Czech University of Life Sciences Prague
Faculty of Economics and Management

Department of Economics

Bachelor Thesis

Oil and gas industry of Kazakhstan

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

Vyacheslav Yeremetko

Economics and Management

Thesis title

Oil and gas industry of Kazakhstan

Objectives of thesis

Evaluation of position of oil and natural gas in Kazakhstan, oil and gas production, oil market, assess contribution of oil production to Kazakh economy, conduct prediction of potential future scenarios related to oil production of Kazakhstan, impact of global oil price to GDP annual growth of Kazakhstan.

Methodology

Theoretical part will consist of synthesis, abstraction, observation and deduction. Practical part: some basic statistical methods, methods of qualitative and quantitative data analysis, econometric models time series forecasting and linear regression.

The proposed extent of the thesis

35+

Keywords

Oil, Natural Gas, Export, Production, Kazakhstan, Economy, Oil price;

Recommended information sources

Buba´kova´, Petra, 2014, Empirical research in economics. V Praze : Cˇeska´ zemeˇdeˇlska´ univerzita, Provozneˇ ekonomicka´ fakulta, ISBN 978-80-213-2508-1;

Marat Terterov, Doing Business with Kazakhstan, publisher: GMB Publishing Ltd, 2004, ISBN 1905050593, 9781905050598;

Бобылев Ю.Н., Факторы формирования цен на нефть, 2006, Москва : Институт экономики переходного периода, ISBN 5-93255-210-7;

Чердабаев, Равиль, 2010, Нефть: Вчера, сегодня, завтра, Альпина Бизнес Букс, ISBN 978-5-904522-44-5;

Expected date of thesis defence

2015/16 SS – FEM

The Bachelor Thesis Supervisor

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Electronic approval: 3. 3. 2016

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Electronic approval: 3. 3. 2016

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Prague on 06. 03. 2016

Acknowledgment

I would like to express my gratefulness to Mr. Petr Procházka for his motivation, professional consultations, feedback and support to complete this thesis.

I would like to thank International Relation Office of Czech University of Life Sciences Prague and in particular to Jarmila Barešová for providing information to admission, Iva Pintová for guidance during the all study.

Finally, I would like to express my gratitude to my father Sergey Yeremetko and sister Margarita Vasiltsyun for supporting any my choice and special thanks to Olga Gobunova and Dorzho Gomboev.

Declaration

I declare that I have worked on my bachelor thesis titled "Oil and gas industry of Kazakhstan" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any third person.

In Prague on 14th March, 2015   _____

                                                                Vyacheslav Yeremetko

Oil and gas industry of Kazakhstan

Ropný a plynárenský průmysl Kazachstánu

Souhrn

Tato práce je o průmyslu ropy a zemního plynu z Kazachstánu. Poskytována všeobecné a aktuální informace o světovém trhu s ropou. Vysvětlení struktury světového trhu s ropou, typ transakcí v detailech je připraven. Analýza produkce ropy a zemního plynu v Kazašské republiky a všech tří ropných rafinerií se provádí v této práci. Popsal význam exportu ropy a příspěvku země na světovém trhu. První ekonometrický model byla analyzována z lineární funkce trendů a předpověď produkce ropy z Kazachstánu. Druhý ekonometrický model byla analyzována dopad globální ceny ropy na HDP meziročního růstu země Kazachstánu.

Klíčová slova: Ropa, Zemní Plyn, Vývoz, Produkce Kazachstánu, Ekonomika, Cena ropy;

Abstract

This thesis is about the oil and gas industry of Kazakhstan. Provided general and current information on the global oil market. Explanation of the structure of global oil market, type of transactions in details is done. Analysis of the production of oil and natural gas in the Republic of Kazakhstan and all three oil refineries is performed in this thesis. Described the importance of oil exports and of the country contribution to the global market. The first econometric model has been analyzed of linear trend function and forecast of production crude oil of Kazakhstan. The second econometric model has been analyzed impact of global oil price to GDP annual growth of the country.

Keywords: Oil, Natural Gas, Export, Production, Kazakhstan, Economy, Oil price;

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1 Introduction

The oil is one of the most important resources of the planet, which keeps the economy of many countries. The oil is one of the most important resources of the planet, which keeps the economy of many countries. The global commodity markets, crude is traded three benchmark grades of oil that are WTI, Brent and Dubai Crude.

In case of Kazakhstan, which plays a big role in global market and oil and gas industry of the country has a huge impact on the national economy. Oil production is the major economic sector of the Republic of Kazakhstan. Because the oil is an important commodity for the economy of the country. The revenue from the oil and gas sector has a significantly impact on the national budget, which provides the possibility to financial support from the government of the national economy. Export of oil products has a significant influence to European countries and China. The country is one of a big oil supplier in the global oil market (Dukenbayev, 1998). Oil trade is key in international relations with foreign countries. The petroleum products of Kazakhstan after refinery are gasoline, mazut, aviation kerosene, jet fuel, diesel fuel, fuel oil, liquefied gas, bitumen, coke, sulfur of various grades.

The national economy of Kazakhstan, which the dependence on oil is a factor of the dollar index (Finance.nur.kz, 2015). As the oil prices that are evaluated in dollars, national currency tenge is dependent on global oil prices.

The theoretical part that is described in details the structure of the global oil market, and how commodity exchanges works, what instruments are performed trade transactions. Focuses on the grades of oil, pricing, supply and demand of oil. Influence and describe of OPEC organization of countries exporters. Overview of the country and emergence of modern state, three major oil and gas fields Kashagan, Karachaganak and Tengiz. Transportation system of Kazakhstan oil and gas pipelines.

The practical part is devoted to analysis and evaluate of Kazakhstan oil and gas industry, reserves, production and export. Full analysis of petroleum refineries of the country. The estimate crude oil production of Kazakhstan from 2003 to 2014. Forecast of production crude oil of the country in 2015. The estimation of indicator economy of the country GDP annual growth and average global oil price in this case of benchmark grade of oil Brent.

2 Objectives and Methodology

2.1 Objectives

The purposes of the study is to analyze of Kazakhstan oil and gas industry, evaluation and position oil and natural gas in the country, to analyze production and export of the petroleum products of the country and reserves. To analyze crude oil production of the country in time series from 2003 to 2014, and the forecast of production crude oil in 2015. To estimate impact of global oil price in this case of benchmark grade of oil Brent to GDP annual growth of Kazakhstan. Determine factors directly or indirectly affect to GDP annual growth of the country.

2.2 Methodology

To fulfill objectives of this thesis methodology in theoretical part conducted using by abstraction, synthesis, observation and deduction methods. The practical part is used methods of qualitative and quantitative analysis. The first econometric model using by estimate and calculate linear trend function and time series forecast. All calculation and tables of the first model using by hand and Microsoft Excel program. The second econometric model using by estimation and calculation simple linear regression model by hand and Gretl program.

Software use: Microsoft Excel, Word and Gretl programs

3 Theoretical part

3.1 Oil Market

Oil is unique in its physical and chemical properties of minerals. Combustible substance constitutes an oily liquid. It is black, although oil colors can be brown, cherry and even transparent. Oil may be fluid as water, and may be so viscous and inactive that it does not flow out from the vessel, even if it is overturned. From the chemical point of view oil is a complex mixture of hydrocarbons with various compounds such as sulfur, nitrogen and others. Its smell may also be different, as it depends on its chemical composition. Oil consists of the following elements: Carbon 84%; Hydrogen 14%; Sulfur 1-3% in the form of sulfides, disulfides, sulfur and hydrogen sulfide; Nitrogen less than 1%; Oxygen less than 1%; Metals less than 1% such as iron, nickel, vanadium, copper, chromium, cobalt, molybdenum; Salts less than 1% such as calcium chloride, magnesium chloride, sodium chloride; (Mirznanii.com, 2015). However, oil in its pure form almost never used, for commodity products, it must be refined. Products for final consumption, such as kerosene, gasoline, heating oil, jet and diesel fuels, various petroleum oils - greases, coolants, insulation, hydraulic and etc. The efficiency of oil refining mainly depends on two basic parameters - oil density and sulfur content. Density of oil divided into light and heavy grades. The highest price has light oil products, such as gasoline and diesel fuel. Dark oil products such fuel oil and heating oil. Oil low density that is light oil in the primary distillation provides a higher yield of light fractions, so these grades of oil valued higher. Composition of oil includes various sulfur compounds, the proportion of which can range from a fraction to a few percent. Sulfur compounds cause serious damage to natural environment. Moreover, they disrupt neutralization of exhaust gas emissions installed on modern cars. Requirements for the content of sulfur in fuel are becoming more stringent. A few years ago was widely used to diesel fuel containing 0.3-0.5% sulfur, and now adopted by the European standard Euro-5 limits the sulfur content in diesel fuel at 0.001%.

3.1.1 Structure of oil market

The oil market is part of the world economy in which exist a trade derivative instruments are usually futures contracts on various grades of oil between countries, international corporations, companies and other market participants. Crude oil in the world is most actively traded commodity. Trading commodity contracts carried out in the

commodity exchanges. Many of major stock exchanges have special commodity sections, where it is trade in these instruments. Trades take place with the use of crude oil, as well as rights to the transportation and refining of oil products. Commodity is widespread consumer goods or product, such as oil, which sold on commodity exchanges (Konoplyanik, 2009). Crude oil is the most demanded commodities in the world. Oil trade carried out by different ways such as futures contracts concluded on a commodity exchange, the contracts in over the counter market, the direct long-term contracts between producers and consumers of oil.

3.1.2   Type of transactions in oil market

A futures contract on oil is a derivative financial instrument or agreement to purchase or sell a specific volume of oil at a given time in the future at pre-agreed terms, and set commodity price of oil. Actual payments in advance on them not carried out. Consumers only need to pay a deposit so called margin requirement, ensuring the performance of obligations. The supplier is obliged to sell at pre-agreed period, the volume and the price fixed at the time of the futures contract. The size of margin requirement, determined by the futures exchanges which to provide from 1% to 10% of the operation. Therefore, futures contract allow to fix the purchase price or sale of oil in the future, so that receive a hedge that is compensation or form of insurance against risks price of changes (Konoplyanik, 2009). The main conditions of futures contract are the contract name, code name, type of contract, the contract size and maturity of contract, the delivery date, minimum price change. Types of futures contracts are deliverable and non-deliverable. Delivery futures contract requires that at the date of execution of the contract the buyer has to buy, and the seller to sell the specified quantity of oil. Delivery performed according to the estimate price fixed on the last day of trading. In the case of the expiration of the contract, but the absence of the goods from the seller, the exchange imposes a penalty. Non-Deliverable futures contract requires that the participants be performed only monetary calculations of the date of execution of the contract without physical delivery of oil. Typically, use for hedging changes in oil prices or for speculative purposes.

The spot oil trading provides short-term transactions, mainly spot trading is the sale of petroleum products. Currently, about 50-55% of transactions concluded on the world market of oil and oil products performed on the spot conditions (Uchebnik.biz, 2015). Spot market of trade in oil and petroleum products is usually associated with Rotterdam, which

is the capital of spot trading. Tanker trade transactions carried out in the northwestern region of Rotterdam - North Sea trade deals with river barges carried out in the area of Rotterdam - the delta of the Rhine. Another world's largest spot market is Singapore. This market is the second in the world after Rotterdam. On the Singapore spot market is oriented producers and traders of oil and petroleum products Malaysia, UAE, Indonesia, China and Iran.

3.1.3 Commodity exchanges

Trading in futures and options contracts, commodities and spot trading occurs on commodity exchanges such as the Chicago Board of Trade CBOT, London International Financial Futures and Options Exchange LIFFE, French International Financial Futures Exchange MATIF, International monetary exchange Singapore SIMEX, Express Exchange Sydney SFE. The most important commodity exchanges is the Intercontinental Exchange ICE in London and New York Mercantile Exchange NYMEX, it is the largest in the world. ICE is a European commodity exchange, where the most popular grade is Brent. American NYMEX futures exchange preferred North American Product grade of WTI.

Over the counter market of oil does not have any specific location and represent network of brokers from around the world, who through of different forms of communication to communicate between themselves and conclude transactions to purchase or sell at any amount of oil (Vseonefti.ru, 2015).

3.1.4 Grades of oil

Due to the difference in the quality of crude oil, to simplify export, procedures developed the standard grades of oil. In the world produces several dozen grades of oil. Nearly every oil-producing country supplies the world market several varieties of oil. For instance, one just Russia supplies to the world market five grades of oil. Availability of different grades of oil makes it difficult market conditions therefore considered grades that are most typical they called as benchmark or marker grade. At the present time quotes exchange are set for a marker grade of oil:

- Brent
- WTI
- Dubai Crude

Prices of other grades determined by the differential that is discounts or surcharges resulting from differences in quality. For instance, the Russian Urals and Tengiz Light grades oil sold at a discount in relation to the grade Brent caused by a higher density and higher sulfur content.

Caspian Pipeline Consortium CPC Blend is a very light Kazakh grade, sweet crude 0.56% sulfur of content, was first introduce to the market at the end of 2001 with the commissioning of pipeline by the CPC (Chevron Policy, 2015).

Tengiz Light is Kazakh grade of oil. It appeared in 2001, after the commissioning of the pipeline Tengiz - Novorossiysk (Banki.ru, 2015). Supplied to the markets of Southern and Eastern Europe, its production is carried out at the Tengiz field is located in Atyrau region 350km southeast of the city of Atyrau. Kazakh grade oil classified as light oil, the density of 789 kg / m3, sulfur content of 0.45-0.55%. Very similar in quality to Saudi Arabia's Arab Light. Tengiz Light is slightly worse quality than Russian Western Siberian oil therefore Tengiz Light trade at a discount to the oil grade Urals.

Karachaganak condensate, deriving from the Karachaganak natural gas, mainly exported as part of CPC Blend. Karachaganak is very sour with a sulfur content of 0.9%.

Kumkol is Kazakh grade of oil, sulfur of content 0.11% proceeds from a variety of fields in central Kazakhstan. This grade is a waxy crude.

Urals is a sort of Russian sour crude oil with sulfur content of about 1.3%, has a density of 860-871 kg / m3, produced in the Khanty-Mansi Autonomous District and Tatarstan. The basis of the grade Urals is a mixture of light West-Siberian oil Siberian Light and sour crude oil Ural and Volga regions.

Brent is benchmark grade of oil for its quality, properties and composition that is the most optimal in terms of refining and production of petroleum products. Produced from the North Sea, it is one of the bases for the price formation of all world oil prices, trading in London on the Intercontinental Exchange ICE. This grade use to estimate two-thirds of the world's international trade to supply of crude oil (Brokerfutures.ru, 2015). Petroleum that is arriving in the Europe from Africa and Middle East estimated relatively Brent, in addition for today the main part of Europe receives oil from Russia. The word derived from the names of Brent oil-bearing layers Rannoch, Broom, Etieve, Ness and Tarbat - Brent Blend (Uchebnik.biz, 2015). Brent classified as light sweet grade of oil it is

considered the most relevant for the production of gasoline and medium distillers, density of 825-828 kg / m3, sulfur content of 0.2-1%.

WTI West Texas Intermediate or Texas Light Sweet is the benchmark grade of oil, produced in the United States of Texas and Oklahoma. It primarily used to produce gasoline and therefore this type of oil has a high demand in the United States and China. Grade of WTI trading on the New York Mercantile Exchange NYMEX. The density is 827 kg / m3, sulfur content of 0.24%. Oil prices are largely determined according to the cost of WTI.

Dubai Crude is light a marker grade of oil produced in Dubai UAE. Benchmark grade of oil in set of prices to other grades of oil exports in Persian Gulf region and export to the Asian region. For a long time Dubai Crude was the only oil, traded freely in the Middle East.

The difference between Brent Crude Oil and WTI Sweet Oil. Difference in quality and technical characteristics of those grades of oil is not significant as the classification of grades WTI and Brent in density and sulfur content is the same. Both grades of oil are light and sweets, and considered as the world's standards and high quality. However, difference in the cost exist. The main reason is the different infrastructure. If grade of Brent refined relatively proximity to place of production in the northwest of Europe, the grade of WTI is necessary to delivery to the Gulf of Mexico, which implies additional financial and time expenses. In addition, the ratio of cost WTI and Brent grades a significant influence the level of natural resources in the relevant fields and the volume of their production. Economic and political news in Western Europe and the United States also receive a share of the impact on the cost of WTI and Brent grades. Areas of application from two benchmarks grades of oil are different, because grade of WTI exclusively use for the production of gasoline, grade of Brent also use as raw materials for distillates.

OPEC oil basket. The international oil organization OPEC introduced oil basket to calculate the average price of crude oil, which is supply to the world market countries of the international organization of oil exporters. It is considered one of the key indicators of the world market price of oil. In January 2009, the OPEC basket represented by 12 grades of oil in the number of member countries of the organization (Neftegaz.ru, 2015). The OPEC basket consist of grades:

- Saharan Blend is grade of oil light, very low sulfur content, high quality, which is ideal for the production of gasoline and diesel fuel, produced in Algeria;
- Girassol is grade of oil produced in Angola on the same name field, which is in the water area the Atlantic Ocean at 200 km north-west from the city of Luanda;
- Merey is grade of sour crude oil, which contains up to 2.45% sulfur, produced in Venezuela. This grade is take into account in the formation of the cost of the total basket of OPEC;
- Arab Light grade of oil produced in Saudi Arabia. Extraction of this grade of oil engage the largest in the world state oil company Saudi Aramco;
- Basra Light is sour Iraqi grade of oil produced approximately Basra, Iraq. The sulfur content of 2.90%;
- Bonny Light is low sulfur grade of oil produced in Nigeria;
- Es Sider is Libyan a high quality grade of oil with low sulfur content. The price of export of Libyan oil Es Sider strictly based on exchange quotations of European grade of Brent;
- Iran Heavy is low sulfur grade of oil produced in Iran. The sulfur content of 1.77%;
- Kuwait Export is a high quality grade of oil. Its stability and quality make it the perfect material for the production of high-quality products available strict control of raw materials;
- Murban is the Arab grade of oil produced in the United Arab Emirates;
- Oriente is Ecuadorian grade of oil produced on the same name basin in Ecuador. It is one of the most productive of the South American Suband basins;
- Qatar Marine is grade of oil produced in Qatar. The sulfur content of 1.47%;

3.1.5 OPEC

The Organization of the Petroleum Exporting Countries OPEC is a member of the global oil market, acting intergovernmental economic organization. It was create by five founding countries such as Iran, Iraq, Kuwait, Saudi Arabia and Venezuela in September 1960 during the conference in Baghdad (Vseonefti.ru, 2015). Later joined by countries such as Qatar, Ecuador, United Arab Emirates, Nigeria, Algeria, Libya and Angola. OPEC headquarters is currently located in Austria city of Vienna, however in the first five years located in the Geneva, Switzerland.

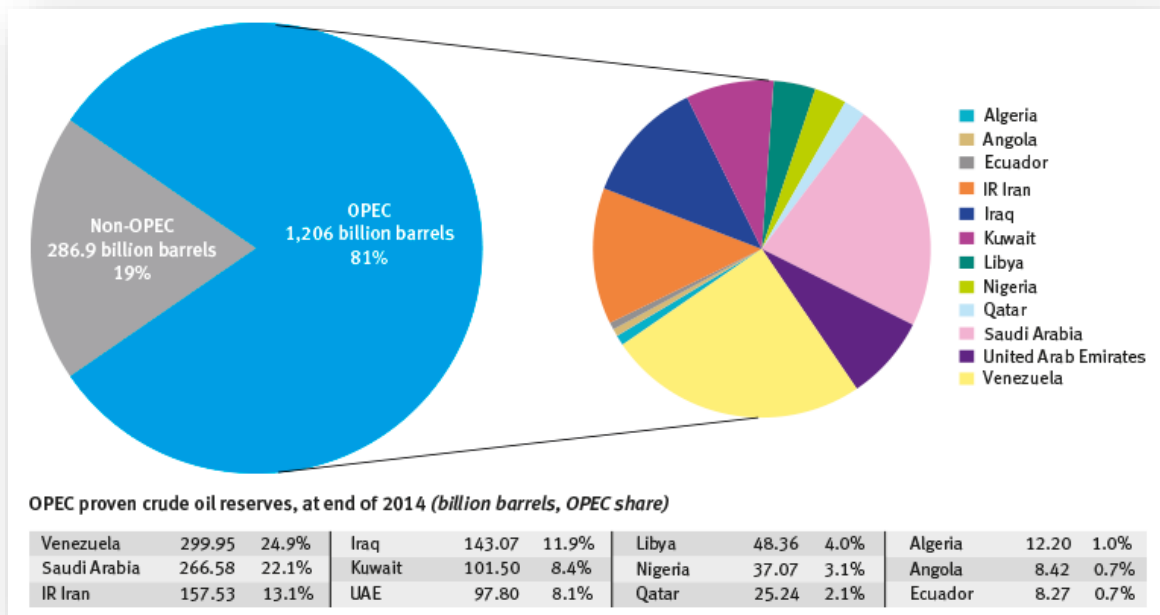The main tasks and objectives of OPEC is:

- to ensure the stability of oil prices and petroleum products in order to avoid fluctuations in oil prices, with adverse implications for the members of OPEC;
- coordination and unification of the petroleum policies of its members;
- to protect the interests of its members;
- to ensure a regular supply of crude oil to other countries;
- members of OPEC guarantee a stable income from oil sales;
- to identify strategies for of production and sales of crude oil;

The delegations of OPEC members meet twice a year at the conference in Vienna to evaluate the conditions of the international oil market, decide on the necessary action to stabilize the market, the budget forecasts for the future. The organization ensures almost half the world's production and half of world exports, coordinates the policy of oil production and global pricing of crude oil, and sets quotas on the amount of oil production OPEC, 2015).

Nowadays the OPEC organization is one of the world's most influential role in the oil industry, determining its further development. It is also a tool against the oil producing countries of the unequal relationship with the monopolies of the West, for the achievement of economic independence and equality in commodity. Regulation OPEC the global oil market is to establish the limit of the total production of oil for the member countries, taking into account the situation prices in the global oil market, monitors compliance with the quotas.

Proved oil reserves of the countries of the OPEC organization at the end of 2014, now constitute 1,206 billion barrels (see Figure 1). Countries of OPEC organization control about 2/3 it is 81% of all the world's oil reserves, and the majority of OPEC oil reserves in the Middle East to the amount to around 66% of the total OPEC reserves. Non-OPEC member's countries currently represent 286.9 billion barrels it is 19% of the world reserves.

Figure 1: OPEC share of world crude oil reserves for 2014

OPEC proven crude oil reserves, at end of 2014 (billion barrels, OPEC share)

Venezuela	299.95	24.9%	Iraq	143.07	11.9%	Libya	48.36	4.0%	Algeria	12.20	1.0%
Saudi Arabia	266.58	22.1%	Kuwait	101.50	8.4%	Nigeria	37.07	3.1%	Angola	8.42	0.7%
IR Iran	157.53	13.1%	UAE	97.80	8.1%	Qatar	25.24	2.1%	Ecuador	8.27	0.7%

Thus, the most important member countries of OPEC of proven oil reserves are Venezuela, Saudi Arabia, Iran and Iraq, and natural gas are Qatar and Iran.

Crude oil production of OPEC member countries during 2014 reached 30.7 million barrels per day, compare to 2013 the production decreased to 2.9 percent (OPEC, 2015).

3.1.6 Supply and Demand. Pricing of oil

The formation of oil prices influence by many factors in the global market. Fundamental factor is the ratio of supply and demand. Moreover, significant influence provides growth of the world economy, geopolitical risks, political stability in oil-exporting countries, weather conditions in the production areas of oil reserves, changes in exchange rates, production volumes, the position of OPEC members. Fluctuations in the exchange rate affects the price of oil, commodity oil measured relative to the dollar therefore a weaker dollar means higher oil prices, and conversely.

Demand of oil determined by the rate of growth world economy and regional. Main factor in formative the world oil demand is economic growth. This factor play a big part in increasing global demand for oil. Climatic conditions greatly affect the demand, the air temperature in the heating period, such as warm winters less demand for oil. The structure of energy efficiency and energy consumption has a significant impact on the global

demand. The impact on global demand of oil also has a level of world oil prices. High prices for oil increase the competitiveness other type of fuels and constrain consumption. Tax authorities also has influence, in particular the total tax on petroleum products (Bobylev Yu.N., 2006). On the demand of oil may also affect military operations if they are concentrated in the region of production, export and supply of oil. The leading role in formation of global demand for oil play industrialized countries. Concerning the countries there are several representatives of the dominant global oil consumption it is United States and China that according to Table 1, consumes 32.7% of total consumption, Japan, India that in last 10 years fast increase demand of oil, Brazil, Russia and Saudi Arabia. Among the countries, United States of America rank first in the consumption of oil in the world, which consume 19035 barrels daily it is 20,6% of total.

Table 1: Top countries by oil consumption for 2014

Countries	thousand barrels daily
United States of America	19035
China	11056
Japan	4298
India	3846
Brazil	3229
Russian Federation	3196
Saudi Arabia	3185
-	-
Republic of Kazakhstan	276
-	-
Czech Republic	198
-	-
Total World	92086

Source: Own table, data from (BP, 2015)

Oil supply in the world market determine by the level of global oil prices, demand for petroleum products and the factors forming this demand, the policy of oil producing countries, especially countries member of OPEC, factors such as military operations and environmental disasters in oil production and export regions, international sanctions. Supply on amount of oil production influence of geological and technological factors that indicate quantitative and qualitative characteristics of available reserves of oil and current technological possibilities of production (Bobylev Yu.N., 2006).

Currently in December 2015 world oil prices drop to historic lows because of the continued surplus of supply on the world oil market and high reserves in oil storages. According to Figure 2, the price of benchmark grade Brent in December 2015 amounted to $ 37.6 per barrel. In 2014 there was a redistribution of balance between indicators, supply exceeded demand. When demand exceeds supply, prices as a rule rise. When supply exceeds demand, prices as a rule fall. As a result, oil prices began to fall and by the end of 2015, oil prices dropped by 65% since 2014, updating the historical lows of last five years. Particular influence on decrease in global oil prices has been the absence of any decisions of OPEC organization on quotas of oil production at the annual meeting in December 2015 in Vienna, also decline sanction of Iran in 2016 that will significant impact of global oil pricing. Nowadays, the amount of oil production by OPEC members is estimate about of 32 million barrels daily, previous quota was at the level of 30 million barrels daily (OPEC, 2015).

Figure 2: Supply and Demand of oil and Brent crude price
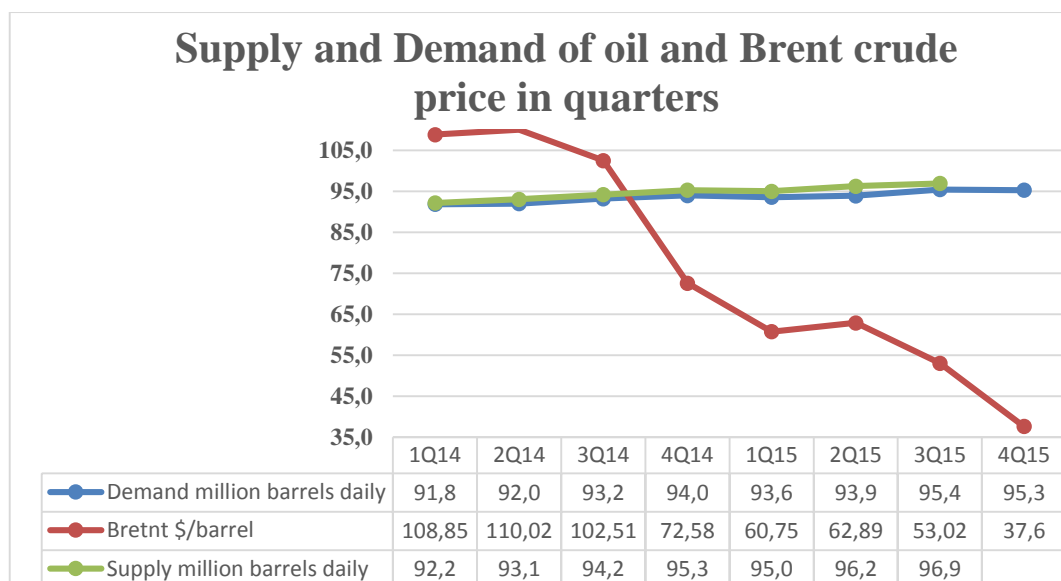
Source: Own figure, data from (Calc.ru, 2015); (Iea.org, 2015)

3.2 Overview of Kazakhstan

The Republic of Kazakhstan, geographically the largest of the former Soviet republics and located in the heart of Eurasia, the largest country in Central Asia located between Russia and China, also borders with Turkmenistan, Uzbekistan and Kyrgyzstan. Moreover, it borders the Caspian Sea. Is the ninth largest country in the world, has 2.724.900 km² land of area, it is five times bigger than France is. It possesses huge reserves

of minerals such as uranium, copper, oil, gas, gold and zinc, large agricultural sector featuring livestock and grain.

In 1991, after the collapse of the Soviet Union, Kazakhstan became an independent state and the oil industry has taken priority directions of the country's economy. The next decades the oil sector of Kazakhstan is considered as the most promising sectors. The basis of this is Kazakhstan subsoil rich in natural resources, including oil and gas. The main industry is the production and export of oil and gas. Oil and gas sector, it is not only the most important branch of country it is one of the main components and commodity of the national economy.

Kazakhstan has become a modern state, where the interests of many countries intersect. This is associated with large oil and gas reserves that attract foreign companies from many countries such as Russia, China, USA, France, Japan and others. Represent by large national and multinational companies: Lukoil, Oman Oil, Shell, Chevron, Total, ExxonMobil, Philips and others. Most of the investment focused on the oil and gas sector.

3.2.1 Three giant fields

Kazakhstan's future as a producer of oil products depends on developments and expansion of three major fields that are Tengiz, Karachaganak and Kashagan. These fields Kazakhstan are focusing considerable attention on production growth of petroleum products. Tengiz and Karachaganak are currently producing, but Kashagan in nowadays in the development stage and start to production expected in 2016/2017 year.

Tengiz field is among of the largest and deepest oil fields in the world, located in the northeastern coast of the Caspian Sea. Originally opened in 1974, Soviet engineers have spent more than one billion dollars, before starting negotiations with Chevron to participate in the development of the field (KaiserPulsipher, 2007). The recoverable reserves of the Tengiz field is estimate from 750 million to 1.1 billion tons of oil (Tengizchevroil.com, 2015). Tengiz production transported on the pipeline of the Caspian Pipeline Consortium CPC in a westerly direction to Black Sea port of Novorossiysk. In 2016, will start to expansion development of Tengiz field.

Karachaganak field is among of the largest oil and gas condensate fields, field was discover in 1979, located in the west of Caspian Sea. So-called operators of project

Karachaganak was establish company of Karachaganak Petroleum Operating. In 2013 total liquids production at level of 222 thousand barrels daily (Eia.gov, 2015). Karachaganak for a long time was oil and gas project in Kazakhstan without the state participation, in 2012 KazMunayGaz national company joined to project with 10% share from Karachaganak Petroleum Operating.

Kashagan field is one of the large, complex and technical field, Kashagan is among of the largest oil fields in the world over the last 40 years situated at sea. Located in the northern part of the Caspian Sea in the territorial waters of the Republic of Kazakhstan. Development of the giant Kashagan field in the harsh marine environment of the North Caspian Sea is a unique combination of technical difficulties and complexities (KaiserPulsipher, 2007). Complexities in the area of work safety, projection, environmental protection, danger of ice and temperature changes in the region, the unpredictable sea level of fluctuations. This large-scale project is the first in Kazakhstan oil development on the sea and among the largest and most complex industrial projects currently in the world. Kashagan Field Development implemented in stages. The North Caspian Operating Company is the operator of the Kashagan project, the company owning the shares are KazMunayGaz, Eni, ExxonMobil, Shell, Total, China National Petroleum Corporation, INPEX (Eia.gov, 2015). Nowadays, Kashagan oil field have already one of the most expensive oil projects in the world, the project exceeds 50 billion dollars. Manufacturing delay will be approximately until 2016. Kashagan was supposed to be the symbol of oil production in Kazakhstan. After all, its reserves are about 13 billion barrels of oil. Briefly the project was launched only in 2013, but quickly stopped because the pipelines fallen into disrepair because of gas leak occurred. The project could grow by another $ 4 billion, because oil companies need to replace the two lines of the pipeline, with a length of 55 miles (Vestifinance.ru, 2014).

3.2.2 Pipelines

Most of the country surrounded by land. Therefore with increasing amount of export, important transportation infrastructure of the country. For the transportation of oil and gas used to over 10,000 km oil and gas pipelines in the country. Over the past decade, Kazakhstan has successfully expanded and improved its export opportunities. The pipeline system of Kazakhstan is under the control of the state company KazTransOil that is

subsidiary of KazMunayGaz. Most pipelines located in the western part of the country because the main oil and gas production located there nearby Caspian Sea. One of the important events in the oil industry of Kazakhstan is the beginning of the pipeline Caspian Pipeline Consortium CPC in 2001, which is one of the important transportation directions of Kazakh oil.

CPC pipeline connects Novorossiysk with the giant Tengiz oil field. The capacity of CPC pipeline is over 28.2 million tons per year. Topical issue of the CPC pipeline is to increase the throughput capacity of the pipeline, because of increase in production Tengiz, Karachaganak fields and begins at Kashagan field production.

Figure 3: Oil and gas pipelines of Kazakhstan

Source: (Caspian peak, 2013)

The pipeline Atyrau-Samara is one of the largest export directions in which the Kazakh oil transported to Uzen, Novorossiysk, Primorsk and the European markets. According to KazMunayGaz, the volume of oil transportation through the pipeline Atyrau - Samara amounted to about 14.6 million tons (KazMunayGaz, 2014).

Kazakhstan-China oil pipeline designed for the transportation of oil western part of Kazakhstan fields to China, as well as the transit of Russian oil grades. Construction proceeded in two stages connection. The first stage the Atasu - Alashankou pipeline with a capacity of over 10 million tons per year and the second stage Kenkiyak-Kumkol pipeline

with a capacity of approximate 10 million tons per year. Construction of both pipelines conducted in cooperation of Kazakhstan and China.

Marine oil transportation system is control of Kazmortransflot organization. Kazakhstan exports oil through the Caspian Sea and a railway. Loading into tankers or barges in the port of Aktau or Atyrau and sent through the Caspian Sea to the Baku-Tbilisi-Ceyhan oil pipeline supply to Turkey and the European market.

Kazakh gas transportation system is approximate 30 thousand kilometers total length of gas distribution networks and over 15 thousand kilometers of trunk gas pipelines. Gas transportation system is control KazRosGas and KazTransGas companies that is subsidiary of KazMunayGaz. The gas pipeline Central Asia-Center CAC is a major gas transportation direction, with a capacity of over 60 billion cubic meters per year. The pipeline passes from Turkmenistan through Uzbekistan and the western part of Kazakhstan and connected with Russian gas transit system. Through the Russian gas transportation system of Gazprom, Kazakh gas transported to Europe market. According to KazMunayGaz, volume of international gas transit through the territory of the Republic of Kazakhstan amounted to 78.6 billion cubic meters for 2014 (*KazMunayGaz*, 2014).

According to Ministry of Energy of the Republic Kazakhstan, were announced projects to expand the Caspian Pipeline Consortium CPC and Kazakhstan - China, the expansion will take place in several stages and should be completed by 2018 (*Energo.gov.kz,* 2014).
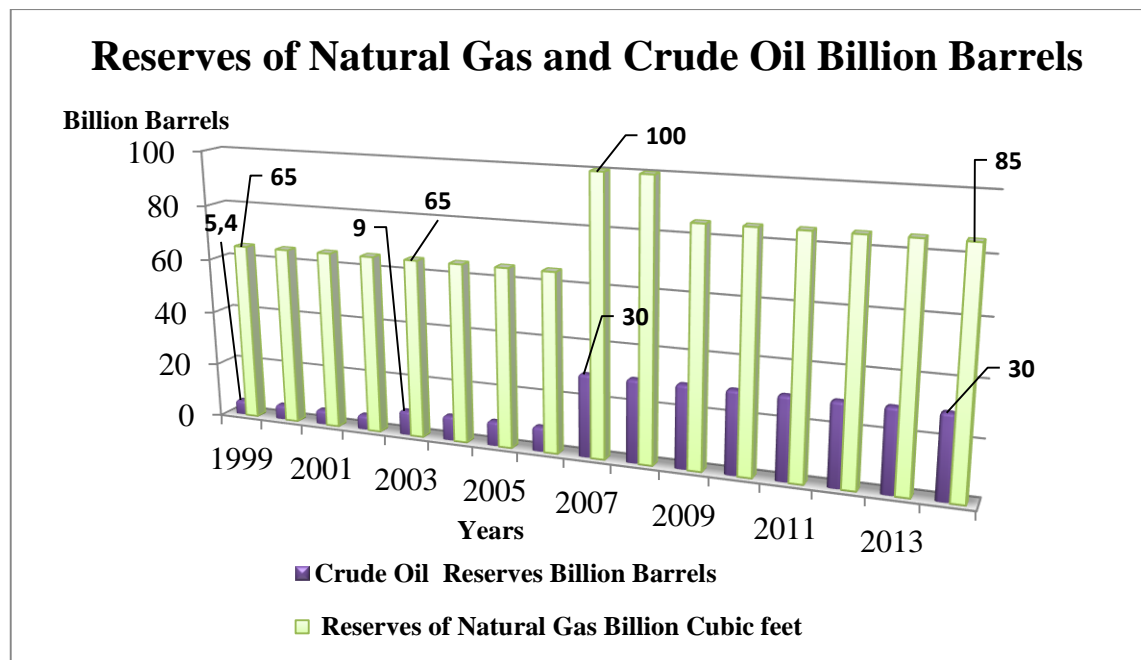
4 Practical part

4.1 Analysis and evaluation of Kazakhstan oil and gas industry

4.1.1 Reserves

In 1899, the first oil gusher was obtain in Karagungul, the first field ever to develop in Kazakhstan (Terterov, 2004). This event was the start of the history of development and production of oil on the territory of Kazakhstan. A century later, the president of Kazakhstan N.A. Nazarbayev said, "Oil has become not just an important sector of the domestic industry, but also a symbol of independent statehood, hoping for a better future" (Neweurasia.info, 1999). Now, Republic of Kazakhstan is one of the major oil powers. The main reason for this is the availability of huge hydrocarbon reserves.

At the current time, Kazakhstan has 172 oil fields and 42 gas fields, occupying a large area of the country. Major oil and gas reserves of the country concentrate on 15 fields, including deposits of giants such as Tengiz, Kashagan and Karachaganak. The fields are located on the Aktobe, Atyrau, West-Kazakhstan regions. The discovery of the Kashagan field in 2000 considered one of the largest discovery oil and gas field in the world.

Figure 4: Reserves of Natural Gas and Crude Oil in Kazakhstan 1999-2014

In January 2014, the Kazakhstan oil reserves held 12th place in the world (Oil & Gas Journal, 2014). According to Figure 4, reserves of crude oil in Kazakhstan estimated at 30 billion barrels. Most oil reserves are located in the west of the country as well as natural gas reserves. Natural gas reserves are at 85 billion cubic feet. Geographically gas reserves are located in the bowels of West Kazakhstan, Mangistau, Atyrau, West Kazakhstan and Aktobe regions. The real state of natural gas reserves is unclear so far, may require a decade to considering technological development.

4.1.2 Production

Kazakhstan's oil and gas fields are located predominantly in the Western part of the country, near under the Caspian Sea. Oil production is major part of the economy of the country because Kazakhstan play a significant role in the global oil market as a producer.

Figure 5: Production of Crude Oil and Natural Gas in Kazakhstan 1999-2014
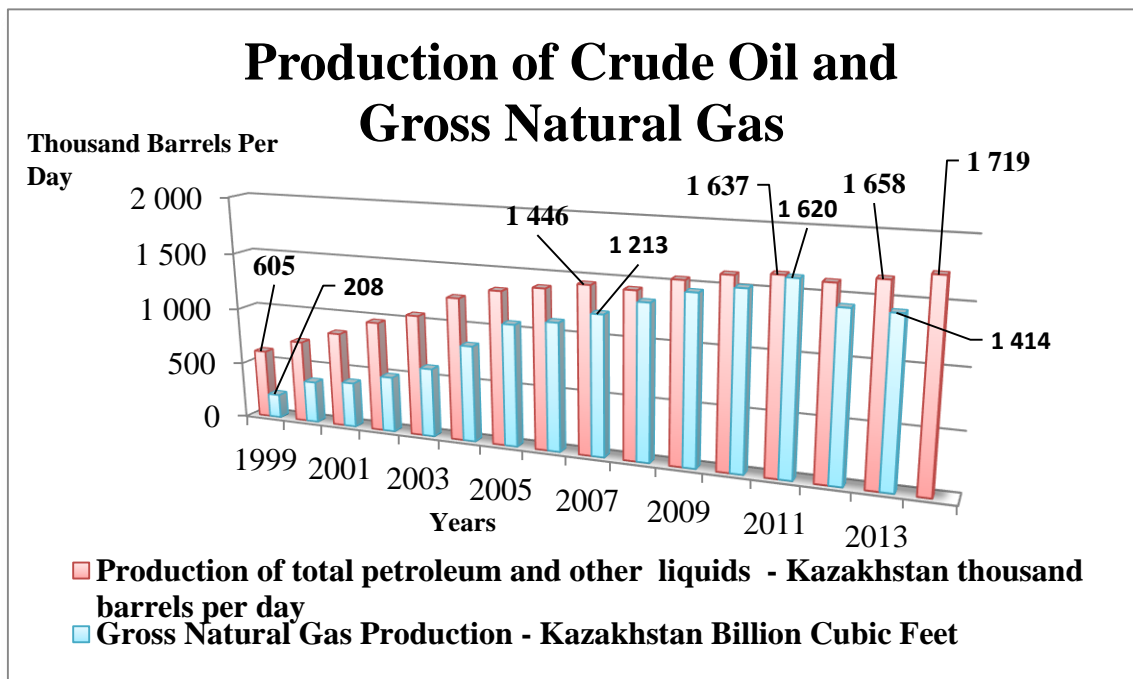
Source: Own figure, data from (Eia.gov, 2015)

In 2014, according to Figure 5 the amount of production crude oil including lease condensate reached at 1,719 million barrels daily and production of gross natural gas in 2013 reached at 1,414 billion cubic feet. In comparison with 1999 in Kazakhstan, crude oil production increased by 65%, while production of gross natural gas increased by 85.5%. The most production of natural gas was in 2011 at the level of 1,620 billion cubic feet. Every year in the production crude oil rises and the program developed country

Kazakhstan 2030 and 2050, the country planning to increase crude oil production in future (Strategy2050.kz).

A lot of oil companies in Kazakhstan participate in development and production of oil and gas fields, exist as Kazakh companies and foreign. The largest national oil and gas company, which is involve in development, production, refining and transportation of oil and gas in Kazakhstan is a state company KazMunayGaz. This company wholly owned by the country's government. The assets of KazMunayGaz have share of companies such as KazakhOil-Aktobe of 67% Mangistaumunaigas of 50%, PetroKazakhstan of 33%, Tengizchevroil of 20%, North Caspian Operating Company NCOC of 16%, Karachaganak Petroleum Operating of 10% (Neftegaz.kz, 2014). Smaller the Kazakh oil companies are Tolkynneftegas, Aday Petroleum, Aktau Transit and Ai-Dan Munai. Many foreign companies in Kazakhstan engage in the development and production of oil, foreign investors attracts huge reserves of the country. Russian oil companies such as Rosneft and Lukoil produce oil on Tengiz, Karakuduk, Karashyganak, Kurmangazy oil fields. Nowadays in territory of Kazakhstan oil production are several large European companies such as Total, Eni, Royal Dutch Shell, British Gas, Petrom and Maersk Oil. Asian oil companies such as China National Petroleum Corporation CNPC and CITIC in the Kazakhstan market oil over 15 years. American company of oil Chevron according to 2008 year in conjunction with European companies accounted for 42% of the total shares in the oil market of Kazakhstan in 1993 signed a "contract of the century" with the company Chevron of 40 years (Neftegaz.kz, 2014).

The largest oil producing company in Kazakhstan is the Kazakh-American company Tengizchevroil. Engage in the development and production of petroleum products at the Tengiz field. In 2014, Tengizchevroil production was 26.7 million tons of oil (Tengizchevroil.com, 2015). Along with crude oil and dry gas, it produces high quality sulfur following types of liquid, granular and scaly. Shares of the company half-owned by the American company Chevron, 20% owned by KazMunayGaz, ExxonMobil of 25% and 5% of Russian company Lukoil.

4.1.3 Petroleum refineries

Currently, oil and gas refining occurs on three refineries Pavlodar, Shymkent and Atyrau. The total capacity is over 15 million tons of oil per year. All three refineries are in process of partial reconstruction and modernization.

Pavlodar Oil Chemistry Refinery is one of the bigger and most modern technology in Kazakhstan, built in 1978 in the city of Pavlodar. The factory focused on refining grades of West Siberian oil that supplied through the pipeline Omsk – Pavlodar. Ensures a high depth of refining that corresponds to level of the best producers of petroleum products. In 2009, national company KazMunayGaz has received 100% share of the refinery. According to Table 2, the factory in 2014 refined 4,925 million tons of crude oil, gasoline refinery reached 1,259 million tons, diesel fuel by refinery amounted of 1,508 million tons and liquid gas refinery amounted of 239 thousand tons. It produces more than 10 types of petroleum products, which are motor gasoline, jet fuel, diesel fuel, fuel oil, liquefied gas, bitumen, coke, sulfur of various grades. Available products gasoline fuel are DT-A, AI-80, AI-92, AI-95, AI-98 and TS-1 highest grade, TS-1 first grade.

Table 2: Production main petroleum products in tons of Pavlodar Refinery

	2012	2013	2014
Oil refining	5,037,480	5,010,020	4,925,774
Gasoline	1,331,832	1,117,045	1,259,249
Diesel fuel	1,513,840	1,472,749	1,508,711
Aviation kerosene TS-1	99,557	133,117	124,828
Mazut	810,183	762,763	668,283
Liquid gas	244,355	214,883	239,360

Source: Own table, data from (*KazMunayGaz*, 2014)

The main purpose of the Pavlodar oil chemistry refinery is the production of high demanded products in the required amount for the country's needs and appropriate according to their quality requirements of the world market. Nowadays the project of reconstruction and modernization of the factory have the stage of practical implementation. In 2016, the factory will begin to produce improved quality of gasoline corresponding to environmental class of Euro-4 and diesel fuel an appropriate to environmental class of Euro-5, increase the productivity of up to 7 million tons per year for the refining of crude oil that is currently 5 million tons per year.

Shymkent Oil Refinery is the newest oil refinery in the Republic of Kazakhstan, built in 1985 in the city of Shymkent located in the south, the most populous part of the country. Focused on refining of West Siberian oil such as Pavlodar oil chemistry refinery. The oil supplied from Western Siberia through the pipeline Tyumen - Omsk - Pavlodar - Shymkent. The enterprise owned two companies by share 50% it is national company

KazMunayGaz and China National Petroleum Corporation CNPC. Types of petroleum products includes different grades of gasoline AI-80, AI-92 and AI-96, aviation kerosene, diesel fuel, vacuum gas oil, liquefied gas and fuel oil. The first priority of petroleum products is the domestic market, specifically densely populated regions of Kazakhstan such as Zhambyl, Kyzylorda, Zhambyl, South Kazakhstan, Karaganda regions and Almaty, Astana (Cherdabayev, 2010). In 2014, according to Table 3 the factory refined 5,065 million tons of crude oil. It means Shymkent Oil Refinery refined the most amount of crude oil among all refineries. Refinery of gasoline in 2014 amounted at the level of 1,126 million tons and diesel fuel reached 1,346 thousand tons and liquid gas refinery reached 142 thousand tons.

Table 3: Production main petroleum products in tons of Shymkent Refinery

	2012	2013	2014
Oil refining	4,754,231	4,857,010	5,065,239
Gasoline	1,045,712	1,038,183	1,126,072
Diesel fuel	1,336,435	1,375,583	1,346,166
Aviation kerosene TS-1	275,002	231,332	278,624
Mazut	902,477	968,231	1,013,213
Vacuum gas oil	797,504	826,541	883,816
Liquid gas	145,571	148,307	142,420

Source: Own table, data from (*KazMunayGaz*, 2014)

Objectives of the factory are to achieve:

- increasing in oil refining capacity to 6 million tons per year that presently amounts more than 5 million tons per year;
- improving the quality of refinery products up to the level requirements standards of Euro-4 and Euro-5;
- reduction of harmful emissions to the environment;

In 2011 started project of modernization and reconstruction of Shymkent oil refinery that will be finished approximate in 2017 year.

Atyrau Oil Refinery is the first factory on oil refining in Kazakhstan. Construction of the factory started in difficult time Soviet Union in 1943 in the city Atyrau. The Factory owner of the share by 99.5% is national company KazMunayGaz. Geographically the factory perfectly located close to the major oil fields in Western Kazakhstan. Oil supplied from local fields it is Emba, Mangyshlak and Tengiz. The Atyrau refinery uses only domestic crude from northwest Kazakhstan (Eia.gov, 2015). Produced gasoline grades AI-

92, AI-95, AI-98, corresponding to the requirements of the environmental standards. Oil refining capacity of the factory is 4,906 thousand tons per year (Esenova, 2011). According to Table 4, Atyrau factory in 2014 refined 4,920 million tons of crude oil and gasoline refined at the level of 613 thousand tons. Mazut in 2014 reached refinery at the level of 1,510 million tons. It means the most amount of mazut refining in Atyrau oil refinery. Liquid gas and aviation kerosene in the factory refined less than on other refineries, for 2014 at the level 28 thousand tons and 22 thousand tons. Diesel fuel for 2014 amounted of 1,344 million tons. Nowadays the factory have situated on reconstruction and modernization that will be finished approximate in 2016.

The purposes of the factory are to achieve:
- increase capacity of the factory up to 5,5 million tons per year;
- production of fuel corresponding of environmental standards;
- production of goods benzene and para-xylene;

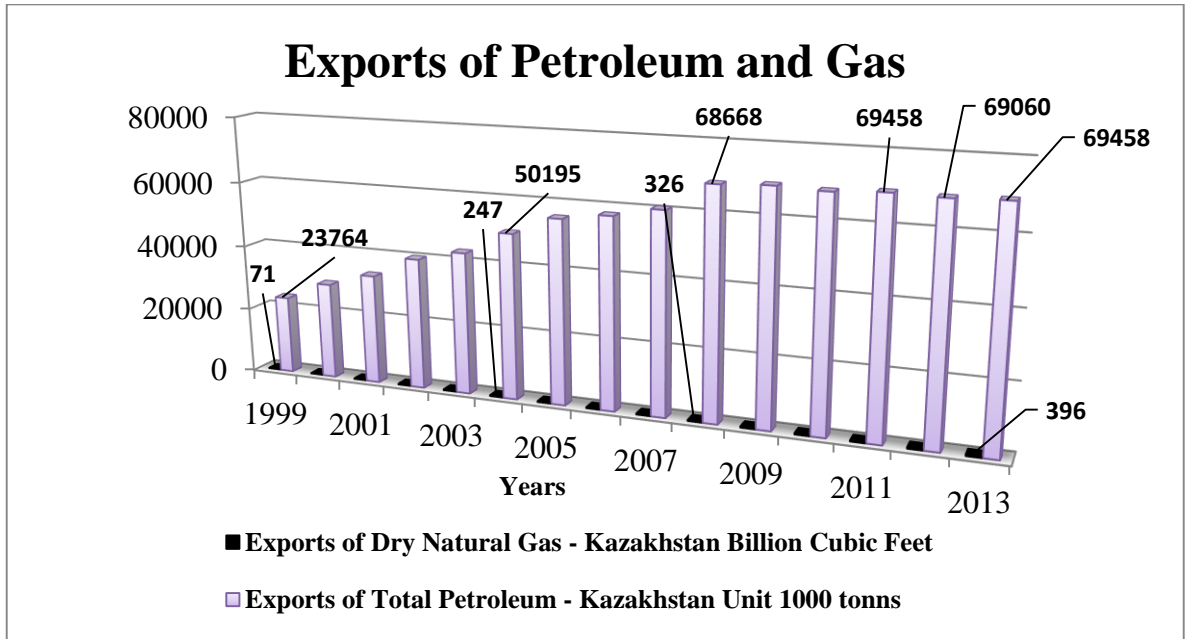**Table 4: Production main petroleum products in tons of Atyrau Refinery**

	2012	2013	2014
Oil refining	4,422,773	4,429,517	4,920,005
Gasoline	506,006	505,197	613,855
Diesel fuel	1,217,795	1,221,659	1,344,089
Aviation kerosene TS-1	56,351	38,230	22,526
Mazut	1,542,892	1,512,016	1,510,269
Vacuum gas oil	606,492	652,492	778,604
Liquid gas	14,255	19,638	28,415

Source: Own table, data from (_KazMunayGaz_, 2014)

4.1.4 Export

Kazakhstan is one of the largest exporters of gas and oil in the world. According to Figure 6, export of total petroleum in 2013 amounted of 69,458 million tons of oil. In comparison of 1999, export of Kazakh oil increased over 66%. As for export of dry natural gas in 2013 accounted at the level of 396 billion cubic feet per year. In relation to 1999 is also highly increased export of gas as well as crude oil by 82%. Kazakhstan produces petroleum in tons, although sold in barrels. This means coefficient of barrels can be various because of the difference in grades and density of Kazakh oil. Kazakhstan exporters of light and sweet grades of oil such as CPC Blend, Tengiz light, Karachaganak condensate, Kumkol.

Figure 6: Exports of Petroleum and Gas in Kazakhstan 1999-2013

Exports of Petroleum and Gas

(Chart showing two data series across years 1999–2013)

Y-axis values: 0, 20000, 40000, 60000, 80000

Data labels (Exports of Total Petroleum - Kazakhstan Unit 1000 tonns):
71, 23764, 247, 50195, 326, 68668, 69458, 69060, 69458, 396

X-axis (Years): 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013

Years

■ Exports of Dry Natural Gas - Kazakhstan Billion Cubic Feet

□ Exports of Total Petroleum - Kazakhstan Unit 1000 tonns

According to the customs declaration majority of Kazakh oil supply to European countries such as Italy, Netherlands, France, Austria and Switzerland as well as in China (Zhumagulov, 2014). In the future, must be increased the amount of exports, as production begins at Kashagan also increasing production at Tengiz and Karachaganak fields.

4.2 Econometric Model. Trend function and forecast of production oil.

4.2.1 Time series forecasting

Time series analysis, the methods of analyze are linear relationship between two variables its time period and annual production of crude oil, estimation, OLS least squares method, forecast and relative error of forecast. Observes data based on 12-time period from 2003 to 2014. The data is collected from eia.gov of energy statistics web site.
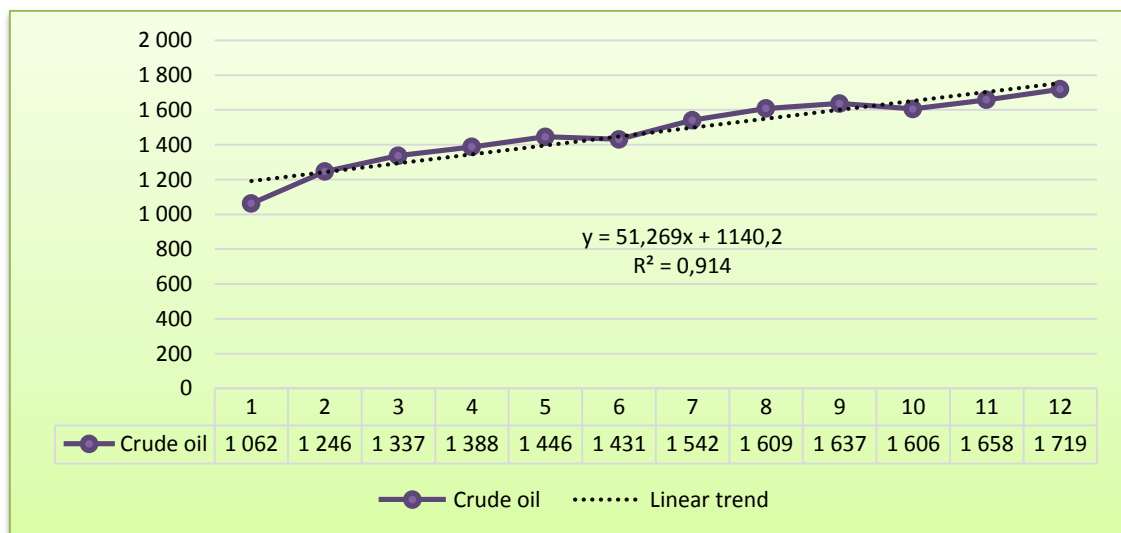
4.2.2 Linear trend equation

$Y' = a + b*t$

Where:

- Y' is predicted value in period t;
- a is intercept, estimated value of Y' when period t equal to zero;
- b is slope of the line or average change of Y' for each change of one unit in t;
- t is time period;

The data set contains t_i observations, which considers annual production crude oil of Kazakhstan in the period from 2003 to 2014. In this particular case: total number of years is equal to 12. Frequency of time series is annually. Observations of y_i considers values of production crude oil in thousands of barrels per day.

Figure 7: Graph of linear trend function using Excel

	1	2	3	4	5	6	7	8	9	10	11	12
Crude oil	1 062	1 246	1 337	1 388	1 446	1 431	1 542	1 609	1 637	1 606	1 658	1 719

y = 51,269x + 1140,2
$R^2 = 0,914$

Source: Own table processing, data from (Eia.gov, 2015)

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Goodness of fit also measured coefficient of determination R^2 is statistical measure of how close the data are to the fitted (Bubáková, 2014). According to Figure 7, coefficient of determination calculated R^2 calculated in excel is 91.4% goodness of fit very good.

4.2.3 Data

Numbers were chose from the official web sources.

Table 5: Data set of crude oil production 2003-2014

Years	t_i (Time)	y_i (Crude oil*)	t^2	t*y
2003	1	1 062	1	1062
2004	2	1 246	4	2492
2005	3	1 337	9	4011
2006	4	1 388	16	5552
2007	5	1 446	25	7230
2008	6	1 431	36	8586
2009	7	1 542	49	10794
2010	8	1 609	64	12872
2011	9	1 637	81	14733
2012	10	1 606	100	16060
2013	11	1 658	121	18238
2014	12	1 719	144	20628
total	78	17 681	650	122 258

Source: Own table processing, *(Eia.gov, 2015)

4.2.4 Least square method OLS

It is used to find the linear relationship between two variables. In case to forecasting method time period t_i is independent variable and value of time series y_i is dependent variable. Based on the OLS equation that to estimate both parameters of linear trend equation slope b and intercept a. Formulas to estimate parameters:

$$n \cdot a_{yx} + b_{yx} \sum_{i=1}^{n} x_i = \sum_{i=1}^{n} y_i \qquad a_{yx} \sum_{i=1}^{n} x_i + b_{yx} \sum_{i=1}^{n} x_i^2 = \sum_{i=1}^{n} x_i y_i$$

$12a + 78b = 17681$

$78a + 650b = 122258$

Where:

- $a = 1140.16$;
- $b = 51.27$;

The trend equation is $Y' = 1140.16 + 51.27 * t_i$

Crude oil are in thousands of barrels daily. The origin, or year 0 is 2002, and t_i increases by one unit for each year.

4.2.5 Estimation and result

Estimate production for 2014 year $t_i = 12$.

$Y' = a + b * t = 1140.16 + 51.27 * (12) = 1755.4$

Actual value for 2014 is 1719 thousand barrels per day. Checking estimation, to determine forecast accuracy is measure of prediction accuracy of a forecasting method how to close actual value to predict value. Determine relative error of forecasting by formula:

$$r = \frac{P - A}{A} \cdot 100 \quad (\%)$$

Where:

- r is relative error;
- P is predicted value;
- A is actual value;

$r = (1755.4 - 1719) / 1719 * 100\% = 2.1\%$

Fit of the model is appropriate when less than 10%. For estimation of 2014 model is good with 2.1% of relative error and with 97.9% of accuracy estimate.

Estimate to forecast production for 2015 year $t_i = 13$.

$Y' = a + b * t = 1140.16 + 51.27 * (13) = 1806.67$

Based on last productions, the estimate for 2015 year show that production of crude oil in 2015 would be 1806.67 thousand barrels per day.

4.3 Regression Model. Impact of Oil price to GDP growth using Gretl

The time series observes data based on 13-time period from 2002 to 2014. The method are analyze variables output and dynamic relationship between two variables. It is

to find out relationship between economic indicators of country economy. Gross Domestic Product GDP growth annual % in Kazakhstan and average price of oil Brent, where GDP annual growth is dependent variable and average oil price Brent is independent variable. Tasks of the model are write a general economic model, write simple linear regression model for the stated issue and declare its variables, compute and interpret summary statistics, estimate the regression model and interpret estimated parameters.

4.3.1 Data

Numbers were chosen from official web sources.

Table 6: Data set of GDP growth and oil price of Brent 2002-2014

Variable	**GDP growth annual % ***	**Average price of Brent dollars per barrel ****
time series	y_t	x_t
2002	9.8	25.2
2003	9.3	28.1
2004	9.6	37
2005	9.7	55.6
2006	10.6	66.3
2007	8.8	74.4
2008	3.2	97.3
2009	1.1	64.0
2010	7.3	80.2
2011	7.5	111
2012	5	110.8
2013	6	108.8
2014	4.3	98.1

Source: Own table, *(Databank.worldbank.org); **(Calc.ru, 2015)

4.3.2 Declaration of the model

1) *General economic model.*

GDP growth annual = f (Average oil price of Brent)

2) *Simple Linear Regression model.*

$Y_t = \beta_0 + \beta_1 + \varepsilon_t$

Where:

- $\beta_0 + \beta_1$ is the systematic component;
- ε_t is the random component;

3) Declaration of variables.

y_t … Gross Domestic Product GDP growth annual %

x_t … Average price of Brent dollars per barrel

4) Generation graphs of variables.

Average price Brent $/ barrel

GDP growth annual %

Source: Gretl, Own processing of graphs

The first graph show average price of Brent dollar per barrel in time period from 2002 to 2014 years. In periods from 2008 to 2009 graph show significant fall global oil Brent price. Nowadays oil price of Brent decreasing. The second graph show GDP growth annual percentage of Kazakhstan in same time period as in first graph from 2002 to 2014 years. Annual growth GDP from 2002 to 2006 show the best stability indicators in this period. From 2007 to 2009 strong fall GDP growth in Kazakhstan, which related with global financial crisis in 2008. At the same in nowadays growth GDP of the country decreasing.

4.3.3 Calculation and interpretation summary statistics

Table 7: Summary Statistics, using the observations 2002 - 2014

Variable	Mean	Median	Minimum	Maximum
x_t	73.6000	74.4000	25.2000	111.000
y_t	7.09231	7.50000	1.10000	10.6000
Variable	Std. Dev.	C.V.	Skewness	Ex. kurtosis
x_t	30.8890	0.419688	-0.258973	-1.23795
y_t	2.96014	0.417373	-0.648879	-0.738378
Variable	5% Perc.	95% Perc.	IQ range	Missing obs.
x_t	undefined	undefined	57.1500	0
y_t	undefined	undefined	5.00000	0

Source: From Gretl, Own table processing

The mean value of Brent oil price in time period 2002-2014 is 73.6 dollar per barrel. The average of GDP annual growth for the same period is 7.09 %. The highest variability is in the case of oil price Brent. The lowest variability in case of GDP growth. The median in both variables are a little higher than mean value.

4.3.4 Parameters' estimation using Ordinary Least Squares method

Table 8: OLS using observations 2002-2014 T = 13

Dependent variable: y_t

	Coefficient	Std. Error	t-ratio	p-value	
const	10.9316	1.92352	5.6831	0.0001	***
x_t	−0.0521643	0.0242385	−2.1521	0.0544	*

Mean dependent var	7.092308	S.D. dependent var	2.960141
Sum squared resid	73.99360	S.E. of regression	2.593586
R-squared	0.296299	Adjusted R-squared	0.232326
F(1, 11)	4.631643	P-value(F)	0.054445
Log-likelihood	−29.74989	Akaike criterion	63.49978
Schwarz criterion	64.62968	Hannan-Quinn	63.26754
rho	0.282803	Durbin-Watson	1.420481

Source: From Gretl, Own processing

Where:

- const is intercept of the *y* dependent variable when explanatory variable equal to zero;

- x_t is parameter of relationship between *y* dependent and *x* independent variables. This parameter shows on how much *y* dependent variable will change if variable *x* independent increases by 1 unit;

Final estimated linear model.

$y_t = 10.9316 - 0.052x_t + \varepsilon_t$

$\hat{y}_t = 10.9316 - 0.052x_t$

4.3.5 Interpretation and result

If the oil price of Brent is equal to zero, GDP annual growth is 10.93 %.

Relationship between GDP growth annual and global oil price of Brent explained by following function:

$y_t = - 0.052x_t$

If the oil price of Brent increases by 1 dollar per barrel, the GDP annual growth will decrease by 0.052 %.

If the oil price of Brent decreases by 1 dollar per barrel, the GDP annual growth will increase by 0.052 %.

Estimated parameters show how changes of the variable value can change the GDP annual growth. Estimated parameter y_t is GDP annual growth depending variable, x_t is global oil price of Brent. Number $-0.052x_t$ is negative it means indirect relationship between variables. This relationship seems to be not logically because pay attention to dependence the national economy of Kazakhstan from oil, the national currency tenge also depends on the oil price. In the fall of oil prices in dollars and at constant exchange tenge revenues of oil companies decrease rapidly. Pay attention that a certain share of expenses is still in dollars and profit of these companies decrease. And considering that the income from the oil sector in the country's budget have a large impact, when global oil price fall it is strongly reduces the amount of revenue to the state budget and, consequently, the possibility of financial support from the real state of the economy. Consequently, increases global oil price of Brent for Kazakhstan economy should increase GDP annual growth of Kazakhstan.

5 Conclusion

The main purposes of the thesis were to analyze the current state of the oil and gas industry in Kazakhstan, oil production and forecasting, the impact of world oil prices on the GDP annual growth of the country.

Analyzing the oil and gas fields including three giant Kashagan, Karachaganak and Tengiz in Kazakhstan the proven reserves of natural gas amount to 85 trillion cube feet and crude oil is at 30 billion barrels. According to the national development of the country program, oil production is planned to rise every year. That means an increase in exports. Crude oil production in 2014 amounted to 1,719 million barrels and the daily production increased by 65% compared with the year 1999. The production of natural gas amounted to 1,414 billion cubic feet since 1999, which is an increase of 85.5%. As the Republic of Kazakhstan is one of the main oil exporters to European countries and China. The objectives of Kazakhstan are the completion of the reconstruction and modernization of all three refineries in order to gain a full advantage capacity of the refineries. Commissioning the giant Kashagan field will greatly increase the export potential of the country.

I have used the first econometric model to analyze the annual crude oil production of Kazakhstan, and obtained the forecast of future production using the Ordinary Least Square method. In this model, the time series ranged from 2003 to 2014. I developed the model using hand calculation and the Excel program. The result for the 2014 model estimation showed a good fit with 2.1% of relative error and with 97.9% of accuracy estimate of the model. The forecast estimation based on past productions showed that in 2015 the production of crude oil would increase and indicated 1806.67 thousand barrels per day.

The second econometric model analyzed the influence of the global oil price grade of Brent on the annual growth of GDP in Kazakhstan. The country's GDP was chosen as a dependent variable for the economic indicator of growth while the average oil price of Brent was the independent variable. The result of the final estimated model showed an independent variable with minus *-0.052$x_{t,}$*. This means that the variable has an indirect relationship. If the oil price of Brent increases by 1 dollar per barrel, the GDP annual growth will decrease by 0.052 % or *vice versa*. However, it is does not seem to be logical because we have to pay attention to the dependence of the national currency tenge on the oil price. With the falling oil prices, which are evaluated in dollars, and the fluctuating

exchange of the national tenge currency, the revenues of oil companies decrease rapidly because a certain share of expenses in dollars and profit of these companies decrease. There is an important finding that income from the oil sector in the country's budget has a huge influence as it strongly reduces the amount of revenue to the state budget and the possibility of financial support from the real state of the Kazakhstan economy. Therefore, increases in the global oil price of Brent for Kazakhstan economy should increase annual growth of GDP in Kazakhstan.

Nevertheless, it is difficult to calculate, explain and predict the actual situation using only an econometric model because there exist many other reasons that can influence the estimation of the production, which influence the growth of the GDP of the country.

6 References

Book sources:

- Marat Terterov, Doing Business with Kazakhstan, publisher: GMB Publishing Ltd, 2004, ISBN 1905050593, 9781905050598;

- Bobylev Yu.N., 2006, *Factors of formation of oil prices*, Moscow: Institute for the Economy in Transition, ISBN 5-93255-210-7;

- Dukenbayev, Kenzhemurat, 1998, *Energy of Kazakhstan. Going to the market*, 2, Almaty: "Gylym", ISBN 9965-01-099-4;

- Cherdabayev, Ravil, 2010, *Oil: Yesterday, today, tomorro*w, Alpina Business Books, ISBN 978-5-904522-44-5;

- Esenova, Elena 2011, *Firstborn refinery in Kazakhstan. Volume II*, Almaty Home Ideas Wheel, ISBN 9965-475-03-2;

- Bubáková, Petra, 2014, *Empirical research in economics*. V Praze : Česká zemědělská univerzita, Provozně ekonomická fakulta, ISBN 978-80-213-2508-1;

Internet sources:

- Neweurasia.info, (1999). [online] Available at: http://www.neweurasia.info/archive/1999/ka_press/09_07_Prez0419.html;

- Eia.gov, 2015, International Energy Statistics. [online]. 2015. Available from: http://www.eia.gov/beta/international/;

- Chevron Policy, Government and Public Affairs, 2015, CPC Blend and Tengiz. *Crudemarketing.chevron.com* [online]. 2015. Available from: http://crudemarketing.chevron.com/crude/central_asian/cpc_blend_tengiz.aspx;

- Mirznanii.com, 2015, Oil. The composition of the oil. [online]. 2015. Available from:

- http://mirznanii.com/info/neft-sostav-nefti;

- Banki.ru, 2015, Mark of oil «Tengiz». [online]. 2015. Available from: http://www.banki.ru/wikibank/marka_nefti_tengiz/;

- Brokerfutures.ru, 2015, Brokerfutures.ru - Crude oil futures for Brent. [online]. 2015. Available from: http://www.brokerfutures.ru/index.php?page=fyuchersy-na-neft-marki-brent;

- Uchebnik.biz, 2015, Tutorial: The world economy is 10.1 global oil market. [online]. 2015. Available from: http://uchebnik.biz/book/363-mirovaya-yekonomika/47-101-mirovoj-rynok-nefti.html;

- Neftegaz.ru, 2015, OPEC oil basket. [online]. 2015. Available from: http://neftegaz.ru/news/view/141161/;

- Neftegaz.kz, 2014, Oil company of Kazakhstan - NefteGaz.kz. [online]. 2014. Available from: http://neftegaz.kz/analitik-articles/neftyanyie-kompanii-kazaxstana.html;

- Vseonefti.ru, 2015, OPEC: Organization of countries - Petroleum Exporting Countries. [online]. 2015. Available from: http://vseonefti.ru/upstream/opec.html;

- Calc.ru, 2015, Dynamics of Brent oil price. [online]. 2015. Available from: https://www.calc.ru/dinamika-Brent.html;

- Strategy2050.kz, Strategy of Kazakhstan 2050. [online]. Available from: https://strategy2050.kz/en/;

- Tengizchevroil.com, 2015, Review of activities in 2014. [online]. 2015. Available from: http://www.tengizchevroil.com/ru/about/overview/2014;

- Vestifinance.ru, 2014, The most expensive oil project will be even more expensive. [online]. 2014. Available from: http://www.vestifinance.ru/articles/48217;

- Caspian peak, 2013. *Crudeoilpeak.info* [online]. Available from: http://crudeoilpeak.info/global-peak/caspian-peak;

- Finance.nur.kz, 2015. In 2016 the price of oil is at $ 30: wherewith it threatens to Kazakhstan. [online], Available from: https://finance.nur.kz/992579-analitik-v-2016-godu-cena-na-neft-budet-na.html;

- *Energo.gov.kz,* 2014. Oil and gas / Statistical information / Information about current activities / Ministry of Energy of the Republic of Kazakhstan. [online]. Available from: http://energo.gov.kz/index.php?id=1755;

E-books, Reports, Blogs:

- OPEC, 2015, *OPEC Annual Statistical Bulletin.* [online]. Vienna. Available from: http://www.opec.org/opec_web/static_files_project/media/downloads/publications/ASB2015.pdf;

- BP, 2015. *BP Statistical Review of World Energy 2015* [online], London, UK. Available from: https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf;

- Iea.org, 2015. *INTERNATIONAL ENERGY AGENCY - OIL MARKET REPORT*. [online], Paris, France. OIL MARKET REPORT. Available from: https://www.iea.org/media/omrreports/tables/2015-12-11.pdf ;

- *KazMunayGaz*, 2014. [online], Astana: KazMunayGaz. Annual report of Joint-stock Company "KazMunayGaz – refinery and marketing" for 2014. Available from: http://www.thkmg.kz/ru/annual-reports;

- Zhumagulov, Nurlan, 2014, Everything of the oil and gas. Facts of the oil and gas industry in Kazakhstan in 2013. [online]. 2014. Available from: http://yvision.kz/post/405781;

- Databank.worldbank.org, World Development Indicators| World DataBank. [online]. Available from: http://databank.worldbank.org/data/reports.aspx?source=2&type=metadata&series=NY.GDP.PETR.RT.ZS;

Journals:

- Oil & Gas Journal, "*Worldwide look at reserves and production*," (January 1, 2014);

- Konoplyanik, Andrew, 2009, About the price of oil and oil derivatives. *Economic strategies.* [online]. 2009. Vol. №2. Available from: http://www.konoplyanik.ru/ru/publications/articles/443_O_cenax_na_neft_i_neftyanyx_derivativax.pdf;

- Babak, Vladimir, 2006, Oil and gas sector in Kazakhstan. *Central Asia and the Caucasus*. [online]. 2006. Vol. Release № 4 (46). Available from: http://cyberleninka.ru/article/n/neftegazovyy-sektor-kazahstana;

- Kaiser, Mark J. and Pulsipher, Allan G., 2007, A review of the oil and gas sector in Kazakhstan. *Energy Policy*. 2007. Vol. 35, no. 2, p. 1300-1314. DOI 10.1016/j.enpol.2006.03.020. Elsevier BV