markets with respect to the environment. After the outbreak of the economic crisis the cartel became a major supporter of the crude oil industry. The supreme body of the organization is the Conference of Representatives of member countries, where representatives of governments, ministers responsible for industry, petroleum and energy meet each other to discuss their policies. The Conference is held twice a year.<sup>78</sup> All proposals and decisions are very difficult to enforce, because it works on the principle of unanimity. The Conference also appoints the Governing Council, each member nominates a governor. Governors run the administration of the organization, enforce the decision of the Conference and decide on the budget. Another body is the General Secretariat headed by the Secretary General who is the official representative of OPEC. Since 2007 it is Abdalla Salem El-Badri.<sup>79</sup>

### **3.2.1. OPEC basket price**

The OPEC Basket is a weighted average of prices for crude oil blends produced by OPEC members. It is used as a benchmark in order to set prices.<sup>80</sup> From 1987 to mid-2005 the price was calculated as the arithmetic average of seven types of crude oil: Algerian Saharan Blend, Indonesian Minas, Nigerian Bonny Light, Saudi Arab Light, Dubai Fateh, Venezuelan Tia Juana Light and Mexican Isthmus.<sup>81</sup> At 136th OPEC meeting in 2005 was decided to change the method of calculating prices as well as the composition of the basket. Since January 1, 2016, second adjustment took place. The adjustment should better reflect quality differences between types of crude oil. The OPEC basket consists of the following crude oil types: Algerian Saharan

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<sup>77</sup> MIT Technology Review [online]: Getting Over Oil. 2002. WWW: <<https://www.technologyreview.com/s/401322/getting-over-oil>>

<sup>78</sup> Your Article Library [online]: Organization of the Petroleum Exporting Countries (OPEC). 2015. WWW: <<http://www.yourarticlelibrary.com/organization/organization-of-the-petroleum-exporting-countries-opec/23553>>

<sup>79</sup> OPEC [online]: Secretary General. 2015. WWW: <[http://www.opec.org/opec\\_web/en/149.htm](http://www.opec.org/opec_web/en/149.htm)>

<sup>80</sup> Investopedia [online]: OPEC Basket. 2013. WWW: <<http://www.investopedia.com/terms/o/opecbasket.asp>>

<sup>81</sup> J. Clifford Jones: "OPEC - Its Role and Influence since 1960." ISBN 978-87-403-0748-1. p. 35



Blend, Angolan Girassol, Ecuadorian Oriente, Indonesian Minas, Iran Heavy, Iraqi Basra Light, Kuwait Export, Libyan Es Sider, Nigerian Bonny Light, Qatar Marine, Saudi Arab Light, UAE's Murban, Venezuelan Merey.<sup>82</sup> The price is not calculated by arithmetic average anymore, but by weighted average according to the size of the production and export. The calculated price is used for monitoring of the situation on the global crude oil market and subsequent decisions.

### **3.2.2. Non-OPEC producers**

Although the production of the non-OPEC producers covers 58 % of the market, they cannot significantly affect the crude oil prices. Unlike OPEC they do not have a common approach. An important criterion is reserves. These states own only 20 % of world reserves, four times less than OPEC.<sup>83</sup> Extraction there requires much more investments than relatively cheap extraction in the Middle East. The biggest non-OPEC producer is the United States of America, it even became a world leader. “In 2012, the U.S. imported 40 percent of their petroleum consumption.”<sup>84</sup> It imports mainly from Canada, Saudi Arabia, Mexico, Venezuela, and Russia. Another major producer outside OPEC is Russia, its main area of influence is Europe, however, it is more matter of energy dependence. Furthermore, it includes Canada, Mexico, China and Brazil.<sup>85</sup>

### **3.3. Crude oil price shocks**

The crude oil price behaves just like the price of any other commodity with huge fluctuation in times of shortage or surplus. Nevertheless the development of crude oil price is significantly influenced by the political situation in the world, and especially by the situation in the Middle East. Increasing the price of “black gold” awakens concerns of people all over the world and

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<sup>82</sup> OPEC [online]: OPEC Basket Price. 2016. WWW: <[http://www.opec.org/opec\\_web/en/data\\_graphs/40.htm](http://www.opec.org/opec_web/en/data_graphs/40.htm)>

<sup>83</sup> CIA [online]: Crude oil - proved reserves. 2015. WWW: <<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2244rank.html>>

<sup>84</sup> EIA [online]: How dependent are we on foreign oil. 2013. WWW: <[http://www.eia.gov/energy\\_in\\_brief/article/foreign\\_oil\\_dependence.cfm](http://www.eia.gov/energy_in_brief/article/foreign_oil_dependence.cfm)>

<sup>85</sup> CIA [online]: Crude oil - production. 2014. WWW: <<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2241rank.html>>

may have a negative impact on the economic development of the world's biggest economies. The oil shock occurs when demand for crude oil exceeds the supply and price goes up in big jumps.<sup>86</sup>

### **3.3.1. OPEC oil export embargo shock**

The first oil shock, which was the biggest so far, has begun in the fall in 1973. The reason was a deliberate reduction of extraction by the Organization of Arab Petroleum Exporting Countries, consisting of the Arab members of the OPEC plus Egypt and Syria, so as to influence the price in its own favor.<sup>87</sup> Simultaneously the organization declared an embargo on oil exports to countries supporting Israel during the Yom Kippur War, namely against Canada, Japan, the Netherlands, the United Kingdom and the US. Before these events economic stagnation already took place in the US, which President Richard Nixon tried to stop by abandoning the Gold Exchange Standard, what led to a decrease in the value of the dollar.<sup>88</sup> It was against interest of the Arabs states as the price of crude oil has been determined in US dollars, exporters received less money.

The US crude oil price has risen sharply from 3 dollars a barrel to more than 5 dollars. During the next year the price continued to increase and had risen up to 12 dollars per barrel.<sup>89</sup> With the rising price of oil the price of all commodities rose as well. Economic growth stopped and overwhelming part of the world led in a phase of stagflation (the inflation rate is high, the economic growth rate slows). Europe and the United States ended up in a deep economic recession, which ended the long period of post-war prosperity. During the crisis production had dropped in most sectors.<sup>90</sup> The impact was visible mainly in the automobile industry. In the US a maximum speed limit 88 km/h was imposed in 1974. According the rule on refueling it was

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<sup>86</sup> David Strahan: "The Last Oil Shock." 2007. ISBN 0719564239. p. 8

<sup>87</sup> NPR [online]: The 1973 Arab Oil Embargo - The Old Rules No Longer Apply. 2013. WWW: <<http://www.npr.org/sections/parallels/2013/10/15/234771573/the-1973-arab-oil-embargo-the-old-rules-no-longer-apply>>

<sup>88</sup> Office of the Historian [online]: Nixon and the End of the Bretton Woods System, 1971–1973. 2013. WWW: <<https://history.state.gov/milestones/1969-1976/nixon-shock>>

<sup>89</sup> Melissa Rossi: "What Every American Should Know About the Middle East." 2008. ISBN 0452289599. p. 66

<sup>90</sup> Dollars & Sense [online]: What can the crisis of U.S. capitalism in the 1970s teach us about the current crisis and its possible outcomes. 2009. WWW: <<http://www.dollarsandsense.org/archives/2009/1109reuss.html>>

important what a kind of the vehicle registration plate you have. Those, who had the registration plate ending with an even number, were allowed to take a fuel only on even days. Those, who had the registration plate ending with an odd number, were allowed to take a fuel only on odd days. European measure was a ban on Sunday rides and as well as in the USA was imposed a maximum speed limit on highways 100 km/h.<sup>91</sup>

The embargo was lifted in March 1974, but above-average crude oil prices persisted.<sup>92</sup> Only after two years the Western world began recovering and US GDP started to grow again. In Europe the recovery took much longer, it was caused by low elasticity of the labor market. This crisis highlighted the big weakness of developed western countries as there are highly dependent on imported oil. As a positive consequence of the crisis would be consider efforts to seek alternative energy.

### **3.3.2. The Iranian revolution shock**

The second oil shock occurred in 1979 after the Islamic revolution in Iran, when the new regime began exporting smaller amount of oil than before. After a few months Iraqi President Saddam Hussein with his army invaded Iran, this action was supported by the US. The conflict lasted 8 years.<sup>93</sup> Iran in retaliation for US support of Iraq implemented a ban on the sale of Iranian oil to American companies. Other countries from OPEC increased crude oil extracting to prevent the sharp decrease of world's crude oil production, thus a reduction of total crude oil production was only about 4-5 %.<sup>94</sup> Although oil prices had increased due to widespread panic, the price of oil in this period reached a historic high. The price of oil rose up to 90 dollars per barrel. Western countries were on the second oil shock much better prepared, thanks to the first oil crisis. In the US unlike past people were buying economical cars, though had been applied the previous measure in the form of restriction on the sale of fuel. Europe again had experienced a recession,

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<sup>91</sup> IAPSC [online]: Speed limits and eco-driving. 2006. WWW: <<https://history.state.gov/milestones/1969-1976/nixon-shock>>

<sup>92</sup> History [online]: OPEC enacts oil embargo. 2015. WWW: <<http://www.history.com/this-day-in-history/opec-enacts-oil-embargo>>

<sup>93</sup> Williamson Murray, Kevin M. Woods: "The Iran-Iraq War - A Military and Strategic History." 2014. ISBN 1107673925. p. 8

<sup>94</sup> e-Education Institute [online]: The Second Shock: The Great Panic. 2014. WWW: <<https://www.e-education.psu.edu/egee120/node/292>>

there was a high rate of unemployment. The biggest impact was in developing countries. The reason was a significant raising of interest rates in banks in developed economies, where crude oil-producing states since 70s had deposited money. After raising in interest rates, loans became more expensive, these states got into considerable debts as in the case of Mexico in 1982.<sup>95</sup> Despite the big price jump the impact was not such powerful as in the case of the first oil shock. The problem with the lack of crude oil production has been solved by starting drilling the new deposits, particularly in Mexico, The United Kingdom, Norway, Alaska and other countries not belonging to OPEC, of which market share suddenly fell by 27 %. The organization failed to hold on to its leading position. It affected mainly Saudi Arabia, whose crude oil revenues fell from 113.2 billion dollars in 1981 to 20 billion dollars in 1986.<sup>96</sup> The second oil crisis lasted until 1982. Over time in the 80s the prices had gradually decreased.

### **3.3.3. The Gulf War shock**

The third oil shock took place in August 1990 after the Iraqi invasion of Kuwait and subsequent the Gulf War. The reason for Iraq was to get rid of the obligation to repay its debt to Kuwait and resolve dispute regarding Kuwaiti pumping of crude oil from Iraqi territory.<sup>97</sup> It also would have brought an increase of the influence in the OPEC for Iraq as both countries are members. This conflict resulted in an interruption of oil supplies from these two major exporters, it led to an increase of crude oil prices in the world. The price had risen from 15 dollars to 40 dollars per barrel.<sup>98</sup> Thus more than 2.5 times that the original price.

A further increase of the price had not occurred, because Saudi Arabia has increased its oil

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<sup>95</sup> Rabobank [online]: The Mexican 1982 debt crisis. 2013. WWW:

<<https://economics.rabobank.com/publications/2013/september/the-mexican-1982-debt-crisis>>

<sup>96</sup> news.com.au [online]: Saudi Arabia posts \$135 billion deficit, raises petrol prices. 2015. WWW:

<<http://www.news.com.au/finance/economy/world-economy/saudi-arabia-posts-135-billion-deficit-raises-petrol-prices/news-story/1302ff662baa8c78280edeb947a4a471>>

<sup>97</sup> Office of the Historian [online]: The First Gulf War. 2013. WWW:

<<https://history.state.gov/departmenthistory/short-history/firstgulf>>

<sup>98</sup> The Atlantic [online]: Why the Gulf War Served the National Interest. 1991. WWW:

<<http://www.theatlantic.com/past/docs/issues/91jul/nye.htm>>

production and in that way prevented any more increasing.<sup>99</sup> The conflict did not last long. After Operation Desert Storm Iraqi troops were forced to retreat from the territory of Kuwait. As the U.S.-led coalition experienced military success against Iraqi forces, concerns about long-term supply shortages eased and prices began to fall.<sup>100</sup> Situation calmed down in the region and the prices returned to their original values.

### **3.3.4. Crude oil prices shocks after 2000**

Among other events, which significantly increased the prices of crude oil on world markets, it can be certainly classified terrorist attacks on the United States in September 11, 2001. Immediately after the attacks the crude oil price soared by \$ 3.20 to \$ 30.65 per barrel, together with the fall in value of the US dollar. At the beginning of 2003 before the US war against Iraq crude oil prices fluctuated around \$ 35 per barrel.<sup>101</sup> Subsequently, prices rose because continued global increases in demand and production stagnated. For a time, geopolitical events and natural disasters indirectly related to the global oil market had strong short-term effects on oil prices, such as North Korean missile tests, the 2006 conflict between Israel and Lebanon, worries over Iranian nuclear plans in 2006, Hurricane Katrina.<sup>102</sup>

In January 2008, the price of crude oil for the first time reached 100 dollars a barrel, and in July it even reached 147 dollars.<sup>103</sup> Increase in price is mainly attributed to financial speculations, disputes over Iran's nuclear program and instability in Iraq and Nigeria, decrease in reserves in the US, weak US dollar and increasing demand for crude oil in countries such as China or India. At the end of 2008, the price fell below 40 dollars.<sup>104</sup> The slump in price accelerated a global

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<sup>99</sup> The New York Times [online]: War in the Gulf - Saudi Arabia - Saudis importing fuel to fight war. 1991. WWW: <<http://www.nytimes.com/1991/01/23/world/war-in-the-gulf-saudi-arabia-saudis-importing-fuel-to-fight-war.html>>

<sup>100</sup> IOGA [online]: History of Crude Oil Prices. 2015. WWW: <<http://www.ioga.com/history-of-crude-oil-prices>>

<sup>101</sup> MacroTrends [online]: Crude Oil Price History Chart. 2016. WWW: <[www.macrotrends.net/1369/crude-oil-price-history-chart](http://www.macrotrends.net/1369/crude-oil-price-history-chart)>

<sup>102</sup> The Times [online]: Hurricane Katrina whips oil price to a record high. 2005. WWW: <<http://business.timesonline.co.uk/tol/business/economics/article560389.ece>>

<sup>103</sup> Reuters [online]: Oil hits record above \$147. 2008. WWW: <<http://www.reuters.com/article/us-markets-oil-idUST14048520080711>>

<sup>104</sup> Dries Lesage, Thijs Van de Graaf, Kirsten Westphal: "Global Energy Governance in a Multipolar World." 2010. ISBN 0754677230. p. 15

financial crisis, which significantly weakened the world economy and caused a recession. In February 2011, the crude oil market began dramatically responding to reports on the situation in Libya, which is the key oil exporter. At that time there broke out anti-government fights, which drove the price of Brent crude oil above 108 dollars per barrel.<sup>105</sup>

### **3.4. The current influence of crude oil on its producers economies**

The year 2015 was a terrible year for the oil companies and according to some analysts next years would be even worse. The slump in crude oil prices has begun last summer, since the middle of 2014 crude oil prices has fallen by more than half. Already hundreds of thousands of people lost their job.<sup>106</sup> Furthermore, it caused cancellations and postpone of many projects worth hundreds of billions of dollars. The price still falls, it reached the lowest value in 11 years.<sup>107</sup> The reason was the excessive supply on the market. It can be observed a fight between OPEC and the United States on who will remain a bigger market share. OPEC has recently proposed a reduction of extraction by one million barrels a day.<sup>108</sup> Saudis gradually turn their opinion. It was Saudi Arabia which came up with a plan to open the taps fully and keep high oil production even at the cost of further decline in prices in order to push out from the market American crude oil producers. Although Saudi Arabia is de facto a leader of OPEC, reduce extraction will not be easy, because it needs permission from other members of the cartel and moreover from countries that are outside the organization. These different interests of individual countries show the biggest weakness of the OPEC.

For example, Russia does not believe that all players will agree on such a proposal, and if yes, Russia would be harmed. Therefore the country even does not want attend meetings of OPEC.<sup>109</sup>

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<sup>105</sup> Naija247news [online]: Brent climbs above \$108 as Libya output drops. 2014. WWW: <<http://naija247news.com/2013/10/brent-climbs-108-libya-output-drops>>

<sup>106</sup> E&P [online]: Oil, Gas Sector Job Losses Continue To Mount. 2015. WWW: <<http://www.epmag.com/blog/oil-gas-sector-job-losses-continue-mount-828001>>

<sup>107</sup> Reuters [online]: Oil dives below \$35, lowest in 11 years, as U.S. supply swells. 2016. WWW: <<http://www.reuters.com/article/us-global-oil-idUSKBN0UK04C20160106>>

<sup>108</sup> Reuters [online]: Oil up two percent on report of Saudi OPEC proposal, weaker dollar. 2015. WWW: <<http://www.reuters.com/article/us-global-oil-idUSKBN0TL00T20151203>>

<sup>109</sup> Reuters [online]: Russia will not attend OPEC consultations, meeting this week. 2015. WWW: <<http://www.reuters.com/article/opecc-meeting-russia-idUSL8N13P3DH20151130>>

Against proposal is also Iran, another important player and member of OPEC. Iran plans, after the end of sanctions imposed the West, to return on global markets and increase production by one million barrels a day.<sup>110</sup> As well the United States, the biggest oil producer in the world, continues to push oil into the global economy. On the other hand Venezuela would agree on a proposal, due to lower crude oil price since its budget has come under enormous pressure. The local economy has fallen by 10 %. All indicators indicate that the price will range between 30 and 40 dollars per barrel in the coming months.<sup>111</sup>

The economies of Russia, Kazakhstan and Azerbaijan have faced hard times with the current situation on the stock exchange. Russia's budget, one of the biggest crude oil exporters in the world, more than half dependent on the production of energy. If the prices remain at current level, may happen financial collapse.<sup>112</sup> If the Russian government succeeds to restructure the tax system in order to save local oil companies for some time, loss will occur on the revenue side. Another option is a partial privatization of oil giant Rosneft, Russia's biggest oil company, however it seems unlikely nowadays. Kazakhstan and Azerbaijan also have the similar problem.<sup>113</sup> Kazakhstan announced plan to privatize some state companies so as to catch up some losses on the revenue side.

In the Arab region low crude oil prices affect mostly Algeria, Iraq and some other OPEC members. Saudi Arabia has relatively big financial reserves, of which may, even at the current prices, fund its budget for the next 4-5 years.<sup>114</sup> Kuwait's financial reserves should last two years. Analysts generally expect that the Gulf States will adapt to the drop in the prices as in the 80s, thus no serious turbulence. All Gulf states have announced cuts in state budgets. Saudi Arabia and the United Arab Emirates reducing subsidies on fuel to hold the budget for education and

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<sup>110</sup> Fuel Fix [online]: What's OPEC going to do with Iran's million barrels a day. 2015. WWW: <<http://fuelfix.com/blog/2015/06/03/whats-opeac-going-to-do-with-irans-million-barrels-a-day/#28630101=0>>

<sup>111</sup> The Economic Times [online]: Oil prices will be in \$30-\$40 range in coming months - Bhaskar Panda, HDFC Bank. 2016. WWW: <<http://economictimes.indiatimes.com/markets/expert-view/oil-prices-will-be-in-30-40-range-in-coming-months-bhaskar-panda-hdfc-bank/articleshow/51007686.cms>>

<sup>112</sup> Independent [online]: Oil prices: Russia risks financial crisis if oil falls below \$30 a barrel. 2015. WWW: <<http://www.independent.co.uk/news/business/news/russia-faces-financial-crisis-if-oil-price-falls-below-30-a-barrel-a6754611.html>>

<sup>113</sup> Radio Free Europe/Radio Liberty [online]: Kazakhstan: Economic Crisis, State Companies, And The Nation's Image. 2015. WWW: <<http://www.rferl.org/content/kazakhstan-economic-crisis/27125331.html>>

<sup>114</sup> The Economic Times [online]: Saudi Arabia risks running out of financial assets in five years: IMF. 2015. WWW: <<http://economictimes.indiatimes.com/news/international/business/saudi-arabia-risks-running-out-of-financial-assets-in-five-years-imf/articleshow/49489237.cms>>

social expenditure. Bahrain reduced support of food policy. United Arab Emirates, Saudi Arabia, Oman, Qatar and Kuwait considering to introduce taxes, which should contribute to a balanced budget.<sup>115</sup> Saudi Arabia at the end of 2015 cautiously approached the cuts in social expenditure and a privatization of state assets.<sup>116</sup> The kingdom considering the partial privatization of crude oil giant Saudi Aramco. In critical cases, it can be expected that the Saudis in short term will financially support allied countries of OPEC. But it is not valid for Algeria, whose budget, due to low returns from crude oil sales last year, got into a deficit of 13.71 billion dollars after a \$4.306 billion surplus in 2014.<sup>117</sup>

Venezuela's collapsing economy is existentially dependent on crude oil exports. Estimates of International Monetary Fund Home Page talk about inflation of 720 % in 2016.<sup>118</sup> There is a lack of basic goods. The government is forced to even more reduce imports. The country is threatened that at the end of 2016 would end up in insolvency. Brazilian state crude oil company Petrobras is in crisis, even without the low prices, mainly due to poor management and prolonged litigations. The current situation on the market makes is even worse. Low prices also affect Ecuador, which last year produced 30 % less. The government is considering introduction of trade barriers or restrictions of import.

With the falling prices also fights Mexico, which is around the top ten crude oil producers.<sup>119</sup> The country two years ago finished its crude oil monopoly and allowed entry private capital into state's company Vemex. The reform was not going very well and Pemex got into troubles, so the government was trying to help the company by abrupt raising of petrol prices, whose is determined by the state. Oil companies have come across several new wells in Canada, USA and Mexico, but they intend to complete and connected the wells to the refineries only in a case

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<sup>115</sup> The Peninsula Newspaper [online]: Kuwait plans to introduce corporate tax as oil slumps. 2015. WWW: <<http://thepeninsulaqatar.com/business/oil-market/327204/kuwait-plans-to-introduce-corporate-tax-as-oil-slumps>>

<sup>116</sup> The Wall Street Journal [online]: Saudi Arabia Cuts Spending, Raises Domestic Fuel Prices. 2015. WWW: <<http://www.wsj.com/articles/saudi-arabia-announces-2016-budget-1451312691>>

<sup>117</sup> Africanews [online]: Algeria: Trade deficit widens as oil earnings drop sharply. 2016. WWW: <<http://www.africanews.com/2016/01/20/algeria-trade-deficit-widens-as-oil-earnings-drop-sharply>>

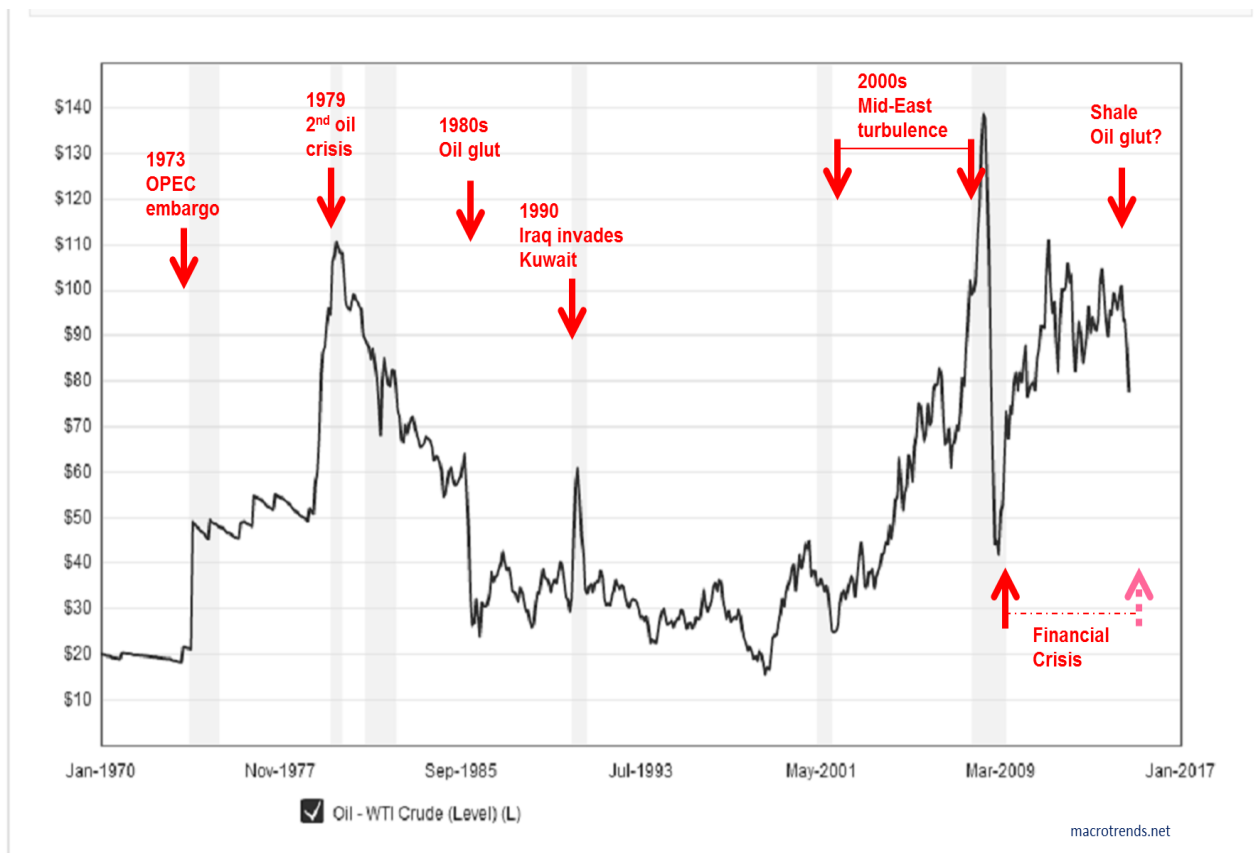
<sup>118</sup> Bloomberg Business [online]: IMF Sees Venezuela Inflation Rocketing to 720 Percent in 2016. 2016. WWW: <<http://www.bloomberg.com/news/articles/2016-01-22/imf-sees-venezuela-inflation-rocketing-to-720-percent-in-2016>>

<sup>119</sup> Infoplease [online]: Top Oil Producers and Consumers. 2013. WWW: <<http://www.infoplease.com/science/energy/top-producers-consumers.html>>



of price rising.<sup>120</sup> Crude oil production of the United States shows considerable tenacity. US refineries hold since October 2015 volume of the production at 9.2 million barrel per dollars.<sup>121</sup> It is expected that the US will keep production high, even if the price per barrel of WTI crude oil begins attacking a threshold of 25 dollars.

**Figure No. 6: Crude oil price history 1970-2014**



### Crude Oil Price History Chart

**Source:** The k2p blog [online]: Can consumer countries fuel global growth with sharply reduced oil prices. 2014. WWW: <<http://ktwop.com/2014/10/20/can-consumer-countries-fuel-global-growth-with-sharply-reduced-oil-prices>>

<sup>120</sup> IER [online]: New Oil Finds Around the Globe - Will the U.S. Capitalize on Its Oil Resources. 2015. WWW: <<http://instituteeforenergyresearch.org/studies/new-oil-finds-around-the-globe-will-the-u-s-capitalize-on-its-oil-resources>>

<sup>121</sup> CNBC [online]: US oil ends 0.76 pct higher, posts best close since Jan. 5. 2016. WWW: <<http://www.cnbc.com/2016/03/01/oil-prices-fall-on-huge-build-in-us-crude-stocks.html>>

### 3.5. Crude oil and world GDP

Claiming that discovery of crude oil is the path to prosperity seems logical. Nevertheless, in the 60's people began to observe also negative aspects of such wealth. Many crude oil-rich countries suffered by negative economic growth, unequal income distribution and a large proportion of the population living in poverty.<sup>122</sup> In general those countries suffer more from corruption, they are more often authoritarian regimes, spending more on military and face a higher likelihood of armed conflict. This paradox is referred as the resource curse, "countries with an abundance of non-renewable resources experience stagnant growth or even economic contraction."<sup>123</sup> For example, countries of East Asia, Korea, Taiwan and Hong Kong, are poor in reserves of crude oil, yet their economic growth is high. Noted economist Paul Collier in his book *The Bottom Billion* shows that after some time countries with large deposits of crude oil may end up poorer than they were at the outset. According to the book such society may live as rentier. A rentier state relies on a rent, which means its economy does not require a strong domestic productive sector. These countries include Gulf monarchies such as Kuwait or Saudi Arabia. Furthermore, it says that rents from crude oil have resulted in incorrect working of democracy and corruption. Surprising is the fact that in the case of large revenues from crude oil economy of autocracy country is growing faster than in democracy. Another problem of crude oil is price volatility. Balancing price volatility is very hard. Overall, crude oil price volatility typically results in an increased sense of economic uncertainty, whereas the absence of volatility instills a false sense of stability.<sup>124</sup>

This leads to high volatility of GDP. Between 1960-1973 crude oil countries rose faster by 62 % than other countries. In the 70's GDP growth of Arab countries was on average 8.7 %, and thus it was higher than the GDP growth of East Asia and the Pacific (7.2 %) and Latin America (5.7 %).<sup>125</sup> In contrast, in the 80s Arab countries faced a sharp slowdown to 1.5 %. In the years

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<sup>122</sup> International Business Times [online]: Nigeria - Oil, Poverty, and an 'Ungodly Mess'. 2012. WWW: <<http://www.ibtimes.com/nigeria-oil-poverty-ungodly-mess-214039>>

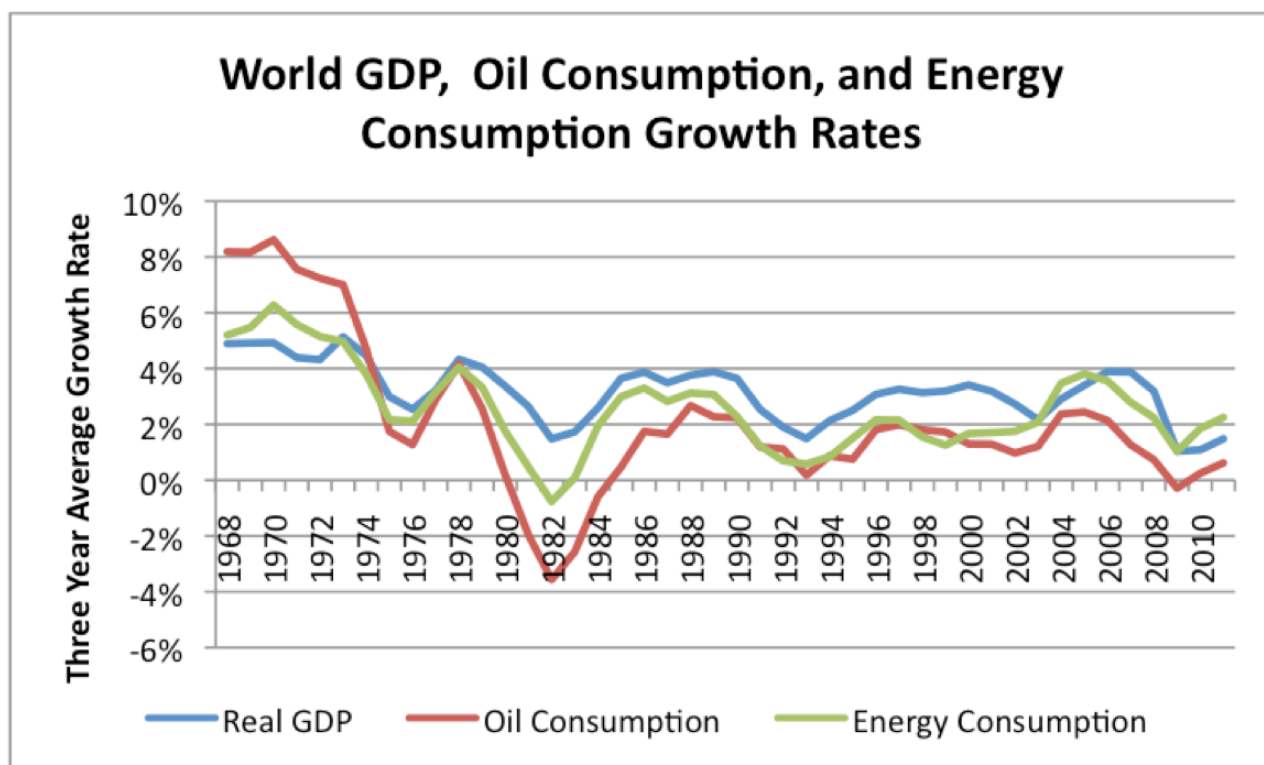
<sup>123</sup> Investopedia [online]: Resource Curse. 2016. WWW: <<http://www.investopedia.com/terms/r/resource-curse.asp>>

<sup>124</sup> World Bank Group [online]: Oil Price volatility - its risk on economic growth and development. 2013. WWW: <<http://blogs.worldbank.org/developmenttalk/oil-price-volatility-its-risk-economic-growth-and-development>>

<sup>125</sup> World Bank Group [online]: GDP growth (annual %). 2015. WWW: <<http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>>

1990-2006 crude oil countries rose again by 40 % compared to other countries. In comparison with other developing regions, countries of the Middle East and North Africa have GDP volatility twice as high.<sup>126</sup> Huge increase and decrease in GDP in the region, as the high growth in the 70s, or the stagnation in the 80s and a return to high growth in 2000, reflects accurately the turbulent fluctuations in crude oil market. Thus crude oil in the years 1960-2006 did not cause slower economic growth, but caused economic instability. Without period 1974-1989 crude oil states would significantly outperform other states in terms of economic growth. So we can say that economically crude oil is not the curse, the countries would not be richer if they were free of crude oil. Crude oil price has a huge impact on world GDP growth. It is obvious from the figure below.

**Figure No 7: Crude oil price history 1970-2014**



**Source:** Our Finite World [online]: The Connection Between Oil Prices, Debt Levels, and Interest Rates. 2014. WWW: <<https://ourfiniteworld.com/2014/05/21/the-connection-between-oil-prices-debt-levels-and-interest-rates>>

<sup>126</sup> Our World in Data [online]: GDP Growth Over the Last Centuries. 2016. WWW: <<http://ourworldindata.org/data/growth-and-distribution-of-prosperity/gdp-growth-over-the-last-centuries>>

## 4. Saudi Arabia overview

Saudi Arabia was founded in 1926 by King Abdulaziz Ibn Saud. He created a base for religious state with the royal family. Nowadays the family is split into several branches, which are engaged in a dispute over the succession.<sup>127</sup> Second largest OPEC member country, officially known as the Kingdom of Saudi Arabia (KSA), straddles the Arabian Peninsula. With a land area of approximately 2 150 000 km<sup>2</sup> it is the 14th largest country in the world. KSA's population in 2013 estimated to be 26.9 million, inclusive of between 5.5 million and 10 foreigners. Around 80 % of inhabitants live in urban metropolitan areas, in Riyadh (the capital city), Jeddah, and Dammam.<sup>128</sup> Saudi Arabia, along with other oil monarchies of the Persian Gulf, represents peculiar politico-economic system, supported by huge oil revenues that government started obtain after the oil boom in the early 70s.<sup>129</sup> The system does not face political problems as most Western democracies. From a global perspective, the issue of political economy of Saudi Arabia has considerable importance, which is determined by economic-strategic significance for the world economy. Kingdom of Saudi Arabia is undoubtedly the most influential member of OPEC, whose decisions on crude oil production influence course of the global economy. Stability of internal development of the country has primary importance not only for neighboring countries but equally for the whole world.

Before founding the modern kingdom in 1932 inhabitants of the Arabian Peninsula were mainly farmers or traders. They were dependent particularly on exports and deals with Muslim pilgrims who came to Mecca and Medina. The kingdom lacked any infrastructure necessary to support economic growth. The discovery of crude oil in 1938 everything changed. Stable and regular oil exports have provided enough funds to build basic infrastructure of roads, airports, seaports, schools and hospitals. In 1970 Saudi Arabia began to build a modern economy capable of producing consumer and industrial goods that had been previously imported. The country's infrastructure has been expanded, so industry and commerce could flourish. At the same time

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<sup>127</sup> Karen Elliott House: "On Saudi Arabia - Its People, Past, Religion, Fault Lines--and Future." 2013. ISBN 0307473287. p. 71

<sup>128</sup> CIA [online]: The World Factbook - Saudi Arabia. 2016. WWW: <<https://www.cia.gov/library/publications/the-world-factbook/geos/sa.html>>

<sup>129</sup> The Economist [online]: Saudi America. 2014. WWW: <<http://www.economist.com/news/united-states/21596553-benefits-shale-oil-are-bigger-many-americans-realise-policy-has-yet-catch>>

crude oil and natural gas company ARAMCO, owned by Saudi Arabia and overseen by Ministry of Petroleum and Mineral Resources, invested in new production facilities, pipelines, factories and transport facilities and continued with exploration of new deposits to maximize revenues from the oil sector in order to finance further growth. The result was a stable economic transformation. Saudi Arabia as a free market economy has undergone in a relatively short time notable changes. At present KSA also manufactures and exports a variety of industrial products throughout the world. The government of Saudi Arabia plays a vital role in the industrial and economic development of the country. Ministry of Economy and Planning formulates economic and social development plans, which provide long-term economic goals. Other areas of the economy are under the supervision of various ministries such as agriculture, energy, transport, communications and finance.

#### **4.1. The political system of Saudi Arabia**

Saudi Arabia is an absolute monarchy. However, the king must abide by the Basic Law of Saudi Arabia. King appoints crown prince, with whom during the government consults on important issues. He rules with help of the Council of Ministers. No political parties or national elections are allowed.<sup>130</sup> The Consultative Council proposes new laws and amends and supplements the existing legislation. The Consultative Council has 150 members, who are appointed by king for four years. Saudi Arabia is divided into 13 provinces. Each province has own council, which deals with the overall development of the province, and corresponds to Governor. The judicial system is based on Islamic sharia law.<sup>131</sup> King has the highest position in the entire legal system. The Sharia court system constitutes the basic judiciary of Saudi Arabia. Most the state institutions, especially ministries, are under control of members of the royal family. Network of clients then compete for the best position in the structure. Another phenomenon preventing greater efficiency is an excessive number of employees in state agencies and offices, what is given by the rules for accepting fresh graduates. That leads to lower qualification of workers.

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<sup>130</sup> Jeffrey Haynes: "An Introduction to International Relations and Religion." 2007. ISBN 1405824743. p. 348

<sup>131</sup> Saudi Legal [online]: Saudi Arabian law overview - Islamic Law. 2015. WWW: <[http://www.saudilegal.com/saudilaw/01\\_law.html](http://www.saudilegal.com/saudilaw/01_law.html)>

Nevertheless clientelistic structure of ministries, some of them work very well. Mainly Ministry of Petroleum and Mineral Resources and Saudi Arabian Monetary Agency (SAMA). One of the outstanding problems is an extraordinary relationships between political administration and business that are associated with corruption.<sup>132</sup>

## **4.2.The economy of Saudi Arabia**

Saudi Arabia's economy characterized not only by being tied to oil industry, but also by other factors which distinguish it from other oil monarchies. Saudi Arabia has planned economy. It is reliant dependent on foreign workers. Saudi Arabia is highly dependent on the extraction of crude oil, its role in the economy of Saudi Arabia is the most important of all branches of the economy, and thus the price of crude oil and its fluctuations are crucial for the performance of Saudi Arabia's economy. Extraction of crude oil along with petrochemical production contribute more than one half of the GDP.<sup>133</sup> Crude oil and oil derivatives make up 85 % of exports, and oil revenues make up 75 % of government budget.<sup>134</sup> KSA seeks to transform the original economy dependent on oil production to an economy built on other fields. Economically, Saudi Arabia is oriented primarily on the US, the European Union (Great Britain, France, Italy, Spain and Germany) and Japan. Today Saudi Arabia is one of the fastest growing countries in the world.<sup>135</sup>

“Saudi Arabia is the 5th largest export economy in the world and the 42nd most complex economy.” Export represents all sectors of the economy now. On the top of the list KSA climbed mainly due to export of petrochemicals, plastics, metal products, building materials and electrical appliances into 90 countries of the world. Saudi Arabia's commercial sector is growing very fast. This growth is mainly supported by generous government incentives such as provision of long term interest-free loans and other support services. The market has around 580

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<sup>132</sup> Saudi Legal [online]: Business Corruption in Saudi Arabia. 2015. WWW: <<http://www.business-anti-corruption.com/country-profiles/middle-east-north-africa/saudi-arabia/show-all.aspx>>

<sup>133</sup> OPEC [online]: Saudi Arabia facts and figures. 2015. WWW: <[http://www.opec.org/opec\\_web/en/about\\_us/169.htm](http://www.opec.org/opec_web/en/about_us/169.htm)>

<sup>134</sup> CNN [online]: Saudi Arabia faces 'economic bomb' and hikes gas prices 50%. 2016. WWW: <<http://money.cnn.com/2016/01/05/news/economy/saudi-arabia-oil-budget-gas>>

<sup>135</sup> SAGIA [online]: Why Saudi Arabia - The hard facts. 2016. WWW: <<https://www.sagia.gov.sa/en/Why-Saudi-Arabia/The-hard-facts>>

000 licensed enterprises engaged in business activities in the Kingdom. Their total invested capital estimated at more than 54 billion dollars. In the kingdom also foreign investments are rapidly growing. Investors' motivation is mainly a royal policy, economic and social stability of the country, modern infrastructure, cheap energy resources and the strategic geographical location of Saudi Arabia. In 2000 KSA eased access to Saudi market for foreign investors by introducing a new law that gave to foreign investors same rights on benefits, offers and guarantees as Saudi individuals and companies have. The law also allows foreign investors to own property and real estate. Another positive development that can be classified is the creation of a free trade zone with several neighboring countries.

The private sector plays in the economy of KSA increasingly important role, now makes up around 48 % of GDP, which is roughly 248.82 billion dollars. It is expected that this sector will continue to grow, thanks to the increasing number of foreign investments. In December 2005 Saudi Arabia joined the World Trade Organization (WTO). This membership gives Saudi products better access to world markets, creates jobs and supports foreign investment. Predominantly due to structure and condition of the economy of Saudi Arabia and conservative politics KSA was not hit by the global financial crisis in 2009. While many economies, especially in developed part of the world, were hit by the negative effect of the crisis, Saudi economy was in a state of relative positive development. Although Saudi banks were hit by negative conditions in global financial markets, domestic financial market continued to operate efficiently and without problems.

### **4.3. Taxation in Saudi Arabia**

In Saudi Arabia is not introduced value added tax (VAT). The main taxes are Corporate Income Tax, Personal Income Tax and Tax withholding. Saudi Arabia has always tried to attract new investments, but in the 90s Saudis was losing among investors on the attractiveness compared to other Arab states of the Persian Gulf. One of the main problems was the high Corporate Income Tax for foreign companies amounting to 45 %. This tax rate seemed even higher, especially when compared to taxation of local companies, which had to pay leastwise 2.5 % as Zakat (the religious tax in Islam), but even that was not always applied. After 2000 Saudi Arabia

came up with a proposal to meet the requirements of investors to create a better business. The kingdom reduced Corporate Income Tax at 30 % and since 2004 at 20 %, regardless to legal status of company. However, this is not valid for companies operating in the sector of extraction and processing of natural gas and crude oil. The rate in businesses involved in production of oil and hydrocarbons is 85 %. On foreign workers is laid down Personal Income Tax 20 %. Yet the total tax reduction still cannot compete with tax havens in other Arab states of the Persian Gulf.

#### **4.4.Aramco and its role**

Involvement of ARAMCO (formerly Arabian-American Oil Company) in the development of the country has not been only related to extraction and transport of crude oil. Since the second half of the 40s the company has played important role in provision of public services and infrastructure.<sup>136</sup> In addition to training of local employees, building roads and terminals in areas of drilling, ARAMCO also had the key role in building schools, hospitals, clinics, wells, radio transmitters. Its effort to build an education system had not initially support of King Abdulaziz Ibn Saud, because he feared the possibility of creation of politically active class that could potentially become an opponent of autocratic rule.<sup>137</sup> Therefore, he preferred more to support education in the fields of craft and trade. In the years 1947-1951 ARAMCO built and operated the second railway in the country. The company also gathered a lot of valuable social and geographic information obtained from Bedouin collaborators, at that time the Saudi Arabian government had not any statistic data on the country. ARAMCO became largely an independent entity whose leaders negotiating with the Saudis independently of the US Department of State.<sup>138</sup> Due its power Aramco was and is able to influence the price development and via it as well the political situation in the world.

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<sup>136</sup> <sup>136</sup> Saudi Aramco [online]: 1940s. 2016. WWW:  
<<http://www.saudiaramco.com/en/home/about/history/1940s.html>>

<sup>137</sup> Anthony Cave Brown: "Oil, God, and Gold: The Story of Aramco and the Saudi Kings Hardcover." 1999. ISBN 0395592208. p. 101

<sup>138</sup> Rachel Bronson: "Thicker Than Oil - America's Uneasy Partnership with Saudi Arabia." 2008. ISBN 0195367057. p. 61





## 5. The role of crude oil in Saudi Arabian economy

Most of the world's crude oil reserves are in the Middle East, almost 50 %, from that 18 % are located within the territory of Saudi Arabia.<sup>139</sup> The reserves are the second largest in the world, and its current production still ranks among the largest oil producers.<sup>140</sup> These deposits reportedly will approximately last for over 70 years.<sup>141</sup> Saudi Arabia has one of the lowest cost of extraction, roughly 5-6 dollars per barrel, the world average is much higher. Saudi Arabia is able to meet the trend of increasing daily crude oil consumption unlike to other countries. Mainly due to these facts KSA has a unique role in influencing global crude oil prices. The distinguishing feature of the Saudi oil industry is considered the fact that all technology, manpower, distribution network built foreigners, especially Americans. The kingdom provided only land. The process of extraction and distribution of crude oil includes many oil companies, for example, Total SA, Sumiton, ExxonMobil or Shell Saudi Arabia Refining, however, a major company in the sector presents Saudi Aramco, not only in Saudi Arabia but throughout the world.

### 5.1. The discovery of crude oil

In the early of 20th century, crude oil was discovered at several locations of the Persian Gulf, after that was concluded that in this area could be large deposits. The history of extracting crude oil in the Middle East began in 1901, when Iran had granted an oil concession to the United Kingdom. The UK also as first expressed an interest in Saudi Arabia's potential of crude oil. However, they did not advantage it and rights expired. In 1933 King Abdulaziz Ibn Saud provided the exclusive extraction rights to the United State.<sup>142</sup> Saudi Arabian crude oil was

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<sup>139</sup> OPEC [online]: Saudi Arabia facts and figures. 2015. WWW: <[http://www.opec.org/opec\\_web/en/about\\_us/169.htm](http://www.opec.org/opec_web/en/about_us/169.htm)>

<sup>140</sup> GEAB [online]: Top 10 Countries With The World's Biggest Oil Reserves. 2015. WWW: <<http://geab.eu/en/top-10-countries-with-the-worlds-biggest-oil-reserves>>

<sup>141</sup> Jerzy Zdanowski: "Middle Eastern Societies in the 20th Century." 2014. ISBN 1443866067. p. 12

<sup>142</sup> History [online]: Standard Oil geologists arrive in Saudi Arabia. 2015. WWW: <<http://www.history.com/this-day-in-history/standard-oil-geologists-arrive-in-saudi-arabia>>

discovered in 1938 in Dammam (oil well there was closed in 1982).<sup>143</sup> Suddenly one of the poorest country in the world got a premise to become one of the richest. Credit for this oil boom have been attributed to several King's foreign advisors, including employees of US company Standard Oil Company of California (SOCAL).<sup>144</sup> This company, later Chevron, obtained the rights to extract in Saudi Arabia. SOCAL set up a subsidiary company, the California Arabian Standard Oil Company (CASOC) to develop the oil concession.<sup>145</sup> The concession was valid sixty years since the launch of prospecting, the main provisions included, for example, exempting the company from an obligation to pay direct and indirect taxes. In 1944 Saudi-American CASOC renamed on Arabian American Oil Company, Aramco, and over the years turned into the most influential and largest oil company in the world. Later, Saudi Arabia has also granted concession to other prominent companies.

Saudi Arabia became world's producer capable of satisfying the increasing demand for oil. At the end of World War II the production was 60 thousand barrels per day. Since the 70s KSA has started extraction in large quantities. In 1973 Saudi Arabia with production 8 million barrels per day became one of the top producers in the world.<sup>146</sup> Since 1973 Saudi Arabia was buying real estate of Aramco and in 1980 acquired full ownership of the company. In 1988 was officially founded a new company Saudi Aramco, which is now fully controlled by the government. It is one of the most sophisticated oil company in the world, employing more than 50 000 employees and a large contractual work force.<sup>147</sup>

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<sup>143</sup> Drillinginfo [online]: Saudi Arabia and Oil - What You Need to Know. 2015. WWW: <<http://info.drillinginfo.com/saudi-arabia-oil-need-know>>

<sup>144</sup> Life in Saudi Arabia [online]: History behind Oil Discovery in Saudi Arabia. 2015. WWW: <<http://life-in-saudi-arabia.blogspot.cz/2015/05/history-behind-oil-discovery-in-saudi.html#.VticL1JMjBY>>

<sup>145</sup> Aramco [online]: Who we are - Our history. 2016. WWW: <<http://www.aramcoservices.com/Who-We-Are/Our-History.aspx>>

<sup>146</sup> Trading Economics [online]: Saudi Arabia Crude Oil Production. 2016. WWW: <<http://www.tradingeconomics.com/saudi-arabia/crude-oil-production>>

<sup>147</sup> Arab News [online]: Aramco emerges stronger from cyber attack. 2012. WWW: <<http://www.arabnews.com/aramco-emerges-stronger-cyber-attack>>

## 5.2. The reserves of crude oil

Saudi Arabia possesses 266 578 million barrels of oil left in their soil at the end of 2015.<sup>148</sup> They are mainly located in the Eastern Province. Until 2011 these reserves were the largest in the world, then Venezuela declared new proven reserves that they had found.<sup>149</sup> A big part of the reserves comes from oil wells within large oil fields. The Saudis have around 100 leading crude oil fields, including offshore types, 8 largest fields cover more than half the reserves. Most of them are located in the area of the Persian Gulf. The largest is Ghawar field, up to 60 % of Saudi production comes from there.<sup>150</sup> With the world's daily production 5.5 % it is the largest crude oil field in the world. From this field is obtained Arab Light, the light type of crude oil represents over 70 % of total production.<sup>151</sup> In case of drop-out of the old wells, they will increase production in the new ones.

Generally, the light crude oil is obtained from terrestrial deposits. While medium and heavy crude oil types are located mainly in wells in the Persian Gulf and the Red Sea. Out of eight major fields only two are offshore. Next large crude oil fields are Safaniya, the largest offshore oil field in the world, in the water of the Persian Gulf with a capacity of 1.2 million barrels per day, Khurais with the same capacity, offshore platform Manifa with a capacity of 0.9 million barrels per day and Shaybah, founded by Saudi Aramco in 1998, with a production 1 million barrels per day and estimated reserves 14 billion barrels.<sup>152</sup> Other deposits are in Shaybah, Qatif, Khursani Yah, Zuluf and Abqaiq. Saudi Aramco does not provide any international oil pipeline. Transportation is provided via Vela International Marine Limited, the company uses 15 so-called Very Large Crude Carriers, it has a dead weight tonnage or cargo carrying capacity ranking up to 250 000 tons.<sup>153</sup> The carriers are in charge of transportation of crude oil in the

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<sup>148</sup> OPEC [online]: Saudi Arabia facts and figures. 2015. WWW: <[http://www.opec.org/opec\\_web/en/about\\_us/169.htm](http://www.opec.org/opec_web/en/about_us/169.htm)>

<sup>149</sup> El Universal [online]: Venezuela's oil reserves increase to 296.5 billion barrels. 2011. WWW: <[http://www.eluniversal.com/2011/02/15/en\\_eco\\_esp\\_venezuelas-oil-rese\\_15A5167373](http://www.eluniversal.com/2011/02/15/en_eco_esp_venezuelas-oil-rese_15A5167373)>

<sup>150</sup> Tiger General LLC [online]: The Ghawar Field - The World's Largest Oil Field. 2014. WWW: <<http://www.tigergeneral.com/ghawar-field-worlds-largest-oil-field>>

<sup>151</sup> EIA [online]: Saudi Arabia - Overview. 2014. WWW: <<https://www.eia.gov/beta/international/analysis.cfm?iso=SAU>>

<sup>152</sup> World List Mania [online]: List of Oil Fields in Saudi Arabia. 2015. WWW: <<http://www.worldlistmania.com/list-of-oil-fields-in-saudi-arabia>>

<sup>153</sup> Maritime-Connector.com [online]: VLCC and ULCC. 2015. WWW: <<http://maritime-connector.com/wiki/vlcc>>

Middle East, Europe and the United States.

Is important to realize that the declared amount of reserves may differ from the real state. Saudi Arabia is located in a politically unstable region. Crude oil is state property, the major oil company is Saudi Aramco, which publishes a statistical yearbook. Since 1977 crude oil reserves over several years increased from 100 to 260 billion barrels, however Saudis did not discover any super giant as the Ghawar field, nor any technological process or invention.<sup>154</sup> It is quite evident that official data on crude oil reserves are under political and economic influence. Still, it is undeniable that KSA has huge crude oil reserves. US geologists estimated over 100 billion barrels of undiscovered crude oil lying beneath the arid sands of Saudi deserts.<sup>155</sup>

If we talk about reserves, a logical question may be how long these reserves will last with current production. For this purpose is used the reserves-to-production ratio, R/P, it shows the remaining amount of a non-renewable resource, expressed in time.<sup>156</sup> Remaining proven reserves of a given year divided by the amount of production the same year. Currently the ratio of Saudi production is 63.6.<sup>157</sup> So, with the assumption that the amount of reserves is unchanged and level of production remains same, reserves will last for next 63 years. This calculation can be regarded as a very relative, as recent developments in the crude oil industry tend to alternative sources. For example, the automotive industry working intensively on electric engines. Therefore, it is possible that in the next few years' consumption will be reduced, in that case R/P increases.

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<sup>154</sup> IAGS [online]: New study raises doubts about Saudi oil reserves. 2004. WWW: <<http://www.iags.org/n0331043.htm>>

<sup>155</sup> World Atlas [online]: The World's Largest Oil Reserves By Country. 2004. WWW: <<http://www.worldatlas.com/articles/the-world-s-largest-oil-reserves-by-country.html>>

<sup>156</sup> WUWT [online]: The R/P Ratio. 2011. WWW: <<http://wattsupwiththat.com/2011/12/13/the-rp-ratio>>

<sup>157</sup> BP [online]: Statistical Review of World Energy. 2015. WWW: <<https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf>>. p. 6

**Figure No. 8: Saudi Arabia's crude oil fields in the area of the Persian Gulf**



Source: EIA [online]: Saudi Arabia - Overview. 2014. <<https://www.eia.gov/beta/international/analysis.cfm?iso=SAU>>

### 5.3. The production of crude oil

Keeping crude oil prices at a relatively reasonable rate ranks among the main interests of Saudi Arabia and its oil industry. In order to not let prices fall too much Saudi Arabia is forced to cooperate not only with members of OPEC, but also with other producers. Saudi Arabia maintains a reserve production capacity, which is able to be used in order to not let prices climb too high.<sup>158</sup> Manipulation with production capacity is a powerful tool that Saudi Arabia has. This mechanism is characteristic for KSA. Saudi Arabia produced in 2014 on average 9.735

<sup>158</sup> The Wall Street Journal [online]: The Mystery of Saudi's Spare Oil Production Capacity. 2013. WWW: <<http://blogs.wsj.com/middleeast/2013/09/18/the-mystery-of-saudis-spare-oil-production-capacity>>

million barrels of crude oil per day.<sup>159</sup> For comparison, at the beginning of the millennium Saudi Arabia produced 8.404 million barrel per dollars. Over 14 years the production increased almost by 16 %. However, growth has not been constant. The decline took place several times. It occurred in the period of financial crisis between 2008 and 2009, but also after 2012, so as to more efficiently integrate the amount of crude oil from other countries, mainly from the United States, into the global market.<sup>160</sup> Therefore the year 2012 can be described as one of the most productive year in terms of the average quantity of crude oil produced per day.<sup>161</sup>

The price in June of 2014 was at 115 dollars per barrel. Then many changes came. After this month price continued to fall. In mid-January 2016 the price was around 30 dollars per barrel. It has decreased by 74 % in 18 months.<sup>162</sup> Major crude oil producers between the years 2001 and 2014 were used to relatively prices above 100 dollars per barrel, so most of them adapt with big difficulty to the fall in prices. There are several reasons which led to these price changes on the market. Of course it is a clash of supply and demand. Due to an extraction expansion of oil shale, where the United States and Canada dominating, supply has significantly increased. This new process represents a threat to KSA. And low crude oil prices weaken this threat, since oil shale is more expensive to produce than traditional crude oil extraction methods and its producers do not have the means to finance a deficit in the long term. Unlike Saudi Arabia, it has the lowest cost per barrel and 900 billion dollars in foreign exchange reserves, which can be used to fund losses.<sup>163</sup>

“Crude oil exports from Saudi Arabia rose from an average of 7.111 million barrels per day in September to 7.364 million per day in October.”<sup>164</sup> Such a production leads to huge reduction

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<sup>159</sup> CIA [online]: Crude oil production - Country Comparison to the World. 2014. WWW: <[https://www.cia.gov/library/publications/the-world-factbook/fields/print\\_2241.html](https://www.cia.gov/library/publications/the-world-factbook/fields/print_2241.html)>

<sup>160</sup> Index Mundi [online]: Saudi Arabia Crude Oil Production by Year. 2013. WWW: <<http://www.indexmundi.com/energy.aspx?country=sa&product=oil&graph=production>>

<sup>161</sup> EIA [online]: U.S. Field Production of Crude Oil (Thousand Barrels per Day). 2015. WWW: <<https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcrfps2&f=m>>

<sup>162</sup> Investing.com [online]: Crude Oil Historical Data. 2016. WWW: <<http://www.investing.com/commodities/crude-oil-historical-data>>

<sup>163</sup> Quora [online]: What is the break-even dollar value per barrel of oil for major oil producing countries. 2016. WWW: <<https://www.quora.com/What-is-the-break-even-dollar-value-per-barrel-of-oil-for-major-oil-producing-countries>>

<sup>164</sup> OilPrice.com [online]: Saudi Arabia Continues to Ramp Up Oil Output in Face of Market Glut. 2015. WWW: <<http://oilprice.com/Energy/Crude-Oil/Saudi-Arabia-Continues-to-Ramp-Up-Oil-Output-in-Face-of-Market-Glut.html>>

in prices. According to published information it was able, if necessary, to immediately increase the production even more. Intention is clear, KSA does not want to free up space on the market for companies with higher costs, such as producers of oil shale in the United States. Saudi Arabia's aim is to defend its market share, as the biggest exporter in the world.<sup>165</sup> Russia, not OPEC member, holds the second place. Increase in production is also driven by the strong growth in global demand for oil and increasing consumption of domestic refineries and power plants in Saudi Arabia. However, this is not the only determinant current of crude oil prices. The market is pushing down by the persistent overproduction, but also by a growing concern about the development of the Chinese economy.<sup>166</sup> When internal demand of the most populous country in the world decreasing, commodity prices falling even more. Thus expectation is next reason. If it is assumed that prices will remain at high levels, producers are encouraged to invest, what leads to bigger economic activity and higher supply of crude oil. The opposite occurs when oil producers expect a price decline.

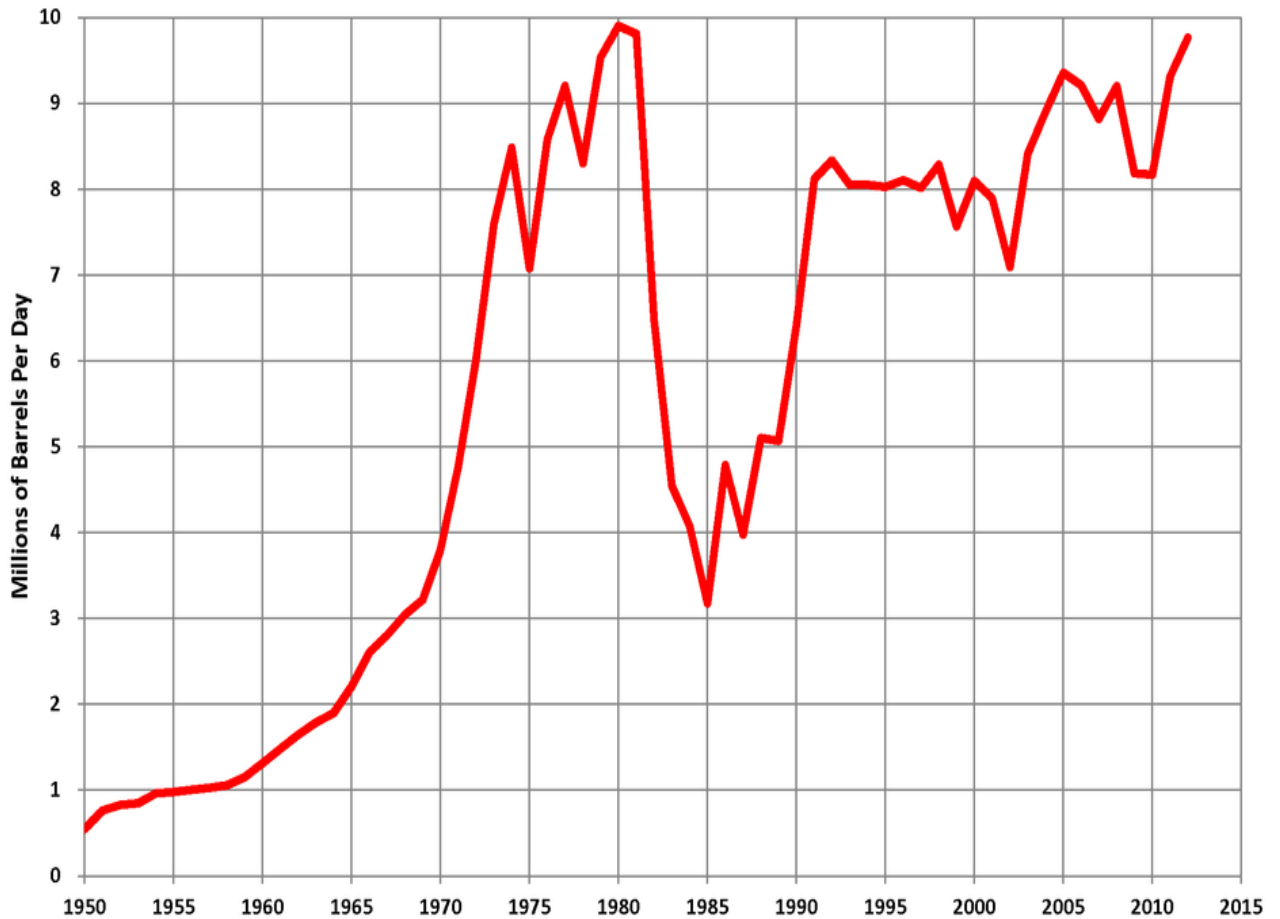
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<sup>165</sup> WTEEx [online]: Crude Oil Exports by Country. 2016. WWW: <<http://www.worldstopexports.com/worlds-top-oil-exports-country>>

<sup>166</sup> The Wall Street Journal [online]: China Economy Concerns Weigh on Oil Prices. 2016. WWW: <<http://www.wsj.com/articles/china-economy-concerns-weigh-on-oil-prices-1452477711>>



**Figure No. 9: Saudi Arabia crude oil production 1950-2012**



**Source:** Wikipedia [online]: History of the oil industry in Saudi Arabia. 2013. WWW:  
<[https://en.wikipedia.org/wiki/History\\_of\\_the\\_oil\\_industry\\_in\\_Saudi\\_Arabia](https://en.wikipedia.org/wiki/History_of_the_oil_industry_in_Saudi_Arabia)>

### **5.4. The consumption of crude oil**

Saudi Arabia belongs to the biggest consumers of crude oil across the Middle East, which is characterized by a rising trend. In 2010 the country ranked 6th place in terms of the amount of crude oil consumed in the world. Daily consumption was 2 580 thousand barrels, the bigger amount consumed only giants as the United States, China, Japan, India and Russia. Three years later, in 2013, KSA was also on the 6th place, but its consumption increased by 14.76 % to 2

961 thousand barrel per dollars.<sup>167</sup> For comparison, in 2005 it ranked at the 10th place. In primary energy consumption, the energy embodied in natural resources, Saudi Arabia in 2013 ranked at the 12th place.<sup>168</sup> There are many reasons why Saudi Arabia's energy consumption is growing. One of them is certainly the low selling prices of crude oil, which the kingdom as one of the main producers can afford. Another aspect is the strong economic growth that was until June of 2014 provided by the relatively high prices of crude oil.<sup>169</sup> With an average annual economic growth of 6.1 % ranks behind China and India as the fastest growing economy. Nevertheless, it is expected that this trend will be slightly changed, due to the expected smaller domestic demand for crude oil.

Another aspects of high energy consumption are government efforts to invest in energy-intensive industries, such as petrochemical, relatively rapidly increasing of population, large distances between industrial areas and populated parts of the country and the climate. 70 % of electricity consumed air conditioning, summer temperatures reach up to 45 degrees Celsius.<sup>170</sup> An interesting feature of Saudi Arabia is also the composition of energy sources that contribute to cover the energy demand. Unlike a large part of the world, which uses all 6 energy resources, i.e. crude oil, gas, coal, nuclear power, hydropower and renewable sources, Saudi Arabia relies almost solely on crude oil and gas.<sup>171</sup> The crude oil consumption is considerably different from the total production of the country. The difference between production and consumption is then available for export to other countries of the world.

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<sup>167</sup> EIA [online]: International Energy Statistics - Consumption. 2014. WWW: <<http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=5&pid=5&aid=2&cid=regions&syid=1980&eyid=2014&unit=TBD>>

<sup>168</sup> EIA [online]: International Energy Statistics - Total energy. 2012. WWW: <<https://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=44&pid=44&aid=2>>

<sup>169</sup> FocusEconomics [online]: Saudi Arabia Economic Outlook. 2016. WWW: <<http://www.focus-economics.com/countries/saudi-arabia>>

<sup>170</sup> Saudi Power [online]: Saudi Aircon - About. 2016. WWW: <<http://www.saudi-power.com/en/Saudi-Aircon/About>>

<sup>171</sup> OpenEI [online]: Saudi Arabia - Energy Resources. 2010. WWW: <[http://en.openei.org/wiki/Saudi\\_Arabia](http://en.openei.org/wiki/Saudi_Arabia)>

## **5.5.The export of crude oil**

Export of crude oil from Saudi Arabia in 2015 climbed to its highest level in nearly a decade, currently the country ranks as the largest exporter of crude oil. KSA's crude oil exports in October rose by 253 000 barrel per dollars from September to 7.364 million barrel per dollars. Exports data are reported by the Saudi Arabian Monetary Agency. Major export partner is United States (14 percent of total exports). However, Saudi crude oil is exported mainly to the Asian part of the world, it is up to 68 % of the total exported quantities. The biggest amounts are exported to Japan (1.2 million barrel per dollars), China (1.1 million barrel per dollars), South Korea (0.9 million barrel per dollars) and India (0.8 million barrel per dollars).<sup>172</sup> An interesting observation is the fact that after the crisis in 2008 export to these Asian countries were bigger than before the crisis as the only destinations in the world. Other relevant partners are United Arab Emirates, Bahrain, Singapore and Taiwan. The big change occurred in exports to Oceania, in 2000 was exported there about 14.38 million barrels, in 2006 it was roughly by 75 % less. In 2013 there was a next small decrease, however, the amount is relatively stable now around 3 million barrels.

## **5.6.The price of crude oil**

Pricing of crude oil in Saudi Arabia is based on Official Selling Price, OSP. This is determined on the basis of two indicators. The first is destination of delivery, and the second type of crude oil. The average value of the price, published by Platts agency, is used for the formation of prices for the Asian market. For the European market is used Brent Weighted Average, the weighted average of Brent Crude. This method is used by several major crude oil exporters, including Kuwait and Iran. The price for export to North America is determined by ASCI index, before 2012 were used prices of WTI crude oil, but ASCI is regarded as the more meaningful index.<sup>173</sup> From 2000 to 2008, we could see a continuous rise in prices, which stopped at 96.16

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<sup>172</sup> Trading Economics [online]: Saudi Arabia Exports. 2010. WWW: <<http://www.tradingeconomics.com/saudi-arabia/exports>>

<sup>173</sup> ARGUS [online]: Key Prices - ASCI (Crude). 2016. WWW: <<https://www.argusmedia.com/Methodology-and-Reference/Key-Prices/ASCI>>

dollars per barrel for Arab light crude oil, 91.01 for medium crude oil and 87.5 for heavy crude oil. Subsequent fall in prices was caused by the global financial and economic crisis, specifically by low economic activity and thus low demand for this commodity. Since 2009 the prices again continuously rose, in 2012 the prices ranged at 109 dollars per barrel, until 2013, when the prices of these three types of crude oil varied between 103-107.<sup>174</sup> Over the next 6 months, until January 2015, the value of Arab light crude oil fell by 57 % to the level of 45.6 dollars per barrel.<sup>175</sup> Two other types of crude oil, whose development was very similar, fell sharply either. In 2015 the prices decline has been even more dramatic than in 2009. The decline of crude oil prices continue till today, in early 2016, when it is at the lowest value since 2003 and prices have fallen below 28 dollars per barrel.<sup>176</sup>

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<sup>174</sup> Statista [online]: Average annual OPEC crude oil price from 1960 to 2016 (in U.S. dollars per barrel). 2016. WWW: <<http://www.statista.com/statistics/262858/change-in-opec-crude-oil-prices-since-1960>>

<sup>175</sup> OPEC [online]: OPEC Basket Price. 2016. WWW: <[http://www.opec.org/opec\\_web/en/data\\_graphs/40.htm](http://www.opec.org/opec_web/en/data_graphs/40.htm)>

<sup>176</sup> Quandl [online]: OPEC Crude Oil Price. 2016. WWW: <<https://www.quandl.com/data/OPEC/ORB-OPEC-Crude-Oil-Price>>

## 6. The impact of crude oil price fluctuations on Saudi Arabian economy

In this chapter I explore the relationships between fluctuations of crude oil price and selected macroeconomic variables of Saudi Arabia. These relationships are expressed statistically. For this analysis I chose quarterly data on OPEC basket price and various macroeconomic variables of Saudi Arabia between the years 2010-2015 - nominal GDP, inflation, current account, money supply and exchange rate SAR/EUR. I selected this period because there have been huge the price fluctuations, it should show clearly dependency among the variables. In the first quarter of 2011 the price was at 78.7 dollars per barrel, later the price continued to rise and climbed up to 120.89. Since mid-2014 crude oil has been undergoing a rout and it just keeps going, in the fourth quarter 2015 the price even fell to 31.27 dollars per barrel.

**Table No. 2: The data of selected variables**

Year	OPEC basket price (d/b)	Nominal GDP (Billions of US \$)	Inflation (%)	Current account (Billions of US \$)	Money supply (%)	Exchange rate SAR/EUR
2010 Q1	78.7	127.60	4.30	18.00	6.20	0.1978
Q2	72.49	124.40	5.00	12.31	2.87	0.2173
Q3	77.48	128.70	5.87	14.48	3.43	0.1954
Q4	88.99	146.70	5.83	21.96	4.13	0.2008
2011 Q1	111.42	157.30	5.20	36.98	10.17	0.1877
Q2	107.5	166.10	4.70	38.91	15.43	0.1845
Q3	101.57	169.70	4.80	37.73	13.27	0.1975
Q4	106.84	176.80	5.23	44.93	13.37	0.2061
2012 Q1	120.89	185.60	5.33	47.68	12.63	0.1997
Q2	92.99	180.20	5.27	39.62	8.50	0.2118
Q3	109.68	183.30	4.23	37.51	10.20	0.2062
Q4	107.76	185.10	3.77	39.95	12.77	0.2023
2013 Q1	107.23	182.60	4.00	31.48	12.57	0.2081
Q2	100.78	184.00	3.90	27.44	14.77	0.2039
Q3	105.61	187.90	3.57	37.93	14.06	0.1975
Q4	107.94	189.90	3.10	38.59	11.60	0.1935
2014 Q1	104.08	192.30	2.90	26.70	13.20	0.1934
Q2	108.59	191.00	2.67	32.05	12.57	0.1952
Q3	94.17	191.50	2.70	16.12	13.70	0.2119
Q4	52	171.00	2.63	-1.10	12.97	0.2196
2015 Q1	51.06	166.80	2.20	-12.75	9.87	0.2479
Q2	58.79	168.20	2.10	-10.10	10.03	0.2383
Q3	43.58	165.20	2.20	-11.13	7.93	0.2380
Q4	31.27	159.90	2.33	-13.10	4.07	0.2449

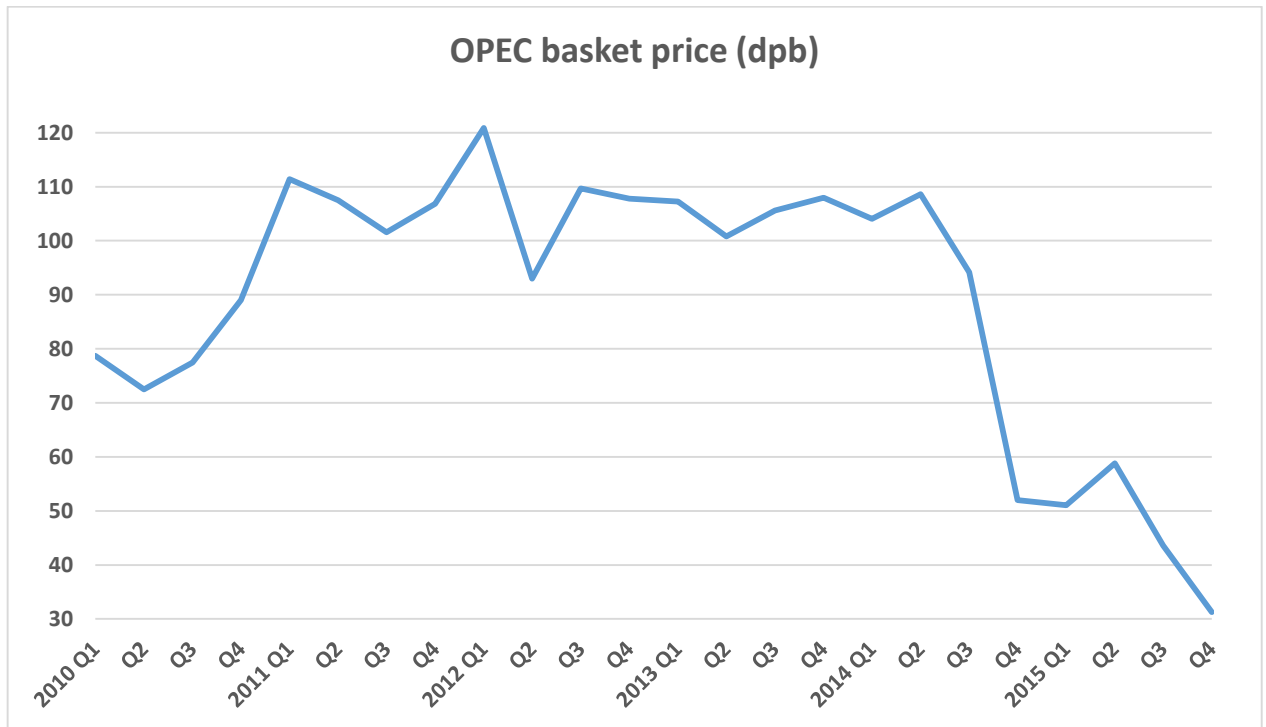
Source: SAMA [online]: Quarterly Statistical Bulletin (Fourth Quarter) 2015. 2015. WWW: <<http://www.sama.gov.sa/en-US/EconomicReports/Pages/QuarterlyStatistics.aspx>>

## 6.1.The data

The first step that was required to do was to collect data of particular variables. Find figures on history of OPEC basket price was not hard, many websites have such records including the official website of OPEC. The macroeconomic variables were another case, especially to find quarterly frequency of data was difficult. Except nominal GDP, the only source for such macroeconomic data is Saudi Arabian Monetary Agency, therefore it cannot be compared with other sources, but as the official one I considered it as the reliable source. Firstly, we look at the developments of crude oil prices and selected macroeconomic variables over the past five years.

### 6.1.1. The development of OPEC basket price

**Figure No. 10: OPEC basket price 2010-2015**



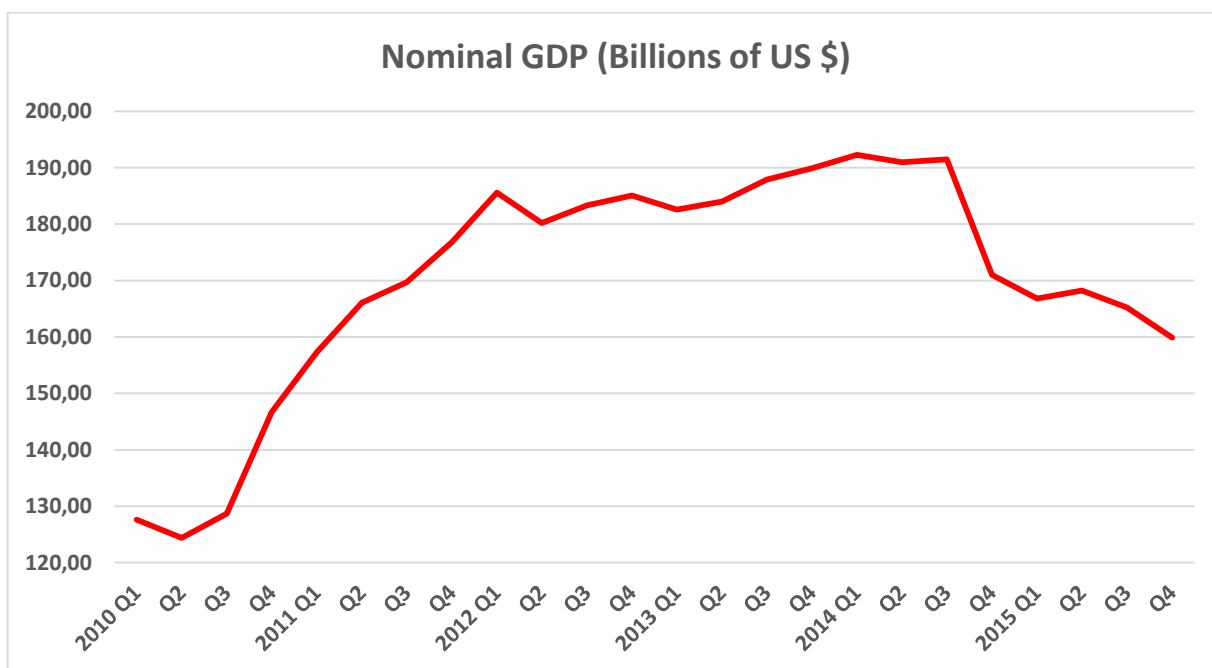
**Source:** OPEC [online]: OPEC Basket Price. 2016. WWW: <[http://www.opec.org/opec\\_web/en/data\\_graphs/40.htm](http://www.opec.org/opec_web/en/data_graphs/40.htm)>

The chart above shows the development of OPEC basket price during the last five years, the price is per barrel. It starts in the first quarter of 2010 when the price was at 78.7 US dollars per barrel. In the next two quarters the price did not change much, then it started to increase and at

the end of the year climbed to 88.99. In the year 2011 the price continued increasing and in the first quarter amounted to 111.42. Then the price began to decline till the end of the year. At the beginning of 2012 the price started again increasing and in the first quarter was at 120.89 dollars, what is the greatest value during the measured period. It represents increased by 53.6 % in the price over the two years. Afterwards OPEC basket price started to decline gradually and at the end of the year 2012 amounted to 107.76. In the second quarter of 2013 the price dropped to 100.78. In the next quarters the price slightly increased and was around 107.94 dollars per barrel. But then the price crude oil price began declining sharply and in the fourth quarter of 2014 fell to 52, thus a lower level than at the beginning of 2010. In 2015 the price has fallen even more to 31.27 dollars per barrel. So between the years 2013-2015 OPEC basket price fell by 74.13 %. Over the entire period the price dropped by 60.26 %.

### 6.1.2. The development of GDP

**Figure No. 11: Saudi Arabia's nominal GDP 2010-2015**



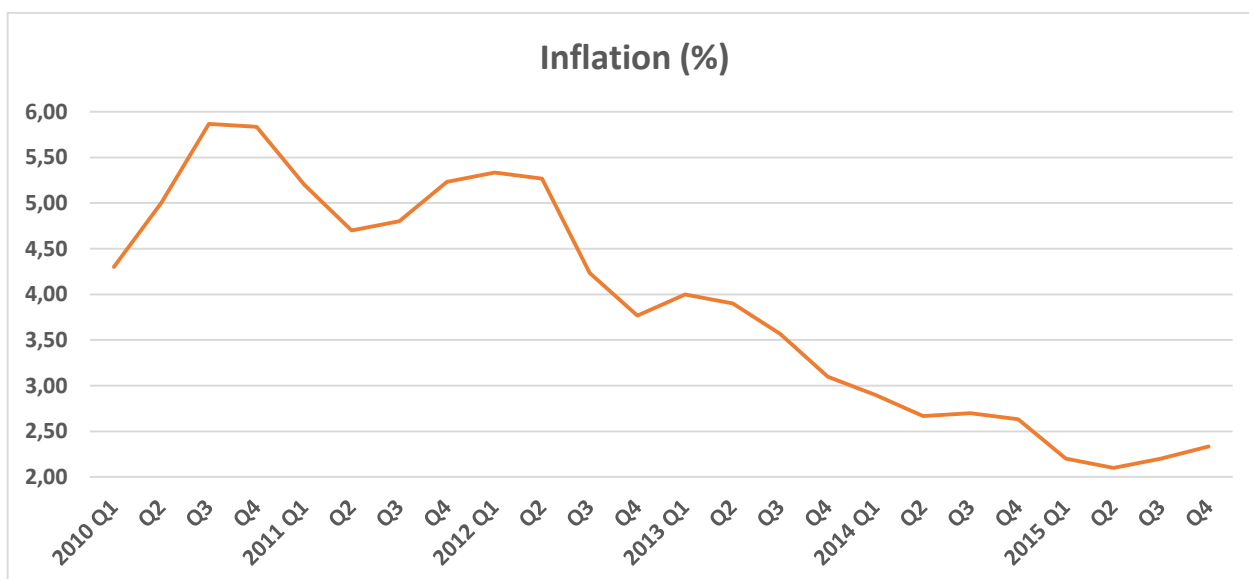
**Source:** Bluenomics [online]: GDP nominal total. 2015. WWW:

<[https://www.bluenomics.com/data#!data/country\\_overview/key\\_indicators\\_1/gdp\\_nominal\\_total/972817959|chart/line&countries=saudi\\_arabia](https://www.bluenomics.com/data#!data/country_overview/key_indicators_1/gdp_nominal_total/972817959|chart/line&countries=saudi_arabia)>

From the macroeconomic variables I couldn't don't pick up GDP as probably the most important indicator. It seems that the GDP development is more or less similar to the development of OPEC basket price. At the beginning of the recorded period nominal GDP was at 127.60 billion of US dollars, thereafter at the end of the year 2010 the value increased and represented number 146.70 with a GDP growth rate 4.1 %. That trend continued and the nominal GDP was constantly increasing till the first quarter of 2012 when amounted to 185.60 billion, at that time the OPEC basket price was at the maximum - 120.89 dollars per barrel. In the last quarter of 2011 the GDP growth rate was at 10.07 %, it is the highest value for the entire period. Afterwards, in 2012 values ranged 180-185. At the beginning of 2013 was a smaller decline, but then again there was an increase. In the first quarter of 2014 nominal GDP reached the maximum 192.30 billion of dollars, it means that the GDP over the four years increased by 50.70 %. After that, as well as in the case of the price, it began steeply declining. The last reported value is 159.90. During the selected period nominal GDP of Saudi Arabia grew by 25.31 %.

### 6.1.3. The development of inflation

**Figure No. 12: Saudi Arabia's inflation rate 2010-2015**



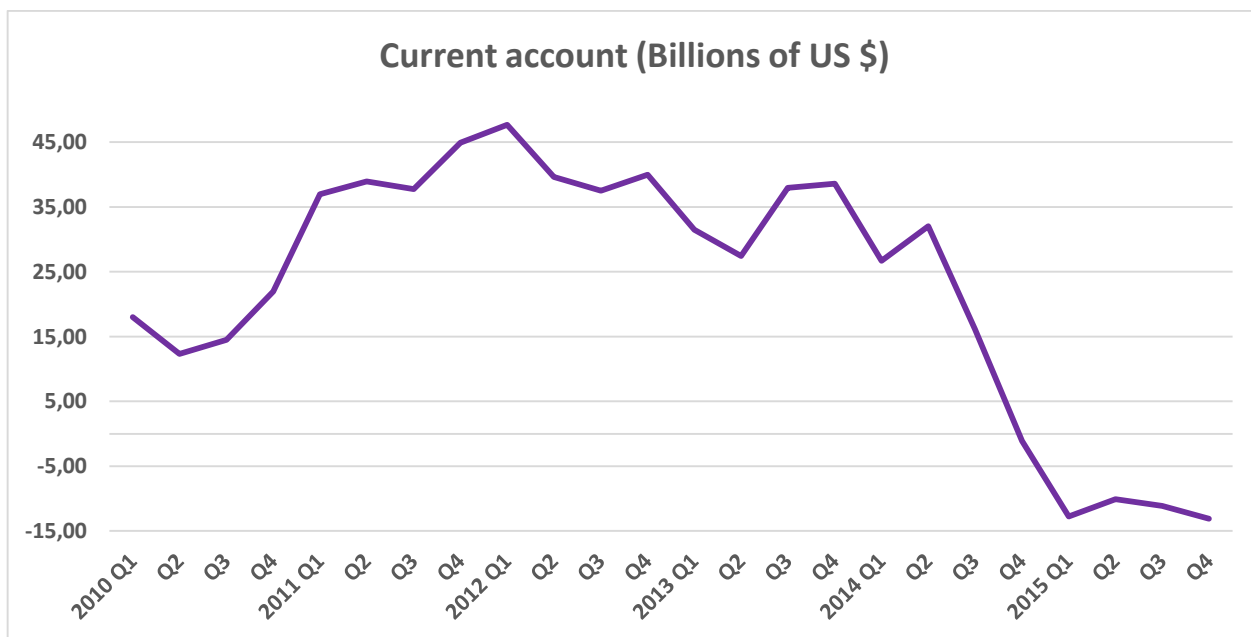
**Source:** SAMA [online]: Quarterly Statistical Bulletin (Fourth Quarter) 2015. 2015. WWW: <<http://www.sama.gov.sa/en-US/EconomicReports/Pages/QuarterlyStatistics.aspx>>



Another important macroeconomic indicator is inflation rate. It is measured in percentage. At first glance, a correlation between the crude oil prices and inflation is not apparent. Let's look at it closely. The inflation rate at the beginning of the reported period amounted to 4.30 %. From this moment the inflation started to grow and soon reached 5.87, concretely in the third quarter of the year 2010. It is the greatest number for the entire period, it should be noted that at the same time the price of crude oil was quite low, 77.48 dollars per barrel. Thereafter the inflation slightly decreased and then increased again. In the first quarter of 2012, when the price was the highest, the inflation rate was at the level of 5.33 %. In the fourth quarter of 2012 inflation fell below 4 % for the first time. The following year inflation rate ranged 3-4 %, the price was around 110 dollars per barrel. At the beginning of 2014 inflation declined below 3 %, at that time the price was still high - 108.17 dollars. The rate was less than 3 % the whole year. Afterwards, in 2015 the price has fallen sharply and the inflation rate has fallen even more, the final reported number is 2.33 %.

#### 6.1.4. The development of current account

**Figure No. 13: Saudi Arabia's current account 2010-2015**

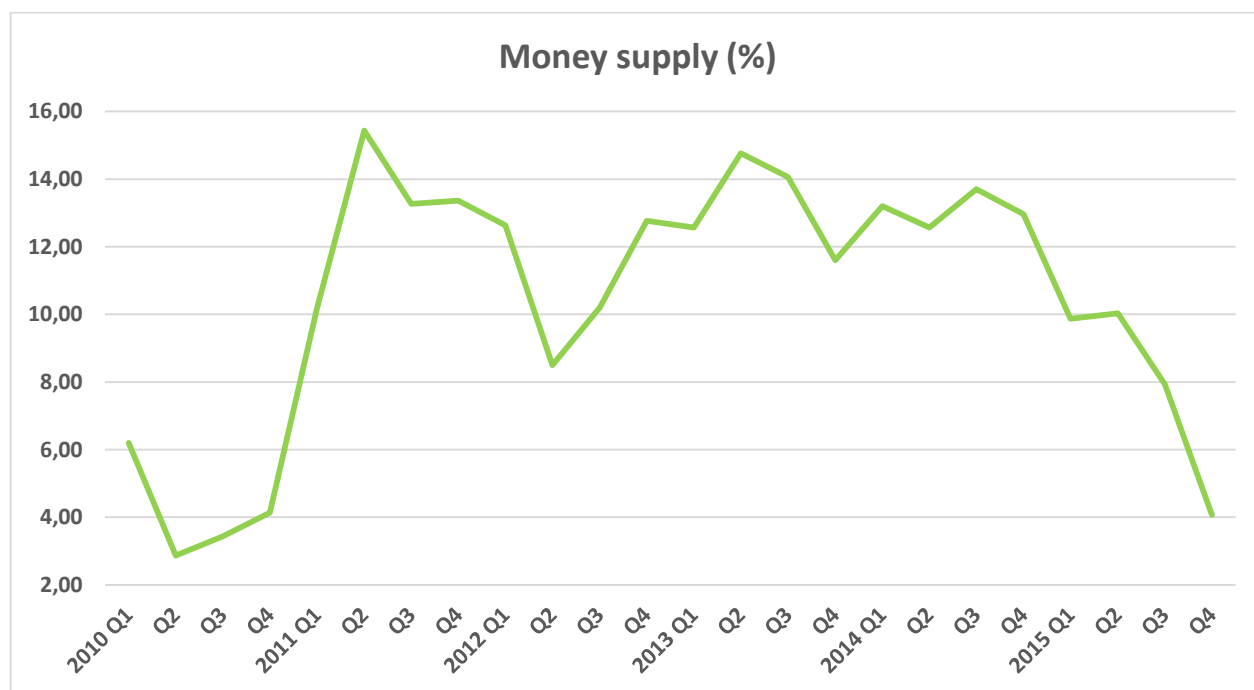


**Source:** SAMA [online]: Quarterly Statistical Bulletin (Fourth Quarter) 2015. 2015. WWW: <<http://www.sama.gov.sa/en-US/EconomicReports/Pages/QuarterlyStatistics.aspx>>

In the chart is clearly visible that the current account development copies the development of OPEC basket price. When the price fell the current account fell as well. After a slight decline at the beginning the value of current account was quickly rising and in the fourth quarter of the first reported year amounted to 21.96 billion of US dollars. In the following quarters of 2011 the value kept constant growth and the beginning of 2012 reached 47.68 billion, it is the highest recorded number, at that time OPEC basket price was also at the highest level. Over the two years current account of Saudi Arabia increased by 164.88 %. That was followed by a decline and the year after value fell to 31.48. After another decline the value began to rise slightly and at the end of 2013 was at 38.59 billion. As the price has started sharply falling, the current account has fallen equally. In the fourth quarter of 2014 the number even fell to minus value, -1.10 billion of dollars. It continued in 2015 and the drop reached -13.10 billion of dollars. During the whole period the current account decreased by -172.7 %.

### 6.1.5. The development of money supply

**Figure No. 14: Saudi Arabia's money supply 2010-2015**

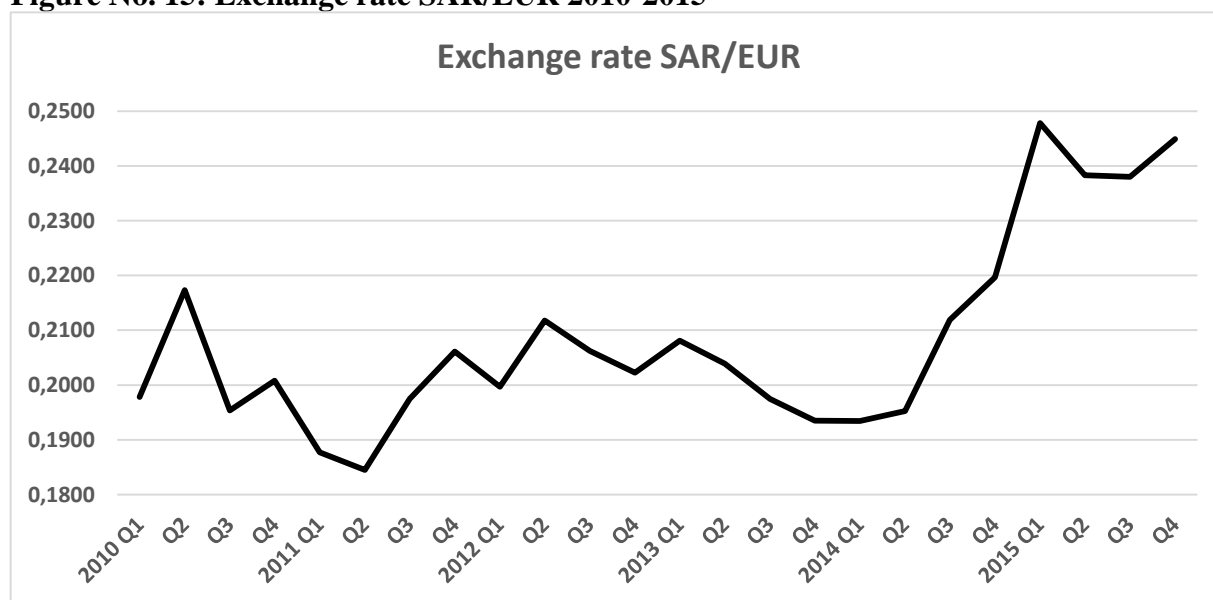


**Source:** SAMA [online]: Quarterly Statistical Bulletin (Fourth Quarter) 2015. 2015. WWW: <<http://www.sama.gov.sa/en-US/EconomicReports/Pages/QuarterlyStatistics.aspx>>

Money supply is another macroeconomic and financial variable I selected. Its development is also very similar to the price one. Collected values start at 6.20 % in 2010. In the following quarter a sudden slump took place and the figure amounted to 2.87 %, that is the lowest value for the entire period, as we could see before at the same time OPEC basket price fell too. This was followed by an increase and that trend peaked in the second quarter of 2011 when the number climbed to 15.43 %, it represents the highest value of the monitored period, the price was at 107.5 dollars per barrel. Then there was a slight decrease and at the beginning of 2012 the number dropped to 12.63 %, at that time OPEC basket price reached the maximum - 120.89 dollars per barrel. Afterwards, there was a fall followed by a rise, in the second quarter of 2013 the money supply amounted to 14.77 %. Then it has gradually declined, in the third quarter of the year 2013 the number was at 13.70 %, and as we have seen before that period was followed by the huge slump in the value and the money supply has fallen to 4.07 %. It is a similar number as at the beginning.

### 6.1.6. The development of exchange rate SAR/EUR

**Figure No. 15: Exchange rate SAR/EUR 2010-2015**



**Source:** SAMA [online]: Quarterly Statistical Bulletin (Fourth Quarter) 2015. 2015. WWW: <<http://www.sama.gov.sa/en-US/EconomicReports/Pages/QuarterlyStatistics.aspx>>

The development of Saudi Arabian Riyal to EURO exchange rate seems different in comparison with the other selected variables. From a closer look is obvious that when OPEC basket price was falling, the exchange rate was rising. The monitored period starts at 0.1978 SAR/EUR. In the second quarter of 2010 a drop occurred in the price and the exchange rate rose by nearly 10 %. Then it gradually declined and in the second quarter of 2011 reached the minimum, 0.1845 represents the lowest value for the entire period. The significance of this quarter we have seen before, for example, in the case of money supply during this period was the highest recorded value. The OPEC basket price was at 107.5 dollars per barrel. The following months, a rising trend of the exchange rate took place and in the second quarter of 2012 climbed to 0.2118. Afterwards the exchange rate was almost two years gradually declining till the beginning of 2014 when it began to rise and in the third quarter climbed to 0.2119. At that time the price has started steeply falling. And as the crude oil price was falling more and more, the exchange rate was just rising. The highest number was recorded in the first quarter of 2015 - 0.2479. The final value of which exchange rate SAR/EUR reached is 0.2449. Over the entire selected period the exchange rate increased by 23.81 %.

## 6.2. Modelling the impact of crude oil prices on macroeconomic variables

When the data was collected, the econometric model was finally able to be processed, which would describe how fluctuations in OPEC basket price affect the macroeconomic variables of Saudi Arabia. For example, it was assumed that there is a significant relationship between gross domestic product and the price of crude oil. In order to confirm this assumption and others the Gretl software was used and performed the statistical tests such as multiple regression analysis, a statistical process for estimating the relationships among variables.

### 6.2.1. The interdependence between crude oil prices and GDP

**Table No. 3: Multiple linear regression model No. 1**

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	21.3741	56.4482	0.3787	0.7094	
OPEC basket price	0.283061	0.273902	1.0334	0.3151	
Inflation	-10.4229	2.68197	-3.8863	0.0011	***
Current account	0.78155	0.356736	2.1908	0.0419	**
Money supply	1.60394	0.786945	2.0382	0.0565	*
Exchange rate	621.612	200.327	3.1030	0.0061	***

Mean dependent var	170.0750	S.D. dependent var	20.54893
Sum squared resid	1282.788	S.E. of regression	8.441920
R-squared	0.867916	Adjusted R-squared	0.831227
F(5, 18)	23.65548	P-value(F)	2.50e-07
Log-likelihood	-81.79937	Akaike criterion	175.5987
Schwarz criterion	182.6671	Hannan-Quinn	177.4740

After estimation of the regression model, it is necessary to evaluate the model quality. In this case what part of the variance in dependent variable (Saudi nominal GDP) was explained by the explanatory variables (the selected variables). This question can be answered through goodness of fit. Goodness of fit can be measured by the coefficient of determination, also called  $R^2$  or R-squared. R-squared is multiplied by 100 and it is interpreted in percentage. In general, the higher the R-squared, the better the model fits your data. If  $R^2$  is equal to 100 %, then the data fall

exactly on the fitted line estimated by using least squares.<sup>177</sup> From the results above the following number has been gained:  $R^2 = 86.79$

It means that 86.79 % variation of OPEC basket price variable was explained by the model. So model's quality is high and the data are close to the fitted regression function.

Before I start with the interpretation, it is also necessary to evaluate the quality of the result. For such reason a p-value helps to determine the significance of the results. Firstly, it must be considered so called null hypothesis ( $H_0$ ), it says that there is not correlation between two variables, in this case between Saudi nominal GDP and OPEC basket price. Always the number ranges 0-1 and is interpreted in the following way:

p-value  $\leq 0.01$  - the risk of rejecting  $H_0$ , when it is true, is 1 %

p-value  $\leq 0.05$  - strong evidence against the null hypothesis, reject the null hypothesis

p-value  $> 0.05$  - weak evidence against the null hypothesis, do not reject the null hypothesis

The p-value I obtained from the test: **0.551**

That is less than 0.05. Therefore the hypothesis is rejected, there is a significant correlation between these two variables. It is statistically significant.

Regression coefficients represent the mean change in the response variable for one unit of change in the predictor variable while holding other predictors in the model constant. A linear regression model with two predictor variables can be expressed with the following equation:  $Y_t = b_0 + b_1X_{1t}$

After I added the values of OPEC basket price nad the Nominal GDP, the equation looks as following:  $Y_t = 21.3741 + 0.283061X_{1t}$

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<sup>177</sup> Petra Bubáková: Empirical Research in Economics. 2014. ISBN 9788021325081. p.70

It says that if all other variables are equal to zero, nominal GDP of Saudi Arabia is 21.374 billions of dollars. Moreover, if the price of crude oil increase by 1 dollar, the GDP will increase by 0.283061 billions of dollars. Important relationship is between the inflation and nominal GDP. Macroeconomic theories reveal that inflation tends to boost GDP through encouraging firms to increase production. However, the result shows that there is a negative relationship between the inflation and GDP. The potential explanation for the unexpected result could lay on importation of products from abroad.

### 6.2.2. The interdependence between crude oil prices and inflation

**Table No. 4: Multiple linear regression model No. 2**

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	5.82017	3.40686	1.7084	0.1048	
OPEC basket price	0.00287857	0.0182567	0.1577	0.8765	
Current account	0.0706048	0.0200007	3.5301	0.0024	***
Money supply	-0.0355146	0.0559552	-0.6347	0.5336	
Exchange rate	19.3148	15.4262	1.2521	0.2266	
Nominal GDP	-0.0437734	0.0112636	-3.8863	0.0011	***

Mean dependent var	3.909722	S.D. dependent var	1.246618
Sum squared resid	5.387368	S.E. of regression	0.547082
R-squared	0.849276	Adjusted R-squared	0.807408
F(5, 18)	20.28473	P-value(F)	7.96e-07
Log-likelihood	-16.12656	Akaike criterion	44.25313
Schwarz criterion	51.32145	Hannan-Quinn	46.12835

R-squared times 100 is equal: **R<sup>2</sup> = 84.92**

84.92 % variation of the inflation variable was explained by the model. Quality of the model is significant.

p-value is very high: **0.8762**

It is obvious that Saudi inflation and OPEC basket price are not correlated to each other. The null hypothesis is not rejected, the price of crude oil has not effect on the inflation. It is useless to continue in the interpretation, since there is independency. The important variables are GDP and exchange rate. From the result we see that an increase in GDP causes inflation to decreases. While an increase in the exchange rate causes inflation to increase.

### 6.2.3. The interdependence between crude oil prices and current account

**Table No. 5: Multiple linear regression model No. 3**

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-42.9479	31.6933	-1.3551	0.1921	
OPEC basket price	0.398191	0.136315	2.9211	0.0091	***
Money supply	-0.0451494	0.512425	-0.0881	0.9308	
Exchange rate	-180.346	139.365	-1.2941	0.2120	
Nominal GDP	0.26936	0.122948	2.1908	0.0419	**
Inflation	5.79414	1.64135	3.5301	0.0024	***

Mean dependent var	23.00734	S.D. dependent var	19.63385
Sum squared resid	442.1112	S.E. of regression	4.955980
R-squared	0.950135	Adjusted R-squared	0.936284
F(5, 18)	68.59543	P-value(F)	4.39e-11
Log-likelihood	-69.01662	Akaike criterion	150.0332
Schwarz criterion	157.1016	Hannan-Quinn	151.9085

The R-squared number:  **$R^2 = 95.01$**

The second important relationship is between the exchange rate, inflation and current account. However, the result is not what is expected from the theory. For instance, it is expected as inflation increases, the exchange rate to depreciate. Nonetheless, in the regression, it can be seen the opposite and the reason could be the currency used in the exchange rate.

This is the highest number so far - 95.01 %. The model is definitely appropriate for estimation.

p-value: **0.0091**



It is less than 0.05, even less than 0.01. It means that for sure null hypothesis is not valid. There is a huge correlation between current account of Saudi Arabia and OPEC basket price.

Regression equation:  $Y_t = -42.9479 + 0.398191x_{3t}$

If the others variables are zero, the current account is equal to  $-42.9479$ . If OPEC basket price increase by 1 dollar, Saudi current account will increase by 0.398191 billions of dollars. In other words, if the price decrease by 1 dollar, the current account will decrease by 0.398191. Further, the relationship between exchange rate and current account balance is in line with the theory. That is, there is a negative relationship between exchange rate and current account. For instance, if the exchange rate depreciates the competitiveness of Saudi Arabia in the international market increases and thereby increases the current account balance. The other important economic relation is between GDP and current account. The causality between GDP and current account shows that when everything remaining constant an increase in GDP causes the current account to increase by 0.2693 units. However, from the conventional macroeconomic point of view, this may not be the case because current account tends to depend on other factors rather than GDP. Last but not least, the relation between inflation and current account balance shows a positive relation. This is particularly truth through the exchange rate channel. For instance, if inflation increases in Saudi Arabia the riyal depreciates and makes Saudi competitive in the international market and ultimately increasing the current account balance.

#### **6.2.4. The interdependence between crude oil prices and money supply**

**Table No. 6: Multiple linear regression model No. 4**

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	3.12222	15.2826	0.2043	0.8404	
OPEC basket price	0.0274251	0.0758347	0.3616	0.7218	
Exchange rate	-59.4982	65.5215	-0.9081	0.3758	
Nominal GDP	0.116908	0.0573587	2.0382	0.0565	*
Inflation	-0.616369	0.971123	-0.6347	0.5336	
Current account	-0.0095484	0.10837	-0.0881	0.9308	

Mean dependent var	10.42889	S.D. dependent var	3.811013
Sum squared resid	93.49974	S.E. of regression	2.279129
R-squared	0.720101	Adjusted R-squared	0.642351
F(5, 18)	9.261770	P-value(F)	0.000168
Log-likelihood	-50.37338	Akaike criterion	112.7468
Schwarz criterion	119.8151	Hannan-Quinn	114.6220

R-squared:  **$R^2 = 72.01$**

72.01 % variation of the inflation variable was explained by the model. It is obvious that this model is not so strong as the above ones.

p-value: **0.7218**

As before in the case of inflation, there is not correlation between Saudi money supply and OPEC basket price. Thus the null hypothesis is valid and there is not reason to continue in the interpretation. Here money supply does not seem to be affected by the variables except GDP. The result here is in line with the economic theories. The money supply is exogenously determined by the central bank irrespective of the level of the variables stated.

### 6.2.5. The interdependence between crude oil prices and exchange rate

**Table No. 7: Multiple linear regression model No. 5**

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	0.159371	0.0385443	4.1347	0.0006	***
OPEC basket price	-0.00049419	0.00024106	-2.0501	0.0552	*
	4				
Nominal GDP	0.000560637	0.000180677	3.1030	0.0061	***
Inflation	0.00414792	0.00331284	1.2521	0.2266	
Current account	-0.00047194	0.000364704	-1.2941	0.2120	
	6				
Money supply	-0.00073622	0.000810757	-0.9081	0.3758	
	5				

Mean dependent var	0.208308	S.D. dependent var	0.017739
Sum squared resid	0.001157	S.E. of regression	0.008017
R-squared	0.840134	Adjusted R-squared	0.795727
F(5, 18)	18.91892	P-value(F)	1.33e-06
Log-likelihood	85.22566	Akaike criterion	-158.4513
Schwarz criterion	-151.3830	Hannan-Quinn	-156.5761

R-squared:  $R^2 = 84.01$

84.01 % variation of the exchange rate variable was explained by the model. The model seems statistically significant.

The p-value I got from the test: **0.552**

The number is less than 0.05, the hypothesis is not valid, OPEC basket price affects exchange rate SAR/EUR. There is dependence between these two variables.

The linear regression is expressed by the following equation:  $Y_t = 0.159371 - 0.000494194x_{5t}$

In the case that other variables are zero, the exchange rate is equal to 0.159371. If OPEC basket price increase by 1 dollar, exchange rate SAR/EUR will decrease by 0.000494194. Theory states that when crude oil price increases, crude oil exporting country's currency appreciates. However,

the regression result shows that the crude oil increases, the exchange rate depreciates, which is the opposite of what the theory states. The possible reason could be the exchange rate taken here and the currency used in the international crude oil market. The exchange rate taken in the regression is between riyal and euro, while crude oil is traded using dollar. The second important relationship is between the exchange rate, inflation and current account. However, the result is not what is expected from the theory. For instance, it is expected as inflation increases, the exchange rate to depreciate. Nonetheless, in the regression, it can be seen the opposite and the reason could be the currency used in the exchange rate.

## Conclusions

Crude oil has a dominant role in the economy of Saudi Arabia. It determines both internal economic development and its position in international economic relations. From this the advantages and vulnerabilities of the economy of this country emerge. This means that any fluctuation in price or quantity of extracted crude oil will affect the international economic position of this country and its political and socio-economic development. Saudi Arabia represents a significant country of the developing world. With regard to the high crude oil reserves and its extraction it occupies an irreplaceable place in the global economy. Crude oil also identifies its key importance in geopolitical approaches to major world political and economic forces. Given that crude oil will remain number one strategic source of energy and very important raw material for the development of the chemical industry for the foreseeable future, Saudi Arabia stand at the forefront of political and economic interests of all the major centers of the developed world.

Fiscal policy in crude oil exporting countries (such as Saudi Arabia) has major importance and its fiscal policy decisions have a major impact on the performance of its economy (GDP, current account) and also influences the development of advanced economies (through commerce of recycling crude oil profits and through financial channels). Fiscal policy of Saudi Arabia has its specific problems (uncertain crude oil revenue is not endless and depends on external demand). This fiscal policy has to cope with these problems both in the long term (fiscal sustainability), and in the short term (macroeconomic stability and fiscal planning). Relevant institutions are addressing these issues as follows: a-by forecasting crude oil prices, b-by setting up crude oil stabilization and savings funds, C-compliance with certain fiscal rules. It must be said that the fiscal policies of Saudi Arabia in case of rising crude oil prices is accompanied by restrictive monetary policy, otherwise it would cause a sharp increase in prices (inflation). Sometimes we can say that the fiscal policy of the petroleum exporting countries should be more moderate, although the pressure on public spending has been considerable especially in times of high crude oil prices. This pressure was a result of reflection on the distribution of crude oil profits across the population, the need for developing social and physical infrastructure and international debate on global imbalances, and saving crude oil revenue for future generations in the long

term.

Recently Saudi Arabia has faced huge challenges in its fiscal policy because of a sharp decrease in crude oil prices. Based on the conducted analysis I found that there is a significant correlation between the crude oil price and GDP of Saudi Arabia, if the price of crude oil increase by 1 dollar, the GDP will increase by 0.283061 billions of dollars. Furthermore that Saudi inflation and the price of crude oil are not correlated to each other. Also there is a huge correlation between Saudi Arabian current account and OPEC basket price. If the price increase by 1 dollar, the current account will increase by 0.398191 billions of dollars. As in the case of inflation, there is not correlation between Saudi money supply and OPEC basket price. OPEC basket price affects exchange rate SAR/EUR as well, if the crude oil price increase by 1 dollar, exchange rate SAR/EUR will decrease by 0.000494194.

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## List of Figures

Figure No. 1: Crude oil density according to American Petroleum Institute scale .....	14
Figure No. 2: The world top proven crude oil reserves in 2000-2013.....	20
Figure No. 3: World's proven crude oil reserves in 1994, 2004 and 2014 .....	22
Figure No. 4: The biggest crude oil producers in 2013 .....	28
Figure No. 5: The biggest crude oil consumers in 2013.....	29
Figure No. 6: Crude oil price history 1970-2014.....	41
Figure No 7: Crude oil price history 1970-2014.....	43
Figure No. 8: Saudi Arabia's crude oil fields in the area of the Persian Gulf .....	54
Figure No. 9: Saudi Arabia crude oil production 1950-2012 .....	57
Figure No. 10: OPEC basket price 2010-2015 .....	62
Figure No. 11: Saudi Arabia's nominal GDP 2010-2015 .....	63
Figure No. 12: Saudi Arabia's inflation rate 2010-2015.....	64
Figure No. 13: Saudi Arabia's current account 2010-2015.....	65
Figure No. 14: Saudi Arabia's money supply 2010-2015.....	66
Figure No. 15: Exchange rate SAR/EUR 2010-2015 .....	67

## List of Tables

Table No. 1: Selected crude oil standards.....	16
Table No. 2: The data of selected variables.....	61
Table No. 3: Multiple linear regression model No. 1 .....	69
Table No. 4: Multiple linear regression model No. 2 .....	71
Table No. 5: Multiple linear regression model No. 3 .....	72
Table No. 6: Multiple linear regression model No. 4 .....	74
Table No. 7: Multiple linear regression model No. 5 .....	75