Hacettepe University Graduate School of Social Sciences

Department of Economics

THE EFFECTS OF UNCERTAINTY IN ENERGY PRICES ON THE ECONOMY OF THE CASPIAN SEA COUNTRIES: EVIDENCES FROM RUSSIA, KAZAKHSTAN AND AZERBAIJAN

Elshan ABDULLAYEV

Master's Thesis

Ankara, 2023

THE EFFECTS OF UNCERTAINTY IN ENERGY PRICES ON THE ECONOMY OF THE CASPIAN SEA COUNTRIES: EVIDENCES FROM RUSSIA, KAZAKHSTAN AND AZERBAIJAN

Elshan ABDULLAYEV

Hacettepe University Graduate School of Social Sciences

Department of Economics

Master's Thesis

Ankara, 2023

ABSTRACT

Abdullayev Elshan. *The effects of Uncertainty in Energy Prices on the Economy of the Caspian Sea Countries: Evidences from Russia, Kazakhstan and Azerbaijan*, Master's Thesis, Ankara, 2023.

By taking into account the role of crude oil in the world economy, the prices of petrol become one of the main indicators of the economic growth. In addition, the uncertainty in the price of crude oil has various effects in both oil exporting and importing countries. However, oil-producing countries are more vulnerable to the volatility in crude oil prices. Countries in the Caspian Sea region, including Russia, Kazakhstan and Azerbaijan depend heavily on oil export revenues, therefore, the uncertainty in oil prices influences macroeconomic variables in these nations. This thesis empirically examined the effects of uncertainty in crude oil prices on the gross domestic product in the selected countries using some macroeconomic variables such as exchange rates, interest rates, inflation rates and oil prices (Brent). Autoregressive Distributed Lag model was used to assess the long run and short run relationship between the volatility in oil prices and the gross domestic product (GDP). The result of the thesis indicates that the gross domestic product (GDP) responds to the uncertainty in oil prices for both short and long run, although at varying degrees. Based on the results of the estimation, the uncertainty in oil prices has negative impact on the gross domestic product for all three countries in both the long term and the short term. Meanwhile, our findings indicate that the effect of oil price uncertainty on the gross domestic product (GDP) in the short-run is greater than in the long-run. The results of this thesis have significant implications for policymakers.

Keywords

Oil prices, oil price uncertainty, ARDL, GARCH

TABLE OF CONTENTS

ABBREVIATIONS

ARDL	Autoregressive Distributed Lag Model
BBL	Billion Barrel
BFEO	Brent, Forties, Oseberg and Ekofisk
BBL/D	Barrels per day
BTC	Baku-Tbilisi-Ceyhan
CDO	Collateralized Debt Obligations
CIS	Commonwealth of Independent States
CPI	Consumer Price Index
ECM	Error correction model
EIA	U.S. Energy Information Administration
EU	European Union
FED	Federal Reserve Bank
FOMC	Federal Open Market Committee
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GDP	Gross Domestic Product
GFC	Great Financial Crisis
GNP	Gross National Product
G-7	Group of seven
IEA	International Energy Agency
IMF	International Monetary Fund
MENA	Middle East and North Africa Region
Mt	Million Ton
MPH	Miles Per Hour
MWC	Multiple Wavelet Coherence
OPEC	The Organization of the Petroleum Exporting Countries
PWC	Partial Wavelet Coherence
RF	Russian Federation

TCP	Trans-Caspian pipeline
USSR	Union of Soviet Socialist Republics
UN	United Nation
WTI	West Texas Intermediate
WWI	World War I
WWII	World War I

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Crude oil is at the top of the list of raw materials, hence it is used to make many vital products which are entailed in our daily lives, such as gasoline, diesel, jet fuel, petrochemical products, all plastics, synthetics polymers, lubricants are derived from oil. As is seen from examples, starting from transportation till chemistry, roughly all sectors are linked to crude oil. For this reason, the demand of global oil shows an-upward trend all over the world. According to a recent BP updated report 2020, the main percentage of energy supply, nearly 84 percent, have come from fossil fuels. It is noted that worldwide oil consumption reached the highest point since 1960s, approximately 33 percent of all energy utilization in 2020.[1] Considering that the population of our world is going up rapidly year by year, in parallel global demand for crude oil will keep growing. Lukoil 2016 Annual Report showed that the demand for petroleum liquid will gradually rise owing to the expansion of the global population, thus the daily petroleum usage will increase up to 105 million barrels in 2025.[2]

According to the World Economic Forum, oil industry currently makes up approximately 3 percent of the global GDP.[3] Taking into account of the share of oil industry in global gross domestic product (GDP), crude oil prices became main issue in the world economy. There exists a lot of papers that investigated the relationship between oil prices and macroeconomic variables. Hamilton (1983), Golub (1983), Krugman (1983), Burbidge and Harrison (1984), Davis (1987), Mork (1989) developed first models that are cited as examples in almost all studies related oil prices. According to these papers, a strong correlation has been identified between oil prices and macroeconomic indicators. In his seminal paper, Hamilton (1983) noted that rising petrol prices dampen the GNP growth and employment rates in U.S. As an extension of Hamilton's investigation, K. N. Mork (1989) argued that there exists strong negative correlation between crude oil prices and U.S. GNP in the period between 1949 and 1986. An increase in oil prices can result in a decrease in economic capacity and higher output prices (Rasche and Tatom, 1997). Lescaroux & Mignon (2008) confirmed that oil prices has deeply affected the economy through GDP, consumer price index (CPI), unemployment, household consumption. And in addition to that, Elder & Serletis (2010) confirmed that there was statistically significant link between oil prices and consumption, investment and real output.

The general thought is that the impacts of oil shocks are transmitted to the economy through different channels. In the literature, the demand and supply side channels are considered as the important transmission mechanisms of oil price shocks to the economy. As a supply side effect, petrol is an input used in the production, so rising oil prices contribute to make production costs more expensive. As a demand side effect, higher oil prices have a negative impact on the general price level (Schneider, 2004). Baffes *et al.* (2015) noted that a decline in oil price supports economic growth in oil importing countries.

---

[1] BP Statistical Review of World Energy 2020

[2] Lukoil, O. J. S. C. (2016). Global trends in oil & gas markets to 2025.

[3] https://www.weforum.org/agenda/2022/02/why-oil-prices-matter-to-global-economy-expert-explains/

In terms of its position in the economy, large fluctuations in petroleum prices are not desirable consequences. Because the volatility in oil prices creates uncertainty and risks to the overall economy. According to theoretical explanation of Bernarke (1983), the uncertainty in oil prices is highly associated with the uncertainty for firms. In case of oil price uncertainty, most firms tend to postpone investment expenditures. Narayan &Narayan (2007) argued that the volatility in oil prices creates the uncertainty which causes an economic instability for both oil importing and exporting countries. Robays (2016) revealed that macroeconomic uncertainty led to oil price fluctuations. Barrero et al. (2017) showed that there was a significant relationship between oil price volatility and short-term uncertainty.

In the literature, only a few studies have investigated the impact of the oil price volatility on the economies in both oil importing and oil exporting countries. And the results of the papers show that the effects of oil price fluctuations on the macroeconomic variables of crude oil importer and exporter countries are different (Moshiri and Banihashem 2012, Brini et al. 2016, Liu *et al*. 2022). Many authors argued that positive changes in oil prices have negative impacts on macroeconomic variables in oil importing countries (see for more details, Lee et al. 1995, Federer 1996, Hamilton 2003, Elder&Serletis 2010, Aktas et al. 2010). Generally, the fluctuations in oil prices transmit to economy in an oil producing country through monetary and fiscal channels (Saddiqui, Jawad, Naz and Niazi, 2018). As monetary policy reaction, an increase in oil prices leads to an appreciation in domestic currency, a deflation in prices and a drop in interest rates. While, as fiscal policy reaction, rising oil prices cause an increase in government spending (Alekhina &Yoshino, 2018).

In this study, our aim is to investigate the effects of uncertainty in oil prices on macroeconomic variables in the Caspian Basis countries, respectively Russia, Kazakhstan and Azerbaijan. Most research papers substantially examined the impact of oil price uncertainty on macroeconomic variables for oil importing countries and several oil exporting countries, on the contrary, only a small number of papers has investigated the correlation between oil price volatility and macroeconomic indicators in the Caspian Sea countries. According to scarce literature, we decided to examine the impact of oil price uncertainty on gross domestic product in selected countries of the Caspian Sea region. In fact, there are several factors that affect the selection of these countries. First of all, the economies of the mentioned countries have been highly integrated since the Soviet Union. Secondly, despite the structural changes and size of these economies, the mentioned countries are still draw the same patterns after the collapse of the Soviet Union. In terms of rich energy resources, the economies of the given countries have shown high growth rates in recent years when energy prices reached high levels. In all three countries, the biggest percentage of budget revenues comes out from oil exports. Falling oil prices refer to budget deficits and economic crises, which will be examined in Section II. Thirdly, trade and economic cooperation among three countries is at a very high level. Particularly, the Russia Federation, which has the largest GDP among the CIS countries, is a major export partner for both Azerbaijan and Kazakhstan.

The point of writing thesis paper is to shed light on the relationship between crude oil uncertainty and macroeconomic variables, then to set out empirical outcomes about the impact of oil prices volatility on the economies of oil exporting countries in the Caspian Sea Basin. Our empirical results indicate that there is a significant relationship between the uncertainty of oil prices and macroeconomic variables for all three countries in both long term and short term. More particularly,

an increase in the volatility of crude oil prices in the mentioned countries has a significant impact on the gross domestic product.

The paper consists of six sections. In the first section, we provide a brief information about oil price uncertainty and the history of oil price shocks. In the second section, the positions of the oil industry in the Caspian region countries are examined. Section III summarizes literature about the relationship between the oil price uncertainty and macroeconomic variables. Section IV sets forth empirical models and introduces the empiric results. Finally, last section presents the conclusion of thesis paper.

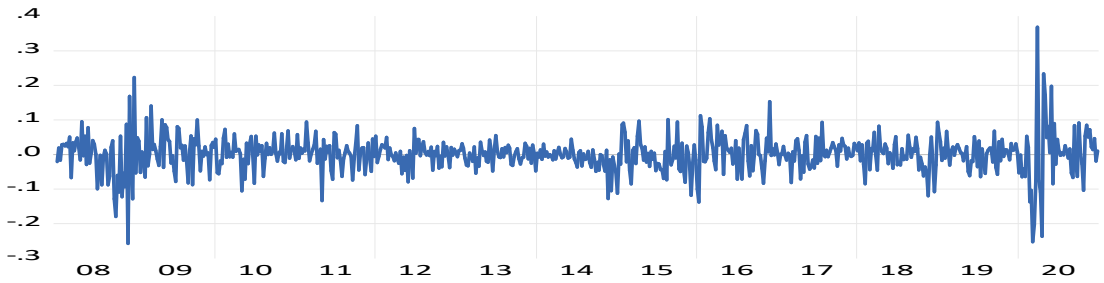
CHAPTER 1. OIL PRICE VOLATILITY

There is no doubt that crude oil prices are the most volatile in contrast to the prices of other commodities. Over the past decades, large fluctuations in oil prices have also been identified. And still today, the price of crude oil has been more volatile than ever. In detail, the world energy market has experienced an extreme volatility in petroleum prices due to historical events, such as the Gulf war, the Financial Crisis, the 2014/16 oil plunge and the Coronavirus pandemic which led to a turmoil in oil markets. As a general rule, oil prices are determined by the law of supply and demand. Hence the deterioration of balance between the supply and demand in short term led to oil price fluctuations. Higher volatility characterizes that the prices which tend to change frequently, on the contrary, lower volatility indicates that the prices remain relatively stable. As an illustrative example, Figure 1 provides weekly Brent oil prices, the rate of change and volatility in Brent oil prices over the period from 1988 to 2021. As seen clearly from the given figure, throughout the late 2000s and the 2010s, the volatility of oil prices have raised when negative shocks occurred.

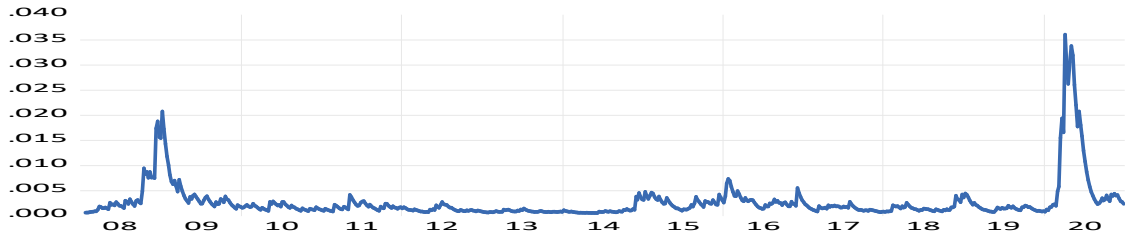
Figure 1. Weekly crude oil prices, rate of change and volatility for Brent crude oil

a) Weekly Brent oil prices

b) First Difference of the Brent crude oil price logarithm



c) Volatility of the first difference of the Brent crude oil logarithm



Source: Author's own work. Data source from World Bank.

1.1 FACTORS BEHIND OIL PRICE VOLATILITY

Oil markets have experienced sharp price swings at different times. Adelman (2000) argued that oil is the most volatile commodity in the markets. And there are several factors that cause the volatility in crude oil prices. Lynch (2002) stated that oil prices have been associated with higher volatility, mostly due to the determining factors that cause the uncertainty in the demand and supply of crude oil, which leads to the volatility in the prices of petrol. Deterioration in the balance of demand and supply is the key issue in the fluctuation of oil prices (Dvir and Rogoff 2009, Baumeister&Kilian 2016). Similarly, Caldara *et al*. (2019) examined the role of demand and supply shocks in the volatility of crude oil prices. According to Demirbas *et al*. (2017), beside the elasticity of demand and supply, a combination of various factors influences the oil price volatility, such as the invariant and variable issues. Examples of the invariant factors are the cost of production, drilling, packaging and storage, whereas the variable factors are related to geopolitical risks, weather-related issues, the value of the U.S. Dollar, global economic outlook and ects.

However, in comparison to the invariant factors, the variable factors have significant effects on the volatility of oil prices. Main variable factors, which affect the fluctuation of crude oil prices, are listed below:

- **OPEC**

Looking back at the history of the Organization of the Petroleum Exporting Countries, just 15 years after the WWII, OPEC was founded in Iraq by its founder countries, including Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. Today, the intergovernmental organization has gathered thirteen major oil producing countries under one roof, seven of which are from Africa, while five states belong to the Middle East region and one is in South America. According to the OPEC Annual Statistic Bulletin 2021, the oil cartel holds more than four-fifths of the world's proven crude oil sources. The largest part of OPEC oil reserves is located in the Middle East region, accounting for 64.5% of total OPEC resources. Actually, about two-fifths of the world's petroleum has been produced in the members of the oil cartel.

When looking through the principle intentions of OPEC, it would seem that providing the stabilization of oil prices in international markets is the statutory task of cartel administration. According to Ghassan et al. (2015), the price stabilization is the most important factor for cartel members in the long run. It is believed that OPEC has dominant position in the oil market, and it can influence the volatility of oil prices due to its position. In the literature, the impact of OPEC on the volatility of oil prices has been analyzed by several authors (Ezzati 1976, Gately 1984, Griffin 1985, Danielsen 1988, Al-Yousef 1998, Horan et al. 2004, Bina and Vo 2007, Schimdbauer and Rosch 2012). According to the papers, the oil cartel can influence the volatility of oil prices through spare capacity production and announcement effects. OPEC's power has dramatically expanded since the 1973-74 oil crisis. Gately (1984) tried to set light to the global energy trading and OPEC organization as a whole. In paper, cartel has been held responsible for controlling oil prices during the 1973 crisis, when the petrol has been utilized by the cartel as a deadly weapon against the West.

It is believed that OPEC use its spare production capacity as an indicator to influence the volatility of oil prices. OPEC refers to as a swinger producer, which has power to stabilize crude oil prices by producing more and less. Fattouh (2006) noted that a reduce in OPEC's spare capacity increases the volatility of crude oil prices. The cartel is able to decrease oil prices or reduce the volatility in oil price through spare production capacity (Pierru *et al*. 2018).

As an announcement effect, many research papers shows that OPEC's announcement effect has an important impact on the volatility of crude oil prices. Horan *et al.* (2004) argued that OPEC's announments have impact on the implied volatility of the prices of oil future options. Weekly volatility on oil prices react positively to OPEC's announcement about the production increase (Wang *et al.* 2008). Loutia *et a*l. (2016) stated that Brent and WTI prices respond differently to OPEC's announcements.

- **Demand and Supply**

In terms of the fundamental economics, the prices of crude oil are determined as the elasticity of demand and supply. A reduction in the demand and the supply of crude oil leads to up and downs of prices in short time period. According to Kilian (2009), uncertainty in international oil prices is mainly driven by the demand and supply shocks. Generally, shocks in the supply and demand of petrol arise due to exogenous and endogenous factors. It is worthy to note that the impacts of the demand and supply shocks on oil prices were not all the same. Cashin *et al*. (2014) stated that the economic results of supply side shocks are different from the results of demand side shocks.

Supply side shocks in energy markets appear as a result of endogenous and exogenous disruptions. And it is well documented that exogenous disruptions mainly refer to geopolitical or political events, such as the wars, the embargos, the political instability, which generate the deterioration of oil supply into the world market. Dotsey et al. (1992) noted that exogenous geopolitical issues are one of the main causes of the oil supply reductions. As it is known, the countries in the Middle East hold the largest part of the world oil reserves, so the stability in this region is so important for the world energy markets in order to keep oil prices in a line. A brief look back at the history of oil price shocks shows that oil supply shocks occurred in the Middle East due to the series of events in the 1970s, 80s and 90s. Such as the 1973 oil embargo, the Iranian Revolution and the war between Iran and Iraq led to the deterioration of oil supply which caused the oil crises. Additionally, Iraq-Kuwait war led to a short-lived oil crisis in the early 1990s. All of these crises left a deep impact on the economy of oil producing countries. Keppler (2007) added that the political instability in the Middle East, including the war in Iraq, the sanctions on Iran and the conflict between Israel and Palestine, has significant impact on the supply of crude oil. However, endogenous supply reductions take place mostly to the decision of oil producer countries about encountering oil shortage in markets. Endogenous supply shocks were seen in international markets after the 2000s.

On the demand side, the fluctuations in crude oil prices are associated with flow demand shocks or exogenous demand shocks. Specifically, the strong demand in the world economy contributes to push international oil prices upward. For instance, the period before the Great Financial Crisis, the demand for petrol has remained high, which pulled up the prices of crude oil. When the crisis hit the world economy, oil demand reduced, and in turn, oil prices decreased. Kilian and Murphy (2014)

demonstrated that an increase in crude oil prices is related to flow demand shocks in recent years. On the contrary, speculative demand shock arose as a new factor, it was defined as the demand for petrol in order to stockpile future use (Kilian and Murphy, 2014). But the speculative shocks have not any significant contribution to the volatility of oil prices.

- **Value of the U.S. Dollar**

The value of the dollar plays a major role on the prices of international crude oil. If we take into account the role of the U.S. Dollar in the world trade as reserve money, so most global oil transactions are traded by the dollar. So, any fluctuations in the value of dollar cause to changes in crude oil prices. The seminal paper of Cheng (2005) confirmed that one percent appreciation in the value of dollar decreases oil prices by 3.06 percent in a long period of time. Similarly, Fratzscher et al. (2014) noted that there is bi-directional causality between crude oil prices and the value of the U.S. Dollar. According to the result of the study, one percent decrease in the value of dollar leads to 0.73 percent increase in oil prices. On the contrary, 10 percent increase in petrol costs decreases the dollar by 0.28 percent. In particular, a decrease in oil prices influences the revenues from oil exports in oil producing countries. Therefore, members of OPEC+ are willing to increase the prices of crude oil in order to regain the loss of oil revenues.

1.2 OIL PRICE VOLATILITY SHOCKS

1.2.1 The Arab-Israel Wars and Oil Embargos:

The first case of oil embargo against western countries occurred in 1967, when the Arab-Israel war erupted. And today's energy market was shaped by the 1967 oil embargo. As of 1967, crude oil was used as a political weapon to make pressure on the countries. It is worth mentioning that the academic literatures about the economic impact of the 1967 petrol embargo are so limited. Shaum (2019) noted that the 1967 oil embargo has been underestimated by scientists. However, the first oil embargo completely failed within the weeks, when Arab League members realized that the oil embargo did not meet the ultimate target. Daoudi and Dajani (1984) showed that the embargo was completely ineffective and costly.

In October 1973, the second oil embargo have been implemented by the members of Arab League countries, which had devastating consequences on the world economy in compare to the 1967 oil embargo. Particularly, in early the 70s, major historical events occurred, which triggered the 1973 oil crisis. Initially, the Nixon Administration in the United States abandoned the Gold Standard. Abandoning the Gold Standard contributed to deprecate the value of the dollar, which hurt OPEC members. Because of the depreciation of the U.S. dollar, oil revenues dropped in oil exporting countries. Secondly, the Arabian military coalition by mainly Syria and Egypt launched a surprise military attack against to Israel on October 6, 1973. Due to the intensity of coalition attacks, the government of Israel fell back on the military support of the United States and European countries. Therefore, the Arab members of OPEC found a pretext to implement the embargo on Israel and its

allies. OAPEC countries or widely known as the Organization of Arab Petroleum Exporting Countries tried again to utilize oil supply as a political instrument to move the goal spots[4]. Girvan (1975) stated that the 1973 oil embargo was a political decision in order to bias the West. On 19 October, Libyan government announced that oil embargo was enforced against to the U.S administration and European countries. In the following days, a dozen Arabian states joined the petrol embargo, which has lasted to March 1974.

As of late-1973, the United States economy commenced to fall on hard times, when it was faced with the first oil embargo by the Arab members of OPEC, namely Saudi Arabia, Kuwait, Libya, Algeria. Because, the U.S. became major buyer of the Middle East crude oil in the early 1970s. Mork and Hall (1980) investigated that daily crude oil import in the U.S. reached to 1.3 million barrels from the Arab League countries, just 56 percent of total imported OAPEC crude oil was provided by Saudi Arabia in 1973.At the end of 1973, several gas stations has been closed on Sundays or served only to regular clients due to quadruplicate increment in fuel costs, therefore; long automobile lines queues were seen at gas stations. The U.S. economy contracted in 1974. An increase in the real prices of crude petroleum led to general higher prices level and lower output. Although the U.S. economy grew by 5.6 percent in 1973, in the following two years GDP growth ratios dropped up to -0.5% and -0.2%, indicated that the Golden age of Capitalism in USA has ended[5]. In addition to negative growth, the Consumer Price Index (CPI) more than tripled in the short-run, it increased from 3.3% to 12.3% in the period between 1972 and 1974. A rocket in oil prices was the main issue of inflation during the two quarters. According to Blinder (2009), inflation in the USA was emerged as a result of two points: oil shock and the dissolve of price control. In an attempt to prevent inflation, FED executed the tight monetary policy during the fourth quarter of 1973.

1.2.2 The Second Oil Crisis: Iranian Revolution and Iran-Iraq War

Following hard on the heels of the first oil shock, the world economy has experienced the second oil shock in 1979, also known as the 1979 Oil Crisis. It is argued that the Iranian Revolution and the war between Iran and Iraq precipitated the second oil crisis.

Since the late 1970s, the political environment has started to change dramatically in Iran. In February 1978, massive demonstrations intensified against the Pahlavi family in the largest cities of Iran. Nationwide protests spread to the key oil refineries within months, and then the petrol well workers joined the demonstrations. As a result, strikes in the petrol fields by workers led to the production cutbacks. According to EIA database, oil output decreased from 5.2 million barrels to 3.1 million barrels per day in the end of 1978 and into 1979[6]. During the first month of 1979, daily petrol output hit all time low and reached 0.45 thousand barrels per day which were recorded as the

[4] OAPEC refers to the Organization of Arab Petroleum Exporting Countries which is consubstantiated 11 Arab countries.

[5] Golden Era accompanied with economic expansion in the U.S. in the period 1948 and 1973. During the quarter century, the employment in the U.S. rose sharply, real GDP increased from 230 million USD to 1.7 trillion dollars level, the income of the middle class drastically grew.

[6] https://www.eia.gov/opendata/v1/qb.php?sdid=INTL.53-1-IRN-TBPD.A

biggest production shortfall throughout the Islamic Revolution. On 16 January 1979, the legitimate government of Shah Pahlavi has been overthrown. And under new government, oil workers ended their strikes and a recovery in the petrol production was noted in March 1979, when the output of crude petroleum soared to 3.8 million barrels, but the pre-revolution output level has not been caught. Coming just twenty months after the 1979 Iranian Revolution, the Iran-Iraq war began on 22 September 1980, which deepened the Second Oil Crisis. The military intervention between two countries have occured in the Khuzestan provinence, where near to Persian Gulf. According to EIA, the main Iranian oil wells are located in Khuzestan basin, 80 percent of total onshore petrol came from that area. Rubin (2003) noted that the war between Iran and Iraq led to substantial fluctuations in oil supply and a rise in oil prices.

Due to the Revolution in Iran and the Iran-Iraq war, the total oil production in the world fell from 60,16 to 53,97 million barrels per day between 1978 and 1985 (see Table 1). A fall in world oil production led to a spike in oil prices which peaked at almost $39 per barrel in 1981. Due to the second oil crisis, the global economic growth has decreased significantly (Ditte and Roell, 2006). In 1982, the growth rate of global economy reached 0.8% which was the lowest point through the 1980s.

Table 1. World Crude Oil Production (million barrel per day) 1978-1988

Years	Saudia Arabia	USSR	United States	Iran	Iraq	World
1978	8,30	11,1	8,72	5,24	2,56	60,16
1979	9,53	11,38	8,56	3,17	3,48	62,67
1980	9,9	11,71	8,60	1,66	2,51	59,56
1981	9,82	11,85	8,57	1,38	1	56,05
1982	6,48	11,91	8,65	2,21	1,01	53,45
1983	5,08	11,97	8,69	2,44	1,01	53,26
1984	4,66	11,86	8,88	2,17	1,21	54,5
1985	3,39	11,59	8,97	2,25	1,43	53,97
1986	4,87	11,9	8,68	2,04	1,69	56,2
1987	4,27	12,05	8,35	2,3	2,08	56,63
1988	5,09	12,05	8,14	2,24	2,69	58,69

Source: Arreppim Statistics, https://stats.areppim.com/stats/stats_oilprod_1960x09.htm

As the largest economy, the U.S. economy has exposed to severe exogenous supply shocks in the early 1980s. The oil supply shocks hampered the economy which shrank by 0.3 percent in 1980. According to the World Bank, the unemployment rate rose above 7 percent. Additionally, higher inflation rate (13.3%) became the front burner in the monetary policy of the Federal Reserve. FED

implemented restrictive monetary policies to tame double digit inflation. At the first stage, the short-term federal fund rates were raised to 15% in mid-1980, then it was increased more than 19% by the board of FED in the second quarter of 1981. As a result of disinflationary monetary policy, the growth speed of the U.S. economy slowed down and the economy tipped into a severe recession phase, which endured until the third quarter of 1982 year. As compared to the post–World War II economic recessions, the deepest economic shrinkage in USA turned out between the years 1980 and 1982. Due to an aggressive tighten monetary policy, the real GDP had fallen to around (-1.8) percent in compare to 1981, as well the unemployment rate reached at 10.8 percent by 1982, which double digit unemployment rate was seen for the first time since WWII (Urquhart & Hewson 1983).

1.2.3 Oil Shocks in the 90s

In the 1990s, the world oil industry has experienced demand and supply shocks on oil prices, which heightened the volatility in a short time (see Figure 1). In 1990, the conflict between Iraq and Kuwait evolved into the war, which went down in history as the first oil war, in that a key factor of the war was related to the spot market prices of crude petrol. On August 2, 1990, Kuwait was invaded by Iraqi regime.

When Iraqi army invated Kuwait, the supply of crude oil deteriorated, and a temporary crisis took place in the international markets. Oil supply declined by 5.01 mb/d which led to the spot market prices doubled at the end of August 1990 (Mabro 1994). Hutchison (1991) stated that oil prices have gone up 100 percent in short term, the prices increased from $15 to $30 per barrel between June and August. However, in mid-October, global oil prices skyrocketed to 41.25 U.S. dollars per barrel, and the price of crude oil continued to remain high towards at the end of the year. By January 1991, a massive coalition forces under the leadership of the United States launched offensive military attack to Iraq's troops. In the immediate result of military operation, Iraqi regime was defeated by coalition forces and the ceasefire agreement was declared on 28 February. As March 1991, the spot market price of oil returned to pre-crisis level, it dropped under $20 and remained the stable until 1998.

After the 1990 oil crisis, oil prices continued to remain unchanged until the second quarter of 1998. when the world oil market was shaken by both the demand and the supply shocks. There exist several factors led to a collapse in oil prices in 1998. As demand side, the Asian Financial Crisis came into the effect in ASEAN countries, when Thailand government abstained to peg its national currency the Baht to the U.S. dollar, henceforth the Thailand Baht was devalued by more than 20 percent in that day. The currency crisis in Thailand made spillover effect in the south-east Asia countries. According to the crisis, oil consumption has significantly decreased in the Asia/Pacific region, and the consumption of petroleum declined by 0.7 mb/day. It should be noted that the oil export of the Asia/Pacific region was equal to 4% of the total world export. On the other hand, warm weather conditions in the U.S. negatively affect oil demand, oil consumption decreased by nearly 350 mb/day in USA. On the supply side, the overproduction of petrol should be take into account as the third main factor that is affecting to the world energy market. At the end of 1997, OPEC announced that output has been increased to maintain its share in growing energy markets and ceiling of production reached to 25 MB/D. In addition to OPEC decision, UN has withdrawn sanctions against S.Hussein governmet, thus petrol production soared to 2.4 mb/d in Iraq during the

same year. Both of demand and supply shocks impacted to a plunge in oil prices, the prices of Brent and WTI benchmark crude oil settled at $11.13 a barrel in 1998 (Mabro 1998).

1.2.4 Oil Crisis in 2000s

Prior to the Financial Crisis, an inexorable increase was seen in the price of crude petroleum products in the period between 2002 and 2007. Indeed, there are many possible reasons why oil prices rose in such a manner, such as the demand and the supply side shock, natural disasters, the war between Iraq and USA affect the price of crude oil.

As a supply-side factor; in the spring of 2003, the United States launched a large-scale military operation to Iraq. The war damaged the oil infrastructure of Iraq, therefore oil production declined by nearly 1 million barrels during the first phase of invasion. It is because Brent crude oil hit $28 per barrel in 2003. In addition to the war in Iraq, the Katrina Hurricane, tropical cyclone hit the coast of the U.S. and Mexico in 2005, it caused severe damage on the U.S. petroleum refinery industry along the Gulf Coast. Blair and Rezek (2007) stated that oil prices have dramatically changed during the hurricane. Oil prices spike above $66 per barrel for a little while, due to the hurricane. The third reason, Nigeria and Venezuela covenanted that daily petrol production will have deliberately reduced in 2007, namely a combined 170,000 barrels. Key-Hernández and Villarroel (2014) calculated that cumulative oil production cutback accounted for 6.3 in Nigeria, whereas it amounted to 7.7 percent in Venezuela.

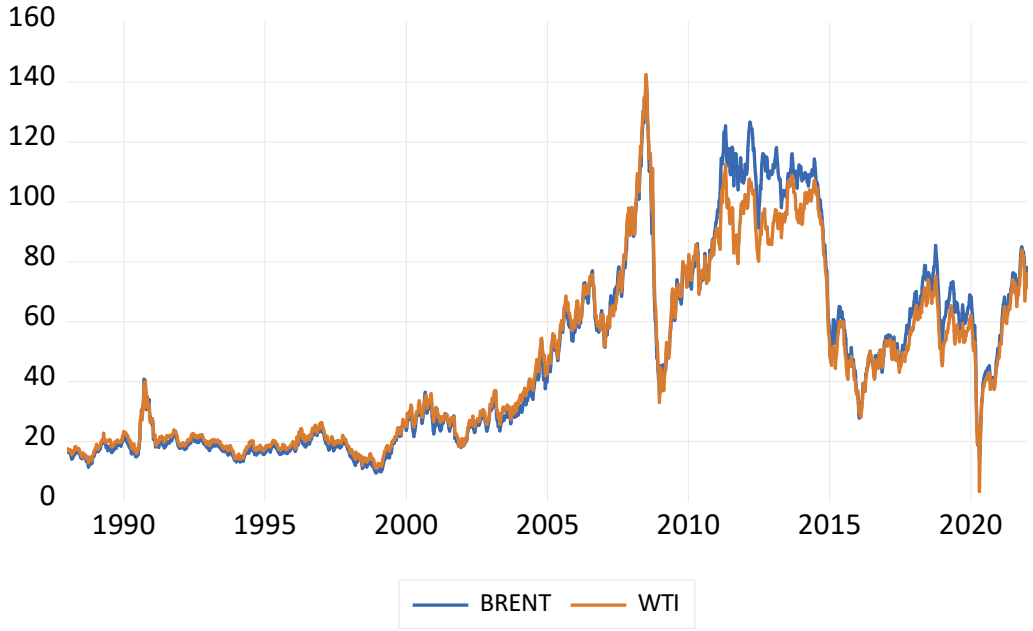
On the demand side, strong growth in Asian countries increased the consumption of petroleum products. By 2007, real GDP annual growth rate in China rose above 14.2 percent for the first time since 1992, while India's real GDP grew at a 7.6 percent rate. At this point, oil demand in the two countries spiked drastically on the eve of the GFC, respectively 7.923 mb/d in China and 3.09 mb/d in India. Additionally, positive growth in world real GDP rate has increased the consumption of petroleum between 2003 and 2007. It has become clear that global energy markets simultaneously experienced petrol supply disruption and high demand, hence series of events led to an increase in oil prices. Brent crude oil have more than doubled in the period from 2003 to 2007, respectively and it has fluctuated averagely between $28.85 and $72.44 a barrel.

Throughout 2008, global oil markets have testified high volatility in oil prices. During the first month of 2008, light oil prices climbed to $92 per barrel and then it skyrocketed to $140 barrel level within six months. On 11 July 2008, the price of the West Texas Intermediate (WTI) light oil reached a record $147 per barrel on the New York Mercantile Exchange. However, petroleum prices nearly dropped by 80% from July to December 2008, mainly owing to the aftermath of the Great Financial Crisis which curbed the global oil demand. According to EIA database, WTI prices dropped to $34.14 a barrel in February 2009 (see Figure 2). Additionally, the production of petroleum in Nigeria has been decreased by violent incidents, so oil prices were pushed to record high and then, the prices of petroleum dropped in the short run.

Many economists argued that the Financial Crisis have significantly affected to global oil prices. Ural (2016) investigated the volatile oil price returns during the financial crisis. The research paper showed that negative shocks caused highly volatile oil prices. Ahn et al. (2020) researched the unexpected effects of the Great Financial crisis on petrol prices in the long-run. Author's findings

indicate that external shock has significantly impacted the volatility of oil prices. EMD based analyses was used to estimate the effects of the financial crisis of 2007-2008 on the world oil market by Zhang, Yu and Wang (2009), who identified that a severe economic recession affected to oil prices volatility.

Figure 2. Weekly Brent and WTI prices



Source: Author's own work

In addition to that, the Financial Crisis led to a depreciation in the value of the U.S. dollar in the period between 2007 and 2008. In regard to a weak dollar against foreign currencies, some producers requested more dollars for crude oil. Hence a weak dollar could be identified as a factor which affected the volatility during the GFC

1.2.5 The Great Oil Plunge between 2014 and 2016

After the Financial Crisis, crude oil prices had typically remained steady between 2009 and 2013, respectively just under $100 per barrel. However, Mead and Stiger (2015) reported that upward pressure has had on light oil prices owing to strong global oil demand between January 2011 and June 2014. Positive economic growth rates both in the U.S. and China helped petroleum prices to reach $100 level. In September 2013, sweet petroleum prices hit the highest level for the first time since 2009, it was purchased at $110 a barrel. Moreover, a surge in prices was driven by some events. For instance, political turmoil in Libya has heightened pressure on crude oil prices.

After peak prices in global energy markets, the average monthly prices of light crude oil started to drop sharply in late June 2014 (see Figure 2). Although Brent benchmark crude oil was traded at around $110 per barrel for the first half of 2014, its prices fell below $50 in a litlle over seven

months [7]. Kitous, Alban, et al. (2016) investigated that light oil prices dropped by more than 60 percent between July 2014 and January 2015. It should be noted that volatility in oil prices has decreased throughout 2015. According to the EIA report, both of WTI and Brent light petrol prices have fluctuated between $40 and $50 a barrel. However, the price of Brent light oil has fallen to its lowest point which was accounted for $30 per barrel in January 2016. According to energy analysts, there is a combination of various factors which lead to a plunge in petroleum prices during 2014/16 period. Based on the report of the World Bank, weak demand, oversupply in global markets, a weak dollar, announcement effect of OPEC decision and others could be emphasized as main reasons which affected to oil prices. The top three factors are listed below, which affected the price of crude oil between 2014 and 2016:

- ***Oil supply:*** A growth in the amount of the U.S. shale oil production is one of the main factors of the 2014-16 oil price decline (Mead & Stiger, 2015). In 2014, daily U.S field output of light petroleum has been increased by 16 percent, which was the biggest production growth since 1940, respectively 11.6 million barrels per day. Hence, the United States became the largest oil producer in the world, surpassing the Russian Federation and Saudi Arabia. Likewise, the supply of light petrol has significantly rose in OAPEC states, notably Iraq, S.Arabia and Libya. World oil production surpassed 96 million barrels per day in 2015. As a result, the supply of crude oil was much higher than global demand in the fourth quarter of 2015, which have pushed prices down.

- ***Oil demand:*** _Due to weaker economic growth, global demand for petroleum products has decreased since the second half of 2014, and crude oil consumption has decreased, especially in Europe and Asia. According to World Bank database, the 2015 projection of crude oil demand dropped by 0.8 percent in comparison with the previous year (Chen et al. 2015). Many research papers showed that weak oil demand has played major role in the 2014 price plunge. Hamilton (2014) illustrated that petroleum prices declined more than 40 percent due to low consumption. In addition to Hamilton's work, it was emphasized that lower demand contributes to nearly one third down in oil price during the given period (Arezki and Blanchard 2014).

- ***The appreciation of the U.S. dollar:*** It is worthy to mention that the U.S. dollar is taken as a base currency in worlwide oil trade; therefore, unexpected changes in the value of the dollar may affect the prices of petroleum products. Because of the appreciation of the U.S. dollar, an increase could be seen in light oil prices, which may lead to a decrease in oil consumption. By 2014, the value of Euro has fallen to a record low point since 2002. IMF reported that the value of the dollar has stiffened against the major currencies, euro/dollar parity dropped from 1.39 to 1.21 in December 2014[8].

[7] https://www.eia.gov/todayinenergy/detail.php?id=19451
[8] https://www.exchangerates.org.uk/EUR-USD-spot-exchange-rates-history-2014.html

1.2.6 Dual Shock in the Oil Industry by 2020

In January 2020, a new Coronavirus case has been reported in Wuhan town (China) and then, it has rapidly spread to all across the globe. According to WTO report, more than 180 world countries has influenced by mortal virus during the first half of 2020. In order to prevent the breakout of the virus, several countries took stringent precautions, thence serious quarantine and lockdown measures have been implemented by central governments, such as the closure of borders, travel restrictions, curfew hours and ects. Because of large scale lockdown, all social activities came to a standstill across the universe, and consequently the world economy has been hammered by the impact of Corona virus. Mou (2020) showed that real GDP declined by 4% in emerging countries and trade balance decreased at around 30% on account of Covid-19 outbreak.

In the year to mid-2020, the Great lockdown has hit the world energy markets, which exposed to strong demand and supply shocks. A fall in global consumption under the impact of Coronavirus and a sudden rise in production owing to the oil price war caused to a historical price collapse in markets. Goutte et al. (2020) investigated that a fall in petroleum prices was fundamentally caused by two main factors, respectively global lockdown and the price war.

After the 2014 price collapse, the global demand for petroleum products has plummeted globally for first time in March 2020. In particular, oil consumption in the U.S. declined by nearly 2.3 million barrels per day, OECD countries reduced the utilization of petrol products at around 5.8 m/bd and 1.5 m/bd drop was observed in the European Union (ww.bp.com). As a consequence, falling petrol demand have negatively affected to both of WTI and Brent benchmark crude petrol prices. In late-March 2020, the volatility in raw petrol prices has been heightened by combined shockwaves and then, large volatile price patterns were observed. EIA reported that WTI oil prices tumbled to $32.01 in March from $63.65 in January 2020, while Brent benchmark dropped from $57.52 to $29.21 at the same time period (see Figure 2). A collapse in raw petrol prices was more than 50 percent. Bildirici, Bayazit & Ucan (2020) showed that many countries began to choke up their oil stocks at lower oil prices.

Together with lower oil demand, energy exporting countries encountered with the excessive supply of petroleum due to the geopolitical conflict between Russia and Saudi Arabia at the beginning of April. In response to the impact of Covid-19, production cutback was laid out by OPEC members to keep petroleum prices under control (Ma, Xiong and Bao 2021). However, this proposal has been rejected by the Russian Federation, which is the third largest oil producer behind the U.S. and S. Arabia, in order to get the market share of the U.S. shale oil. Because, the monthly crude oil production in the United States has dropped from 12.9 million b/d in January to 11.1 million b/d, oil producers in USA could be burst up owing to lower prices. In response to Russia, OPEC announced that daily production was lifted by 1.8 mb/d and the total output in OPEC countries expanded to 30.41 million b/d[9]. According to OPEC monthly database, S. Arabia light oil production to hit record 11.55 million barrels a day in April, while Russia's crude oil output remained at around 11.6 million b/d. Thanks to overproduction movements, the prices of WTI crude oil settled at minus $37 dollars a barrel in mid-April. However, Brent benchmark petroleum was traded at $10 at the same days.

[9] https://www.opec.org/opec_web/static_files_project/media/downloads/publications/OPEC_MOMR_May_2020.pdf

Coming to the end of the 2020, reopening workplace and the production quota agreement between OPEC and non-OPEC members has impacted to global oil demand, therefore, a rebound was seen in petroleum products prices. The spot prices of WTI and Brent light oil brands increased to $40 a barrel at the end of year.

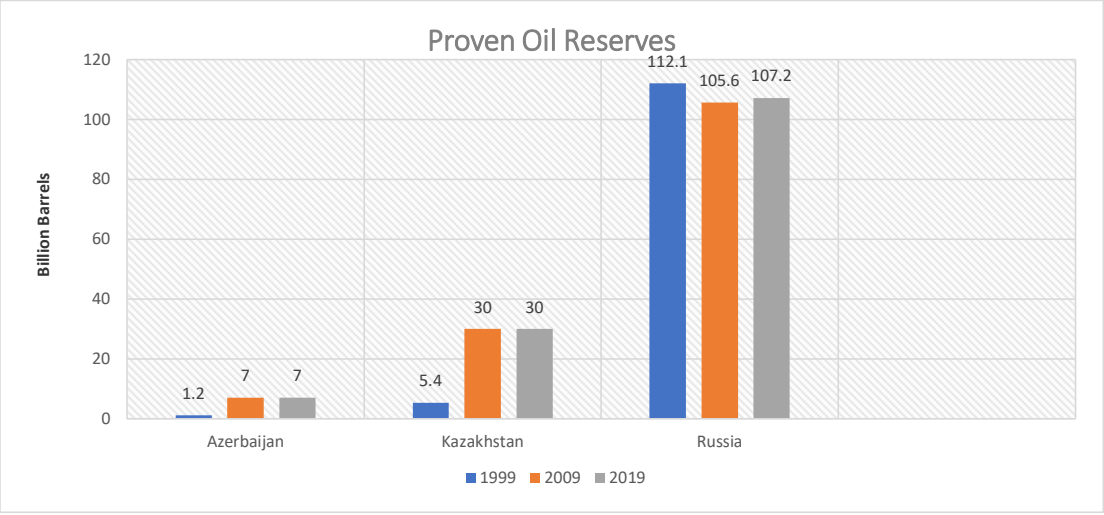
CHAPTER 2: THE POSITION OF CRUDE OIL IN THE ECONOMY OF CASPIAN SEA COUNTRIES

In this chapter, we examined the role of crude oil in the economy of selected countries in the Caspian Sea countries. Chapter 2 consists of four sections. In first section, we provide the information about proven and possible oil sources in the Caspian Sea Basin. Secondly, the economy and the oil industry in Azerbaijan are investigated. In third and fourth sections, we analyzed the position of crude oil in the economies of Kazakhstan and Russia, respectively.

2.1 CASPIAN SEA BASIN

The Caspian Sea is a landlocked water basin, it is known as the largest land-locked water reservoir all around the world, withal the area of the Caspian Sea covers nearly 386 000 km squares and the Caspian Sea is situated at the border of Central Asia and Eastern Europe. The Caspian Sea Basin is fundamentally divided into three physical regions, the North, Middle and South Caspian. According to EIA report, the majority of huge hydrocarbon fields are founded in both the North and Middle parts. Particularly, the largest oil fields were discovered in the sections of Azerbaijan and Kazakhstan of the Caspian Sea, such as Azeri-Chiraq-Guneshli was extracted from Azerbaijan's waters and Tengiz oil field was discovered under the western part of the Caspian Sea in Kazakhstan's section. However, in the Russian part of the Caspian Sea waters, there are not bulk petroluem and natural gas sources as much as Azerbaijan and Kazakhstan. This region holds only a few hydrocarbon wells, like Vladimir Filanovsky, Rakushechnoye and Korchagin oil shafts..

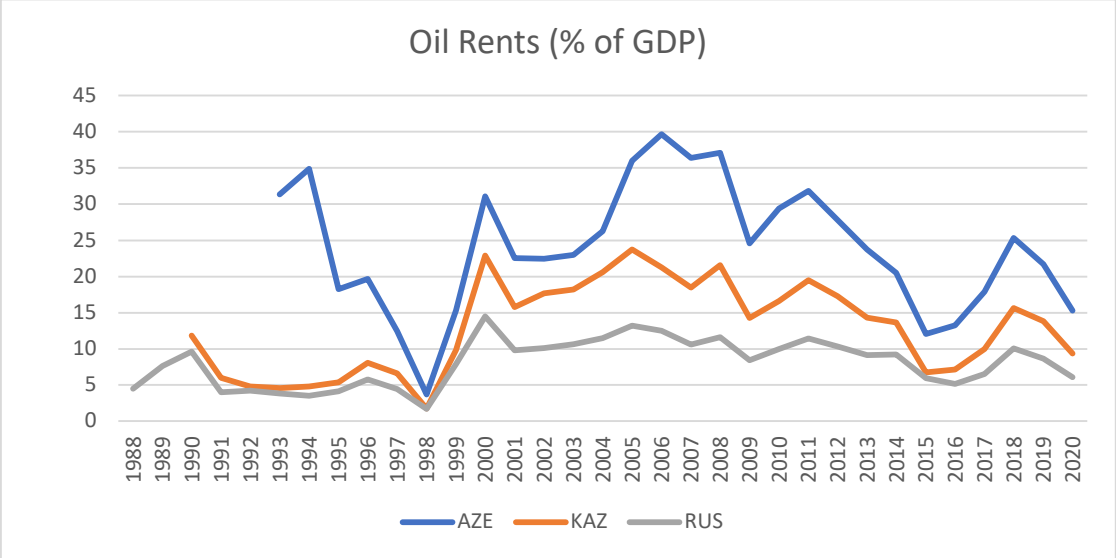
Figure 3. Oil reserves in the Caspian Sea countries



Source: BP Statistical Review of Energy Outlook 2021

After the dissolution of the Union of Soviet Socialist Republics, the Caspian Sea succeeded to steal the spotlights by its rich oil and gas reserves, the region was inherently called as a new "Arab Gulf" or "North Sea" in global oil and gas industry. It is estimated that proven oil reserves in the Basin of the Caspian sea are nearly 48 billion barrels and proven natural gas reserves are equal to about 290 trillion cubic feet. According to BP Statistical Review of Energy Outlook 2021, the world oil reserves were around 1.7 trillion barrels. Countries in the Middle East region hold over 50 percent of worldwide oil reserves at the end of 2020, whereas countries in the Caspian Region, which including Azerbaijan, Kazakhstan and Russia, accounted for nearly 10 percent of the total world oil reserves (see Figure 3). Based upon estistmation of British Petroluem (BP), crude oil reserves of these countries in the region was at level of 145 billion barrels. It was reported that the ratio of oil reserves to production was equal to 30 years[10].

Figure 4. Oil rents (% of GDP) in the selected countries of the Caspian Sea region



Source: World Bank

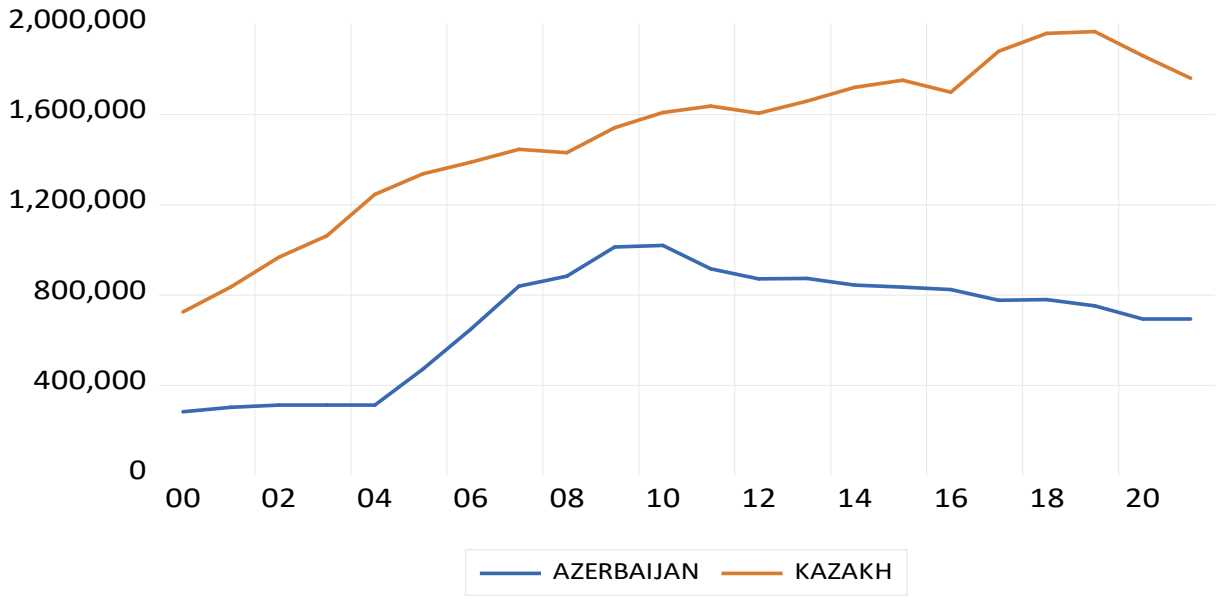
2.2. OIL INDUSTRY IN AZERBAIJAN

Azerbaijan has been known as a birthplace of Caspian oil since 19th century, in the intervening years it became one of the major oil-condensate producing provinces in the whole world. Most of Azerbaijan giant crude oil and gas fields are in offshore waters. At the end of 2020, Azerbaijan's proven as well as possible crude oil reserves equaled to seven billion barrels (1Mt), which was calculated for about 0.42 proportion of the worldwide stocks, as stated by the 2021 BP Statistical Review of Energy Outlook. It should be noted that over 80 percent of Azerbaijan oil produced comes from offshore. Based on R/P ratio, it is accounted that the petrol sources of Azerbaijan will

[10] The oil reserves to production proportion are frequently utilized by experts to measure the remaining quantity of non-renewable sources which is expressed in time. If a state has a 30 million barrels oil reserves and daily oil production is around 300 thousand barrels, the ratio of R/P is estimated as 30,000,000 / 300,000 = 100 years. In 1980s, R/P ratio was 30 years, it increased up to 50 years at the end of 2019.

be enough for the next quarter century. Because of aging oil infrastructure, in the late 1990s, Azerbaijan has invested considerably in the oil industry. Investing production facilities contributed to increase productivity, as of mid-2000s daily oil production substantially increased. In 2009, the total oil production in Azerbaijan reached an all-time high of 1,012.530 mb/day after its independence (see Figure 5). However, in the following years, the production of crude oil tended to decrease, in 2020 the annual oil output declined to 770 thousand barrels per day in Azerbaijan, such a level was seen in 2007.

Figure 5. Crude oil Production in Azerbaijan and Kazakhstan (mb/day)



Source: https://fred.stlouisfed.org/series/AZENGDPMOMBD

As a Petrostate, crude oil and natural gas play a dominant role in Azerbaijan's exported. With reference to the Azerbaijan State Custom Committee, more than 29 million metric tons (MMt) of oil condensate and 12.5 billion cubic meters of natural gas were exported between January-December 2020. Azerbaijan earned high income from selling petrol and gas products within the same year. The volume of exported energy products amounted to $11.9 billion. In the list of energy exports in 2020, petroleum and condensate were ranked first place, the amount of oil revenue accounted for 9.36 billion USD. It was followed by natural gas with $2.2 billion. However, Azerbaijan's petrol exports decreased in 2020 by 6 percent in compare to the previous year. During the twelve months of 2019, Azerbaijan exported 30.8 million tons of light oil and the value of its petrol exports amounted to $14.8 billion. It should be noted that members of OECD Europe and some ASEAN countries are the major purchasers of Azerbaijan light oil. According to EIA report, 65% of Azerbaijan's total oil products were exported to OECD Europe countries, while Asian countries imported 14% of total exported. By 2020, Italy became the leading country in Europe owing to the volume of imported oil condensate which was equal to 11.78 million metric ton. Approximately 34 percent of Azerbaijan's exported oil was bought by Italy. The top three European countries in terms of petrol condensate imported during 2020 were Croatia with 1.64 million metric tons, Spain with 1.6 million metric tons and Greece with 1.4 million tons. Whereas, China was the biggest buyer of Azerbaijani petroleum in Asia region, specifically, more than 2 million metric tons oil products were exported to China in

2020, representing 9% of Azerbaijan's total oil exports. Additionally, Israel imported 1.167 million tons (4%) of oil products.

Safe transportation of petrol condensate and natual gas resources to global markets has been emphasized as the main priority of the national oil strategy, thus several alternative export routes has been constructed under the Azerbaijan Energy Programme. Under the Energy programme, the construction of alternative transport routes will contribute to minimizing Azerbaijan's export dependency on any country. Azerbaijani oil, is known as Azeri light, is delivered to Europe, Asia and America's markets by three pipelines. Currently, three oil pipelines and one railway system are used to convey petroleum and condensate to foreign countries.

- *The Baku-Tiblisi-Ceyhan Pipeline (BTC):* As of June 2006, the 1768 km BTC crude oil pipeline was officially inaugurated by the BTC company. It connects the Sangachal industrial complex in Azerbaijan to Ceyhan port at South-eastern Mediterranean in Turkey. The large majority of Azerbaijani crude oil, which is extracted from the Azeri-Chiraq-Deepwater Gunashli wells (ACG) is carried by the BTC. Thanks to the Ministry of Energy of Azerbaijan, around 475 million metric ton or 3.57 billion barrel was carried by the pipeline between 2006 and 2020. In detail, the pipeline system transported more than 27.8 million tonnes, or 211 million barrels light oil throughout 2020. Additionally, Kazakhstan and Turkmenistan petroleum products have been delivered by the BTC since 2013.

- *The Baku-Supsa Pipeline:* By the export pipeline, Azerbaijani offshore petrol has been carrying out to Supsa terminal on the shores of Black Sea in Georgia. The total length of pipeline is around 830 kilometers, and the 150,000 barrels light oil could be transported daily through the Baku-Supsa oiltube. State Statistics Comittee reported that nearly 3.1 million tons light petrol have been transported by the export pipeline in the period between January and September 2020. During the given time period, petroleum export increased by 13% in comparsion with the same period of 2019.

- *Baku-Novorossiysk Pipeline:* The construction of this oil pipeline was compleated in the era of Soviet Union (1983). Raw petrol from Baku oil fields was transferred to Novorossiysk port on the Soviet waters of Black Sea. Currently, it is operated by SOCAR and Transneft. In the course of time, the pipeline system started to lose its importance. Due to the database of Statistics Comittee, only 825 thousands ton of petrol have been exported through the Baku-Novorossiys pipline in 2019.

2.3. AZERBAIJAN'S ECONOMY IN A SNAPHOT

The oil industry completely dominated the economy of Azerbaijan, due to EIA report, the export of crude oil and natural gas accounts for 90% of total exports and the share of the petrolem sector in Azerbaijan's GDP amounted to 50 percent. Taking into account its dependency on the industry of oil, a large fluctuations in oil prices make the pressure on macroeconomic variables in Azerbaijan, in particular the growth rate of GDP substantially changed based on the oil price uncertainty. According to its development stages, we can split the economy of Azerbaijan into three different phases, including a severe recession in the early 90s, a rapid growth in the 2000s, the oil price fluctuations in the 2010s.

It should be noted that the 90s are often culturally defined as a sudden downturn in economic activity in Azerbaijan, and as well the recession is also expressed for the economies of the Federation of Russia and Kazakhstan in the same decade. Azerbaijan's economy adopted to a centralized economic model at the beginning of the 20th century, and with the collapse of the planned economy in the 1990s, the country has experienced a severe recession. In addition to the collapse of the command economy, the war between Azerbaijan and Armenia, political instability and the deteration of the oil industry plunged the economy into a deep economic crisis. Suleymanov and Aliyev (2015) noted that real gross domestic product (GDP) in Azerbaijan has declined dramatically in the period between 1991 and 1994, respectively real GDP decreased on average by -16.5 percent. Moreover, the authors stated that a major drop has been seen in the indexes of industry (-64.5%), services (-64%) and manufacturing (-77%), particularly Azerbaijan's export volume fall almost threefold in the period between 1992 and 1994, largely due to a sharp drop in the exports of crude oil.
However, the economic crisis resulted in the devaluation of Azerbaijani Manat in 1992, the Manat tumbled sharply against the U.S. dollar[11]. According to the Central Bank of Azerbaijan, the official exchange rate of the dollar against the currency of Azerbaijan was nearly 118 Manat in 1993, while the Central Bank of Azerbaijan devalued its national currency in 1994, after that the Manat stood at nearly 4,180 against the dollar. In parallel, the CBAR raised the key intereset rates to 250% amid runaway inflation in 1994. It is worthy to note that hyperinflation was recorded in Azerbaijan from to 1993 to 1995. In detail, inflation in Azerbaijan hit an all of time high of 1662.2 percent in 1994. Suleymanov and Aliyev (2015) noted that hyperinflation was caused by the priting money in order to finance the budget deficit.

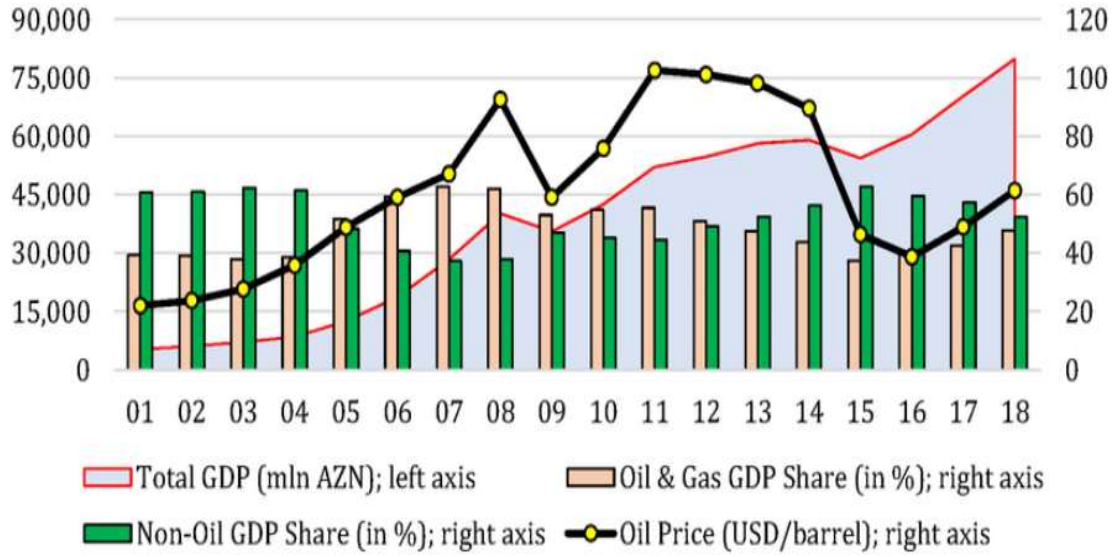
The economy in the late 1990s and early 2000s: Since the mid-1990s, the governmet of Azerbaijan began to implement economic refors in order to ensure the economic stability since the mid-1990s. Based on the economic reforms, the orthodox economy policies were implemented under the IMF programme to tame hyperinflation, to reduce the budget deficit and to provide the growth of GDP. Furthermore, foreign investors were invited by the government to participate in the restruction of the oil industry. To this end, the signing of the Contract of Century was milestone in Azerbaijan's history, which caused the inflow of foreign direct invesment to the country. Bayulgen (2003)

[11] https://www.cbar.az/page-40/statistical-bulletin

mentioned that the value of the contract between the State Oil Company of Azerbaijan Republic and the international consortium was estimated at 60 billion dollars.

As of the early 2000s, the economy in Azerbaijan took a step into a oil boom period, much due to raising oil prices. By numbers, the amount of foreign direct investment in the economy increased to 42 billion dollar between 1994 and 2006. Real GDP in Azerbaijan doubled in the period between 2000 and 2008, and double digits were seen in the growth rate of the gross domestic product. The annual average rate of GDP growth in Azerbaijan was estimated at 16% from 2001 to 2008, and the growth rate of real GDP reached its peak in 2006, respectively 34.6%. In addition to that, GDP per capita reached about $5,575 in 2008, appropriately, the poverty rate declined below 30 percent.

Figure 6. Oil prices and GDP in Azerbaijan



Source: Baku Research Institue

By 2005, the government in Azerbaijan revalued its own currency, the Manat became more valuable than the Dollar and the Euro. According to Asian Development Bank, the nominal exchange rate was 0.87 AZN against the U.S. dollar. As an extra, the supply of Board Money (M2) surged by 116% in mid-2000s. Despite an increase in money supply, inflation fell to single digit.

However, rising oil prices caused an increase in the government expenditure in Azerbaijan, hence the total government spending rose to 10.7 billion AZN in 2008, which accounted of 25 percent of GDP. Chubrik and Walewski (2010) noted that oil prices have significant impact on the budget of Azerbaijan, and the percentage of transfers from the State Oil Fund (SOFAZ) was around 35% in 2008.

Oil crisis: In the result of the Great Financial crisis and a decline in oil prices, Azerbaijan's economy exposed to a short-lived recession. By 2009, a drop in Azerbaijan's GDP was observed,

while the inflation rates hit double digits for the first time since 1996[12]. Meanwhile, non-oil GDP growth rate dropped to 3% in 2009 in contrast to previous year, particularly construction sector was hit hard by the crisis. Guliyev (2013) noted that revenues from oil exports have dropped by 35%. In subsequent years, an increase in the gross domestic product was triggered by rising oil prices. Between 2010 and 2014, Azerbaijan's economy grew on average by 3.2 percent.

In comparison with the 2008 crisis, the results of the petrol prices plunge between 2014 and 2016 on Azerbaijan's economy was more severe. A slump in crude oil prices led to a deep recession in the economy of Azerbaijan, alike Kazakhstan and Russia. The crisis resulted in a significant decline in the gross domestic product, and also the growth of GDP decreased from 5.8% in 2013 to 2.8 % in 2014, in the following year the growth fell to 1.1% (worldbank.org). While non-oil sector growth has also decreased from 10% to 1.1% percent between 2013 and 2015. Bayramov and Abbas (2017) stated that a considerable decline was seen in the budget revenues in 2015.

It is worthy to mention that the oil crisis was accompanied with the devaluation of the Manat and the collapse of Banking sector. The anti-crisis measures have adopted by the Central Bank of the Republic of Azerbaijan to stabilize the exchange rates. In order to defend the value of Manat against foreign currencies, CBAR has injected the U.S Dollar into the economy, which nearly caused a third percent reduction in the reserves of the Central bank in three months. But the Central Bank failed to prevent the devaluation of the national currency in this period, and the CBAR shifted to a floating exchange regime. So, the Manat underwent sharp depreciation on February 21, 2015 or was known as Black Saturday. In parallel, the currency crisis brought about the banking crisis, the devaluation of the currency led to the closure of 13 banks in Azerbaijan. Ibrahimov (2016) found that the prices of crude oil prices have positive effects on the profitability of banks in Azerbaijan, whereas the devaluation of the Manat has negative impact.

The triple shock: By 2020, the Azerbaijan economy exposed to the combination of triple shocks, including the Covid-19 pandemic, a fall in oil prices and the war with Armenia, which negatively affected the economic activity throughout the country. In the first second of the year, lockdowns have been implemented by the government to minimize the spread of the Coronavirus, which caused a halt in economic activity. According to the World Bank, the economy has contracted by 4.3% throughout the whole year. Azerbaijan's GDP dropped from $48 billion in 2019 to $42 billion in 2020. A decrease in oil sector reached 6.5%, while non-oil sector decreased by 2.9 percent in 2020. Furthermore, government expenditures were increased by 12.4 percent in contrast to the previous year. Particularly, the growth of agricultural sector hit its the lowest rate in recent years, which provides employment and income for 20 percent of the whole population. Despite drops in the prices crude oil amid the Covid-19 crisis, the national currency of Azerbaijan remained the stable (Czech and Niftiyev, 2021).

[12] https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=AZ

2.4. A REVIEW OF THE OIL SECTOR IN KAZAKHSTAN

Kazakhstan is the second largest oil stock holder after Russian Federation in both Eurasia and Caspian Sea regions, the amount of proven onshore and offshore Kazakh crude oil reserves was just 30 billion barrels as of December 2019 (see Figure 3). It ranked 12th in the world list for the quantity of available petrol sources. According to the Oil&Gas journal (2017), the largest proportion of Kazak oil reserves is located in Caspian Sea region. It should be noted that Kazakhstan has few super-giant crude oil and natural gas shafts in North Caspian Basin, like Kashagan offshore, Tengiz and Karachaganak onshore fields. According to EIA data, more than three third percent of Kazakh petrol is being extracted in its 15 main petrol fields. By 2020, Kazakhstan's crude oil and condensate output was around 2 million barrel (90Mmt) which was the highest point since 1991.

Since gaining independence from the Soviet Union, Kazakhstan has auspiciously enlarged and diversified its oil export routes over the years. At present, the Republic of Kazakhstan is considered an export-oriented country. Its economy has exceptionally depended on the shipment of oil products to foreign countries. In the international market, Kazakh oil is known as CPC Blend which was introduced for first time to international markets by the Caspian Pipeline at the end of 2001, so the brand name originated from the Pipeline. The export of oil condensate and natural gas is the primary revenue sources of the Kazakh budget. In 2020, the Kazakh economy was exposed to highly negative impacts by the outbreak of coronavirus and fluctuations in commodity prices. First of all, the total amount of Kazakhstan exports declined by 19 percent in 2020 compared to 2019. According to Enerdata report, approximately 85.7 million tonnes petrol and condensate were produced in both onshore and offshore fields in 2020, with the Tengiz oil well accounting for 31 percent of total oil output. Whereas the volume of the Kazakhstan's oil exports accounted for 70 million tonnes in the same year. In parellel, the revenues from selling petrol decreased from $33 billion to $23.7 billion between January and December 2020, a 30 percent decrease from the previous year.

Year after year, the Kazakhstan government continues to diversify its petrol export routes. Nikonorov (2021) reported that Italy became the major trade partner of Kazakhstan in Europe. Therefore, the total value of exported petrol condensate to Italy was more than 6.5 billion U.S. dollars in 2020 (Figure4). According to the author's report, the volume of Kazakh petrol export to India in 2020 was $1,831 billion, an increase of 37% from the previous year. Furthermore, Brunei, Belgium, Netherlands, China, Crotia are the main export routes for Kazakh light oil[13].

Obstacles to Kazakhstan's access to the world oceans directly pushed it to construct multi-billion dollars pipeline projects in order to export hydrocarbon reserves to international markets. Oil condensate is mainly transported by two main oil tubes, Caspian Pipeline Consortium (CPC) and thev Kazakhstan-China Pipeline.

- With the Kazakhstan-China crude oil pipeline, China gets a chance to access to Eastern Caspian shores, where huge hydrocarbon fields is located. The 2800 km pipeline is ranked among the longest pipelines; it links the South Turqai Basin of Kazakhstan to Dusshanzi in

[13] https://inbusiness.kz/ru/news/na-chem-zarabatyvaet-kazahstan-top-5-klyuchevyh-eksportnyh-tovarov-2020-goda#gallery%20-5

China. In 2019, more than 10.8 million barrel per day oil condensate was transported by the pipeline.

- It should be noted that the Caspian Pipeline Consortium (CPC) is the main pipeline for the export of Kazakh light oil to European countries. It transports Tengiz oil from Caspian shore to Novorossiysk port on Black Sea. In 2001, the construction of the oil pipeline was completed. By 2016, the crude oil from the Kashagan well was connected to the CPC. According to Consortium database, more than 668 million tons of crude oil was transported between 2001 and April 2020[14].

2.5. KAZAKHSTAN'S ECONOMY AT A GLANCE

The economy of Kazakhstan has drawn the same patterns with Azerbaijan in the economic development. In early 1990s, Kazakhstan's economy has contracted sharply, mostly owing to the dissolution of the Soviet Union. According to the World Bank report, real GDP in Kazakhstan has declined on average by nearly (-9.2) percent between 1991 and 1995. And with it, a drop was observed in the industry and agriculture indexes by nearly -28 and -21 percent, respectively. A decline in real GDP brought the hyperinflation, the prices got out of control. According to Pomfret (2005), the rate of inflation was estimated at around 79% in Kazakhtsan, however, after two years the inflation reached its record peak, it stood at 1,880 percent in 1993. According to the recession, the Tenge devastatingly depreciated, the official exchange rate of Kazakhtan national currency against the dollar was nearly 60 Tenge in 1995.
In the period between 1996 and 1998, the economy started to recover. An increase in real GDP was seen for the first time after the independency of Kazakhstan, the gross domestic production rose by 0.5% and 1.7% in 1996 and 1997. In parallel, inflation dropped sharply to under 20 percent in the same period.
Starting from the early 2000s, Kazakh economy enjoyed the rapid economic growth due to the oil prices increases, the economy expanded by more than 75% between 1998 and 2007. A rise in oil production led to export expansion, particularly, the total quantity of exports in 2003 was approximately 4 times more than the volume of exports in 1994. Revenues from the oil sector reached nearly $5.15 billion. Consequently, GDP growth rate reached its peak in 2003, when the gross domestic product grew by 13.5 percent, after a year it dropped to 9.8% and remained almost steady between 2005 and 2007. Kazakhstan's annual inflation rate in 2006 was at 8.7 percent (data.worldbank.org). The amount of foreign direct investment reached to $25 billion in the same phase. Kazakhstan's reserves exceeded 8 billion US dollars, including gold and foreign reserves.

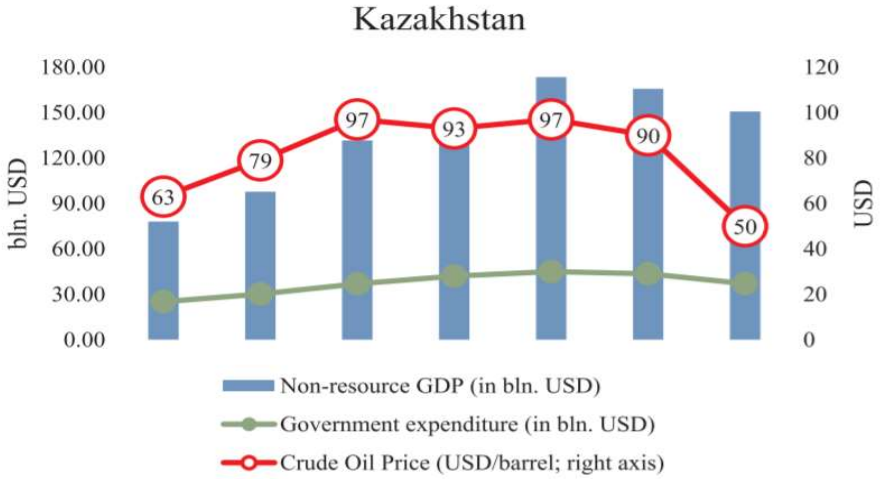
Oil crisis in the Kazakh Economy: The era of rapid growth in Kazakhstan has ended in 2008, when the Financial Crisis and the oil price crisis hit the economy. It is well known that the oil sector has the largest pie in the economy of Kazakhstan. Therefore, with collapse of oil prices, Kazakh economy was pushed into the economic crisis. As the result of the crisis, the annual growth rate of GDP fell to 1.2% in 2009 from 8.9% in 2007 (worldbank.org). The total value of exports reduced by

[14] https://www.cpc.ru/EN/press/releases/2020/Pages/20200506.aspx

more than 40 percent, respectively the exports dropped from $76 billion in 2008 to $48 billion. In parallel, the inflation rate soared to 17% in the same year. IMF shows that the government of Kazakhstan devalued its national currency by 20 percent at the beginning of 2009. The economic crisis caused a trouble in the banking system, because of that the banks in Kazakhstan heavily borrowed from overseas. Amid the crisis, the growth rate of credits began to halt which increased the panic in the banking sector. Delice and Karadas (2022) stated that the 2008 crisis has serious effects on the Kazakhstan banking sector. Similarly, Laruelle (2008) found that the real estate market and the banking sector in Kazakhstan was influenced by the 2008 Subprime crisis.

In short, the result of the 2008 oil crisis was the short lived. The Kazakh economy started to recovery at the beginning of 2010, when oil prices surged above $70. Barisitz et al. (2010) noted that the recovery of crude oil prices contributed to stabilize the exchange rates of the Tenge and the Ruble.

Figure 7. Kazakhstan's Government expenditures and oil prices



Source: V. Bayramov and G. Abbas "Oil shock in the Caspian Basin: Diversification policy and subsidized economies"

The oil shocks of 2014 and 2020: World Bank reported that Kazakhstan's GDP has grown on average at 6.5% in the period between 2010 and 2013, however, the GDP growth dropped from 6% in 2013 to 1.2% in 2015, mostly due to a sharp fall in oil prices[15]. In nominal terms, Kazakhstan's GDP dropped from $237 billion to $137 billion in just two years. Based on a fall in budget revenues, a considerable budget deficit was recorded in 2014, roughly the deficit was equal to 5.8 percent of the gross domestic product. In addition to that, industrial production declined by more than 2 percent. Moreover, falling oil prices affected the trade balance of Kazakhstan. Specifically, trade with Russia and China has decreased between 2014 and 2016, foreign trade turnover with the

[15] https://www.worldbank.org/en/country/kazakhstan/publication/kazakhstan-economic-update-spring-2015

Federation of Russia has declined by 28 percent. Kazakhstan exports to Russia dropped to $4.3 billion (Bayramov and Abbas, 2017). The Kazakhstan National rejected to defend the Tenge, it declared that a floating exchange regime was implemented, therefore, the national currency devalued by more than 40%. With the depreciation of the national currency of Kazakhstan, the inflation rate reached over 14% in 2016[16]. And the interest rates have been raised sharply by the National Bank to prevent the depreciation of the Tenge and control the inflation.

In contrast to the 2014/16 crisis, the results of the Covid-19 pandemic and oil crisis on the economy in 2020 was modest. In terms of macroeconomic indicators, Kazakhstan's GDP shrinked by 2.5 percent in 2020. Particularly, trade and trasportation sectors were contradicted by 9.5% and 17% in the first quarter of 2020, due to lockdowns. EBRD report (2021) showed that fixed investment declined by 4.9% year on year. The crisis led to an increase in the inflation rate (averagely 6.1%), in tandem the Tenge lost its value by more than 15 percent. Czech and Niftiyev (2021) found that there was negative linkage between the Tenge and the Dollar during the Covid-19 pandemic.

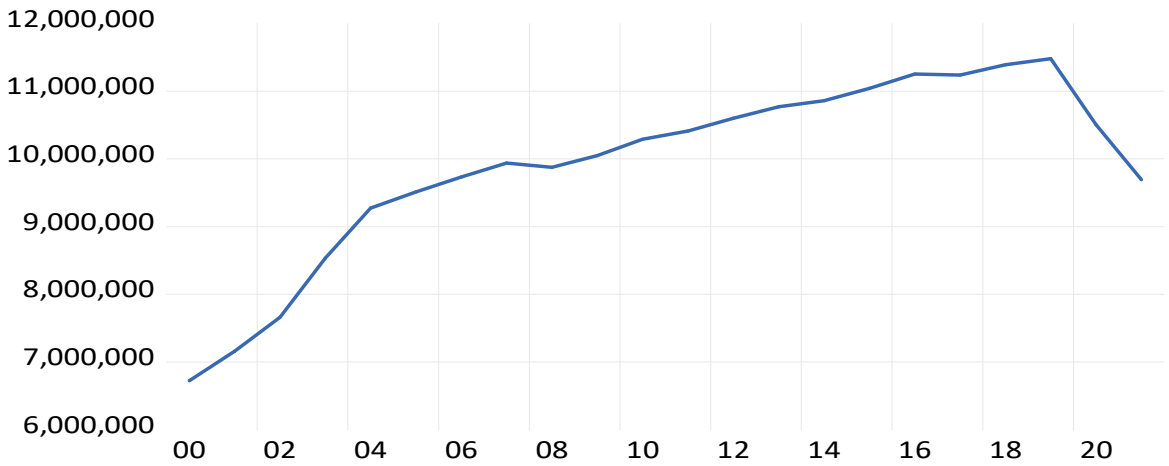
2.6. THE POSITION OF THE OIL INDUSTRY IN RUSSIA

Russia is leading country in the Caspian Sea region due to proven petrol reserves. According to the 2021 BP Statistical Review of Energy Outlook, the possible oil reserves of the Russia Federation is just over 107 billion barrels which equals to 6.2 % of the global oil resources. Thanks to volume of petroleum sources, the Russia Federation has been ranked in 6th place in the world, as of 2019. Grama (2012) noted that the majority of Russia oil fields are in Western Siberia Basin and approximately 75% of the total Russian oil is produced in this region. By 2019, solely 320 million metrics ton oil was produced in the Western Siberia. In 2019, Russian oil industry hit record among post-Soviet states, with the production of petrol accounted for nearly 11.5 million barrels per day or 570 million metric ton (MMt). However, in 2020 global energy markets were stiffly influenced by Covid-19 epidemic, particularly global lockdowns reduced demand on the products of crude oil and natural gas. In a closely-watched annual report, the growth in international oil consumption declined to 8.6 million barrels per day. In the same year, the pandemic generated a decline in the production of Russian crude oil, petroleum production fell below 10 million barrels per day in comparison to 2019 (see Figure 8).
By 2020, demand reduction directly influence to trade balance in energy exporting states, as well as coronavirus has remarkable effects on the export products of Russian Federation. According to Statista report, in 2020, Russia's crude oil export fell to 238 million metric ton (MMt) in compared to 2019, it was equal to 40% down in the export of crude oil. Apart from Covid-19, there are other reasons for the reduction of Russian oil exports to main destinations, such as European countries's attempt to minimize their oil dependency from Russian Federation. In the EU, the import of crude oil eqauled to 512.5 million metric tonnes (MMt), at around 151.6 million ton oil products were purchased from the Russia Federation. As of 2018, the balance of energy exports was nearly 110 billion Euros. In comprasion with 2018, trade volume between European countries and Russia

[16] https://www.statista.com/statistics/436183/inflation-rate-in-kazakhstan/

decreased to 60 billion Euros (almost 45 percent decline) in 2020. For this reason, the market share of some countries increased in the EU in the following years, like Kazakhstan, Iraq, Azerbaijan et al. However, China became the largest trade partner of Russia towards the end of 2020. The volume of trade balance between two states reached up to 108 billion U.S. dollars. Although Covid-19 pandemy, Russia's crude oil exports to China expanded to US$ 57.18 billion. On the contrary, imports from China increased by 1.7 percent. The value of imports accounted for 50.85 billion U.S. dollars.

Figure 8. Annual oil production in Russia (million barrels per day)



Source: Federal Customs Services of Russia

It is a matter of fact that cross-country oil and gas pipelines are the most economic and eco-friendly way to transport huge hydrocarbon sources to different countries over long distances at the present time. A noteworthy portion of state's energy demand is provided through pipelines, as well as pipelines contribute shipping energy types to consumers swiftly. Additionally, the ratio of pipeline failures is much lower than that of railways or seaborne transportation. The Russian Federation have the longest crude oil and natural gas pipeline network in the world. The total length of oil pipelines in Russia amounted to 54 thousand kilometers. It is referred as "pipelines" and has irreplaceable importance in the Russian oil transportation system. Essentially, two vital oil pipelines take attention at first glance, the Eastern Siberia-Pacific Ocean (ESPO) and the Druzhba (Friendship) conduit.

- In 2012, the construction of the Eastern Siberia-Pacific oil tube project was completed. The main aim of pipeline is to convey Russian crude petroleum to East energy markets, namely Japan, China and Korea. Oil tube length is a 4188 kilometer, the petrol shipping capacity of tube is 600 thousand barrels per day.

- Druzhba or Friendship oil pipeline transports Russian oil from West Siberian, Urals and Caspian oil fields to the heart of Europe. The total length of tube including all its network is 4000 kilometers, it is being operated by Transneft oil company. The pipeline has power to transmit 1.4 million barrels oil per day.

2.7. A BRIEF OVERVIEW OF RUSSIAN ECONOMY

Immediately after the breakup of the USSR, the newly formed governments in the Russian Federation began to introduce macroeconomic stabilization policy in order to provide the economic stability in the period from 1992 to 1997. Under the stabilization program, the Russian government achieved to capture the economic growth in 1997. According to the World Bank, the gross domestic product increased from -14.5% in to 1.6% in 1997. Meanwhile, the inflation rate, which estimated at nearly 874 percent in 1993, dropped to 14.8% in the same phase. However, within fall of oil prices, Russian economy faced with the economic crisis in 1998, when the Asian financial crisis spread to the world economy. The crisis caused a decline in oil prices, mostly due to weak demand for petroleum products and crude oil overproduction. By 1998, real GDP in Russia contracted by -5.3 percent. The annual inflation rate incresed from 27.7 percent in 1998 to nearly 86% in 1999[17]. In particular, the crisis made the pressure on the Russian Ruble. The Central Bank of Russia lost nearly $6 billion to defend the ruble against the dollar, which melted the foreign currency reserves. But the result of the crisis on the economy was temporary, because of raising oil prices the economy in Russia recovered quickly since the 1999.

Since the 2000s, with the help of higher crude oil prices, the economy in Russia took off. More importantly, the average rate of GDP growth in Russia was estimated at nearly 7 % in the period from 2000 to 2008. Additionally, GDP per capita in Russia reached about $11,635. Together with a growth in the gross domestic product, the poverty rate declined below 10 percent, while the size of the middle class in Russian population doubled. The annual inflation rate dipped below 10% between 2000 and 2008. Moreover, the amount of foreign direct investment in Russia hit $75 billion in 2008. The poverty rate declined below 10 percent, while the size of the middle class in Russian population doubled. Throughout mid-2000s, the official exchange rate of Russian Rouble against the USD remained almost stable, the rouble traded at averagely 70 to the U.S. dollar. Particularly, trade surplus had positive effect on the Ruble, Russia's budget enjoyed $136 billion trade surplus in 2006.

Triple shocks in Russia's Economy: In early 2000s, an economic boom was seen in the Russian Federation, in consequence chiefly of the higher oil prices which almost hit $150 per barrel. In terms of macroeconomic indicators, the Russian economy was performing its best. Havlik (2010) noted that Russia's GDP increased at an annual rate of 6 percent throughout 2008. Additionally, the revenues from exports and real income money grew by 24% and 8%, respectively.

Despite the strong performance of the economy, in the last quarter of 2008, the economic situation in Russia began to changes gradually. Russia's economy was badly hit by triple shocks, including a drop in oil prices, the U.S. subprime mortgage crisis and the politic situation after the war with Georgia. In contrast to the crisis in 1998, the 2008/09 crisis turned out to be a much more severe, which led to a negative growth rate in real GDP and the budget deficit. As of the last quarter of 2008, the symptoms of the crisis appeared. The stock market in Russia fell even more than 70 percent from its peak in May 2008, a crash in stock market fueled the sale of the Ruble-denominated

[17] https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=RU

assets in short run (Desai, 2010). In parallel, the stock market crash triggered the devaluation of the Ruble, which fell nearly by 14%. In order to stabilize the Ruble and prevent capital outflow, the Central Bank of Russia raised the interest rates and pumped the dollar into the market.

In short, the deep recession in Russia was relatively short lived, like Azerbaijan and Kazakhstan. Despite the fall in GDP (-7.9%) and the double digits in the inflation rate (11.6%) in 2009, Russia succeeded to overcome the economic downturn with help of rising oil prices[18].

Oil collapse in the Russian Economy in 2014-16: Between 2010 and 2012, Russia's economy demonstrated good momentum of steady and modest growth. Positive growth trend in the economy has reduced the volatility of the Ruble. And the annual inflation rate has dropped back into single numbers after the 2008/2009 crisis.

However, as of 2013, the economic growth in Russia began to slow down, the growth slowed from 4% in 2012 to 1.8% in 2013 (worldbank.org). Within a year, the Russian economy encountered a severe recession in the end of 2014. The recession was triggered by mostly due to two events, including the annexiation of the Crimea in the first quarter of 2014, which led to the sanctions and, a historical collapse in the prices of petrol.

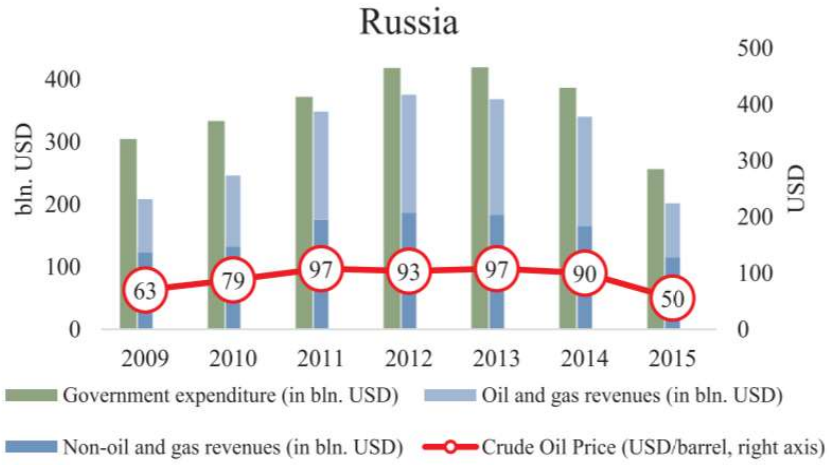
As the results of economic growth, the Russia's economy has contracted by 2% in 2015. In this regard, real gross domestic product decreased from $2.05 trillion to $1.36 trillion between 2014 and 2015. It can be clearly seen from the given figure, government spending and the revenues from oil and gas sector declined sharply (Figure 9). In addition to that, the volume of fixed investments has contracted by 1.5 percent. By 2015, double digit inflation rates were seen in the economy of Russia. It is worth pointing out that the Central Bank implemented contractionary monetary policy in order to tame inflation and stablize the Ruble. The CBR raised the interest rates by 7.5% basis points (bps) at the beginning of 2015, from 9.5% to 17%.

Economic turmoil brought about a volatility in the exchange rates of the Ruble. The national currency of Russia lost its value by more than 72 percent (Bayramov and Abbas, 2017). To prevent the depreciation of the Ruble, Russian Central Bank began to inject the dollar into the markets, which resulted in a sharp decline in the volume of foreign reserves. According to Russia's Central Bank, the reserves decreased from $510 billion in January 2015 to $364 billion in December 2015[19].

[18] https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=RU

[19] https://www.cbr.ru/eng/hd_base/mrrf/mrrf_7d/?UniDbQuery.Posted=True&UniDbQuery.From=01.2014&UniDbQuery.To=12.2022

Figure 9. Oil and Gas revenues, Government Expenditure, Oil prices and non-oil and gas revenues in Russia



Source: V. Bayramov and G. Abbas "Oil shock in the Caspian Basin: Diversification policy and subsidized economies"

*Dual Shock: the Price War and the Covid-19 pandemic*y: After the 2014/16 crisis, the Russian economy has succeeded to rebound quickly. But real GDP in Russia has enlarged at a rapid pace amidst the higher crude oil price enviroment of 2017-19. According to Russian Central Bank, the average growth rate of real GDP volume increased by 8.7 percent over three years. In this regard, real gross domestic product increased from 1.57 billion dollar to 1.68 billion dollar between 2017 and 2019

However, by 2020, Russia's economy faced a dual shock, which generated by the outbreak of Coronavirus and the price war between Saudi Arabia and Russia. First of all, the pandemic has triggered a severe economic slump in the Russia Federation, due to the sudden closure of all type of businesses. According to the Bank of Russia, real GDP in the second quarter of 2020 declined by 7.8 percent, and a downward growth trend in the growth rate of GDP lasted to the last quarter of the year (see Figure 9). Considering the full 2020, a real gross domestic product (GDP) decreased by 2.9 percent in compare to previous year. In addition, GDP per capita in Russia for 2020 was around 10.126 U.S. Dollar, whereas it dropped by nearly 12 percent in contrast to 2019 ($11.497). A large majorty of low income families were more effected by the crisis. World Bank Group estimated that a sharp contraction in real GDP led to an increase of the national poverty rate in 2020 to 2.2 percent in contrary to 2.1 percent in 2019.

A decline in economic growth was not only caused by the Covid-19, but also a abrupt drop in crude oil price increased the pressure on Russia's economy. Above all, the Oil Price war between Russia and Saudi Arabia has crippled global oil market in the midst of the Coronavirus pandemic. After a failure in bilateral negotiations between the members of OPEC and the Government of Russia over voluntary crude oil production cutback, the Saudi Kingdom on 8 March 2020, has initiated an agressive oil price war with OPEC Plus countries against its onetime ally. M. Jeong (2021) stated that economic turmoil in Rusia associated with lower price of Ural crude oil through the first half of

2020, when the price of the Russian flagship petrol brand dropped to $18.22 a barrel in April. Sweatman *et al.* (2021) noted that the price war has a negative impact on Russia's real GDP. As a result, the dual neagtive shocks from the Coronavirus and the oil price volatility has had significant impact on the economy of Russian.

By 2020, Russia's two-way merchandise trade in goods and services have dropped dramatically due to falling oil price and lockdown measures. Even though two-way trade has declined, the trade balance of Russia remained positive (roughly $91 billion). In detail, World Trade Organization (WTO) reported that the volume of Russia total exports declined by 21 percent in 2020 compared to 2019. Specifically, a drop in energy prices had tramendous impact on the value of export of goods and services. According to Statista database, the total worth of export was around 332.23 billion US dollars, thus Russia became 13th largest world exporter in 2020. Of that, the total energy export currently amounted to nearly 167 billion USD and then, crude oil export accounted for around $72.36 billions of all energy revenues. Furthermore, manufactures and agriculture products have a great share in Russia's merchandise export. Meanwhile, the share of the Russian Federation in world total exports remained just under 1.90 percent.

Amid the crisis, the volume of merchandise imports have dropped heavily and a sharp drop in imports of goods and services was mainly cuased by the lockdowns and the depreciation of the Ruble. WTO estimated that the value of imports to Russia fell by nearly 6 percent in 2020, Russia's total imports amounted to 240 billion dollars. In terms of volume, manufactures products accounted for nearly 80 percent of total imports, and followed by agricultural and mining products, respectively 12.3 percent and 3.8 percent. Based on the report, trade in commercial services to Russia have dropped by 35 percent, specifically a notable drop was observed in transport and travel sectors.

One of the major impacts of dual shocks on the Russian economy were a fall in investment rates throughout the year. World Bank survey showed that foreign direct investment rate declined by 4.1% year on year for the three quarter of 2020. With meticulously attention to detail, a growth in investment ratios has only seen in major oil producing regions and few federal cities, such as Moscow, St. Peterburg, and Tyumen oblasts which are located in the heart of Western Siberia where is the top oil producing region in Russia. Filimonova (2020) noted that Russian investment projects in oil and gas sectors are highly addicted to borrowed money abroad.

In response to the crisis, the Russian Central Bank has cut key interest rates to 4.25% from 8% at the meeting of the Bank of Russia Board of Directors, thereby interest rates in Russia have ever reached a record low level for the first time during the post-Soviet era. According to Bank of Russia, between March and November of 2020, the money supply (M2) in circulation has gradually increased, respectively from 11% to 16.2%[20]. However, expansionary monetary policy put rising pressure on the Russian Ruble and the exchange rates. Coherently, depending upon economic fragility- including falling oil prices, Covid-19 lockdowns, lower interest rates, concerns about weak global demand and the sanctions against Moscow, the Ruble crushed just under the pressure. As of mid-March 2020, the Russia's national currency has declined to its lowest level since January 2016, averagely the US dollar was converted for more than 80 rubles.

[20] https://www.cbr.ru/eng/statistics/ms/

CHAPTER 3: LITERATURE REVIEW

3.1. A BRIEF OVERVIEW OF THE LITERATURE

From theoretical framework, the transmission channels of the uncertainty in crude oil prices on macroeconomic variables are investigated by several papers. Smiech et al. (2021) noted that the key transmission mechanism of the oil price uncertainty is associated with the strategy of the wait and see. Most studies investigated the transmission channels of the uncertainty of oil prices on the economy in terms of the investment, consumers and economic activity. According to Bernanke (1983) and Pindyck (1991), firms postpone their investment decisions just in case that higher uncertainty exists in oil prices. Lee at al. (1995) investigated the correlation between the oil price changes and the U.S. economic activity. Federer (1996) examined the relationship between oil price uncertainty and economic activity in the U.S. between 1970 and 1990. Edelstein and Kilian (2009) stated that consumers increased their precautionary savings, mostly due to the uncertainty. Similarly, Kilian and Vigfusson (2011) noted that the uncertainty influences the expenditures of consumers, and in this case they are not prone to purchase durable goods.

A vast body of the papers investigated the effects of uncertainty in oil prices on macroeconomic variables for both oil importing and exporting countries. Based on the empirical evidence, the uncertainty of oil prices has statistically significant impact on macroeconomic variables in oil importing countries (Elder and Serletis 2010, Bredin et al. 2011, Aye et al. 2014, Kocaarslan 2019, Punzi 2019, Maghyereh et al. 2019, Skold 2020, Oge Guney 2020). On the contrary, a few of studies analyzed the effects of uncertainty in crude oil prices on the economic activity in terms of oil producing countries. The uncertainty of crude oil prices has negative effects on the economic activity in Canada (Elder and Serletis 2009, Rahman and Serletis 2012). Similarly, Bashar et al. (2013) has examined the relationship between the oil price uncertainty and real output for Canada and Malasian economies.

From the empirical perspective, a vast body of the papers demonstrated the importance of oil price uncertainty on the economy using different methods. For instance, Huseynov (2015) investigated the effect of oil price fluctuations on the macroeconomic variables of petrol producing countries for the period 1992: Q1- 2014: Q4. According to study, a significant link has been found between the oil price volatility and real gross domestic product. Similarly, Eyden *et al.* (2019) has examined the impact of crude oil price volatility on the economic growth of some OECD countries from 1870 to 2013. According to the results of the paper, the GDP growth rate in the OECD was greatly affected by oil price changes for over 144 years.

Jawad (2013) analyzed the link between oil price fluctuations and real GDP in Pakistan between 1973 and 2011 with Linear Regression method. The paper indicates that oil price volatility significantly influences the gross domestic product in Pakistan. Similarly, Salim and Rafiq (2014) examined the impact of oil price volatility on the economy of Asian emerging countries for the

period 1983: Q1 and 2009: Q3. According to the result of the paper, there was a significant relationship between oil price volatility and GDP growth rate. The investigation of Kaplan (2015) shows that the price of oil is a significant factor in Russia's economic growth. Nyangarika (2018) analyzed the gross domestic product and petrol prices volatility by GARCH model for Saudi Arabia and Russia. According to the result of the paper, interdependency was found between variables, namely higher volatility in oil prices has a negative impact on the gross domestic product in both countries.

Abdulkareem and Abdulkareem (2016) investigated the impact of fluctuations in crude oil prices on Nigeria's macroeconomic variables such as exchange rates, interest rates and GDP by applying GARCH model. The authors stated that higher oil price changes lead to economic instability in Nigeria. Similarly, Aigheyisi (2018) analyzed the relationship between oil price volatility and the volatility in real GDP by using ARDL bound test for Nigeria in the period between 1970 and 2015. The author noted that the volatility of crude oil influenced the volatility in real GDP in short time period. Sadeghi (2017) noted that government expenditures have expanded owing to rising oil prices in 28 different oil exporting countries. Chiweza and Aye (2018) analyzed the impact of oil price shocks on South Africa's macroeconomic variables for the period 1990:01 to 2015:12 using the SVAR model. It is stated that the oil price uncertainty shock has significant effects on real output and inflation.

Meanwhile, Brown and Yucel (1999) used the VAR model to observe how crude oil prices affect the general price level and economic activity in the USA. According to the paper, the fall in GDP and the increase in interest rates are provoked by sudden and temporary oil price shocks.

Adam et al. (2019) used ARDL model, to calculate the impact of oil price uncertainty on the economic growth of Indonesia in the long run. The result of empiric model implies that a cointegration relationship was not found between oil prices fluctuations and economic growth rate. In order to investigate the impact of oil price volatility and monetary shocks on the economy of Russia, the VEC model was used by Ito (2008). Author found that the impact of monetary shocks is greater than oil price shocks.

Bredin, Elder, & Fountas (2008) showed that in short run, oil price uncertainty affects industrial production index in selected G-7 countries, like the U.K, France, Canada and the U.S. In addition to that, Aye, et al. (2014) examined the impact of oil price uncertainty on monthly manufacturing production in South Africa. According to research paper, as a result of high volatility in petrol prices, the indicator of manufacture production in South Africa was negatively affected.

Yıldırım and Öztürk (2014) used asymmetric and non-asymmetric causality tests to analyze the casual relationship between petrol prices and the industrial production index in G-7 countries. The causality test results are mutually opposite. According to the asymmetric casuality test, a sudden increase in petroluem prices does not reduce the industrial production index. On the contrary, non-asymmetric causality test show that the production index can be affected by oil prices shocks in G-7 countries.

In the literature, some papers investigate the impact of oil prices on exchange rate. For example, Farooq (2004) used statistical model to research the effect of oil price volatility on the national currency of Norwegian Krone in both short and long run. According to results in short time period,

the crude oil price volatility has substantial impact on the Krone, whereas any negative impact was not found on the national currency of Norwegian in long term. In another study, Schneider, Van Robays, and Fratzscher (2014) modified an econometric model to measure the causality between oil prices and exchange rates. The survey shows that 10 percent increase in general oil prices causes to a deprecation in U.S dollars, around 0.28 percent. Otherwise, 1 percent devaluation of U.S dollars contributes to go up oil price, approximately 0.73%. Similarly, Kaushik, Raja, and Upadhyaya (2014) developed an econometric model to estimate the effects of oil price changes on the exchange rate of Rupee. Their results show that oil prices fluctuations have a significant impact on the depreciation of Indian currency. Mishra and Debasish. (2017) measured the oil shocks effects on Rupee against U.S dollar via GARCH model, from June 2003 till March 2016. They found that as an oil importing country, a sudden increase in oil prices made strong pressure on the national currency.

Liu, et al. (2015) analyzed the impact of oil price fluctuations and exchange rates volatility on the French economy. The authors used Engle and Granger cointegration test to measure oil prices and exchange rate volatilities. They found that both of higher oil prices and exchange rates have a great impact on the gross domestic product in France.

Oil price volatility may affect the unemployment rate. For example, Carruth, Hooker and Oswald (1998) developed an empirical model to investigate the rate of the U.S joblessness in the period between 1979 and 1995. The main variables included in the cointegration model are the price of crude oil and the interest rate. According to the result of the paper, the impact of oil price volatility is greater than the role of interest rates in unemployment fluctuations. In addition, Rafiq et al. (2009) estimated the role oil price fluctuations on the unemployment and investment in Thailand using VAR model. The analysis of authors illustrates that the volatility of oil prices had a major impact on the indicator of unemployment and investment in the period between 1993 Q1 and 2006 Q4.

Some papers consider the impact of oil prices on interest rates. Depending on whether the oil shock is supply or demand shock, there are bidirectional relationships between interest rates and petroleum prices. When supply-side oil shocks occur, oil prices move upside due to the petrol shortage in the market, and rising energy prices cause to an increase in interest rates. Interest rates are decreasing owing to the lower energy prices during demand shocks (Noureddine 2006). On other hand, Akram (2009) have analyzed the correlation between three variables based on the VAR model, commodity prices, the U.S. dollar exchange rate and the fund rates. In the study it is determined that an unexpected shock in interest and exchange rates caused fluctuations in commodity prices and vice-versa.

Additionally, Arora and Tanner (2013) investigated the impact of oil prices changes on ex-ante interest rates in the long-run. In that paper it is found that, oil prices conversely respond to the real interest rates, thus any surging in U.S short term interest rates lead to a decrease in the general prices of crude oil. Any asymmetric dependency link was not provided for WTI crude oil and U.S interest rate (Kim and Jung 2018). Applying partial wavelet coherence (PWC) and multiple wavelet coherence (MWC) methods, Mensi (2020) analyzed the WTI prices and macroeconomic variables. The paper found a strong correlation between oil prices and interest rates at various time horizons.

It is beyond a shadow of doubt that there is a cause-effect linkage between crude oil prices and inflation rates. Generally, high petrol costs are associated with higher inflation rates which make a

pressure on all goods and services. Because of the usage of petrol made products in nearly all sectors, an upward movement in oil prices has caused to cost-push inflation in many oil importing economies[21]. Starting from 1970s, the first oil crisis happened, cost-push inflation has been investigated by many researchers. According to Hickman (1987), oil shocks cause a drop in the real growth rate of GDP. Additionally, rising petroleum costs led to an increase in general prices of goods and services. He recommended that a reduction on payroll taxes would ease inflation rates. Huntington (1985) investigated the results of 1970s oil crisis on the U.S. economy. In his study, it was emphasized that a short-lived spikes in general prices was seen on the onset of the crisis, which the general price level of all goods and services had raised by nearly 2 percent point.

Schneider, M. (2004) puts forth very strong quantitative evidence about the effect of oil shocks on Austrian economy. Austrian economy is heavily dependent on the import of natural gas and crude oil. Any movements in energy prices directly influence to the entire economy through different channels. Firstly, importing petroleum products at high prices causes to an increase in domestic product costs, after that household's disposable income started going down smoothly. Secondly, the growth rate of real GDP has declined by 0.5% on the eve of the Financial Crisis. Sussman and Zohar (2015) have analyzed that a plunge in oil prices pushed down the inflation rates in four different regions, the U.S., U.K, Euro Zone and Israel. Additionally, it was found that oil price shock was highly correlated with breakeven inflation rates in 2014.

It is clear that creeping inflation rates can be observed in small and oil-rich countries, which the prices of goods and services rise annually to around 3 percent. General prices levels began to increase when negative oil price shocks hit oil-rich countries. Low currency flows, the devaluation of national currency, a rise in demand are possible determinants of inflation in energy exporting countries during negative oil price shock.

Antonakakis, Filis and Chatziantoniou (2014) stated that there is a negative correlation between oil demand shocks and economic policy uncertainty in both oil-exporting and oil-importing countries. Using a Vector Heterogenous Autoregressive model (VHAR), Caporin, Nikpour and Valbonesi (2020) examined the relationship between oil price uncertainty and the conflict incidence for OPEC and non-OPEC countries in the Middle East and North Africa region. According to research paper, OPEC members are more successful than the member of non-OPEC countries in eliminating the negative impact of oil shocks on macroeconomic variables.

It is worth note that many important global crises are related to higher petroleum prices, with the expansion of petrol costs reduces global aggregate demand and economic activity all across world. Jimenez-Rodriguez and Sanchez (2005) revealed that an increase of nearly one-tenth in crude petroleum costs caused the Euro zone economic growth rate to slow down by around 0.1-0.3%. However, decreasing oil prices bring along many benefits for oil importing countries. Major oil importing countries such as China, India, Germany, Japan and South Korea has taken advantages like lower energy bills and manufacturing prices, preferable fiscal deficits, improvements in current balance account, lower inflation rates caused by low oil prices. These improvements help to boost their GDP growth. Whereas, downward petroleum prices become a pain in the neck for many

[21] https://www.economicshelp.org/blog/1919/oil/effect-of-higher-oil-prices/

emerging market economies, like Russia, Saudi Arabia, Iran, Nigeria which have to regulate financial and monetary policies to respond either positive or negative oil price shocks.

An empiric survey was held by Dotsey, M. and Reid, M. (1992) to measure the correlation between oil prices and monetary policy. Authors showed that tight monetary approaches and rising petroluem prices are highly correlated. Bernanke, B. S., Gertler and Friedman, B. M. (1997) have documented the link between monetary policy and oil shocks via VAR model, which allows examining macroeconomic variables under the pressure of exogenous and endogenous variables. According to the findings of the study, the treatment of the U.S economic activity did not originate from the fluctuation of petroleum prices, whereas the impact of contractionary monetary policy was more remarkable. Alekhina and Yoshino (2018) have tested VAR model and Taylor equation to find an answer how petroleum prices influence to economies through monetary channels in energy exporting countries. The authors warned that the volatility in oil prices have substantially impacted onto macroeconomic variables, mainly GDP, CPI inflation index, exchange rates.

To summarize briefly, a vast body of the papers has examined the importance of oil price uncertainty on macroeconomic indicators in terms of oil importing and oil exporting countries (Bernanke 1983, Pindyck 1991, Lee et al. 1995, Federer 1996, Elder and Serletis 2009, Edelstein and Kilian 2009, Elder and Serletis 2010, Bashar et al. 2013). These studies show that both net oil exporter and importer states react differently to the uncertainty in oil prices. It is seen that macroeconomic variables such as the gross domestic product, exchange rates, inflation, investment, industrial production, interest rates are most affected by the volatility in crude oil prices. In the shed of the existing literature, our study investigates oil exporting countries in the Caspian Sea region as a whole, and examines the sensitivity of the economy in the mentioned countries towards the uncertainty in crude oil prices. It is worthy to mention that the research about the effects of uncertainty of oil prices on macroeconomic variables for the selected countries in the Caspian Sea Basin is limited. So, our thesis contributes to the literature by providing the effects of uncertainty of crude oil prices on the gross domestic product in these countries in both the long and short term.

CHAPTER 4: ECONOMETRIC METHODOLOGY AND EMPIRICAL RESULTS

This chapter highlights the data, the econometric methodology and the empirical results to investigate the relationship between the gross domestic product and the uncertainty in oil prices for the selected countries in the Caspian Sea region, including Russia, Kazakhstan and Azerbaijan. This chapter consists of two sections. In the first section, we explain our data and, employ the unit root tests to examine the stationary of the time series in the model. Then, we provide the empirical metodology and our econometric model. We use the ARDL methodology to investigate the cointegration among the variables. GARCH model is used to measure the volatility of Brent crude oil prices. In the second section, we introduce the empirical results, including the results of unit root tests, bound test, long and short run estimations, CUSUM and CUSUMSQ tests.

4.1. DATA

The paper uses the monthly data to investigate the impact of oil price uncertainty on macroeconomic variables in the Caspian Sea countries between 2008 and 2020, which cover the period of large fluctuations in oil prices. As mentioned above, the monthly dataset is used in this paper, and the series for the variables are gathered from the databases of the Central Bank of Azerbaijan, the National Bank of Kazakhstan and the Central Bank of Russian Federation. The given Table 2 describes the definition of series used in this study. Firstly, we informed that the dataset for GDP is not available on the monthly basis, therefore, Industrial Production Index (IIP) is used as a proxy. Secondly, we use the official exchange rate of the U.S. dollar against Azerbaijani Manat, Kazakh Tenge and Russian Ruble, which the U.S. dollar is accepted as the payment for oil trading in all three countries. Thirdly, we use the key rate of the Central Bank for interest rates in the mentioned countries. And fourthly, we used dummy variable (dummy2009) in the model. It is mentioned to note that dummy variables used to solve structural breaks in our empirical model, so it does not involve splitting the dataset. Finally, the price of Brent crude oil is used for oil prices (U.S. dollars per barrel) and then, we applied Generalized Autoregressive Conditionally Heteroscedastic (GARCH) model [1.1] to measure the uncertainty in oil prices. All series are expressed in natural logarithms except the price of Brent crude oil.

Table 2. Variables Description

Notation	Variable
lnazgdp	Azerbaijan's IPI index
lnazexch	Manat to to the U.S. dollar exchange rate
lnazinf	Monthly inflation rate
lnazint	Interest rate
lnkazgdp	Kazakhstan's IPI index
lnkazexch	Tenge to the U.S. dollar exchange rate
lnkazinf	Monthly inflation rate
lnkazint	Key interest rate of the NBK
lnrusgdp	Russia's IPI index
lnrusexch	Ruble to the U.S. dollar exchange rate
lnrusinf	Monthly inflation rate
lnrusint	Key interest rate of the CBR
brent	Brent oil prices
brentvol	the volatility of Brent oil prices
dummy2009	Dummy variable

Source: Central Bank of Azerbaijan Republic, National Bank of Kazakhstan, Central Bank of Russia

4.2. UNIT ROOT TESTS

Before applying the ARDL bound test, the stationarity of the time series should be controlled in order to be sure that the variable are not integrated of I(2) (Shin et al. 2014). The stationarity of time series refers to that statistical properties are constant over time (Gujarati, 2004). Generally, two traditional ways are used to check the stationarity of the series, through Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) methods. For ADF and PP unit root tests, the null hypothesis indicates that a unit root has founded in the time series, which means that the series are not stationary or the series are integrated of I(2). In the model, we can reject the null hypothesis, in case that the computed t-test for the time series must be less than the critical values at level; hence the series are stationary at level or the series are integrated of I(0). If the time series are non-stationary at level, so the stationarity of the series is checked in first difference. The computed t-test must be less than the critical values at the first difference, in that we can reject the null hypothesis; the variables are stationary at first difference or the underlying variables are integrated of I(1).

4.3. ARDL MODEL

To examine the link between the volatility of crude oil prices and the gross domestic product (GDP), the cointegration analyses is one of the best ways. With help of the cointegration test, we are able to determine the presence of long term equilibrium relationship between two or more series for a specific time frame. If the cointegration is detected among the series, which means that the variables share the same stochastic trend. Most often, a large number of the previous papers applied the Engle-Granger and the Johansen cointegration methods to examine the cointegration. However, these methods require that the all of the variables in the model must be stationary of the same order, hence we are not able to implement these cointegration tests in our empirical analysis. Therefore, implementing the Linear ARDL model is more appropriate in contrast to the traditional cointegration tests.

For our econometric analysis, we applied Autoregressive Distributed Lag model (ARDL) to examine the existence of relationship between the uncertainty of oil prices and the gross domestic product in the Caspian Sea countries. In fact, ARDL bound test is the most accurate approach to test the effects of long run and short run relationship between the dependent variable and the independent variable. By ARDL model, we are able to explain dependent variable (y_t) using its own lagged value (y_{t-1}) and also the model has distributed lag component, in the form of successive lag (x_t) independent variable. The ARDL approach was suggested by Pesaran *et al.* (2001), as an alternative model to determine co-integration relation. In comparison with other cointegration techniques, this approach has a considerable number of advantages. As an important advantage, ARDL bound test can be employed on condition that the sample size of the dataset is small. Secondly, the presence of the long and short term correlation between two variables can be tested simultaneously. As a third advantage, the cointegration method can be employed in case that the underlying variables whether are integrated of I(0) and I(1) or a combination of both (Pesaran *et al.* 2001).

According to Pesaran and Shin (1999), there are two stage to process the ARDL model. In first stage, the cointegration relation is analyzed using the bound test which developed by Pesaran *et al.* (2001). In next stage, the coefficients in the long term relationship are estimated and the process is followed by the ECM, which estimates the short run dynamics of the model.

Based on a meticulous investigation of the methodology, we defined the econometric model for our thesis. The econometric model is as follows:

$$\begin{aligned}\Delta\text{lngdp} = \beta_0 &+ \sum_{i=1}^{m} \beta_1 \Delta lngdp_{t-i} + \sum_{i=0}^{m} \beta_2 \Delta lnexch_{t-i} + \sum_{i=0}^{m} \beta_3 \Delta lninf_{t-i} \\ &+ \sum_{i=0}^{m} \beta_4 \Delta lnint_{t-i} + \sum_{i=0}^{m} \beta_5 \Delta brentvol_{t-i} + \sum_{i=0}^{m} \beta_6 \Delta brent_{t-i} \\ &+ \beta_7 \text{lngdp}_{t-1} + \beta_8 \text{lnexch}_{t-1} + \beta_9 \text{lninf}_{t-1} + \beta_{10} \text{lnint}_{t-1} + \beta_{11} \text{brentvol}_{t-1} \\ &+ \beta_{12} \text{brent}_{t-1} + \text{dummy2008}_{t-1} + \varepsilon_t \end{aligned} \quad (1)$$

where: β_0 is the intercept, ε_t is the random error term and t is the time dimension, while Δ is the first difference operator. In the econometric model, we use the dummy variable which is usual way to solve structural breaks in the model. The variable dummy2008_{t-1} represents our dummy variable,

which does not splitting the data. The long term relationships are measured by β_7 to β_{12}, while the short run relationships are by β_1 to β_6.

The test has the null hypothesis of

$$H_0 : \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = 0$$

against the alternative hypothesis

$$H_1 : \beta_7 \neq \beta_8 \neq \beta_9 \neq \beta_{10} \neq \beta_{11} \neq \beta_{12} \neq 0$$

The null hypothesis indicates the absence of a long term relationship. To conduct the hypothesis, which is a familiar coefficient restriction test (F-test), critical values are introduced by (Pesaran *et al*. 2001), which used in the test.

In the second stage, the long run and the short run relationship are expressed in the following equations 4 and 5:

$$\text{lngdp}_t = \alpha_0 + \alpha_1 \text{lngdp}_{t-1} + \alpha_2 \text{lnexch}_{t-1} + \alpha_3 \text{lninf}_{t-1} + \alpha_4 \text{lnint}_{t-1} + \alpha_5 \text{brentvol}_{t-1} + \alpha_6 \text{brent}_{t-1} + \varepsilon_t \quad (2)$$

where ε_t is the error correction term. The ARDL maximum lag (p,q) is selected base on Akaike selection criterion (AIC). The short run dynamic parameters are derived from Error Correction Model (ECM).

$$\Delta\text{lngdp} = \beta_0 + \sum_{i=1}^{m} \beta_1 \Delta lngdp_{t-i} + \sum_{i=1}^{m} \beta_2 \Delta lnexch_{t-i} + \sum_{i=1}^{m} \beta_3 \Delta lninf_{t-i} + \sum_{i=1}^{m} \beta_4 \Delta lnint_{t-i} + \sum_{i=1}^{m} \beta_5 \Delta brentvol_{t-i} + \sum_{i=1}^{m} \beta_6 \Delta brent_{t-i} + \beta \text{ECT}_{t-1} + \upsilon_t \quad (3)$$

Where EC_{t-1} represents the error correction term, which estimates the dynamics of short run.

4.4. GARCH MODEL

Generally, two common approaches are used to measure the uncertainty in the literature. With help of the first method, the uncertainty is estimated by using the conditional volatility of the series, on the contrary, the second method that measures unconditional volatility.

GARCH is the most useful way to measure the uncertainty modelling. A vast body of the papers have implemented GARCH model to investigate the volatility in crude oil prices (Agnolucci 2009, Elder and Serletis 2010, Mohammadi and Su 2010, Hou and Suardi 2012, Rahman and Serletis 2012, Pan et al. 2017). The model illustrates the continuity shocks over volatility (Byrne and Davis, 2005). According to Serven (1998), GARCH which measures conditional volatility, provides the most accurate estimation. It has some advatageous: firstly, the conditional mean and the conditional variance can be estimated simultaneously, secondly the variance of unpredictable innovations in variables can be estimated by GARCH.

In our model, we applied the generalized autoregressive conditional heterodeskedasticity or GARCH model to get the volatility variables. The GARCH model can be defined in the following equations:

$$y_t = \beta_0 + \sum_{j=1}^{q} \beta_j y_{t-1} + \varepsilon_t \quad (4)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1} + \alpha_2 h_{t-1} \quad (5)$$

where:

y_t is the variable the volatility of which we desire to find,

ε_t is stochastic processes with zero mean,

h_t is its conditional variance.

Table 3. The results of GARCH model

Variable	Model	Coefficient				
		Constant	y_{t-1}	α_0	α_1	α_2
brent	GARCH (1,1)	0.03	0.263*	0.001	0.628*	0.273**

Note: *, ** and *** denote significance at 1%, 5% and 10% levels respectively. α is variance equation.

In Table 3, we introduce the results of GARCH estimation. It can be seen from the given table, GARCH (1,1) model is the appropriate way to calculate the uncertainty of crude oil prices. Our results show that the variable of the volatility is statistically significant at 5%. And also α indicates the equation of variance in the model.

4.5 EMPIRICAL RESULTS

4.5.1 Unit Root tests

Initially, we applied the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests to check the stationarity of the variables at level and at first difference, the ADF unit root tests was developed by Dickey et al. (1981), while the PP test was introduced by Phillips et al. (1988). Table 4 below shows our results. The ADF results represent that all series for Azerbaijan is stationary at the first difference, while the PP results show that the series of GDP (lnazgdp) are stationary at level. For Kazakhstan, the ADF and PP tests describe that the series of inflation (lnkazinf) are stationary at both level and at the first difference, the remaining variables are stationary at the first difference. For

Russia, the ADF test shows that all variables are stationary at the first difference, according to the PP results, only the series for GDP are stationary at level. Moreover, the results of the ADF test show that the series for Brent oil prices and the conditional variance (volatility) of Brent oil prices are stationary at the first difference, on the contrary, the results of the PP test indicates that the series for the conditional variance (volatility) of Brent oil prices are stationary at level.

Table 4. ADF and PP unit root test results

Azerbaijan

	ADF		**PP**	
	Level	**First Difference**	**Level**	**First Difference**
lnazgdp	-2.75	-12.73*	-2.76***	-12.82*
lnazexch	-1.38	-8.12*	-1.79	-8.05*
lnazinf	-2.19	-8.76*	-2.28	-9.05*
lnazint	-1.99	-8.42*	-2.08	-8.66*
brent	-2.43	-6.96*	-1.73	-7.09*
brentvol	-2.42	-8.19*	-6.01**	-19.01*

Kazakhstan

	Level	**First Difference**	**Level**	**First Difference**
lnkazgdp	-3.58	-3.73*	-6.85*	-29.52*
lnkazexch	-2.03	-10.12*	-2.11	-10.24*
lnkazinf	-3.75*	-6.55*	-3.05**	-6.50*
lnkazint	-2.24	-9.67*	-2.22	-9.67*

Russia

	Level	**First Difference**	**Level**	**First Difference**
lnrusgdp	-1.16	-4.57*	-7.45*	-24.90*
lnrusexch	-1.37	-8.78*	-1.48	-8.45*
lnrusinf	-2.40	-5.65*	-1.93	-5.73*
lnrusint	-1.42	-9.81*	-1.64	-10.06*

Note: *,** and *** denote significance at the 1%, 5% and 10% levels, respectively

4.5.2 Bound Test for Cointegration

As mentioned above, conventional co-integration models can not be implemented in case the variables are not the same order of integration. Therefore, the Bound cointegration test is applied to examine the existence of cointegration relation in the model. According to Pesaran et al. (2001), ordinary least squares (OLS) is used to estimate the Bound test, and the calculated F-statistic test examines the significance of the lagged levels of the series in compare to the critical values. In the model, if the F-statistic value is greater than the upper bound values in order that there is a cointegration between the series or we are able to reject the null hypothesis. If the F-statistic is less than the bottom bound value, which means that there is no cointegration or we can not reject the null hypothesis. If the F-statistic lies between the bottom and upper bound values in that case the model is inconclusive.

Table 5. Bound test results

Azerbaijan		
F-statistics: 6.14*	***Critical Value***	
	Lower Bound	Upper Bound
10% significance level	2.53	3.59
5% significance level	2.87	4
1% significance level	3.6	4.9
Kazakhstan		
F-statistics: 14.33*	***Critical Value***	
	Lower Bound	Upper Bound
10% significance level	2.53	3.59
5% significance level	2.87	4
1% significance level	3.6	4.9
Russia		
F-statistics: 13.70*	***Critical Value***	
	Lower Bound	Upper Bound
10% significance level	2.53	3.59
5% significance level	2.87	4
1% significance level	3.6	4.9

Note: The critical values are proposed by Pesaran et al. (2001) in Table CI(iii).

In Table 4, the ADF and PP test results show that our variables are stationary at both level and the first difference, so we can apply the Bound cointegration approach to estimate the cointegration among the series. The Bound cointegration test results are summarized for all three countries in Table 5 above. As can be seen from the given table, the calculated F-statistic value is greater than the upper bound of the critical values for all three countries, which means that there is a long run relationship among the variables, hence we are able to reject the null hypothesis.

4.5.3 Toda-Yamamoto Causality Test

In the model, to carry out the Toda-Yamamoto Causality test, we need to first identify maximum order integration (m_{max}) using the ADF and PP unit root tests. Unit Root test results show us that the series in our model are integrated of I (0) and I (1). After that, we decided to detect the direction of causality between gross domestic product and oil price volatility using Toda-Yamamoto causality test (TY), which developed by Toda and Yamamoto (1995). According to Granger (1969), if a Y variable could be explained by an X variable based on all available information, we can say that X Granger causes Y. Generally, in order to run traditional Granger test, on condition that F statistic can be used in the model, the series should be cointegrated. However, Toda and Phillips (1993) argued that Granger test with the ECM could cause wrong estimations, thanks to the dependence of parameters that could be asymptotic.

In contrast to Granger causality test, we can apply Toda-Yamamoto causality test, in case of time series are not cointegrated or cointegrated of random order. TY test or Toda-Yamamoto causality test requires to estimate the VAR model ($k+d_{max}$). In first stage, we estimated the optimal lag length by using the VAR model, and k presents the optimal lag length. Meanwhile, we can calculate the maximum order integration using the ADF and PP unit root tests, d_{max} describes that the maximum order integration. Based on the Toda-Yamamoto causality test, we are able to reject the null hypothesis, if the p value is less than 0.05 (typically ≤ 0.05), which indicates that X Granger causes Y.

According to ADF and PP unit root test results in Table 4, maximum integration order is calculated as I (1) or $d_{max} = 1$, while, based on the VAR model, optimum lag lengths are k =2 (see Appendix A, Tables 17-22). In Table 6, we found that the unidirectional Granger causality running from brentvol to gross domestic product for all three countries, which can be rejected at %1 and %5 significance levels, respectively. Meanwhile, the findings in Table 6 demonstrate that the unidirectional Granger causality runs from brent to GDP for Azerbaijan at %5 level. However, the null hypothesis cannot be rejected for Kazakhstan and Russia, which means there is no causality from brent to gross domestic product in these countries.

Table 6. Toda-Yamamoto causality test results

Azerbaijan		
H_0	$\chi 2$	Prob.
brent does not Granger cause lnazgdp	13.08	0.00
lnazgdp does not Granger cause brent	0.75	0.34
brentvol does not Granger cause lnazgdp	8.79	0.01
lnazgdp does not Granger cause brentvol	0.42	0.40
Kazakhstan		
brent does not Granger cause lnazgdp	0.36	0.41
lnazgdp does not Granger cause brent	2.16	0.16
brentvol does not Granger cause lnazgdp	5.10	0.04
lnazgdp does not Granger cause brentvol	1.78	0.20
Russia		
brent does not Granger cause lnazgdp	1.48	0.23
lnazgdp does not Granger cause brent	3.87	0.07
brentvol does not Granger cause lnazgdp	4.85	0.04
lnazgdp does not Granger cause brentvol	0.65	0.36

Note: $\chi 2$ indicates that Chi-square

4.5.4 ARDL Long run estimation

Based on the bounds test, the co-integration has been founded among the time series in our model, thus we can proceed to the next stage. In the second stage, we estimated the ARDL model. And the results of ARDL estimation are presented in Table 7. Our results show that in the long run, the volatility of oil prices has a negative impact on the gross domestic product in all three countries. While 1% increase in the volatility of oil prices decreases the gross domestic product by about 0.06 percent in Azerbaijan, the increase in the volatility of oil prices leads to a decrease in Kazakhstan's GDP by 0.05% and Russia's GDP by 0.02%. Our findings are line with the results of Nyangarika (2018) for Saudi Arabia and Russia, Eyden et al. (2019) for Norway and Canada, respectively. Additionally, Abdelsalam (2020) noted that oil prices have positive effects on GDP growth of the oil exporting countries in MENA region and its volatility has negative impact.

Meanwhile, the results show that the gross domestic product in Azerbaijan and Russia increases by 0.003% and 0.006%, when crude oil prices increase 1%. On the contrary, the estimation shows that the prices of crude oil have negative impact on Kazakhstan's GDP, but it is not statistically

significant. Our findings are consistent with Rautava (2004) who showed that an increase in oil prices leads to a rise in Russia's GDP in the long term. In the model, the results present that the impacts of the interest rates on real GDP for all three countries are not statistically significant. The positive effect of the exchange and inflation rates on real GDP is founded for Azerbaijan, but the impact of inflation rate is negative on Kazakh GDP. While one percent increase in the exchange rates decreases the gross domestic production of Russia by nearly 0.20 percent. However, it is not statistically significant.

Table 7. Estimated Long Run Coefficient

Azerbaijan		
Variable	**Coefficient**	**T-ratio**
lnazexch	0.539*	3.67
lnazinf	0.050*	2.29
lnazint	0.266	0.51
brent	0.003*	2.96
brentvol	-0.06***	-1.83
dummy2009	0.08	1.04
Kazakhstan		
Variable	**Coefficient**	**T-ratio**
lnazexch	-0.071	-0.94
lnazinf	-0.074*	-3.25
lnazint	0.485	0.99
brent	-0.04	-1.28
brentvol	-0.05*	-3.64
dummy2009	-0.008	-0.70
Russia		
Variable	**Coefficient**	**T-ratio**
lnazexch	-0.196	-1.44
lnazinf	0.028	1.43
lnazint	-0.388	-0.69
brent	0.006**	1.91
brentvol	-0.02**	-1.98
dummy2009	-0.057**	-2.23

*, ** and ***denote significance at the 1%, 5% and 10% levels, respectively

4.5.5 Error Correction Model (ECM)

For this study, the short run dynamics of the model are estimated by error correction model (ECM). The parameters of error correction model (ECM) are given in multiplication Tables 8, 10 and 12 for all three countries. Based on the given tables, the error correction term is negative and statistically significant for the variables of all three countries, which means that the gross domestic product in the selected countries are the speed adjustment move back to long run equilibrium. In short run, we found the volatility of oil prices has a negative impact on the gross domestic product for all three countries. Meanwhile, we used the Wald test to estimate that independent variables in the model are significant or not. The results of the Wald test was illustrated in Tables 9, 11 and 13, respectively.

Table 8. Short-run results of the linear ARDL for Azerbaijan

Variables	Coefficient	T-ratio
C	1.065*	6.68
@TREND	-0.008*	-6.18
Δ(lnazgdp)	0.166**	2.26
Δ(lnazexch)	0.113	1.20
Δ(lnazexch(-1))	0.300*	3.05
Δ(lnazinf)	0.121*	7.44
Δ(lnazinf(-1))	-0.078*	-4.29
Δ(lnazint)	-0.773**	-2.37
Δ(brent)	0.009*	3.77
Δ(brentvol)	5.99	0.12
Δ(brentvol(-1))	0.001*	3.25
Δ(brentvol(-2))	-8.63	-1.65
Δ(brentvol(-3))	0.001**	2.31
Δ(brentvol(-4))	-9.57***	-1.97
Δ(brentvol(-5))	8.44***	1.75
d(dummy2009)	-0.002	-0.43
d(dummy2009(-1))	-0.020*	-2.95
d(dummy2009(-2))	-0.014*	-2.05
d(dummy2009(-3))	-0.014**	-2.02
d(dummy2009(-4))	-0.020*	-3.42
ECT(-1)	-0.251*	-6.71
R-squared	0.691777	
Adjusted R-squared	0.646380	
F-statistic	15.23*	
Durbin-Watson	2.09	
$X^2_{BGAB}(1)$	2.63(0.07)	
$X^2_{BGAB}(2)$	4.70(0.10)	

Note: *,** and *** denote significance at the 1%, 5% and 10% levels, respectively

First of all, we began to analyze the results of the short run parameters of the Linear ARDL model for Azerbaijan. Table 8 presents the results of short run. Our findings indicate that the error correction term (ECT) is negative and statistically significant in the model. And the coefficient of ECT is (-0.251), which means that approximately 25% of the shocks in the short term will be fixed in a long period of time. In other words, after the shocks in short run, the balance in long run will be adjusted. Furthermore, $X^2_{BGAB}(1)$ and $X^2_{BGAB}(2)$ indicate that autocorrelation is not found in the model.

Table 9. Short run coefficients and Wald Test for Azerbaijan

	Azerbaijan		
Variables	Coefficient	F-test	Prob.*
lnazexch	0.413	4.27	0,01
lnazinf	0.043	14.96	0,00
lnazint	-0.773	4.25	0,04
brent	0.009	6.77	0,00
brentvol	-3.760	4.43	0,00
dummy2009	0.070	8.79	0,00

And then, the Wald test is used to check the significance of the short-run coefficients. When Table 9 is analyzed, it can be clearly seen that the volatility of oil prices (brentvol) has a negative impact on the gross domestic product in the short run for Azerbaijan. The results in Table 9 show that one percent increase in the volatility of oil prices decreases the gross domestic product by 3.76% and the coefficient is statistically significant. Additionally, 1% rise in oil prices increases the GDP by nearly 0.009 percent. Futhermore, one percent increase in exchange and inflation rates increase the GDP by 0.41 and 0.04, respectively.

Table 10. Short-run results of the linear ARDL for Kazakhstan

Variables	Coefficient	T-ratio
C	4.29*	10.29
@TREND	0.006*	6.01
Δ(lnkazgdp)	0.276*	3.66
Δ(lnkazexch)	-0.339*	-2.74
Δ(lnkazint)	-0.060	-0.10
Δ(lnkazint(-1))	0.338	0.63
Δ(lnkazint(-2))	0.663	1.28
Δ(lnkazint(-3))	0.696	1.21
Δ(lnkazint(-4))	-1.17**	-2.23
Δ(lnkazinf)	-0.069*	-3.16
Δ(brent)	-0.001*	-2.63
Δ(brent(-1))	-0.004	-1.25
Δ(brentvol)	-0.024*	-2.80
Δ(brentvol(-1))	0.002*	2.94
Δ(brentvol(-2))	0.003***	1.75
Δ(brentvol(-3))	0.001*	2.82
Δ(dummy2009)	-0.007	-0.70
ECT(-1)	-0.932*	-10.29
R-squared	0.481761	
Adjusted R-squared	0.430305	
F-statistic	9.36*	
Durbin-Watson	1.95	
$X^2_{BGAB}(1)$	2.133(0.924)	
$X^2_{BGAB}(2)$	1.704(0.0597)	

Note: *,** and *** denote significance at the 1%, 5% and 10% levels, respectively

Secondly, we analyzed the result of the error correction model for Kazakhstan. The results of the error correction model are given in Table 10. In the model, error correction term ECT (-0.932) is negative and statistically significant. Based on Breusch-Godfrey diagnostic tests, any autocorrelation is not detected in the model.

Table 11. Short run coefficients and Wald Test for Kazakhstan

	Kazakhstan		
Variables	Coefficient	F-test	Prob.*
lnkazexch	-0.339	4.17	0,04
lnkazint	0.467	2.13	0,06
lnkazinf	-0.069	9.42	0,02
brent	-0.005	1.12	0,91
brentvol	-0.018	2.85	0,02
dummy2009	-0.007	0.88	0,34

Based on the Wald test, we found the volatility of crude oil prices has negative impact on Kazakhstan's GDP in the short term. Table 11 shows that 1% rise in oil price volatility decreases the gross domestic product by 0.018 percent. Additionally, the results show that the impact of oil prices volatility on Kazakhstan's GDP is so smaller in comparison with Azerbaijan and Russia in short run. While, 1% increase in oil prices decrease the GDP by around 0.005%, but it is not statistically significant.

Table 12. Short-run results of the linear ARDL for Russia

Variables	Coefficient	T-ratio
C	4.10*	10.00
@TREND	0.001*	9.02
Δ(lnrusgdp)	-0.709*	-8.92
Δ(lnrusexch)	-0.098	-0.67
Δ(lnrusexch(-1))	0.021	0.14
Δ(lnrusexch(-2))	0.264***	1.72
Δ(lnrusexch(-3))	-0.137	-0.91
Δ(lnrusexch(-4))	-0.340**	-2.33
Δ(lnrusexch(-5))	0.491*	3.69
Δ(lnrusint)	-0.275	-0.70
Δ(lnrusinf)	0.019	1.45
Δ(brent)	-0.0021**	-2.23
Δ(brent(-1))	0.0043***	1.09
Δ(brentvol)	-4.25	-0.48
Δ(brentvol(-1))	0.0002**	2.42
d(dummy2009)	-0.018**	-2.26
ECT(-1)	-0.709*	-10.01
R-squared	0.476931	
Adjusted R-squared	0.431115	
F-statistic	10.40*	
Durbin-Watson	1.91	
$X^2_{BGAB}(1)$	1.46(0.23)	
$X^2_{BGAB}(2)$	1.53(0.19)	

Note: *,** and *** denote significance at the 1%, 5% and 10% levels, respectively

Finally, when Table 12 is investigated, it can be clearly seen that the term of the error correction is negative (-0.709) and statistically significant. Similarly, we applied the diagnastic tests to examine the autocorrelation, and the results show that there is not any autocorrelation problem in our model.

Table 13. Short run coefficients and Wald Test for Russia

	Russia		
Variables	Coefficient	F-test	Prob.*
lnrusexch	0.201	3.17	0,00
lnrusinf	0.019	2.33	0,12
lnrusint	-0.275	2.64	0,10
brent	0.002	8.02	0,00
brentvol	-4.250	3.04	0,04
dummy2009	-0.018	2.10	0,14

In Table 13, the Wald test shows that 1% rise in the volatility of crude oil prices decreases the gross domestic product in Russia by roughly 4.25%. And also oil prices have postive effect on Russia's GDP in short time period, like Azerbaijan. Table 13 represents that one percent increase in crude oil prices increases Russia's GDP by nearly 0.002 percent.

4.5.6 Stability Condition

The stability of the model has been tested by the CUSUM and CUSUMSQ tests, which propounded by Brown *et al.* (1975). The estimated model is stable and constant in case that the lines of the CUSUM and CUSUMSQ tests lies within the critical bands of the 5% significance level. The results for all three countries are graphically demonstrated in figures 10 to 15. The results imply that the estimated long-run coefficients in the model are stable and reliable in all three countries.

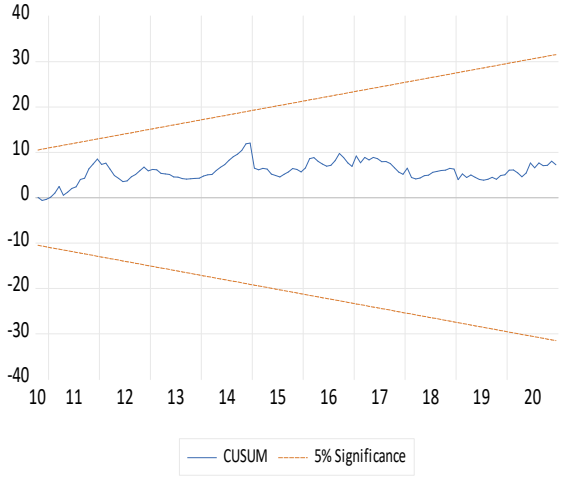


Figure 10. Azerbaijan CUSUM test

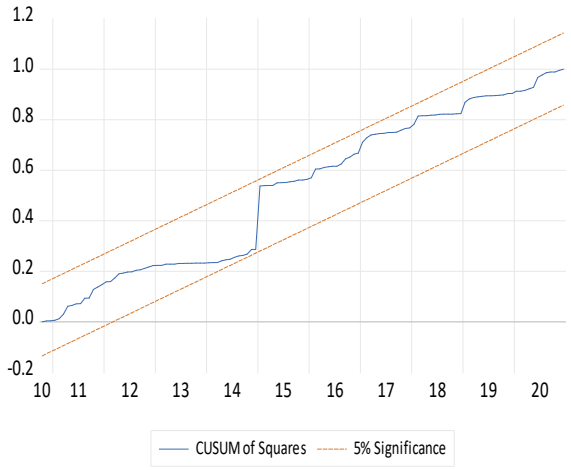


Figure 11. Azerbaijan CUSUMSQ test

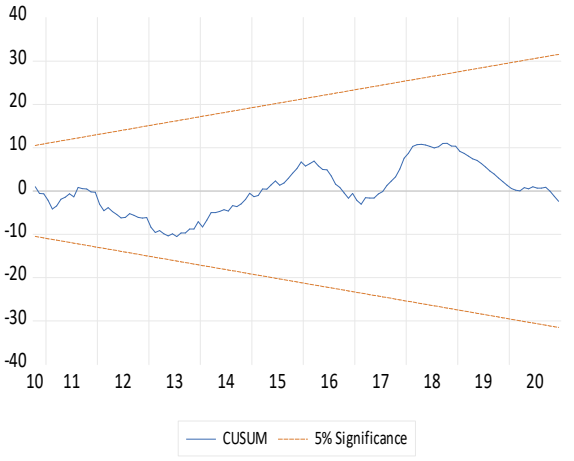


Figure 12. Kazakhstan CUSUM test

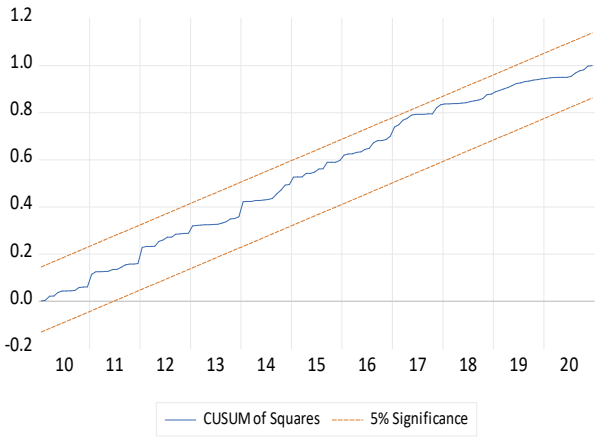


Figure 13. Kazakhstan CUSUMSQ test

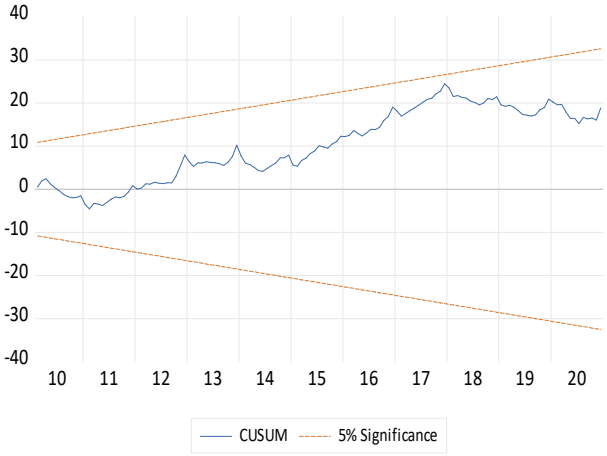


Figure 14. Russia CUSUM test

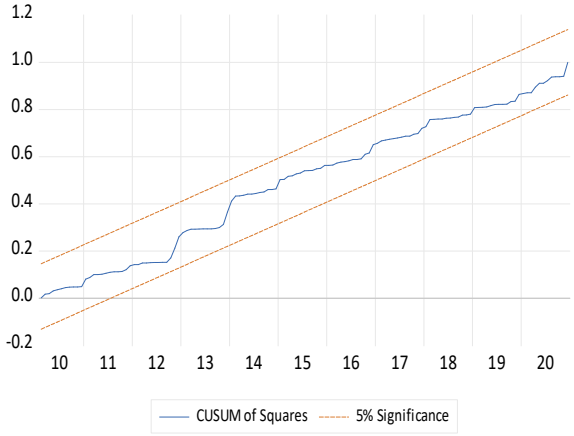


Figure 15. Russia CUSUMSQ test

CHAPTER 5. CONCLUSION

Oil accounts for roughly three percent of global GDP, and fluctuations in crude oil prices can easily affect national economies. As summarized in the first part of the thesis, the volatility in oil prices arising from factors such as supply and demand shocks, wars and embargoes is seen as an important element of macroeconomic variables. Firstly, uncertainty in oil prices primarily means cost uncertainty for firms, and in this case, firms may delay their investments. In addition, consumers can delay consumption expenditures and increase precautionary savings. Recently, the impact of petrol prices volatility on macroeconomic indicators has captured great interest and several researchers began to investigate this relationship. In the literature it is seen that, macroeconomic variables such as the gross domestic product, exchange rates, inflation, investment, industrial production, and interest rates can be affected by the volatility in crude oil prices.

This thesis investigates the effect of uncertainty in oil prices on macroeconomic variables in the Caspian Sea countries, including Russia, Kazakhstan and Azerbaijan, where the relationship between the changes in crude oil prices and macroeconomic indicators has not been comprehensively examined. According to our results, the uncertainty in oil prices has a significant negative effect on the gross domestic product of the mentioned countries. This implies that, a higher level of the volatility in petrol prices has constituted additional obstacles to governments in this region.

To investigate the long and short run relationship between the uncertainty in crude oil prices and the gross domestic product in the selected countries, we use monthly data for the period from 2008 to 2020. Firstly, we provide pure description of the dataset, and use the unit root tests to examine the stationarity of all variables. After that, we use GARCH (1,1) model for measuring the uncertainty in crude oil prices which is the useful technique to obtain the uncertainty. Then, we define the Autoregressive Distributed Lag model (ARDL) to estimate the long run relationship and short run dynamics between the variables. Indeed, there are various techniques to examine the cointegration between the gross domestic product (GDP) and the volatility of crude oil prices, including Engle-Granger and Johansen cointegration tests which are widely used. However, these techniques require that all variables should be integrated in the same order. On the other hand, the ARDL approach suggested by Pesaran *et al.* (2001 can be employed in case that the underlying variables whether are integrated of I(0) and I(1) or a combination of both. Owing to similar problems, we decided to perform the ARDL cointegration test. Lastly, we define Toda-Yamamoto test to ascertain the causality between the gross domestic product and oil price volatility.

Our model consists of the gross domestic product (GDP) as the dependent variable, and exchange rates, inflation rates, interest rates, oil prices, the volatility of oil prices and dummy variable as independent variables. According to our ADF and PP unit root test results, since our variables are integrated of I (0) or I (1), we cannot apply traditional cointegration methods. So, we employ ARDL model to investigate co-integration between the volatility of oil prices and the gross domestic product for all three countries. The bound test analysis indicates that the calculated F-statistic values are greater than the upper bound critical value at 1% significance level. These results imply that

there is a long-term relationship between the variables. It should be noted that the presence of cointegration in the model does not mean that there is causality between the series. Therefore, we apply Toda-Yamamoto test to identify the direction of causality, which showed that the unidirectional Granger causality running from oil prices volatility to gross domestic product for all three countries. The estimation of the long run coefficients demonstrated that the gross domestic product in all three countries was negatively affected by the volatility of crude oil prices in the long run. Our results were matched with the findings of Nyangarica (2018), Eyden et al. (2019) and Abdelsalam (2020). Furthermore, Alekhina and Yoshino (2018) showed that oil price fluctuations have significant impact on GDP, CPI, inflation, interest and exchange rates in Azerbaijan, Kazakhstan, Indonesia and other countries. Next, we estimated the error correction model (ECM) to investigate the short run dynamics of the model. The significance of the short run coefficients is determined using the Wald test. As for the short run dynamics, 1% increase in the volatility of petrol prices is linked with 3.76% decrease in Azerbaijan's GDP, also 0.018% decrease in Kazakhstan's GDP and 4.25% decrease in Russia's GDP. Moreover, the results show that oil price volatility in short term has a remarkable influence on GDP for all three countries in comparison with the long term. Finally, the stability of the model was examined by CUSUM and CUSUMSQ tests, which illustrates that our model is stable and constant.

As a result, our findings illustrate that the uncertainty in crude oil prices cause a decrease in the gross domestic product in both long and short run for all three countries. This result implies that Russia, Kazakhstan and Azerbaijan, countries in the Caspian Sea Basin, should take in consideration the effects of the uncertainty in crude oil prices on the gross domestic product. In other words, the finding that uncertainties in oil prices lead to a decrease in GDP is important in designing policies that ensure output stability. For example, monetary and fiscal authorities should implement expansionary policies rather than restrictive ones when there is uncertainty in oil prices.

BIBLIOGRAPHY

Abdelsalam, M. A. (2020). Oil price fluctuations and economic growth: The case of MENA countries. *Review of Economics and Political Science*.

Adam, Pasrun, Manat Rahim, and Rosnawintang Rosnawintang. (2019). The Effect of crude oil prices on economic growth in South East Sulawesi, Indonesia: An application of autoregressive distributed lag model. *International Journal of Energy Economics and Policy 9*, 194.

Adelman, A. (2000). Determinants of growth and development of the Australian economy. *Australian journal of Economics, 14(3)*, 19-21.

Agnolucci, P. (2009). Volatility in crude oil futures: A comparison of the predictive ability of GARCH and implied volatility models. *Energy Economics, 31(2)*, 316-321.

Aigheyisi, O. S. (2018). Oil price volatility and business cycles in Nigeria. *Studies in Business & Economics, 13(2).*

Akram, Q. F. (2004). *"Oil prices and exchange rates: Norwegian evidence." The Econometrics Journal 7.2* , 476-504.

Akram, Q. F. (2009). Commodity prices, interest rates and the dollar. *Energy economics, 31(6),* 838-851.

Aktas, E., Özenç, Ç., & Arıca, F. (2010). The impact of oil prices in Turkey on macroeconomics. *MPRA Paper No. 8658*.

Alekhina, V., & Yoshino, N. (2018). Impact of world oil prices on an energy exporting economy including monetary policy. *ADBI Working paper*, 828.

Alekhina, V., & Yoshino, N. (2018). Impact of world oil prices on an energy exporting economy including monetary policy . *ADBI Working paper, (No. 828)*.

Alfred Cang, Javier Blas, and Sharon Cho. (2020, February 2). *China oil demand has plunged 20% because of the virus lockdown*. Retrieved from ww.bloomberg.com: https://www.bloomberg.com/news/articles/2020-02-02/china-oil-demand-is-said-to-have-plunged-20-on-virus-lockdown.

Algahtani, J. G. (2015). "Impact of rising interest rate on Saudi economy." *Saudi Arabian Monetary Agency*.

Alhajji, A. F., & Huettner, D. (2000). The target revenue model and the world oil market: Empirical evidence from 1971 to 1994. *The Energy Journal, 21(2).*

Aloui, D., Goutte, S., Guesmi, K., & Hchaichi, R. (2020). *COVID 19's impact on crude oil and natural gas S&P GS Indexes.* https://halshs.archives-ouvertes.fr/halshs-02613280/document.

Al-Qenaie, J., & Al-Shammari, N. (2016). Causes of inflation across main oil exporting countries. *Journal of the Faculty of Commerce for Scientific Research, 54(2),* 93-116.

Al-Yousef, N. A. (1998). Economic models of OPEC behaviour and the role of Saudi Arabia (No. 94). *Surrey Energy Economics Centre (SEEC), School of Economics, University of Surrey.*

Al-Yousef, N. A. (1998). Modelling saudi arabia behaviour in the world oil market 1976-1996 (No. 93). *Surrey Energy Economics Centre (SEEC), School of Economics, University of Surrey.*

Arezki, R., & Blanchard, O. (2015). The 2014 oil price slump: Seven key questions. *VoxEU, January, 13.*

Arora, V., & Tanner, M. (2013). Do oil prices respond to real interest rates. *Energy Economics, 36,* 546-555.

Austvik, O. G. (1993). The war over the price of oil: oil and the conflict on the Persian Gulf. *International Journal of Global Energy Issues, 5(2-4),* 134-143.

Awadh, S. M., & Al-Mimar, H. (2015). *Statistical analysis of the relations between API, specific gravity and sulfur content in the universal crude oil.* International Journal of Science and Research, 4(5), 1279-1284.

Aye, G. C., Dadam, V., Gupta, R., & Mamba, B. (2014). Oil price uncertainty and manufacturing production. *Energy Economics, 43,* 41-47.

Aye, G.C., Dadam, V., Gupta, R. and Mamba, B.(2014). Oil price uncertainty and manufacturing production. *Energy Economics 43*, 41–47.

Baffes, J., Kose, M. A., Ohnsorge, F., & Stocker, M. (2015). The Great Plunge in Oil Prices: Causes, Consequences, and Policy Responses. *Washington, DC: World Bank.*

Baker, D. (2008). The housing bubble and the financial crisis. *Real-world economics review, 46(20),* 73-81.

Barisitz, S. H. (2010). Crisis response policies in Russia, Ukraine, Kazakhstan and Belarus–stock-taking and comparative assessment. *Focus on European Economic Integration Q, 4*, 48-77.

Barrero, J. M., Bloom, N., & Wright, I. (2017). Short and long run uncertainty. *(No. w23676). National Bureau of Economic Research*.

Bashar, O. H. (2013). Oil price uncertainty, monetary policy and the macroeconomy: The Canadian perspective. *Economic Modelling 35*, 249-259.

Baumeister, C., & Kilian, L. (2016). Forty years of oil price fluctuations: Why the price of oil may still surprise us. *Journal of Economic Perspectives, 30(1),* 139-60.

Bayramov, V. &. (2017). Oil shock in the Caspian Basin: Diversification policy and subsidized economies. *Resources Policy, 54*, 149-156.

Berkowitz, B. D. (1996). Victory: The Reagan Administration's Secret Strategy That Hastened The Collapse Of The Soviet Union. ORBIS, 40(1).

Bernanke, B. S. (1997). "Systematic monetary policy and the effects of oil price shocks. *Brookings papers on economic activity 1997.1 (1997):* 91-157.

Bernanke, B. S., Gertler, M., Watson, M., Sims, C. A., & Friedman, B. M. (1997). Systematic monetary policy and the effects of oil price shocks. *Brookings papers on economic activity*, 91-157.

Bildirici, M. G. (2020). Analyzing crude oil prices under the impact of covid-19 by using lstargarchlstm. . *Energies, 13(11), 2980.*

Bildirici, M., Guler Bayazit, N., & Ucan, Y. (2020). Analyzing crude oil prices under the impact of covid-19 by using lstargarchlstm. *Energies, 13(11),* 2980.

Bina, C. (1992). Global oil and the Oil Policies of the Islamic Republic. Modern Capitalism and Islamic Ideology in Iran. *London, Macmillan,* 121-158.

Blair, B. F. (2008). The effects of Hurricane Katrina on price pass-through for Gulf Coast gasoline. *Economics Letters, 98(3),* 229-234.

Blinder, A. S. (2009). The Anatomy of Double-Digit Inflation in the 1970s. *University of Chicago Press*.

BP. (2020). Statistical Review of World Energy.

Bredin, D. E. (2008). The effects of uncertainty about oil prices in g-7. *UCD Geary Institute Discussion Paper Series*, 200-840.

Bredin, D., Elder, J., & Fountas, S. (2011). Oil volatility and the option value of waiting: An analysis of the G-7. *Journal of Futures Markets 31(7):* 679-702.

Brini, R. J. (2016). Macroeconomic impacts of oil price shocks on inflation and real exchange rates: evidence from MENA economies. *Topics in Middle Eastern and African Economies, Vol. 18 No. 2*, pp. 170-185.

Brown, S. P. (1999). Oil prices and US aggregate economic activity: a question of neutrality. *Economic and financial review-federal reserve bank of Dallas*, 16-23.

Byrne, J.P. and Davis, E.P. (2005). Investment and Uncertainty in the G7. *Review of World Economics, 141(1)*, 1-32.

Caldara, D., Cavallo, M., & Iacoviello, M. (2019). Oil price elasticities and oil price fluctuations . *Journal of Monetary Economics, 103*, 1-20.

Caporin, M. N. (2020). Oil Price Uncertainty and Conflicts: Evidence from the Middle East and North Africa. *Università degli studi di Padova, Dipartimento di scienze economiche" Marco Fanno".*

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

Chen, D. C., Gong, X., Raju Huidrom, E., Vashakmadze, J. Z., & Zhao, T. (2015). *Understanding the plunge in oil prices: Sources and implications.* Washington, DC, USA: The World Bank:.

Cheng, W. L. (2005). Quantitative Analysis of Influencing Factors of International Oil Price. *International Petroleum Economics. Vol 8* , p. 20.

Chubrik, A., & Walewski, M. (2010). Oil money vs. economic crisis: The case of Azerbaijan. *CASE Network E-Briefs, (6),* 1.

Craig, J. G. (2018). The history of the European oil and gas industry (1600s–2000s). *Geological Society, London, Special Publications, 465(1),* 1-24.

Czech, K. &. (2021). The impact of oil price shocks on oil-dependent countries' currencies: the case of Azerbaijan and Kazakhstan. *Journal of Risk and Financial Management, 14(9)*, 431.

Danielsen, A. L., & Kim, S. (1988). OPEC stability: an empirical assessment. *Energy economics, 10(3),* 174-184.

Daoudi, M. S., & Dajani, M. S. (1984). The 1967 oil embargo revisited. *Journal of Palestine Studies, 13(2),* 65-90.

Delice, G. Ü. (2022). Structure and stability of the Kazakhstan banking system. *Karamanoğlu Mehmetbey Üniversitesi Sosyal Ve Ekonomik Araştırmalar Dergisi, 24(42)*, 387-414.

Demirbas, A., Omar Al-Sasi, B., & Nizami, A. S. (2017). Recent volatility in the price of crude oil. *Energy Sources, Part B: Economics, Planning, and Policy, 12(5)*, 408-414.

Desai, P. (2010). Russia's financial crisis: economic setbacks and policy responses. *Journal of International Affairs, 63(2)*, 141-151.

Dickey, D. A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica 49 (4)*, 1057-1072.

Ditté, P., & Roell, P. (2006). *Past oil price shocks: Political background and economic impact. Evidence from three cases.* Institut für Strategie-Politik-Sicherheits-und Wirtschaftsberatung (ISPSW) website.

Ditté, P., & Roell, P. (2006). *Institut für Strategie-Politik-Sicherheits-und Wirtschaftsberatung (ISPSW) website.* Retrieved from Past oil price shocks: Political background and economic impact. Evidence from three cases : Institut für Strategie-Politik-Sicherheits-und Wirtschaftsberatung (ISPSW) website.

Dotsey, M. M. (1992). Oil Shocks, Monetary Policy and Economic Activity. *Economic Review of the Federal Reserve Bank of Richmond. Vol 78, Issue 4*, 14-27.

Dotsey, M., & Reid, M. (1992). Oil shocks, monetary policy, and economic activity. *FRB Richmond Economic Review, 78(4)*, 14-27.

Dvir, Eyal, and Kenneth S. Rogoff. (2009). Three epochs of oil. *No. w14927. National Bureau of Economic Research*.

Edelstein, P., & Kilian, L. (2009). How sensitive are consumer expenditures to retail energy prices? *Journal of Monetary Economics 56(6)*, 766-779.

Elder, J. and Serletis, A. (2010). Oil price uncertainty. *Journal of Money, Credit and Banking 42*, 6.

Elder, J., & Serletis, A. (2009). Oil price uncertainty in Canada. *Energy Economics 31(6)*, 852-856.

Ezzati, A. (1976). *Future OPEC price and production strategies as affected by its capacity to absorb oil revenues.* European Economic Review, 8(2), 107-138.

Fattouh, B. (2006). “Spare capacity and oil price dynamics” *Middle East Economic Survey 49(5)*.

Filis, G., & Chatziantoniou, I. (2014). Financial and monetary policy responses to oil price shocks: evidence from oil-importing and oil-exporting countries. *Review of Quantitative Finance and Accounting, 42(4)*, 709-729.

Fratzscher, M. S. (2014). Oil prices, exchange rates and asset prices. *ECB Working Paper No. 1689*.

Gately, D. (1984). *A ten-year retrospective: OPEC and the world oil market.* Journal of Economic Literature, 22(3), 1100-1114.

Ghassan, H. B., Basher, S. A., & AlHajhoj, H. R. (2015). Long Run Dynamic Volatilities between OPEC and non-OPEC Crude Oil Prices. *Munich Personal RePEc Archive*.

Girvan, N. (1975). The Oil Crices: In Perspective; Economic Nationalism. *Daedalus. Vol 104, No 4,* 145-158.

Glynn, J., Perera, N., & Verma, R. (2007). Unit root tests and structural breaks: A survey with applications. *Journal of Quantitative Methods for Economics and Business Administration, 3(1)*, 63-79.

Golombek, R., Irarrazabal, A. A., & Ma, L. (2018). *OPEC's market power: An empirical dominant firm model for the oil market.* Energy Economics, 70, 98-115.

Goutte, S. A. (2020). COVID 19's impact on crude oil and natural gas S&P GS Indexes. *HAL open science*.

Graefe, L. (2013, Novenber 22). *Oil Shock of 1978–79*. Retrieved from www.federalreservehistory.org: https://www.federalreservehistory.org/essays/oil-shock-of-1978-79

Grama, Y. (2012). The analysis of Russian oil and gas reserves. *International Journal of Energy Economics and Policy, 2(2),* 82-91.

Granger, C. I. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica, 37(3* , 424-438.

Griffin, J. M. (1985). *OPEC behavior: a test of alternative hypotheses.* The American Economic Review, 75(5), 954-963.

Griffin, J. M., & Neilson, W. S. . (1994). The 1985-86 Oil Price Collapse And Afterwards: What Does Game Theory Add? *Economic Inquiry, 32(4),* 543-561.

Guliyev, F. (2013). Oil and regime stability in Azerbaijan. *Demokratizatsiya, 21(1)*, 113-147.

Gustafson, T. (1985). The Origins of the Soviet Oil Crisis, 1970–1985. *Soviet Economy, 1(2),* 103-135.

Hamilton, J. (2014). *Oil prices as an indicator of global economic conditions.* Econbrowser Blog entry, 14.

Hamilton, J. D. (1983). Oil and the macroeconomy since World War II. *Journal of political economy, 91(2)*, 228-248.

Hamilton, J. D. (2011). *Historical oil shocks.* nber.org.

Havlik, P. (2010). European energy security in view of Russian economic and integration prospects. *(No. 362). wiiw Research Report*.

Hickman, B. G. (1987). Macroeconomics impacts of energy shocks.

Horan, S. M., Peterson, J. H., & Mahar, J. (2004). Implied volatility of oil futures options surrounding OPEC meetings. *The Energy Journal, 25(3).*

Hou, A. &. (2012). A nonparametric GARCH model of crude oil price return volatility. *Energy Economics, 34(2)*, 618-626.

Husain, T. (1995). *Kuwaiti oil fires: Regional environmental perspectives.* Elsevier.

Huseynov, I. (2015). *An analysis of the effect of oil price shocks on GDP and Final consumption growth, major oil exporting countries.* researchgate.net.

Islam, M. R., & Muyeed, A. (2020). Impacts of COVID-19 pandemic on global economy: A meta-analysis approach. *Int. J. Tech. Res. Sci, 5,*, 8-19.

Itayim, F. (1975). Strengths and weaknesses of the oil weapon. *Adelphi Papers, 15(115),* 1-7.

Ito, K. (2008). Oil price and macroeconomy in Russia. *Economics Bulletin, 17(17)*, 1-9.

Jawad, M. (2013). Oil price volatility and its impact on economic growth in Pakistan. *Journal of Finance and Economics, 1(4),* 62-68.

Jiménez-Rodríguez*, R., & Sánchez, M. (2005). Oil price shocks and real GDP growth: empirical evidence for some OECD countries. *Applied economics, 37(2),* 201-228.

Joo, K., Suh, J. H., Lee, D., & Ahn, K. (2020). Impact of the global financial crisis on the crude oil market. *Energy Strategy Reviews, 30, 100516.*

Kaplan, F. (2015). Oil price, exchange rate and economic growth in Russia: a multiple structural break approach. *Advances in Management and Applied Economics, 5(4)*, 91-104.

Kaushik, Neetu, Raja Nag, and Kamal P. Upadhyaya. . (2014). Oil price and real exchange rate: The case of India. *International Business & Economics Research Journal (IBER) 13.4*, 809-814.

Keane, M. P., & Prasad, E. S. (1996). The employment and wage effects of oil price changes: a sectoral analysis. *The Review of Economics and Statistics,*, 389-400.

Keppler, J. H. (2007). International Relations and Security of Energy Supply: Risk to Continuity and Geopolitical Risks. *European Parliament: Policy Department External Policies. Report number: 43*, 1-41.

Key-Hernández, R. E. (2014). Domestic impact of production cuts in OPEC countries: The cases of Nigeria and Venezuela (No. 7007). *EcoMod.*

Kilian, L. &. (2011). Are the responses of the US economy asymmetric in energy price increases and decreases? *Quantitative Economics 2(3)* , 419-453.

Kilian, L. (2009). Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market . *American Economic Review, 99(3)*, 1053-69.

Kilian, L., & Lee, T. K. (2014). Quantifying the speculative component in the real price of oil: The role of global oil inventories. *Journal of International Money and Finance, 42,* 71-87.

Kilian, L., & Zhou, X. (2019). Oil prices, exchange rates and interest rates.

Kim, J. M. (2018). Dependence structure between oil prices, exchange rates, and interest rates. *The Energy Journal, 39(2)*.

Kitous, A., Saveyn, B., Keramidas, K., Vandyck, T., Rey Los Santos, L., & Wojtowicz, K. (2016). Impact of low oil prices on oil exporting countries. *Joint Research Centre Science for Policy Report,* 1-80.

Kocaaslan, O. K. (2019). Oil price uncertainty and unemployment. *Energy Economics, 81*, 577-583.

Krichene, N. (2006). World crude oil markets: Monetary policy and the recent oil shock. *IMF Working Paper*, 1-27.

Kum, H. (2012). The impact of structural break (s) on the validity of purchasing power parity in Turkey: Evidence from Zivot-Andrews and lagrange multiplier unit root tests. *International Journal of economics and financial issues, 2(3)*, 241-245.

Laruelle, M. (2008). Kazakhstan challenged by the world financial crisis. *CACI Analyst, 11(12)*.

Lescaroux, F., & Mignon, V. (2008). On the influence of oil prices on economic activity and other macroeconomic and financial variables. *OPEC Energy Review, 32(4)*, 343-380.

Liao, J. S. (2018). Why is the correlation between crude oil prices and the US dollar exchange rate time-varying?—explanations based on the role of key mediators. *International Journal of Financial Studies, 6(3),* 61.

Lin, S. X., & Tamvakis, M. (2010). OPEC announcements and their effects on crude oil prices. *Energy Policy, 38(2),* 1010-1016.

Liu, H. I. (2015). Exchange rate volatility and oil prices shocks. *International Journal of Academic Research in Business and Social Sciences, 5(1)*, 249.

Liu, Y. S. (2022). The relationship among oil prices volatility, inflation rate, and sustainable economic growth: Evidence from top oil importer and exporter countries . *Resources Policy, 77*, 102674.

Loutia, A., Mellios, C., & Andriosopoulos, K. (2016). Do OPEC announcements influence oil prices?. *Energy Policy, 90,* 262-272.

Lukoil, O. J. (2016). Global trends in oil & gas markets to 2025.

Lynch, M. C. (2002). Causes of oil price volatility. *The Journal of Energy and Development, 28(1)*, 107-141.

Ma, R. R., Xiong, T., & Bao, Y. (2021). The Russia-Saudi Arabia oil price war during the COVID-19 pandemic. *Energy Economics, 102, 105517.*

Mabro, R. (1994). The impact of the Gulf crisis on world oil and OPEC. *International Journal, 49(2),* 241-252.

Mabro, R. (1998). *The oil price crisis of 1998.* Oxford institute for energy studies.

Mann, J. (2013). A reassessment of the 1967 Arab oil embargo. *Israel Affairs, 19(4),* 693-703.

Maull, H. (. (1975). "Oil and influence: The oil weapon examined: Introduction". *Taylor&Francis*, 1-2.

McDermott, R. f. (2001). Risk-taking in international politics: Prospect theory in American foreign policy. *University of Michigan Press.*

Mead, D., & Stiger, P. (May 2015). The 2014 plunge in import petroleum prices: What happened?. *U.S. Bureau of Labor Statistics*, Vol. 4 / No. 9.

Mead, D., & Stiger, P. T. (2015). *he 2014 plunge in import petroleum prices: What happened?* ecommons.cornell.edu.

Mensi, W. R.-Y. (2020). Time-frequency co-movements between oil prices and interest rates: Evidence from a wavelet-based approach. *The North American Journal of Economics and Finance, 51*, 100836.

Mert, U. R. (2016). The impact of the global financial crisis on crude oil price volatility. *Yönetim ve Ekonomi Araştırmaları Dergisi, 14(2),* 64-76.

Mishra, S. &. (2017). Analysis of volatility spill over between oil price and exchange rate in India: GARCH approach. *SSRN 2892670.*

Mohamed, A. S., Ahmad, M. M., Hamouda, A. M. S., & Sapuan, S. M. (2008). Review of the legal aspect in Libyan Oil Industry and the importance of technology transfer. *In Conference on Law and Technology.* Bengazhi: researchgate.net.

Mohammadi, H., & Su, L. (2010). International evidence on crude oil price dynamics: Applications of ARIMA-GARCH models. *Energy Economics, 32(5)*, 1001-1008.

Mork, K. A. (1989). Oil and the macroeconomy when prices go up and down: an extension of Hamilton's results. *Journal of political Economy, 97(3)*, 740-744.

Mork, K. A., & Hall, R. E. (1980). Energy Prices and the US Economy in 1979-1981. *The Energy Journal, 1(2).*

Moshiri, S. &. (2012). Asymmetric effects of oil price shocks on economic growth of oil-exporting countries. *Available at SSRN 2006763*.

Mou, J. (2020, July). Research on the Impact of COVID19 on Global Economy. In IOP Conference Series: . *Earth and Environmental Science (Vol. 546, No. 3, p. 032043). IOP Publishing.*

Narayan, P. K. (2007). Modelling oil price volatility. *Energy policy, 35(12),* 6549-6553.

Nyangarika, A. M. (2018). Correlation of oil prices and gross domestic product in oil producing countries.

O., B. (2003). Facing the Dilemma of Global Capitalism: the Case of Azerbaijan. *Central Asian Survey, 22(2-3)*, 209-220.

Öge Güney, P. (2020). Oil price uncertainty and macroeconomic variables in Turkey. *OPEC Energy Review, 44(4)*, 351-368.

Olmstead, A. L., & Rhode, P. (1985). Rationing without government: The west coast gas famine of 1920. . *The American economic review, 75(5),* 1044-1055.

OTHMANOVÁ, S. M. (2012). Oil Prices and the Value of US Dollar: Theoretical Investigation and Empirical Evidence. *Ekonomický časopis, 60, č. 8, s. 771 – 790* , s. 771 – 790 .

Pan, Z., Wang, Y., Wu, C., & Yin, L. (2017). Oil price volatility and macroeconomic fundamentals: A regime switching GARCH-MIDAS model. *Journal of Empirical Finance, 43*, 130-142.

Pesaran, M. H. (1985). Economic development and revolutionary upheavals in Iran. *Palgrave Macmillan, London*, In Iran (pp. 15-50).

Pesaran, M.H., Shin, Y. (1995). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis. *Cambridge: Cambridge University, Department of Applied Economics,* DP No. 9514.

Pesaran, M.H., Shin, Y., Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationship. *Journal of Applied Economics, 16*, 289-326.

Phillips, P. C. (1988). Testing for a Unit Root in Time Series Regression. *Biometrika 75 (2)*, 335-346.

Pierru, A., Smith, J. L., & Zamrik, T. (2018). OPEC's impact on oil price volatility: The role of spare capacity. *The Energy Journal, 39(2).*

Pindyck, R. S. (1991). Irreversibility, Uncertainty, and Investment . *Journal of Economic Literature, 29*, 1110–48.

Punzi, M. T. (2019). The impact of energy price uncertainty on macroeconomic variables. *Energy Policy, 129*, 1306-1319.

Rafiq, S., & Salim, R. (2014). Does oil price volatility matter for Asian emerging economies? *Economic Analysis and Policy, 44(4),* 417-441.

Rafiq, S., Salim, R., & Bloch, H. (2009). Impact of crude oil price volatility on economic activities: An empirical investigation in the Thai economy. *Resources policy, 34(3),* 121-132.

Rahman, S. &. (2012). Oil price uncertainty and the Canadian economy: Evidence from a VARMA, GARCH-in-Mean, asymmetric BEKK model. *Energy Economics 34(2)*, 603-610.

Rasche, R. H., & Tatom, J. A. (1977). Energy resources and potential GNP. *Review.*

Richardson, G. (2007). The collapse of the United States banking system during the Great Depression, 1929 to 1933. New Archival Evidence. *Australasian Accounting Business and Finance Journal, 1(1),* 4.

Robelius, F. (2007). Giant oil fields-the highway to oil: GIant oil fields and their importance for future oil production. *(Doctoral dissertation, Acta Universitatis Upsaliensis).*

Romer, C. D., & Romer, D. H. (1989). Does monetary policy matter? A new test in the spirit of Friedman and Schwartz. *NBER macroeconomics annual, 4*, 121-170.

Rose, E. A. (2004). OPEC's dominance of the global oil market: the rise of the world's dependency on oil. *The Middle East Journal, 58(3),* 424-443.

Rubin, A. (2003). The Double-Edged Crisis: OPEC and the Outbreak of the Iran-Iraq War. *Middle East, 7(4), 1.*

Rutland, P. (2001). Russia: Entrenched Elites Ride Out the Crisis. In S. H. *The political economy of international financial crisis: interest groups, ideologies, and institutions,* pp. 243-263.

Saddiqui, S. A., Jawad, M., Naz, M., & Niazi, G. S. K. (2018). Exchange rate, fiscal policy and international oil prices impact on oil prices in Pakistan: A volatility and granger causality analysis . *Review of Innovation and Competitiveness: A Journal of Economic and Social Research, 4(1)*, 27-46.

Sadeghi, A. S. (2017). Oil Price Shocks and Economic Growth in Oil-Exporting Countries: Does the Size of Government Matter. *IMF working paper*.

Sánchez, M. V. (2011). Welfare Effects Of Rising Oil Prices In Oil-Importing Developing Countries. *The developing economies 49.3*, 321-346.

Scheinder, M. (2004). The impact of oil prices changes on growth and inflation. *Monetary policy & the Economy, 2*, 27-36.

Schneider, D., Van Robays, I., & Fratzscher, M. . (2014). Oil prices, exchange rates and asset prices . *No. 1689*.

Schneider, M. (2004). The impact of oil price changes on growth and inflation. *Monetary Policy & the Economy, 2*, 27-36.

Serven, L. (1998). Macroeconomic Uncertainty and Private Investment in ldcs: An Empirical Investigation. *World Bank Policy Research Working Paper No: 2035.*

Shaum, A. (2019). The Overlooked Embargo: The 1967 Oil Embargo, the Arab Cold War, and the Creation of OAPEC. *ideaexchange.uakron.edu*.

Shiller, R. J. (2015). *Irrational exuberance.* Princeton university press.

Śmiech, S., Papież, M., Rubaszek, M., & Snarska, M. . (2021). The role of oil price uncertainty shocks on oil-exporting countries. *Energy Economics, 93*, 105028.

Smiley, G. (2004). *"US Economy in the 1920s".* Retrieved from EH.Net Encyclopedia: https://eh.net/encyclopedia/the-u-s-economy-in-the-1920s/

Smith, J. L. (2005). *Inscrutable OPEC? Behavioral tests of the cartel hypothesis.* The Energy Journal, 26(1).

Sorkhabi, R. (2017). *A Brief History of Booms and Busts: Part I*. Retrieved from geoexpro.com: https://www.geoexpro.com/articles/2017/10/oil-prices-and-crises

Stauffer, T. R. (Fall 1985). 'Economic warfare in the Gulf' *American-Arab Affairs (14)*, pp 98-116.

Suleymanov, E. &. (2015). Macroeconomic analysis and graphical interpretation of Azerbaijan economy in 1991-2012. *Expert Journal of Economics, 3(1).*

Suleymanov, E., & Aliyev, K. (2015). Macroeconomic analysis and graphical interpretation of Azerbaijan economy in 1991-2012. *Expert Journal of Economics, 3(1).*

Sussman, N., & Zohar, O. (2015). Oil prices, inflation expectations, and monetary policy. *Bank of Israel Discussion Paper*, 092015.

Toda, H. P. (1993). Vector autoregressions and causality. *Econometrica, 61(6)*, 1367-1393.

Toda, H. Y. (1995). Statistical inference in vector autoregressions with possibly integrated processes. . *Journal of econometrics, 66(1-2)*, 225-250.

Trehan, B. (1990). Lessons from the oil shocks of the 1970s. *FRBSF Economic Letter.*

Urquhart, M. A., & Hewson, M. A. . (1983). *Unemployment continued to rise in 1982 as recession deepened. .* 106, 3: Monthly Lab. Rev.

Van Robays, I. (2016). Macroeconomic Uncertainty and Oil Price Volatility. *Oxford Bulletin of Economics and Statistics*.

Verleger, P. K. (1979). "The US petroleum crisis of 1979." *Brookings Papers on Economic Activity 1979.2*, 463-476.

Wang, T., Wu, J., & Yang, J. (2008). Realized volatility and correlation in energy futures markets. *Journal of Futures Markets: Futures, Options, and Other Derivative Products, 28(10),* 993-1011.

Wheelock, D. C. (1992). Monetary policy in the Great Depression: What the Fed did, and why. *Federal Reserve Bank of St. Louis Review, 74(2),* 3-28.

Wirl, F., & Kujundzic, A. (2004). The impact of OPEC Conference outcomes on world oil prices 1984-2001. *The Energy Journal, 25(1).*

Yergin, D. (. (2008). *The Prize: The Epic Quest for Oil, Money, & Power. New York: Free Press.* Retrieved from www.e-education.psu.edu: https://www.e-education.psu.edu/egee120/node/233

Yıldırım, E. &. (2014). Oil price and industrial production in G7 countries: Evidence from the asymmetric and non-asymmetric causality tests. *Procedia-Social and Behavioral Sciences, 143*, 1020-1024.

APPENDIX A

Table 14. Lag Length Selection (Azerbaijan)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1082.201	NA	0.117636	14.88709	15.13121	14.98628
1	-11.45532	2024.948	9.05e-08	0.808916	1.785384	1.205665
2	83.22869	171.3330*	4.09e-08*	0.010494*	1.719313*	0.704806*
3	109.6095	45.58321	4.69e-08	0.141367	2.582536	1.133241
4	133.4570	39.25913	5.60e-08	0.306707	3.480228	1.596143
5	151.5541	28.31521	7.29e-08	0.550284	4.456155	2.137282
6	173.0899	31.93738	9.14e-08	0.747076	5.385298	2.631636
7	205.8472	45.90475	9.95e-08	0.791195	6.161768	2.973317
8	230.6287	32.70486	1.23e-07	0.943827	7.046751	3.423512

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Figure 16. Inverse roots of AR characteristic polynomial (Azerbaijan)

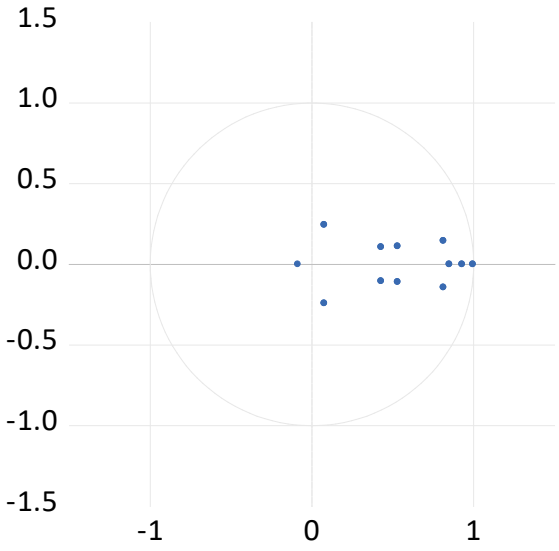


Table 15. Roots of Characteristic Polynomial (Azerbaijan)

Root	Modulus
0.996875	0.996875
0.931815	0.931815
0.850510	0.850510
0.814461 - 0.144165i	0.827121
0.814461 + 0.144165i	0.827121
0.533329 - 0.109728i	0.544500
0.533329 + 0.109728i	0.544500
0.429520 - 0.105582i	0.442307
0.429520 + 0.105582i	0.442307
0.077609 - 0.243578i	0.255643
0.077609 + 0.243578i	0.255643
-0.084536	0.084536

Table 16. Lag Length Selection (Kazakhstan)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-892.8915	NA	0.008953	12.31145	12.55557	12.41064
1	-24.31029	1642.623	1.08e-07	0.983814	1.960281	1.380563
2	92.39047	211.1728	3.61e-08*	-0.114156*	1.594663*	0.580156*
3	123.1028	53.06752*	3.90e-08	-0.042215	2.398955	0.949659
4	146.2945	38.17966	4.70e-08	0.132047	3.305567	1.421483
5	167.6227	33.37057	5.86e-08	0.331664	4.237535	1.918662
6	186.6843	28.26827	7.60e-08	0.562118	5.200340	2.446678
7	214.2619	38.64610	8.88e-08	0.676709	6.047282	2.858831
8	238.9327	32.55879	1.10e-07	0.830847	6.933771	3.310531

Figure 17. Inverse roots of AR characteristic polynomial (Kazakhstan)

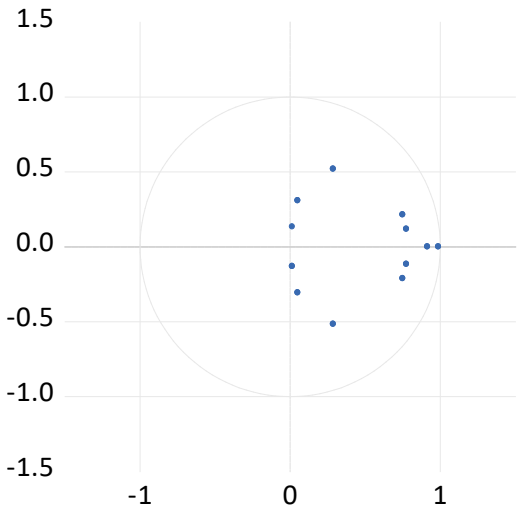


Table 17. Roots of Characteristic Polynomial (Kazakhstan)

Root	Modulus
0.990407	0.990407
0.915714	0.915714
0.775795 - 0.117431i	0.784632
0.775795 + 0.117431i	0.784632
0.750880 - 0.212118i	0.780265
0.750880 + 0.212118i	0.780265
0.287513 - 0.518161i	0.592583
0.287513 + 0.518161i	0.592583
0.051494 - 0.308085i	0.312359
0.051494 + 0.308085i	0.312359
0.016639 - 0.132169i	0.133213
0.016639 + 0.132169i	0.133213

Table 18. Lag Length Selection (Russia)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-825.1980	NA	0.003564	11.39045	11.63457	11.48964
1	104.4139	1758.042	1.87e-08	-0.767536	0.208931	-0.370787
2	205.0842	182.1653	7.78e-09*	-1.647405*	0.061414*	-0.953093*
3	235.2131	52.05938*	8.49e-09	-1.567525	0.873644	-0.575651
4	262.2484	44.50703	9.71e-09	-1.445556	1.727964	-0.156120
5	283.7944	33.71153	1.21e-08	-1.248904	2.656967	0.338094
6	310.4179	39.48249	1.41e-08	-1.121332	3.516889	0.763227
7	335.4446	35.07140	1.71e-08	-0.972036	4.398537	1.210086
8	364.1173	37.84016	1.99e-08	-0.872344	5.230579	1.607340

Figure 18. Inverse roots of AR characteristic polynomial (Russia)

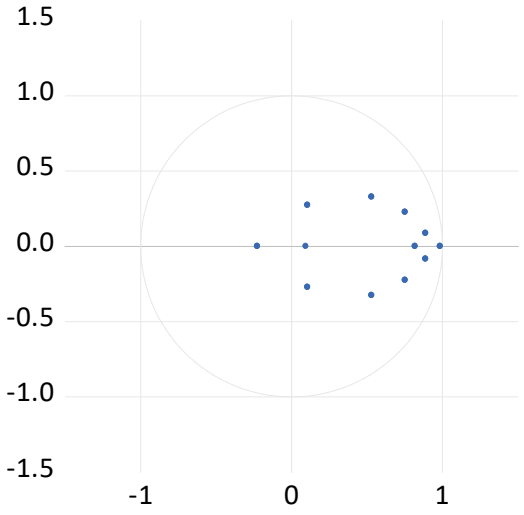


Table 19. Roots of Characteristic Polynomial for Russia

Root	Modulus
0.987035	0.987035
0.890004 - 0.084845i	0.894039
0.890004 + 0.084845i	0.894039
0.821102	0.821102
0.753092 - 0.224954i	0.785972
0.753092 + 0.224954i	0.785972
0.533210 - 0.326461i	0.625211
0.533210 + 0.326461i	0.625211
0.106084 - 0.272068i	0.292019
0.106084 + 0.272068i	0.292019
-0.226917	0.226917
0.094331	0.094331