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Oil Revenue Fluctuations, Institutions and the Stabilizer Fund in Iran: An Empirical Investigation

Thesis submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy in Energy Economics by Kingston University London in Department of Economics

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ABSTRACT

In carrying out the objectives, the main body of the thesis is organized into five chapters:

The second chapter will discuss the main macroeconomic trends mostly in post-revolutionary Iran. The role of the oil revenue in the national economy are examined by different graphs. The review of existing literature is discussed in chapter three. This chapter reviews the role of natural resource revenue in general and oil revenue in particular in economic performance of oil producer countries.

Our hypotheses are thoroughly investigated by using ARDL Bound test, VECM time series model as well as symmetric and asymmetric methods are reviewed in chapter four. Chapter five analyses the role of institutions, oil and economic growth in Iran. It focuses on the role of institutions on economy and addresses the question: "why is oil revenue a blessing in some countries and a curse in others". Moreover, the impact of oil revenues on institutional quality in Iran has been examined. Chapter six discusses the role of oil stabilizer funds in reducing the negative impact of oil revenue fluctuation on the economy. The relation between performance of stabilizer fund and institutional quality has been assessed. Chapters four, five and six have their own literature review.

Chapter seven contains a discussion of the main results emerging from the research. The chapter also presents policy implications, recommendations and directions for further research in this area.

The general conclusion emerging from empirical analysis is that oil revenue have positive impact on Iranian economic growth. Moreover, we find oil revenue fluctuations have not asymmetric effects in Iranian economy.

As to the effect of institutions, in our models and in all specifications we found that despite the positive effect of institutional quality on growth, resource curse is stronger the weaker of the institutional quality**.**

This research has assessed that whether natural resource revenue in general or oil revenue in particular causes bad institutions? The result shows higher oil revenue in Iran worsen institutional quality.

Managing natural resources revenue has been a serious issue in resources rich countries. We studied the impact of oil stabilization fund on inflation rate as a proxy for instability in Iranian economy and found that oil stabilisation fund reduced inflation rate in Iran.

Regarding the relation between institutional quality and performance of stabilizer fund, we found that there is high correlation between fund score and institutional qualities which means higher institutional quality results in better fund performance.

KEY WORDS: Oil revenue, Institutions, Stabilizer fund, Sovereign wealth fund, Iranian economy, Economic growth, Energy economics, OSF, NDFI, ARDL, Bound test, VECM.

Declaration

I hereby declare that this thesis has not been submitted in whole or in a part to another university for the award of any other degree.

Signature: Ali Zamani

Acknowledgements

The following dissertation, while an individual work, benefited from the insights and directions of several people.

This thesis would not have been possible without the support of many people and organizations. First and foremost, I would like to express my heartfelt gratitude to my principal supervisor, Dr Ali Shamsavari for his supervision, support and patience throughout the final stage of my PhD study. I would also like to take this opportunity to thank my viva examiners Dr Jalal Siddiki and Dr Mona Chitins for their very helpful comments and suggestions.

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Last but not least, I am deeply thankful for my family for their support and patience during all stages of the research, specifically my wife, daughter and son who have shared this dream with me.

Dedication

I dedicate my thesis to my wife Bahareh.

Publications from the Thesis

The following conference papers are based on certain parts of the thesis:

"Impact of oil revenue fluctuation in the economy" Finance and Economics Conference 2010 in Frankfurt, Germany, on August 17-18, 2010.Lupcon Centre for Business Research

"The Impact of Oil Revenue Fluctuations on the Macroeconomic Variables of Iranian Economy ", The First Workshop and Annual Student Conference, Azad University in Oxford, 29 July 2011.

"Overview of the role of oil revenues in Iran's Economy" Economics Research Students Conference, June 2010, Kingston University London.

"The Impact of Oil Revenue Fluctuations on the Macroeconomic Variables of Iranian Economy" Economics Research Students Conference, June 2012, Kingston University London.

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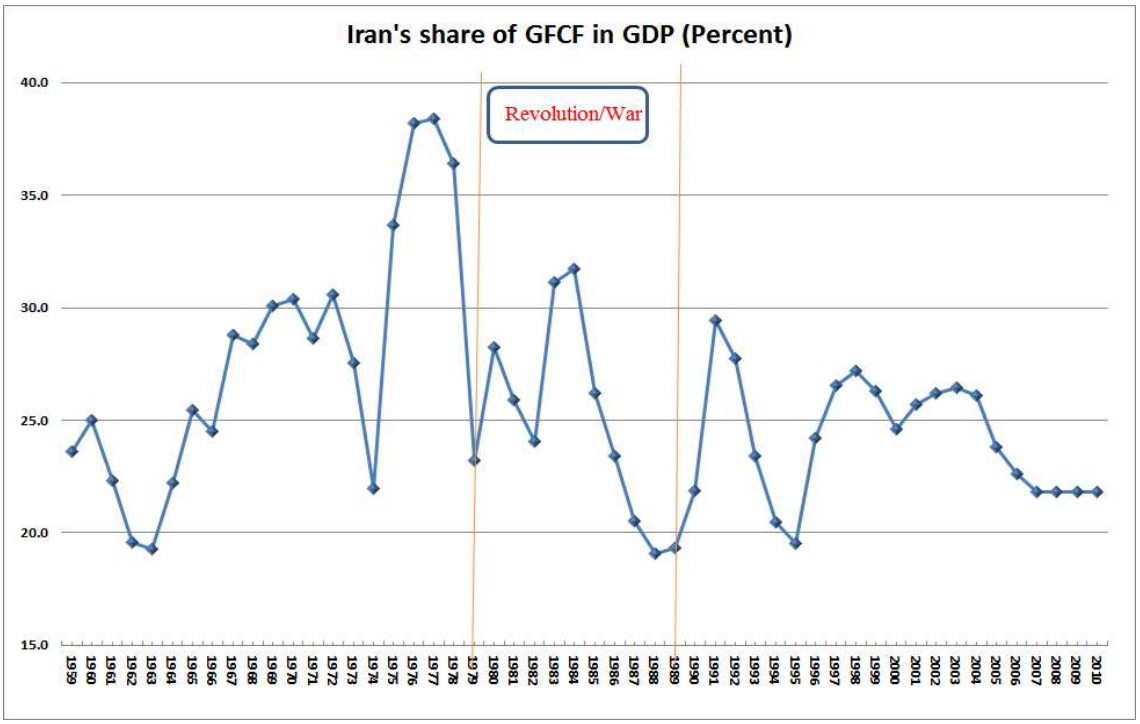
Chapter One:

An Overview of the Thesis

1-Motivation/Background

Oil revenue not only have great economic impact on Iranian economy but also political and cultural impact as well at least in last century. In economic side which the main subject of this thesis, Iran depends heavily on oil revenue; nearly 80% of its export income comes from crude oil exports, as does, on average about 45% of its government budget[1]. Because oil revenue is such a major source of income for the government of Iran, oil revenue volatility has serious effects on the economy. For instance, Iranian government itself carries out a large percentage of the country's Gross Fixed Capital Formation (GFCF), private sector GFCF on the other hand, originates mainly by the construction sector.

Figure 1



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

[1] Based on Central Bank of Iran statistics, the average ratio of oil revenue/government budget in the periods 1965-2010 and 2000-2010 was around 47% and 42% respectively. The ratio of oil and gas export to total export in the periods 1973-2010 and 2000-2010 was around 87% and 79% respectively. In years 2014-15 because of oil price and export decrease the mentioned ratios has reduced.

Approximately 40% of GFCF is generated by the Iranian government's direct investments in various sectors of the economy which mostly financed by oil revenue. The GFCF as a percentage of Iran's GDP in the period (1979-2007) was around 26% while this percentage for developing countries was around 24%.[2]

At the same time Iran is an established member of the Organization of Petroleum Export Countries (OPEC), and therefore has to abide by the quota system determined by the organization. The price of crude oil is established in commodity markets by thousands of brokers and dealers who trade crude oil on behalf of their clients. Therefore, Iran has no control over the price of crude oil or the amount produced so it is very difficult for its government to estimate the annual crude oil revenue. In case of either fluctuation in crude oil price or quantity of oil export will cause fluctuations in oil revenues. So the government can only control the impact of oil revenues in the economy.

Since most of the empirical studies in the literature are related to mature, advanced and industrialize economies, there is a gap in this literature as far as developing countries are concerned. This study is a contribution to the impact of natural resource revenue on the economic performance of producer countries' in general and Iran in particular as an oil producer. More specifically this study has been motivated by the need to develop a deeper understanding of the impact of oil revenue on Iran's economy and its performance.

2-The Aim and Objective of the Study

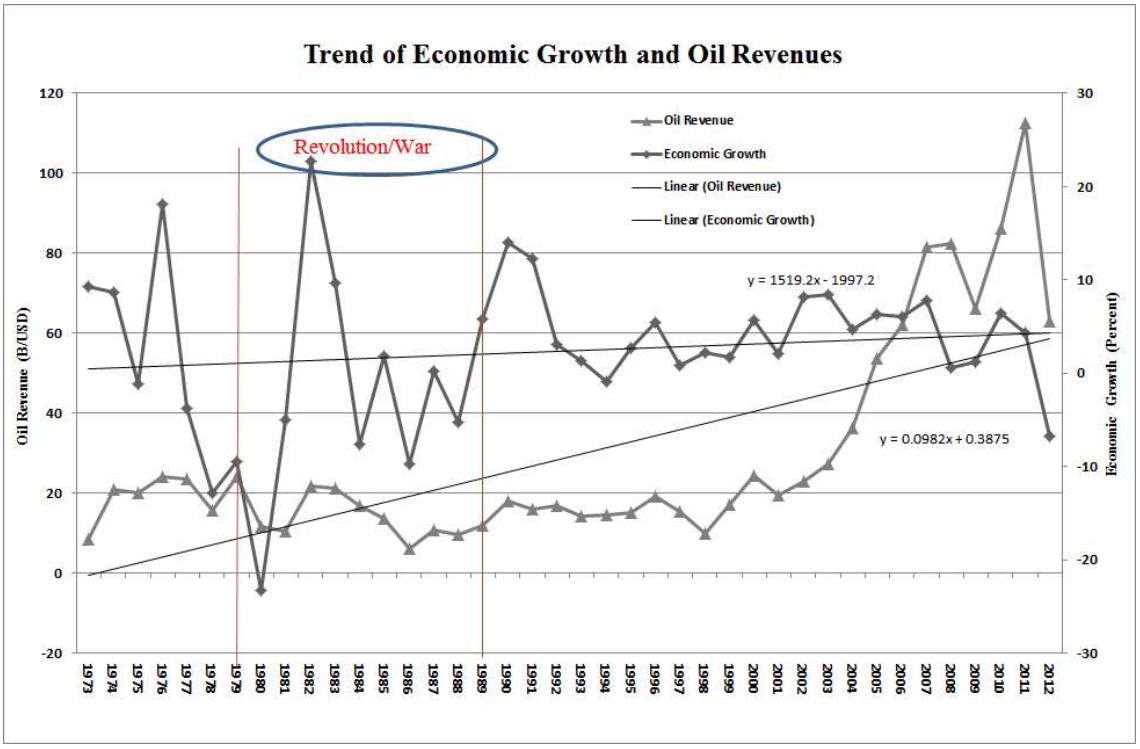
Since the appearance of crude oil in Iran in early 20th century, and especially after 70s, it has played a large part in the economic and political scene in the country. From the economic point of view, crude oil revenue has become dominant factor in the economy. By analysing its role, we can identify the effects of crude oil revenue and learn lessons from the past in order to avoid making the same mistake of misusing oil revenue in the future.

In order to illustrate the situation, in the following pages we present graphs that compare the trends in oil and gas revenue with some key macroeconomic variables in the Iranian economy. All data shown in the graphs are the latest available data from the Central Bank of Iran's web site.

[2] Zamani, Ali," The Role of Tehran Stock Exchange on Gross Fixed Capital Formation (GFCF)", Postgraduate thesis, Tehran University

Figure 2 shows the trend of economic growth and oil revenue during the period 1973-2012. It can be seen that the trends are not completely match and sometime have got reverse trend. In recent years, there has been a sharp increase in oil revenue, but this has not been mirrored by economic growth. This would be a sign of Dutch Diseases in Iranian economy.[3]

Figure 2



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

The following graph, figure 3, shows the trends in crude oil revenue and GFCF (fix prices) in the period of 1973 - 2012. Although there are some fluctuations, almost both trends are matched. This indicates that there was a high correlation between crude oil revenue and GFCF in Iran in that period, as expected. In the presence of shortfalls in foreign as well as private investment a significant share of GFCF comes from the government direct investment in the economy such that the government budget was largely dependent upon crude oil revenue. On the other hand, stock market in Iran is still is less developed, despite significant progress since

[3] The term "Dutch Disease" originates from a crisis in the Netherlands in the 1960s that resulted from discoveries of vast natural gas deposits in the North Sea. The any form of sharply increase of foreign currency resulted to increase of tradable goods import and decrease to industrial export. Also facing inflation of non-tradable goods. More information available regarding Dutch Disease in the following chapters.

year 2000. For the period of 2000-2012 the number of listed companies increased from 285 to nearly 400.

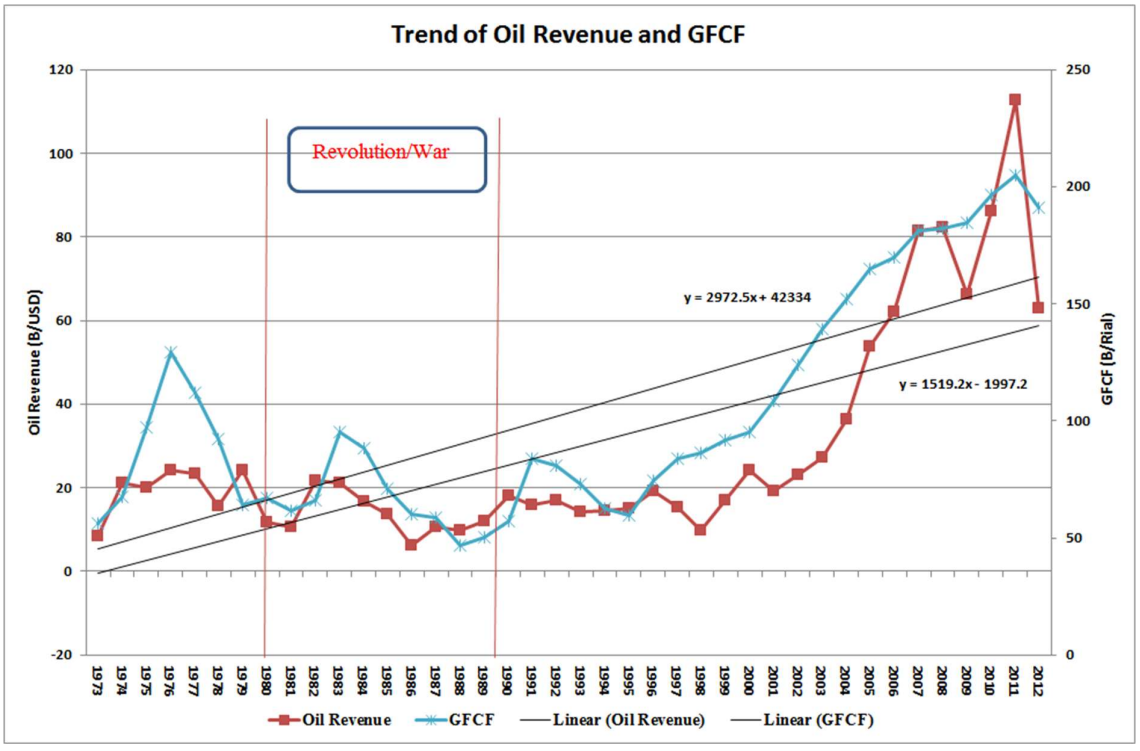
In the same period market capitalization[4] of listed companies (as a percentage of GDP) increased from 6.1 to 25 percent.[5]As shown in table below stock market performance in comparison with other countries is not in healthy condition. This proves high dependency of the economy on the government investment, which is heavily reliant on oil revenues.

Table 1: Market Capitalization of Listed Companies (% of GDP)

YEAR	IRAN	TURKEY	SPAIN	SAUDI	INDONESIA
2012	25	39	73	50.9	43.2
2011	18.6	26	69	50.6	43.7

Source: http://data.worldbank.org/

Figure 3



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

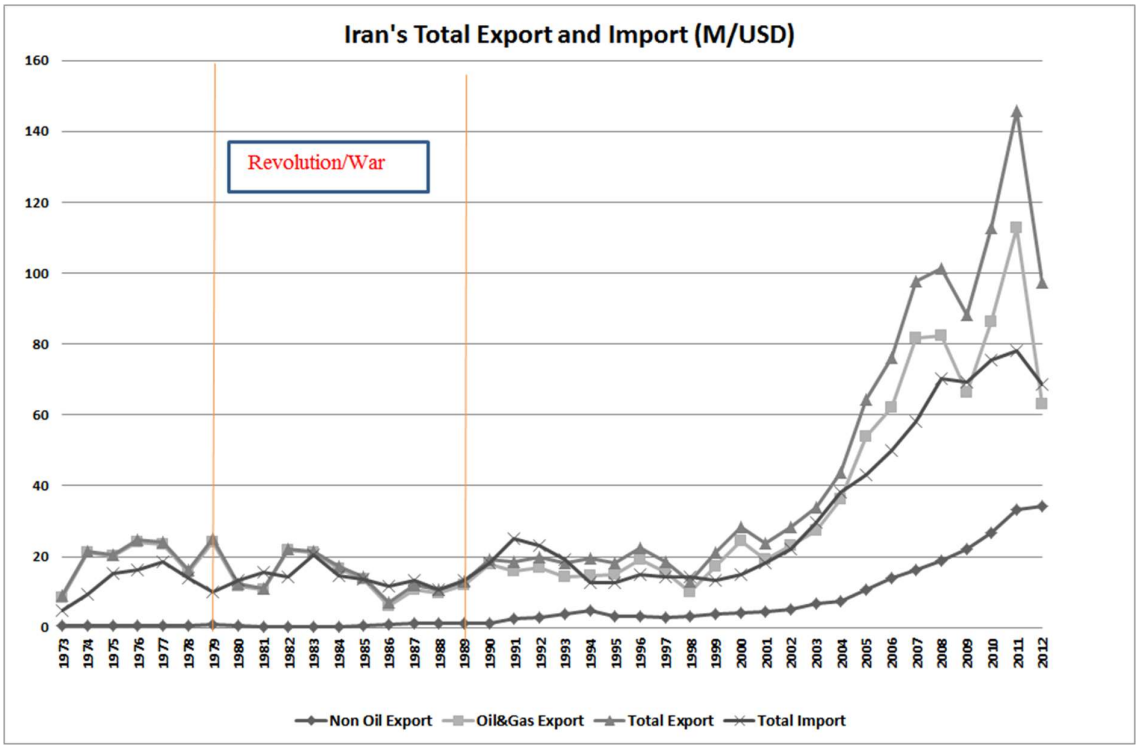
[4] Market capitalization (also known as market value) is the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year.

[5] Author calculations and Paytakhti Oskooe, S (2011)," The Iran stock market: efficiency, volatility and links to the international oil market "PhD Thesis, Kingston University

Regarding the effect of crude oil revenue on foreign trade, as shown in figure 4, there is a significant correlation between trend of crude oil revenue and total import (customs data base). Even in the recent years these two trends almost overlapped which means due to huge crude oil revenue the government increased total import. This evidence again initially indicates Dutch Decease in Iran's economy.

Crude oil revenue in Iran's economy is as essential as putting petrol into the car. For example, many industries need foreign currency in order to import intermediate goods and technology to be able to produce their product. As the next graph shows not only there is a significant correlation between crude oil revenue and total import and export but also non-oil export as well. This graph also is in line with our expectation.

Figure 4

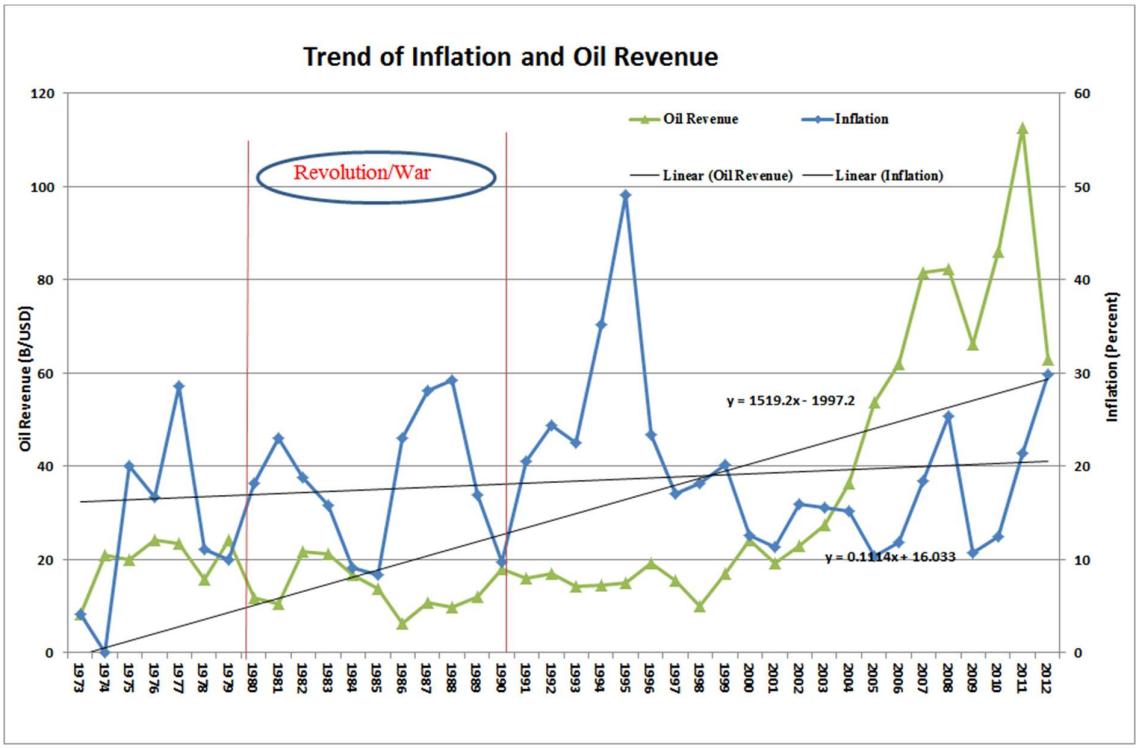


Source: Central Bank of Iran Website, http://tsd.cbi.ir/

The trend of crude oil revenue and inflation is shown in graph 5. As you can see there is a lot of fluctuation in the both trends but in many years when crude oil revenue increased the inflation rate decreased and vice versa. But in recent years after year 2005 when oil prices

sharply increased the inflation rate also increase and reached to 30 per-cents in 2012, this is another sign of Dutch Disease. However, there are some exceptions during the period under investigation which we will explain more in the following chapter.

Figure 5



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

Second target in this study is to estimate to what extent oil revenue fluctuations can impact key macroeconomic variables of Iranian economy by using econometric models.

Our next objective is answering to this question that why natural resource revenue is blessing in some countries and curse in others by carrying out an analysis of institutions.

The final objective is to find out the role of sovereign wealth fund to reduce the negative impact of natural resource revenues fluctuations.

To the best of our knowledge there is no single research to focus on the impact of oil revenue fluctuation on Iranian economy in this scale.

3- Methodology of the Research in Terms of its Contribution to the Subject

Most of the available literatures regarding the impact of crude oil price/revenue or natural resources on the economy focus on oil consumer/importing advanced countries which have completely different situation from an oil exporting economy. In other words, the dominant role of the government in Iranian economy creates new situation which we have to deal with it in this research.

A few macroeconomic models have been developed in the past in this subject. This research will try to develop a long run output relation for a big crude oil exporting economy such as Iran where crude oil revenue to output ratio is expected to stay high over a long time period. This study is a contribution to the limited literature on oil exporter economies in general and Iran in particular. In sum, this study has been motivated by the need to develop a deeper understanding of the dynamic nature of Iran's economy and its performance and contribution to the Iranian economy.

Most of the studies about the impact of crude oil price or crude oil revenue on the economy in general and the Iranian economy in particular arguing:

1-Dutch Disease: The analysis of Dutch Disease normally focuses on short run implications of a temporary natural resource discovery but is not suitable for the long run in major crude oil exporting countries. Empirical support for this has been provided by Khalid S.Alkhelaiwi (2001), Arman (1998), Neary and van Wijnbergen (1986), Corden (1984), Fardmanesh (1991), Wijnbergen (1984)

2- Natural resource curse or blessing: this approach is a social-political economy perspective argues that large unexpected revenue from the natural resource creates incentives for the rent-seeking activities that involve corruption. Here we can mention the studies of Cavalcanti *et al*. (2009), E.Røed. Larsen (2005), Farzanegan and Schneider (2009), Robinson *et al*. (2006)

3-Arguing the impact of crude oil price / revenue on a single macroeconomic variable for instance GFCF, Income, GDP, etc. We can find a lot of research both in English or Farsi in this subject such as Benhua Yanga,Yewfoong Lam (2008) , Yong U.Glasure and Aie-Rie Lee (2002) , jarzadeh (Farsi 2005) , Hakan Berument and Nildag Basak Ceylan , Mehara (Farsi 2006) , Manzor (Farsi 2002) , Ayadi *et al*. (2000)

4- Some researchers, Abrishami *et al*. (Farsi 2008), Glasure and Lee (2002), Rebeca Jimenez - Rodreguze (2009), considering the impact of oil price (not oil revenue) fluctuation on oil importer countries such as USA, China, Australia, Japan etc. which is completely different from the economic situation of producer countries.

5- Researches which considering the period before 1979 Islamic revolution in Iran. Habib – Agahi (1971), Baharie (1973), Vakil (1973), Sahhshahani (1978).

6- Finally, Sana Zaouali (2007),Abbasi Nejad (Farsi 2006), Abbas Valadkhani and William F. Mitchell (2002), Roberto A. De Santis (2003),Hodjat Ghadimi(2006), arguing the impact of crude oil price or oil revenue on the economy based on Computable General Equilibrium (CGE).

Despite existing of a large body of literature on the impact of fluctuations in oil price on the Iranian Economy, it appears that gaps still exist in the debate. This thesis attempt to fill the gap as follows:

1- Using suitable real oil and gas revenue instead of crude oil price estimations.
2- Using all available annually observations over the period of 1956 till 2012. Some time series quarterly data are available but they are not accurate.
3- Selecting most important suitable macroeconomic variables of Iranian economy that has been affected by oil revenue shocks.
4- Running Casualty test, ARDL Bound test and Vector Error Correction Model (VECM) between crude oil revenue and key macroeconomic variables of Iranian economy.
5- Estimating linear and nonlinear specification in two different nonlinear functional oil revenue shock forms. The nonlinear functional forms are the asymmetric functional form of Mork (1989) and the net oil price increase of Hamilton (1996).
6- Contribution of institutional quality factors on Iranian economic growth and addressing this question: "why oil revenue is blessing in some countries and curse in other countries?"
7- Answering the question that whether oil revenue have negative impact on institutional quality.
8- Testing oil fund stabilizer role to reduce the impact of oil revenue fluctuations.

As far as the impact on the Iranian economy is concerned there is a big difference between crude oil price and oil revenue, in other words the economy is affected by net oil revenue rather than oil prices. Crude oil production levels might vary given different price levels, seasons or OPEC Quotas. Also all published physical oil prices are estimates not real, and only crude oil prices which are published in Futures (Paper) market for Benchmark crude oils[6]are real.

[6] A benchmark crude or marker crude is a crude oil that serves as a reference price for buyers and sellers of crude oil. There are three primary benchmarks, West Texas Intermediate (WTI), Brent Blend, and Dubai. Benchmarks are used because there are many different varieties and grades of crude oil. Using benchmarks makes pricing of different crude oil easier for sellers and buyers.

Always there is a differential between benchmark crude oil prices and other crudes.

4-Hypotheses of the Study

Given the following facts:

1- Iranian economy depends heavily on the crude oil revenue
2- In Iran economic growth, government expenditure, exchange rate, inflation rate, and total imports are all intimately connected to its crude oil revenue
3- The main source of the government budget and foreign exchange is crude oil revenue
4- Government budget is the main source of capital formation in Iran
5- Exchange rate and foreign trade sector are heavily managed by the government
6- Non-oil export is dependent on the crude oil revenue
7- Iran is a rent seeking state due to lack of powerful institutions and democratic structure

This study attempts to investigate the following hypotheses/questions:

1-The extent to which the oil revenue fluctuations impact Iran's economy by using ARDL Bound test and VECM models
2-The applicability of causality and asymmetric oil revenue phenomenon to Iran's economy
3-The extent to which institutional quality factors are important in economic growth of oil exporting countries by answering this question that "why oil revenue is blessing in some countries and curse in other countries."
4-Given the size and significance of oil revenue fluctuations, testing (by using econometrics models) whether or not oil fund stabilizer can protect the economy from oil revenue fluctuations.

5-Provisional Chapter Structure

In carrying out the objectives, the main body of the thesis is organized into five chapters:
The second chapter will discuss the main macroeconomic trends mostly in post-revolutionary Iran. Role of the oil revenue in the national economy are examined by different graphs.
The review of existing literature will be discussed on chapter three. This chapter review the role of natural resource revenue in general and oil revenue in particular in economic performance.

The next chapter, chapter four, will describe Granger causality, ARDL Bound test and VECM time series model that shows the long run relations. Symmetric and asymmetric method will be investigated. This chapter has its own literature review.

Chapter five is to investigate the role of institutions, oil and economic growth in Iran. Focusing on institutional economy and answering the question: “why oil revenue is blessing in some countries and curse in other countries”. This chapter have their own literature review.

Chapter six will discuss the role of oil fund stabilizer to reduce the negative impact of oil revenue fluctuation on the economy. This chapter has its own literature review.

Chapter seven contains a discussion of the main results emerging from the research. The chapter also presents policy implications, recommendations and directions for further research in this area.

Chapter Two:
Overview of the role of oil revenues in Iran's economy

Introduction:

Iran is a natural resource rich and young labour rich economy in the Middle East. Current economic performance has been limited by high dependency on crude oil revenue, inflation, unemployment rate, political dispute, huge amount of public subsidies[7] and low levels of foreign and private investment. Also Iran is facing a lot of external disputes including USA and United Nations (U.N.) sanctions and other forms of USA/European Union financial and banking system pressure especially in recent years because of nuclear power.[8]

Before booming of crude oil price at 1973 crude oil did not have a significant impact on Iran's GDP but after that and gradually the economy addicted to crude oil revenues. By contrast high oil prices in some periods have increased the government's ability to handle economic and political issues, while hiding mismanagement of the economy from public.

After more than 100 years of production, Iran's current estimated reserve to extraction ratio suggests more than 100 years of crude oil production.[9] Thus for major crude oil producing countries in middle east, such as Iran, Saudi Arabia or Iraq, the production ratio shows that they can produce for a long time even when there is no any new crude oil field discoveries or having new technologies in crude oil exploration and production.

As shown in Figure 6, over the past five decades or so the ratio of Iran's crude oil export revenues/GDP with many fluctuations, has reached %16.4 in 2012. The annual average of the ratio since 1959 amounted to %18.3 reaching %20.6 during 2000-2012 period. Surely, Iran is not unique in this regard, as most other Organization of the Petroleum Exporting Countries (OPEC) such as Venezuela, Saudi Arabia, Algeria, Nigeria, UAE and Kuwait, and a few non OPEC countries such as Russia and Norway have more or less similar crude oil income /GDP ratios that have remained relatively stable (and in some cases have even been rising as in case of Norway).

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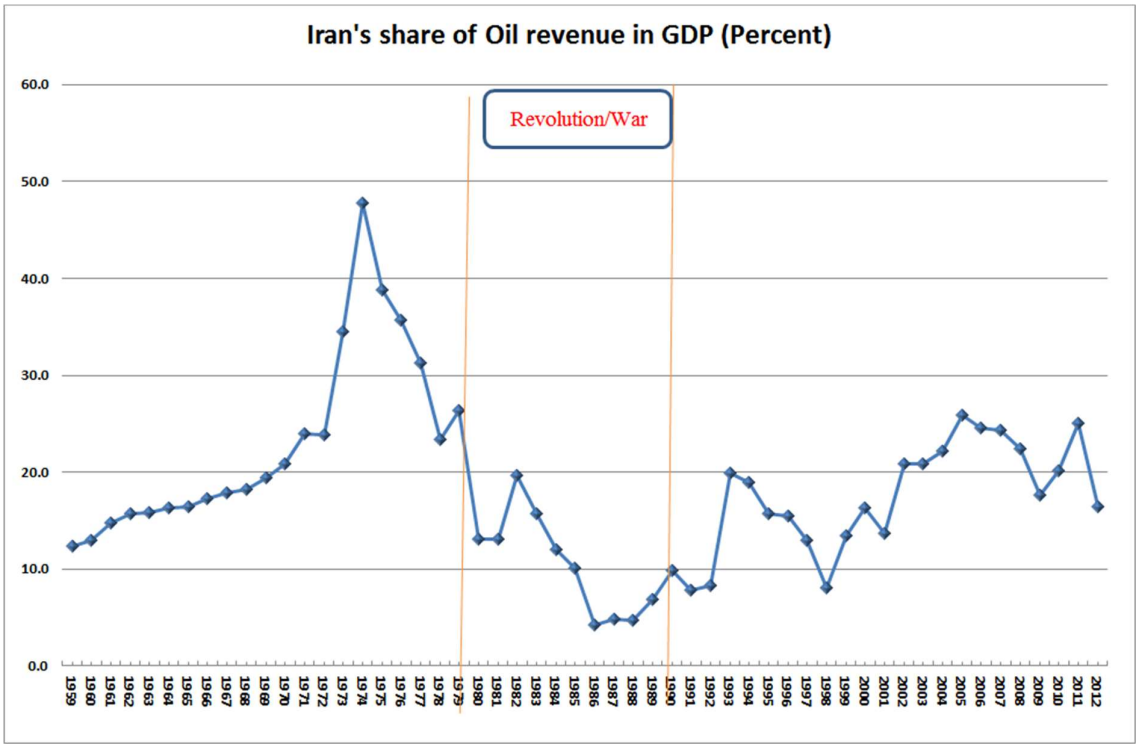
[7] Iran's leadership came to agreement in 2010 on a general plan for subsidy reform involving gradual removal of subsidies.

[8] On 14 July 2015, the Joint Comprehensive Plan of Action between Iran and the P5+1 and EU, a comprehensive agreement in nuclear dispute based on the April 2015 framework, was announced. After the IAEA confirmed that Iran met the relevant requirements under the JCPOA, all nuclear sanctions were lifted by the UN, the EU and USA on 16 January 2016.

[9] Salehi Esfahani, H. Mohaddas, K. Pesaran, M.H. (2009)," Oil Exports and the Iranian Economy", Page 4

Figure 6



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

1-Overiew of Iran's oil industry

1-1-Dicovery of oil in Iran until first oil shock (1908-1973)

In 1901 Mozafardin Shah gave William D'Arcy a concession for exploration and production of oil in southern Iran for 60 years. In exchange Shah received lump sum of £20k cash and 16 per-cents of company's future net profits. By 1908 oil was discovered by William D'Arcy in Masjid Suleiman and established the Anglo-Persian Oil Company (APOC)[10] in 1908. Crude oil production started to supply oil to the Abadan refinery, the largest refinery in the world at the time in 1913.

After a while disagreement developed between Iran and APOC. At a meeting that took place, in Netherlands the two parties reached to new agreement in 1933. Based on terms and

[10] Later in 1954, after nationalization of oil industry in Iran, APOC became British Petroleum Company (BP).

conditions of new agreement, concession extended for 60 more years but reduced APOC exploration and production within designated area to 260k square kilometres. Also guaranteed paying £750k to Iranian government and paying income tax to Iranian authority as well. Later in 1935 the APOC changed its name to the Anglo-Iranian Oil Company (AIOC) which was still heavily depended on Iranian crude oil. During Second World War production of crude oil by the AIOC sharply increased in order to meet global demand.

"*By 1950, Iran, via the AIOC's activities, had become hugely important to the global oil industry. It was the second largest exporter of crude petroleum and contained the third largest oil reserves, and in Abadan, the AIOC had the world's largest refinery. Between 1930 and 1950, the company's pre-tax profits grew from approximately £6.5 million to nearly £85 million, bringing in large amounts of income, but disproportionately shared, to the British Treasury, company shareholders, and the Iranian government."*[11]

1-2-Nationalization of Oil Industry in Iran

Also some other issues in background encouraged nationalisation of oil industry in Iran. Including small share of the Iranian government of AIOC'S profit, Iranian worker and their families' poor condition, and the refusal of the company to train and promote domestic workers to more skilled jobs, which were mostly controlled by the British who led a luxurious life style. The Iranians wanted an increase in royalty payments and better access to job opportunity, accommodation, education, and healthcare. The table below shows Iranian royalties and taxation vs British taxation for the period of 1914-1950. In the mentioned period Iranian royalties and taxation was just about 28% of total oil export revenue. Also for instance in 1947, the share of Iranian government of £40 million profit of AIOC was only £7 Million.

[11]Henniker-Major, E (2013), "Nationalisation: The Anglo-Iranian Oil Company, 1951 Britain vs. Iran" Seven Pillars Institute Moral Cents Vol. 2 Issue 2, Summer/Fall 2013

Table 2: Iranian Royalties and Taxation vs British Taxation, 1914-1950

Years to	Iranian Royalties and Taxation (M/£)	British Taxation (M/£)	Ratio of Iranian Government to Total Oil Export Revenue%
1914 - 1919	0.22	0.23	-
1920 - 1924	0.52	0.76	5.3
1925 - 1929	1.05	0.87	6.3
1930 - 1934	1.63	1.32	17.2
1935 - 1939	3.19	2.38	18.4
1940 - 1944	4.09	11.18	15.2
1945 - 1949	8.50	22.66	10.7
1950	16.03	51.40	8.10
Sum	**35.23**	**90.80**	

Source: Mohades, K *et al*. (2013), "One hundred years of oil income and the Iranian economy: A curse or a blessing?" CESifo Working Paper: Empirical and Theoretical Methods, No. 4118

The table below shows salaries of Iranian and British workers in 1945 and 1949. Despite considerable growth in Iranian labour wages during 1945-49 still there was huge gap compared with British labour.

Table 3: Average annual wages and salaries of Iranian and British workers

Salaries	1945/£	1949/£	Growth %
All Iranian labour	76	314	413
All British labour	980	2140	218
Non-graded Iranian staff	290	838	289
Graded Iranian staff	604	1910	316

Source: Abdelrehim, N *et al*.," A pretty good deal just now' The Anglo-Iranian Oil Company, Oil Nationalisation and Managerial Response: 1951", University of York.

Above mentioned disputes motivated strong support for nationalisation of the AIOC both in the parliament and the government. In March 1951, the Iranian parliament and prime minister Dr Mosadegh strongly supported the nationalisation of the AIOC and its holdings. British government reacted and put embargo on the sale of Iranian crude oil and Abadan refinery was shut down. The tension between two countries escalated and the British even threatened Iran with military invasion. The USA government was opposed of military intervention. Even international court of justice resolution regarding a 50/50 profit-sharing arrangement was rejected by both parties.

After several months the crisis became tense and all Iranians supported Dr Mosadegh even Shah attempted to replace him by mid-1952 but he could not. At the same time there was a crisis in the government revenue because main source of revenue which was oil export was drying up.

The AIOC was also important to Britain and Europe's economic independence as well. The AIOC oil supply to world market nearly doubled for the period of 1945-1950 and rose from 118 million barrel per year to 222 million barrel per year.[12] The table below shows that %80 of AIOC's activities concentrated in Iran.

Table 4: Geographical Distribution of AIOC's Activity

Country	Oil Production	Refined	Total	Share%
Iran	31750	24050	55800	80
Kuwait	7367	1054	8421	12
Iraq	1681	na	1681	2.4
Qatar	380	na	380	0.55
UK	46	3291	3337	4.8
Total	41224	28395	69619	100

Source: Abdelrehim, N *et al*.," A pretty good deal just now, The Anglo-Iranian Oil Company, Oil Nationalisation and Managerial Response: 1951", University of York

1-3-Coup

Finally in August 1953 the American CIA and British MI6 with the help of bribes to some elites, military, crowd, and magazines incited an anti Mosadegh riot in Tehran, which gave the Shah an excuse to topple Mosadeqh. They also spread rumour about Mosadegh that he is pro-communist and should be remove from power.

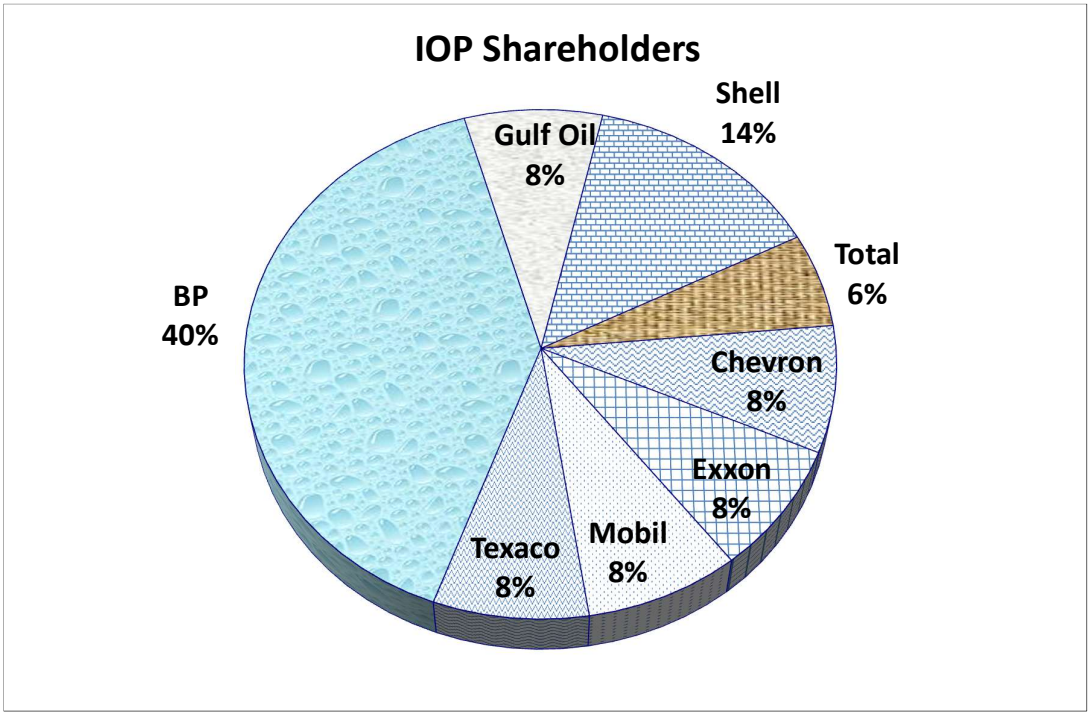
At the end of 1953 he was sentenced to death but commuted to life in prison but later exiled to Ahmadabad village where he served his sentence. He died on March 1967 while he was in exile.

Anyway oil industry in Iran was nationalized and National Iranian Oil Company (NIOC) owned the oil and facilities in Iran. The Anglo-Iranian Oil Company changed its name to British Petroleum (BP) in 1954.

[12]Henniker-Major, E (2013), "Nationalisation: The Anglo-Iranian Oil Company, 1951 Britain vs. Iran" Seven Pillars Institute Moral Cents Vol. 2 Issue 2, Summer/Fall 2013

Later in London a consortium of major oil companies called Iranian Oil Participants Ltd (IOP) bring Iranian oil back to the market. The consortium agreed to share profits on a 50–50 basis with Iran. The graph below shows shareholders of IOP Ltd.

Figure 7



Source: Kuhn,M (2012) "Enabling the Iranian Gas Export Options: The Destiny of Iranian Energy", Springer, Germany

1-4-Iran's Oil Industry Analysis in the world

The first major crude oil field in Iran was discovered in 1908 with crude oil production started flowing in economical rate in 1912. After more than a century of oil production the industry is facing a lot of problems mostly causes by impact of sanctions, lack of technology, constant mismanagement, and financial challenges. Nevertheless, given that removal of sanctions[13] in 2016, and pro-foreign investment government in office, the oil industry is poised to expand rapidly in the years ahead.

[13] After the IAEA confirmed that Iran met the relevant requirements under the JCPOA, all nuclear sanctions were lifted by the UN, the EU and the US on 16 January 2016.

1-4-1-World oil supply and demand

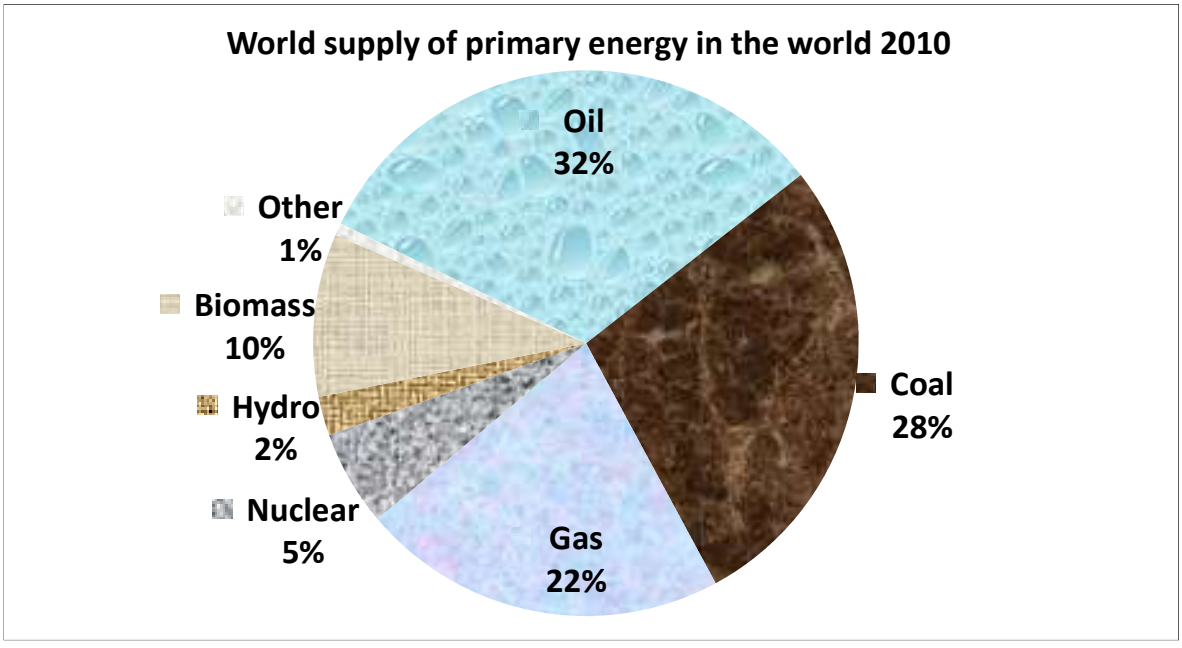
Based on OPEC statistics Iran's current recoverable crude oil reserves with current technology is estimated to be 154 billion barrels which is one of the biggest in the world. Another advantage is low cost of crude oil extraction which is around $4 per barrel onshore and $8 per barrel offshore. In addition, Iran's huge natural gas reserve is estimated at about 34 trillion cubic meters (tcm), the second largest source after Russia.

Considering such a massive oil and Gas reserves, Iran is a great power in world energy.

"*Iran's primary energy consumption amounted to 192.1 million tons' oil equivalent in 2008. Oil and natural gas are the primary energies consumed largely by Iran, while other energies are consumed sparingly*."[14]

In 2010, world crude oil production reached 81 million barrel per day with 32 per cent of global supply of primary energy. However crude oil production by OPEC Members, accounted for 45 per cent of world crude oil production. Based on OPEC prediction for the period of 2010–2040, energy demand increases by 60%, but fossil fuels (oil, coal and gas) still the main source of supply. Gas is likely to overtake coal post-2040, while oil continues to be comparably one of the larger energy sources.

Figure 8



Source: World oil outlook, OPEC 2013

[14] Central Bank of Iran, Annual Review 2008-2009

Table 5 shows long-term increases in demand for oil by close to 21 mb/d over the period of 2013–2040; reaching 111.1 million barrel per day by 2040. The biggest share of the increase belongs to developing countries including China and India.

Table 5: World oil demand outlook in the Reference Case (mb/d)

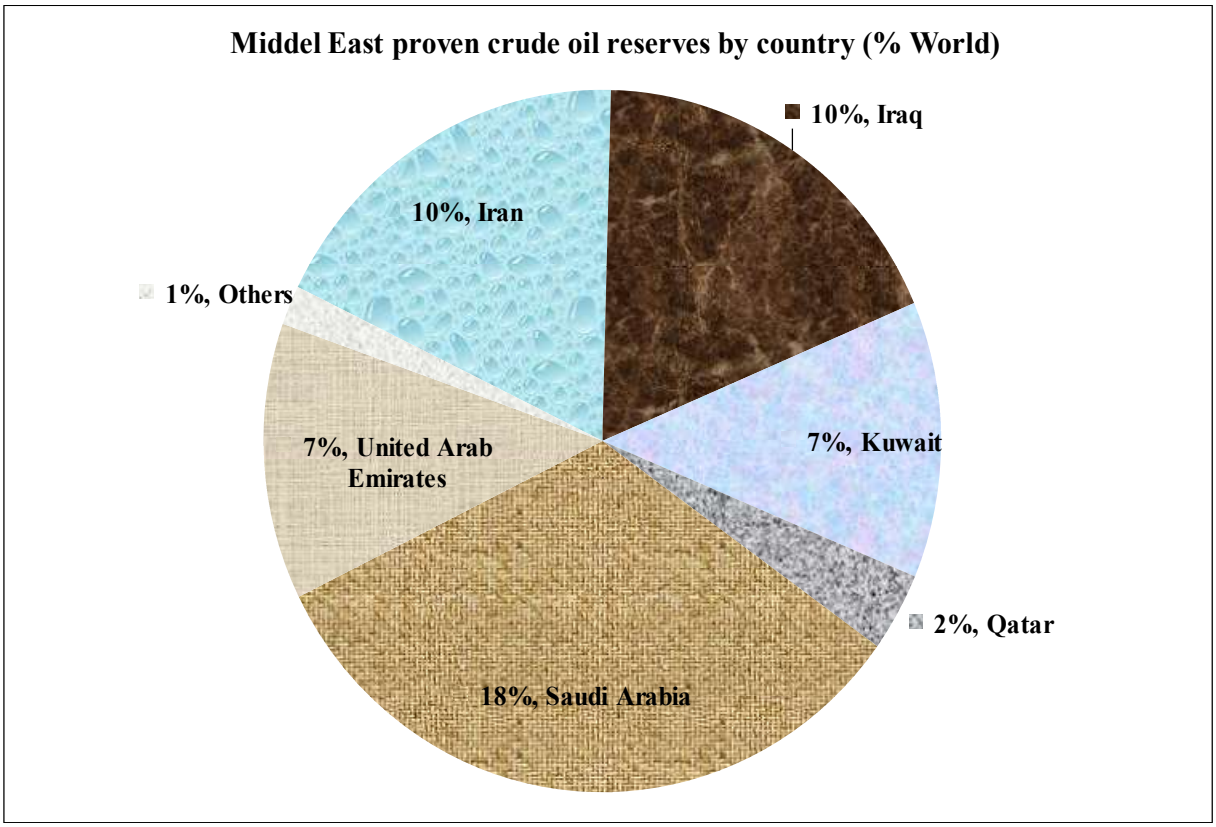
	2013	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
OECD America	24.0	24.3	24.1	23.6	22.7	21.7	20.6
OECD Europe	13.6	13.3	13.0	12.6	12.1	11.5	11.0
OECD Asia Oceania	8.4	8.1	7.9	7.6	7.2	6.8	6.5
OECD	**45.9**	**45.8**	**45.0**	**43.8**	**42.0**	**40.0**	**38.2**
Latin America	5.3	5.7	6.1	6.5	6.8	7.1	7.4
Middle East & Africa	3.5	3.7	4.1	4.5	4.9	5.3	5.8
India	3.7	3.9	4.7	5.7	6.9	8.3	9.8
China	10.1	10.7	12.6	14.6	16.4	17.8	18.8
Other Asia	7.4	7.6	8.6	9.7	10.6	11.5	12.4
OPEC	9.0	9.7	10.3	10.9	11.5	12.1	12.8
Developing countries	**39.0**	**41.2**	**46.5**	**51.9**	**57.1**	**62.2**	**67.0**
Russia	3.4	3.5	3.6	3.6	3.6	3.6	3.5
Other Eurasia	1.7	1.7	1.9	2.0	2.1	2.2	2.3
Eurasia	**5.1**	**5.2**	**5.5**	**5.6**	**5.7**	**5.8**	**5.9**
World	90.0	92.3	96.9	101.3	104.8	108.0	111.1

Source: World oil outlook, OPEC 2014

1-4-2- Proven crude oil and natural gas reserves by country

Iran is one of the biggest oil and gas reserves in the world which is not developed well. While oil recoverable reserves estimated %10 of world oil reserves the production is just %5 of world production. For instance, in Saudi Arabia the oil production accounted %13.2 of world production with around %18 of world oil reserves in 2014.

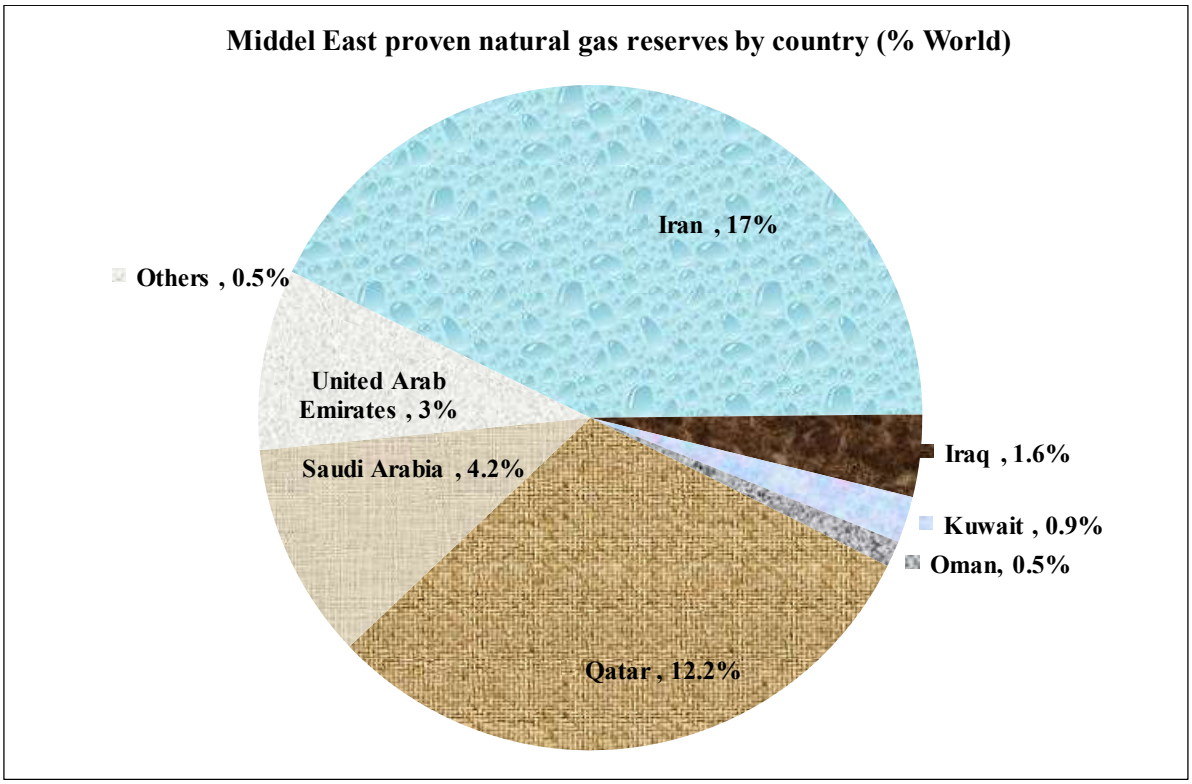
Figure 9



Source: OPEC (2015)" Annual Statistical Bulletin"

In case of natural gas, the situation is worse because Iran having %17 of world proven natural gas reserves but just %6 of world production belongs to this country which mostly consume internally. In order to compare to other countries for instance Russia and Qatar with %24 and %12 of world proven natural gas reserves, produce %18 and %5 of world natural gas production respectively in 2014. Iranian share in world natural gas export is %0.8 which is really disaster. However, Russia and Qatar supplied %12 and %20 of world natural gas market respectively in 2014

Figure 10



Source: OPEC (2015)" Annual Statistical Bulletin"

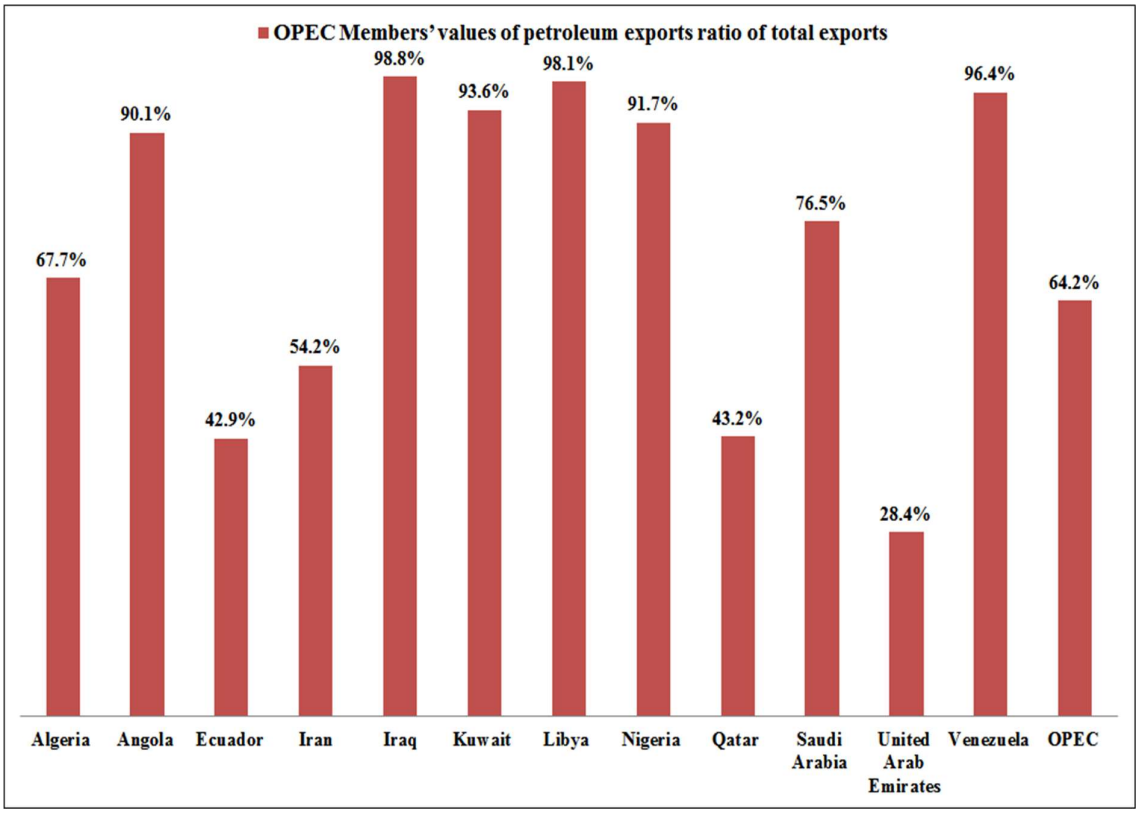
1-4-3-Crude oil and petroleum products exports by country

Based on OPEC statistics physical world crude oil exports estimated about 40 million barrel per day which OPEC members supply almost %60 of world crude oil exports. Iran's situation in crude oil market declined in recent years due to several sanctions over nuclear dispute. Iran's total crude oil export reduced from 2.3 to 1.1 million barrel per day in period 2010-2014. However Saudi Arabian crude oil export increased from 6.64 to 7.15 million barrel per day in the same period.

In terms of world exports of petroleum products OPEC members provide almost %18 of world petroleum products demand which is around 26.5 million barrel per day. Despite Iran having considerable refinery capacity but value of petroleum product export comparing with other OPEC members is low because of high internal consumption. Iran exported 470 thousand barrel per day of petroleum products in 2014 however Saudi Arabia and United Arab Emirates supplied 988 and 760 thousand barrel per day of petroleum products respectively.

As shown in graph 11 Iran's situation among OPEC members is in good position in terms of values of petroleum exports share of total export in 2014. The mentioned ratio estimated %98.8 for Iraq the highest and %28.4 for united Arab Emirate the lowest.
Iran's total export estimated 100 billion USD and petroleum export 53.6 billion USD in 2014.

Figure 11

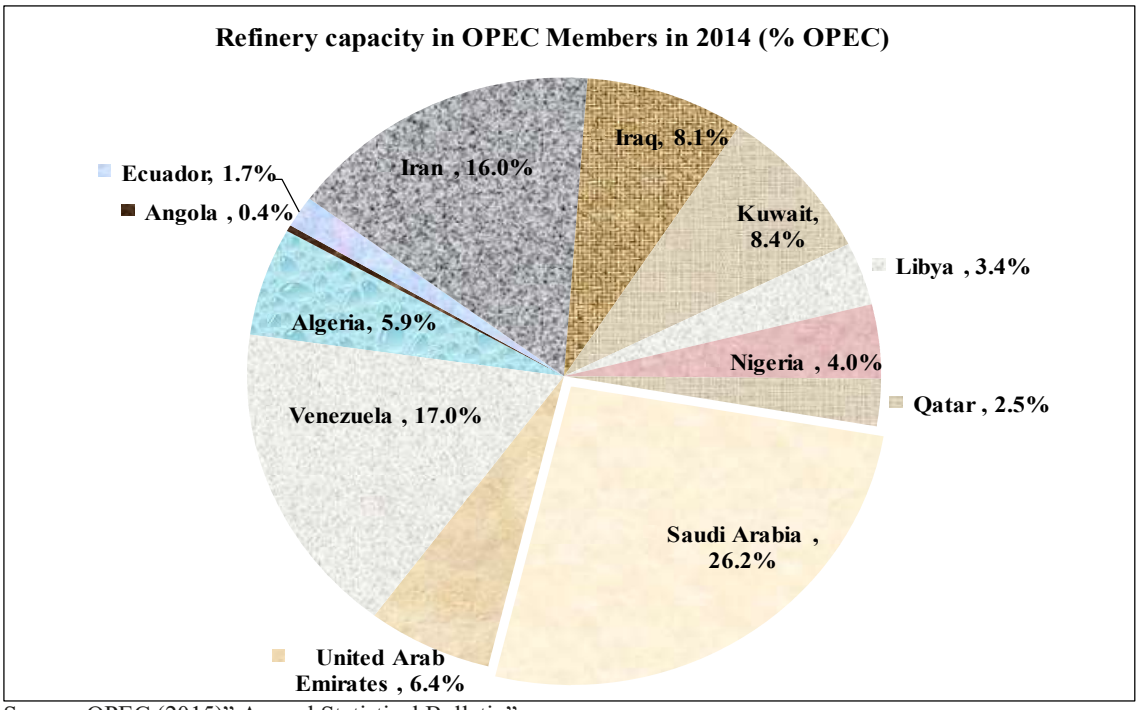


Source: OPEC (2015)" Annual Statistical Bulletin"

1-4-4-Refinery capacity in OPEC Members

Refinery capacity in OPEC members with 11.1 million barrel per day accounted %11.6 of total world capacity. Iran has 9 refineries with daily capacity of 1.78 million barrel. Iran after Saudi Arabia and Venezuela has biggest refinery capacity estimated %16 of OPEC members.

Figure 12

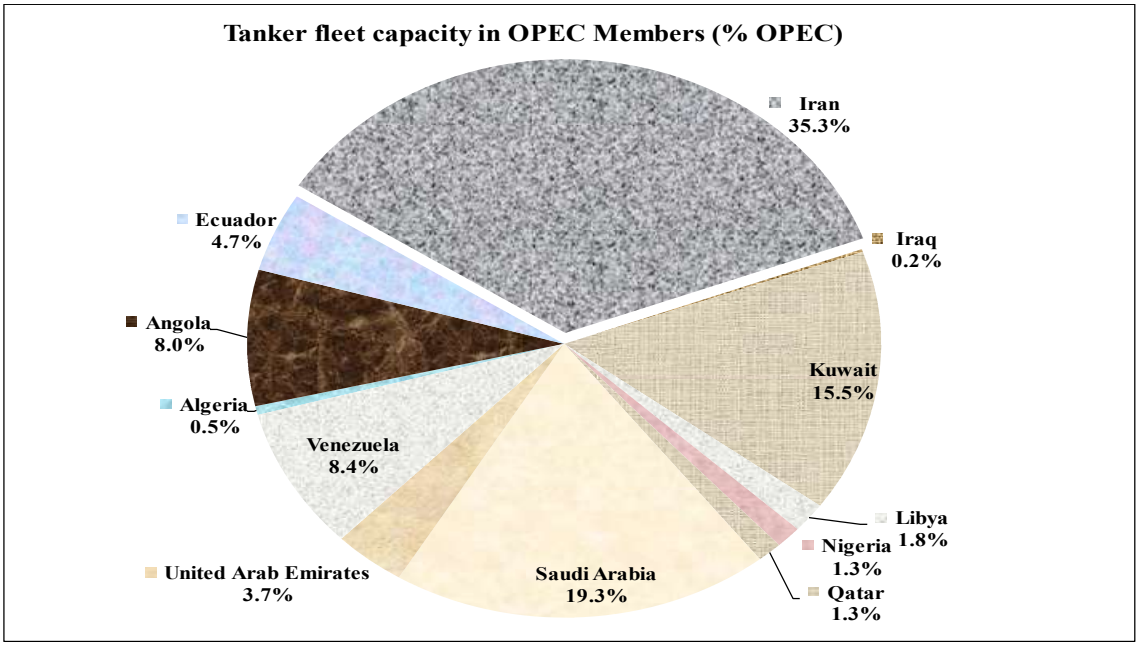


Source: OPEC (2015)" Annual Statistical Bulletin"

1-4-5-Tanker fleet development in OPEC Members

Iran's tanker fleet is the biggest one among OPEC members. Iran own 46 tanker fleet with %35 of tanker capacity in OPEC members.

Figure 13



Source: OPEC (2015)" Annual Statistical Bulletin"

2-Role of oil revenue in the Iranian economy

The analysis of political change, crude oil revenues and macroeconomic variables over different phases in Iran's economic development will help to highlight the impact of oil revenue on the economy. Five distinct phases may be distinguished with regard to the role of oil revenue in the Iranian economy after the rise in crude oil prices in 1973.

2-1-Before the revolution (1973-78)

The first phase began with the first oil shock of 1973–74 during the Arab-Israeli war of 1973, and ended with the Islamic revolution of 1979. Due to a sharp increase in crude oil revenue in this period, crude oil started to play a significant role in the socioeconomic life of Iranians. Before this time, although crude oil exports were considerable but total oil revenues were not noticeable because of its low price. In 1978 a year before of Islamic revolution in Iran, the total population was 35.5 million, half of which lived in rural and the other half in urban areas. In the period of 1973–78, more than 60 per cent of total government budget came from crude oil revenues. In this period the share of oil export in total exports on average was more than 80 per cent, also annual inflation on average remained at 14.4 per cent and liquidity (M2) grew at an average of 36.5 per cent annually.

2-2- After the revolution and during imposed war with Iraq (1979–89)

The second phase began after Islamic revolution and imposed war with Iraq which started in the 1980 and continued until 1988. The significance of this phase was a period of establish new constitution was approved based on Shia Muslim sharia law, and also the uncertainty created by the war with Iraq. The different aspects of the transformation of the Iranian economy over this period were largely shaped by isolation from the world economy resulting from Islamic revolution and the war. After the Islamic revolution of 1979, the laws and regulations pertaining to financial institutions and monetary policy were amended and were included in the new constitution of the Islamic Republic of Iran. All 36 banks were merged and nationalized into 6 public banks (recently many formerly private banks have begun to trade).

During imposed war with Iraq (1980–88) the government assumed direct control of the economy to deal with the consequences of the war. Such policies included, rationing of essential goods, strict foreign currency control, and an industrial policy based import substitution strategy and allocation of bank credit facilities by the government. Also the oil industry infrastructure was badly damaged and on the other hand Iran faced a lot of economic problems such as negative economic growth, fast growth in internal demand, high inflation rate

and declines in crude oil production and export. Liquidity and inflation rate grew annually at average rates of 20 and 18.7 per cent respectively. Also capital outflow and brain drain after the revolution resulted in GDP losses, huge government budget deficits, and sharp decrease of national currency value. Because of the government new policy to encourage population growth, the size of Iranian population grew from 37 million in 1979 reaching 53 million by 1989. Unemployment rate raised sharply in this period due to on the one hand the economic downturn and on the other hand rapid population growth.

2-3- Following the war (1989-1997)

The third phase since 1989 after the end of imposed war with Iraq which is called post-war reconstruction period which included a number of economic reforms and political changes. The post war construction period witnessed important changes in the economy and the domestic political scene, which led to an important shift in the development path of the Iranian economy. During the 90s Iran struggled to rebuild the war-torn economy, attract foreign investment with open market orientation in the economy. In this period there was also a considerable inflow of crude oil revenue and foreign capital. This made a great contribution to national capital formation.

After a few years of open market oriented reforms by president Rafsanjani, his government contributed to open up the foreign currency market from 1993 onward. But, the process was not managed well and this led to a serious balance of payments crisis in 1993-1994.

The country quickly accumulated a huge stock of short-term external debt, followed by a major balance of payments crisis. The debt crisis put the reform program on hold and even reversed it in many areas, especially in the credit and foreign exchange markets.[15]Iran started series of five-year economic development plans in all aspects of economy including recovery in oil production, but because of decrease in oil revenue the country faced a serious economic downward later.

2-4- The fourth phase, for the period of (1998-2012)

The fourth phase was during 1998-2012 and it began with low crude oil revenue and ended with historically high crude oil prices. Attempts to incorporate the Iranian economy into the world market, political and cultural freedom by reformist president Khatami resulted in socioeconomic and political changes and these led to a political crisis.

[15] Salehi Esfahani, H. Mohaddas, K. Pesaran, M.H. (2009)," Oil Exports and the Iranian Economy", page11

The populist government of president Ahmadinejad took power in 2005. The country was facing two important events, first historically high oil prices and second several sanctions over nuclear issue by United Nation and Western countries. Actual Iranian oil revenue increased from 36 B/USD to113 B/USD for the period of 2004-2011. But the government wasted oil export revenue mostly because of high mismanagement. Also several sanctions over nuclear conflict badly damaged the economy. At the end of this period the country was facing Dutch disease, high inflation and recession as well.

2-5- The fifth phase, for the period of 2013-Current

Iranian politics shifted direction in June 2013 by victory of Moderate President Rouhani to replace Mahmoud Ahmadinejad. The new government has since launched better relations and constructive negotiations with the West. As a result, announcing a historical nuclear deal was announced in July 2015 after nearly two year negotiations with the prospect of sanctions relief in 2016. Also the government was very successful in reducing inflation from 30 per cent to nearly 12 per cent per year. One of the big problems which the government is facing is sharply decreased oil prices in 2015-16 to nearly 40 USD/BBL[16]. This means the government's oil revenues were reduced from 120 billion in 2011 to 30 billion in 2015.

3- Five Year Development Plans (FYDP)

During past two decades, Iran has engaged in five of five-year economic development plans as follows:

3-1-First Five-Year Development Plan (1989–93)

After the end of the imposed war with Iraq in 1988, an ambitious reconstruction program was introduced by the government to deal with special situation in the economy created during last decade. The First Five-Year Economic, Social, and Cultural Development Plan concentrate on the development of infrastructure of the economy which was badly damaged during the revolution and war. The government ended the multiple exchange rate systems in the last year of the plan 1993, but then because of external debt payment crisis the system of multiple exchange rates was re-established. However, during the first development plan real GDP and inflation grew at an annual average rate of 7.5 and 18.8 per cent respectively, with substantial improvement in social and economic indicators.

[16] US dollar per barrel

3-2-Second Five-Year Development Plan (1995–99)

The Second five years Economic, Social, and Cultural Development Plan concentrated on increase in non-oil exports in order to diversify the economy which was depending on oil revenue. The period of the second FYDP due to low global crude oil prices in 1997-99 was characterised by low economic growth and instability. As a result, the government reacted by increasing direct control of economic activities. But settlement of external debt was a very positive step taken by the central bank which resulted in most of the debt repaid by 1999. During the second development plan real GDP grew at an annual average rate of 2.6 and inflation rate reached 25.5 per cent.

3-3-Third Five-Year Development Plan (2000–2004)

Third five-year plan has been significant to some extent, such as greater trade liberalization, economy diversification and privatization. Tax policy changes and the third five-year development plan sought to restore market-based prices, reduce the size of the public sector, and encourage private sector investment. The main objectives of the plans were the following:

• Combined different exchange rate system including official rate, export, free market and Tehran stock exchange market versions.

• Liquidate, privatize, merge, and restructure Iran's state-owned enterprises (SOEs)

• Raise the efficiency of the tax system and eliminate organizational bottlenecks

•Establish the Oil Stabilization Fund (OSF) to cushion the economy and the government budget against fluctuations in oil proceeds.

• Adjust certain regulations to promote foreign trade

• Introduce flexibility into the banking industry

On the positive side, Iran experienced growth of capital formation, improvement of the balance of payments, and reduction of unemployment rate. On the negative side, the economy suffered from high liquidity growth, a high inflation rate, a large government sector and state-owned enterprises (SOEs). It should be noted that during the third five year plan, Iran's international relations were rendered unstable by the US-led invasion of Iraq and resulting insurgency in Iraq and by issues related to Iran's nuclear energy industry.[17]

During the third development plan real GDP growth was at an annual average rate of 5.8 and inflation rate was 14 per cent.

[17] Komijani, A. (2006)," Macroeconomic Policies and Performance in Iran", Asian Economic Papers. Page 180

3-4-Fourth and Fifth Five-Year Development Plan (2005-2009 and 2010-2014)

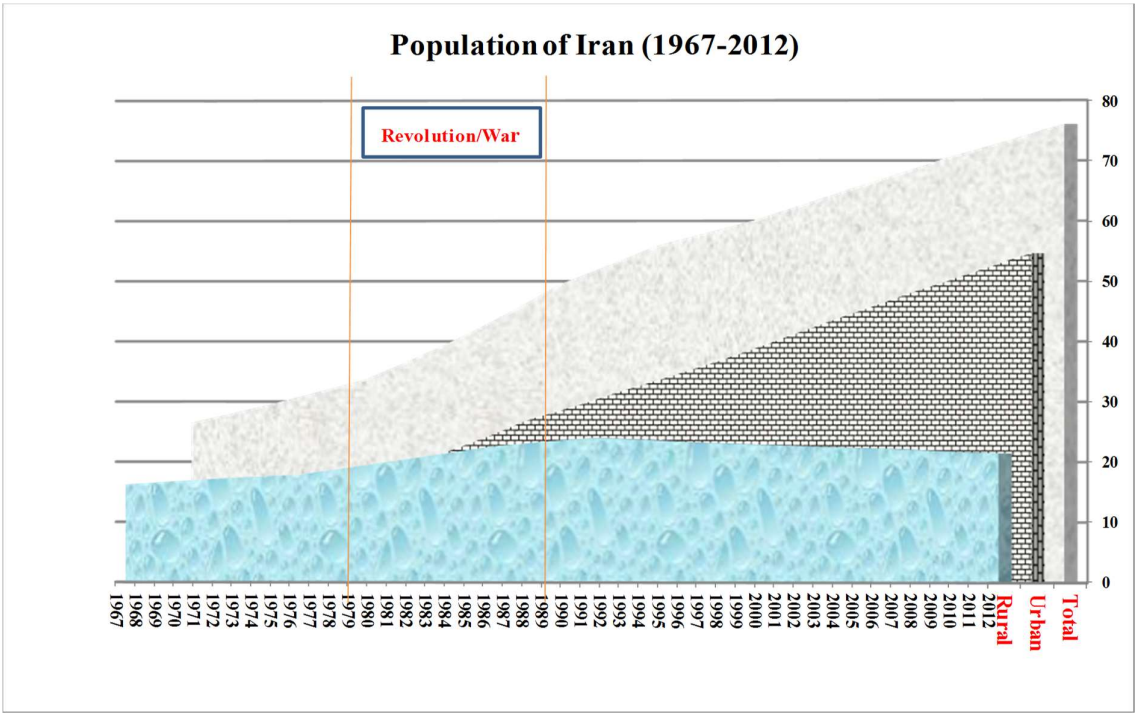
The latest five-year development plan was for the period of 2010-2014 and Iran is currently working on sixth five-year plan. The fourth and fifth five-year which has taken a largely different approach. New government (Ahmadinejad) took power in 2005 and the new president with highly populist approach has changed the targets of fourth five-year plan and establishes the same approach to fifth five-year plan with mostly toward to redistribute crude oil revenue to poor people. During the fourth development plan real GDP growth was at an average annual rate of 4.4 per cent and inflation rate was 15.3 per cent.

4-Overiew of Iran's Economy

4-1- Population and Human Development

According on Statistical Centre of Iran (SCI) estimation, Iran's total population grew by 1.2 per cent to 76 million in 2012, of whom 72% lives in urban and 28% live in rural area. Population density averages 42 people per square kilometre, but with significant regional variations. Iran has one of the youngest populations in the world with nearly 70% of population being under 35 years old. The median age is 26.4 years. The main ethnic groups in Iran are Persians (55 %), Azerbaijani (25 %), Kurds and Lurs (13 %), Arabs and Baluchi and Turkmens (5 %), Other minority and Tribal groups (2 per cent).

Figure 14



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

As shown in figure 14, Iran's population during (1967-2012) sharply increased mostly in urban area, while because of rural-urban migration we see slightly decrease in rural areas after 1991. In overall during past 4 decades the population almost tripled and reaching about 76 million. In 2014 supreme leader had an order to stop all incentive for people to have less children and parliament approved a law to encourage people to have more children.

In terms of human development among Middle East and North African countries (MENA), the most recent available data belong to year 2014. Based on life expectancy, adult literacy, school enrolment and GDP per capita, Iran's position is in the middle of the table as shown in table 6 below:

Table 6: Human Development Indicators in MENA Countries, 2014

	Index	Human Development Index (HDI)	Life expectancy at birth	Expected years of schooling	Gross national income (GNI) per capita PPP $
Israel	**19**	**0.888**	**81.8**	**15.7**	**29,966**
Qatar	**31**	**0.851**	**78.4**	**13.8**	**119,029**
Saudi	**34**	**0.836**	**75.5**	**15.6**	**52,109**
UAE	**40**	**0.827**	**76.8**	**13.3**	**58,068**
Bahrain	**44**	**0.815**	**76.6**	**14.4**	**32,027**
Kuwait	**46**	**0.814**	**74.3**	**14.6**	**85,820**
Libya	**55**	**0.784**	**75.3**	**16.1**	**21,666**
Oman	**56**	**0.783**	**75.3**	**13.6**	**42,191**
Lebanon	**65**	**0.765**	**80**	**13.2**	**16,263**
Turkey	**69**	**0.759**	**75.3**	**14.4**	**18,391**
Iran	***75***	***0.749***	***74***	***15.2***	***13,451***
Jordan	**77**	**0.745**	**73.9**	**13.3**	**11,337**
Tunisia	**90**	**0.721**	**75.9**	**14.6**	**10,440**
Algeria	**93**	**0.717**	**71**	**14**	**12,555**
Egypt	**110**	**0.682**	**71.2**	**13**	**10,400**
Syria	**118**	**0.658**	**74.6**	**12**	**5,771**
Iraq	**120**	**0.642**	**69.4**	**10.1**	**14,007**
Morocco	**129**	**0.617**	**70.9**	**11.6**	**6,905**
Yemen	**154**	**0.500**	**63.1**	**9.2**	**3,945**

Source: Human development Index, 2014, World Bank

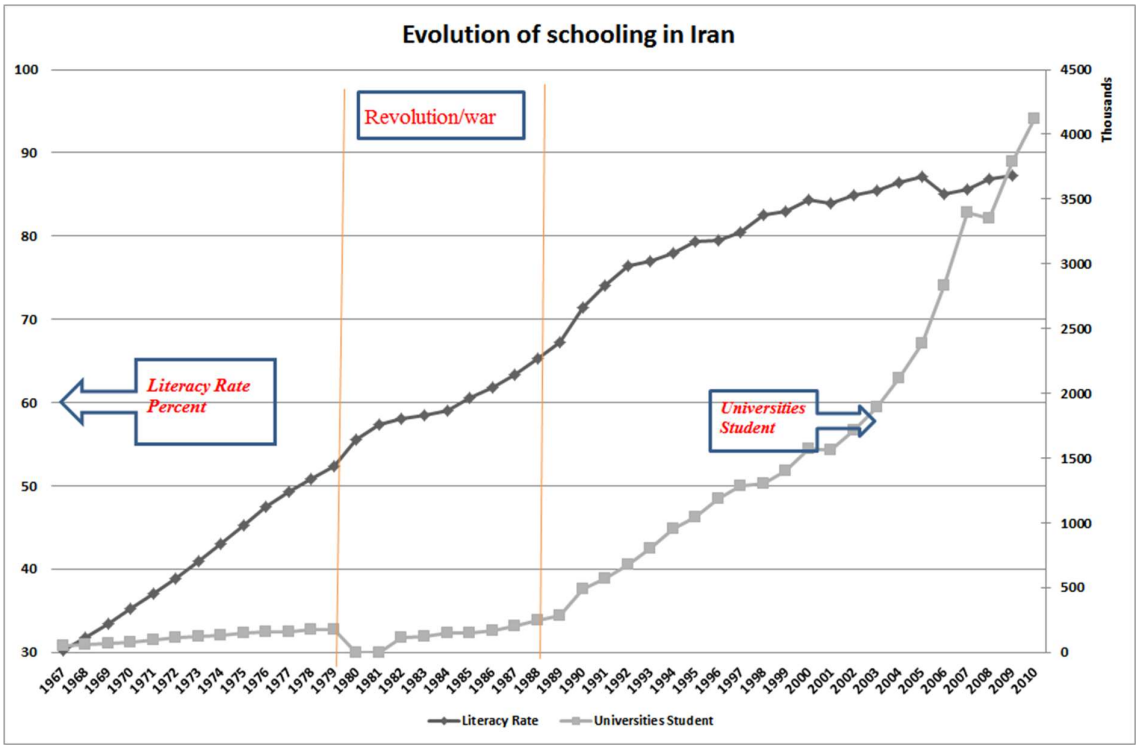
4-2-Education and Literacy:

In 2009 the literacy rate of the population was 87.3 per cent (90 per cent for males and 82 per cent for females).

Graph 15 shows a real revolution in literacy rate in Iran during past 4 decades. The literacy rate was 30 per cent on 1967 with a sharp upward trend: it tripled and reached almost 90 per cent

in 2008. The revolution and war did not affect that upward trend of education, even the Islamic government paid special attention to education in poor and rural areas after 1979 revolution. University student numbers also shows an upward trend until 1979. The universities were closed during 1980-1981 but after that time and during the war there was not a significant increase in university students. When the war finished in 1989 the number of university student increased sharply and reached to 4.1 million in 2010.

Figure 15



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-3- The Trend of Real GDP

The performance of real GDP since early 1960 is shown in the next graph. In 1960, GDP growth was around 11.5 per cent, this number decreased gradually to 6.7 per cent by 1963, continued with some fluctuations and reached more than 18.1 per cent in 1976. Actually before revolution the economy was already in downward trend so this number decreased to minus 9.4 per cent by 1979. In the last three years just before the revolution the average GDP growth was minus 8.6 annually.

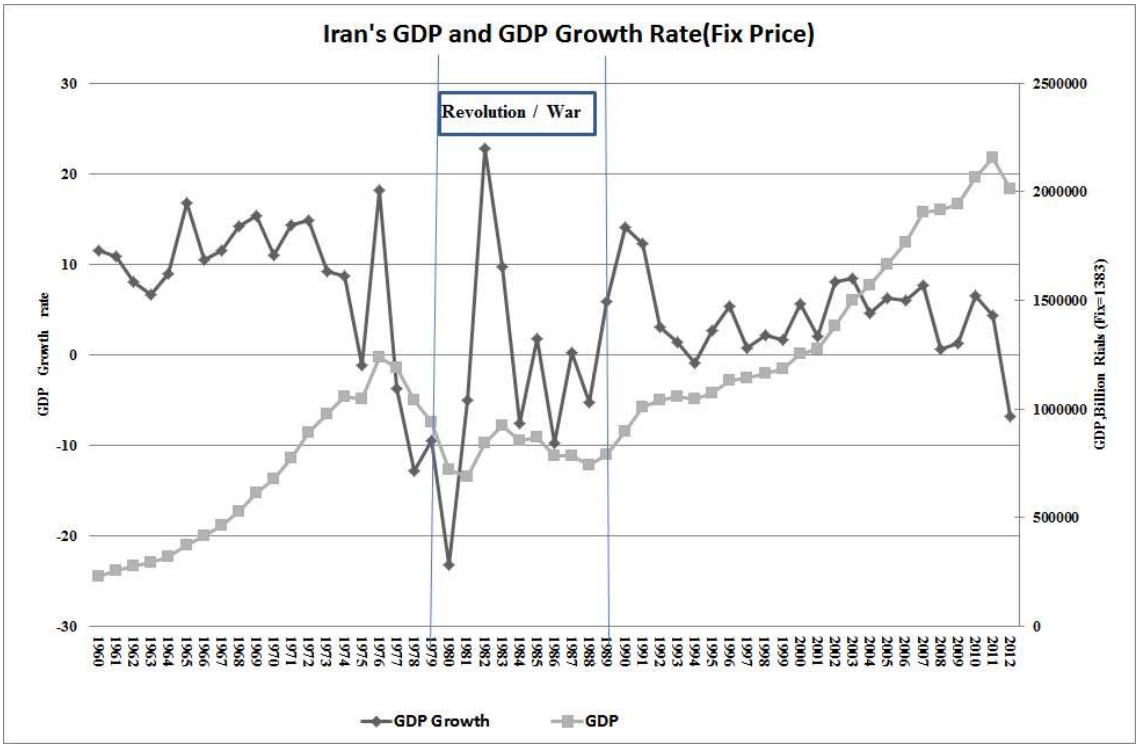
Moreover, the real GDP lowered by almost a quarter of its 1979Q1 value in the two subsequent years. According to Salehi Esfahani *et al.* (2009), part of the problem was the redistribution

and political conflicts that undermined the production and investment incentives. They noted that many large firms and all banks and financial enterprises fell under the government control. The government also, restricted trade and capital movements, and expropriated household property from those who were associated with the preceding Shah's regime. Property rights were at risk generally and there was significant emigration of skilled labour.

The war with Iraq during 1980-1988 also destroyed property and infrastructure and diverted resources away from productive investment. During war time the economic growth mostly was negative but after that the trend mostly was upward. During 2000-2012, Iran's economy has experienced real economic growth rates of about 4.2% on average annually.

"*Overall, Iran's economy recorded an average annual real GDP growth rate of 4.6 per-cents over the four and a half decades between 1961 and 2005. Although this aggregate long-term growth rate surpasses the growth rate for the MENA region as well as the world mean for this period (3.8 per-cents and 3.7 per-cents per year, respectively).*"[18]

Figure 16



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

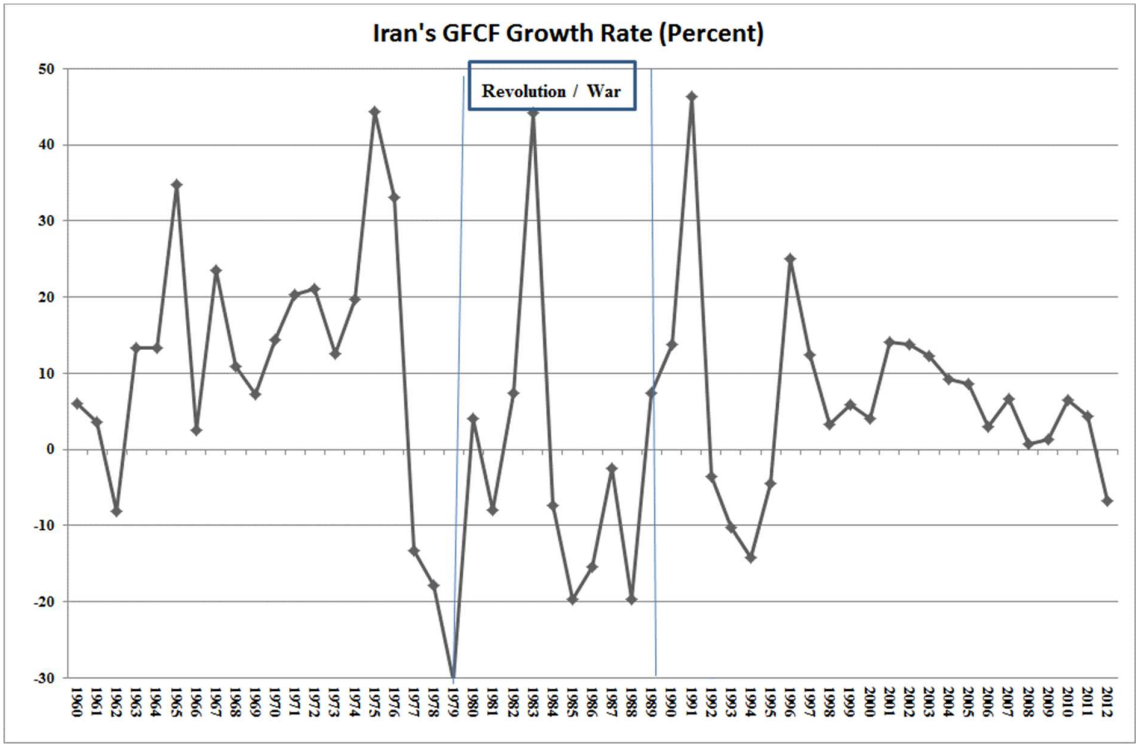
[18] Hakimian, H, "Institutional Change, Policy Challenges, and Macroeconomic Performance: Case Study of the Islamic Republic of Iran (1979–2004)" The International Bank for Reconstruction and Development / The World Bank,2008

However, performance of Iranian economy comparing with high preforming economies such as Korea and Turkey especially after 1979 revolution is disappointing. Iran's Per capita GDP in 70s was higher than Korea and Turkey. After the revolution and the war, Per capita GDP in Iran sharply decreased but Korea's per capita GDP starting to shoot up. In recent years Korea's per capita GDP developed a wide gap with Iran estimated around 20,000 USD per year. Turkey offers similar situation as its per capita GDP was around 12,000 USD while Iran's is 8,000 USD per year

4-4-The Trend of GFCF (Gross Fixed Capital Formation)

As shown in the graph below Iran's GFCF growth rate with some fluctuations, sharply decreased in 1979. After that year it was mostly negative until 1989 when the imposed war with Iraq ended. During 1990 until 2012 there was not constant trend in GFCF growth rate although the overall trend was mostly negative.

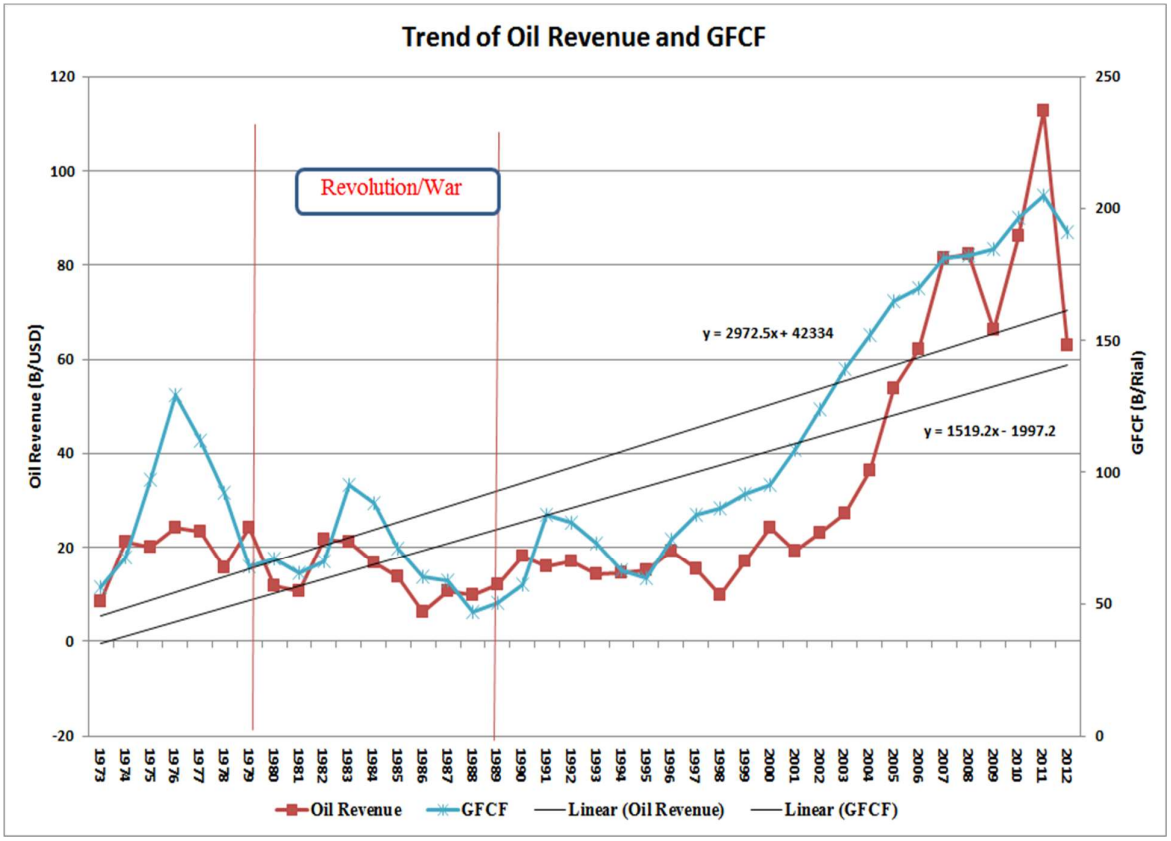
Figure 17



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

Due to the role of the government in capital formation on the one hand and the main income of the government accruing from oil revenue on the other hand, there was significant match between the trend of oil revenue and GFCF during (1973-2012). In presence of scarcity of foreign and private investment in Iran's economy, the graph below proves that the main source of GFCF in Iran is government investment.

Figure 18

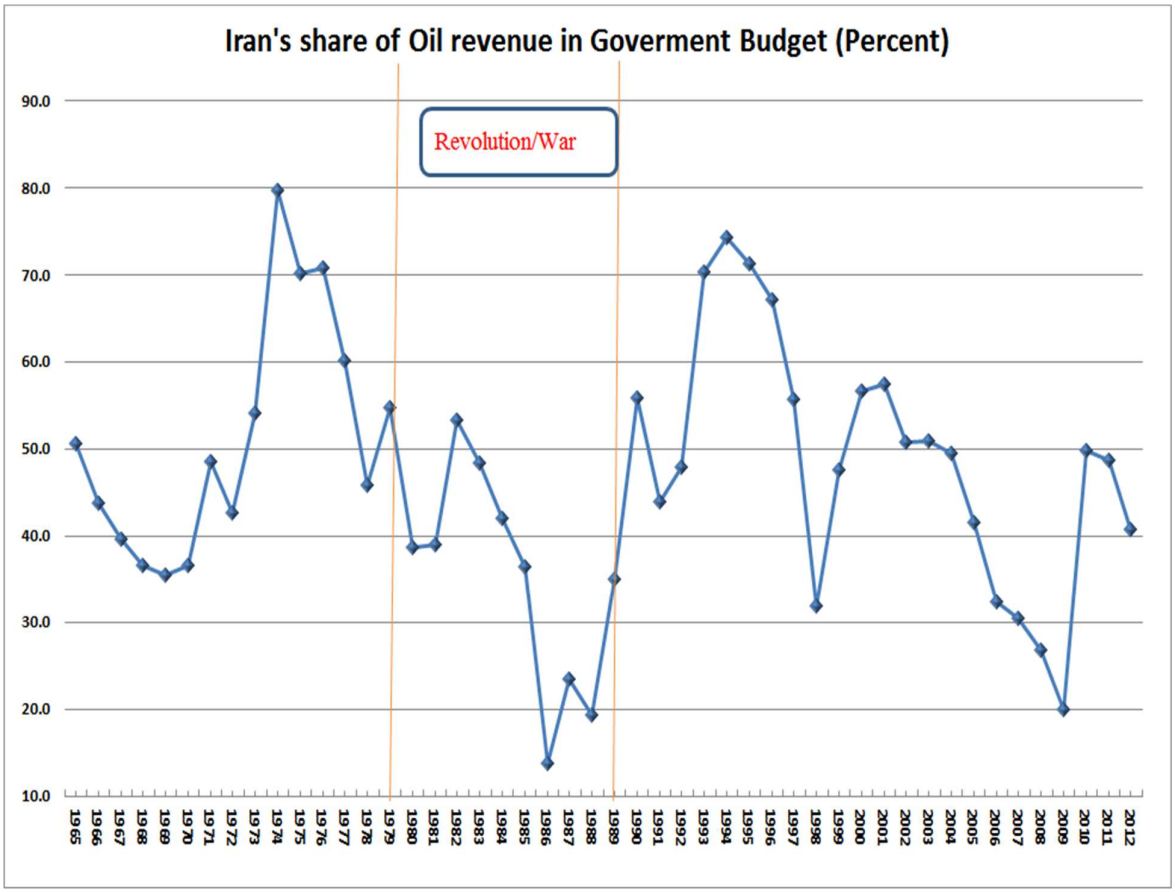


Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-5-The Trend of Government Budget and Oil Revenue

Graph 19 shows that the main source of government budget in Iran is oil revenue. As during 40 years of observations the annual average ratio of oil and gas revenue to government total budget reached to 47.7% and during 2000-2012 it was 42%.

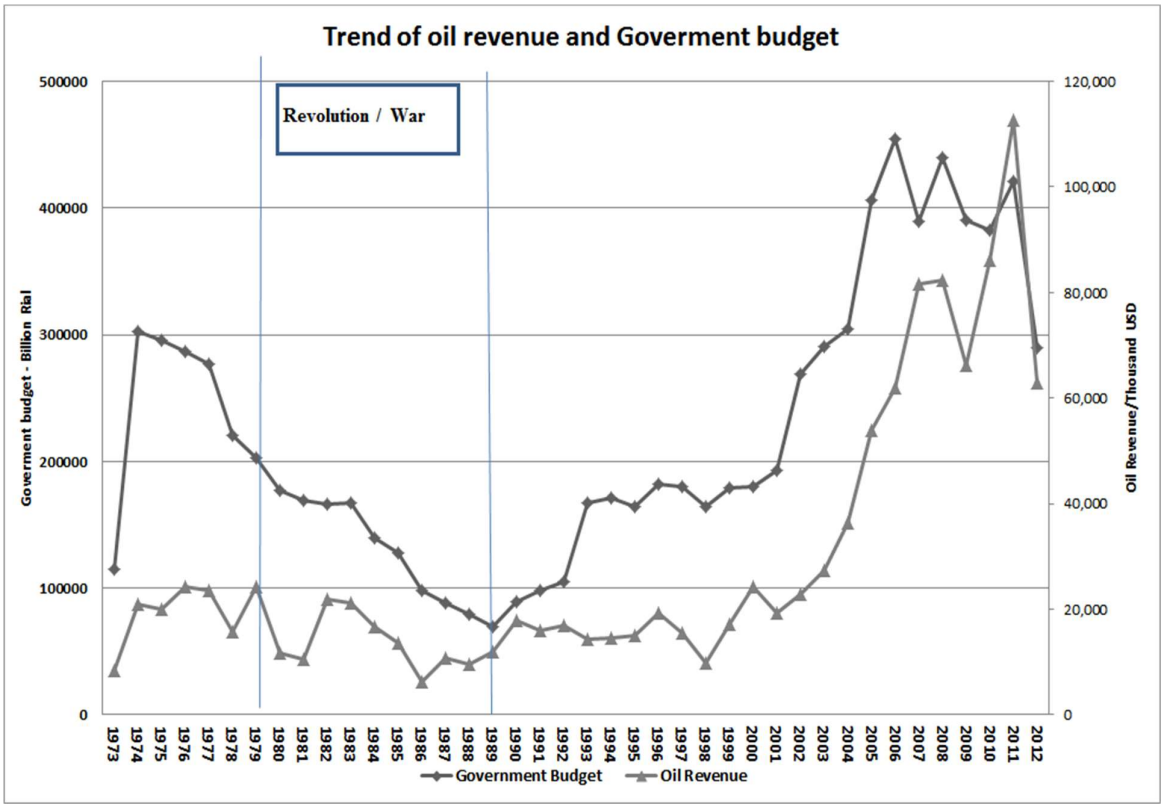
Figure 19



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

As shown in figure 20, trend of oil revenue and the government budget have significant match. Since year 2000 following increase of oil revenue, government budget also increased. Despite the government's verbal commitment efforts to reduce dependency to oil revenue practically the situation is the same as before and has even worsened.

Figure 20



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

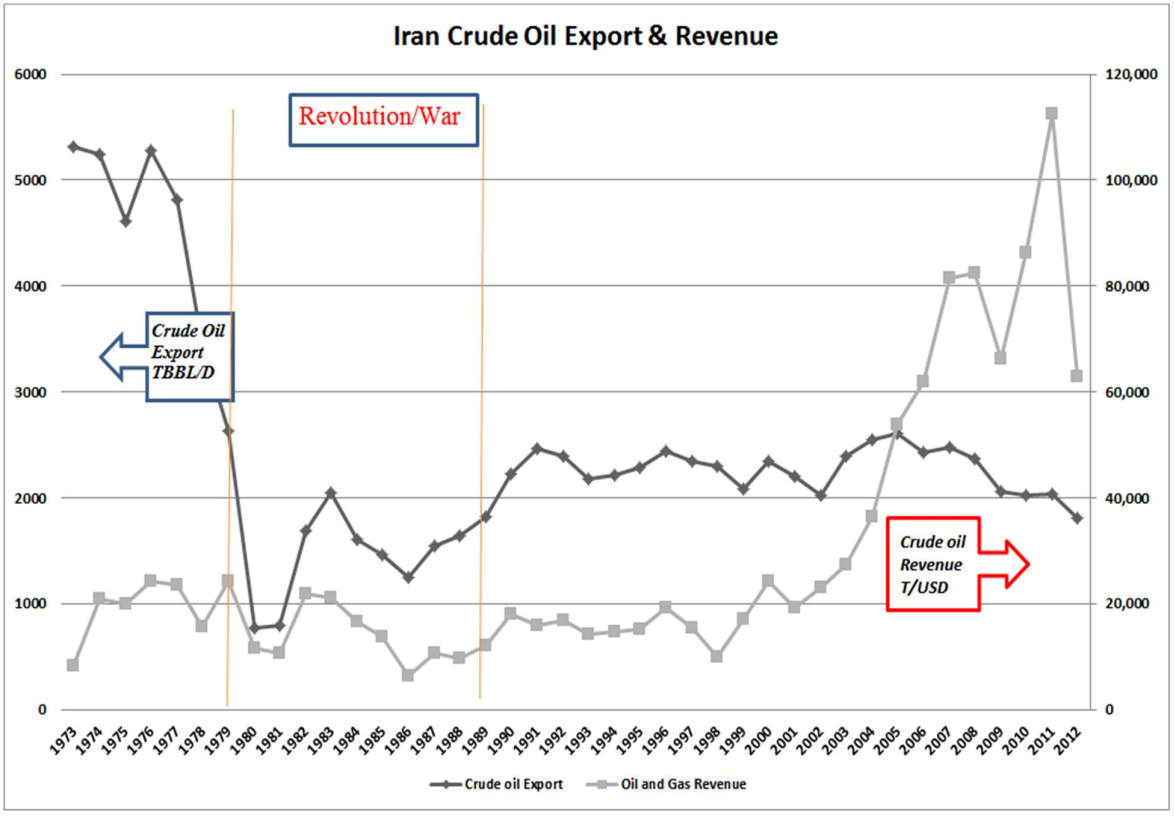
4-6-The Trend of Crude Oil &Non-Oil Export and Oil Revenue

Graph 21 shows the trend of crude oil export and crude oil revenue which do not match together exactly. Despite Iran is a member of OPEC and there is a quota of oil production for each country. But sometimes some countries which have extra capacity of oil production will increase their production beyond the quota in order to compensate the actual oil revenue decline due to decrease of global oil prices. That is why in this research we choose actual crude oil revenue instead of crude oil price in order to avoid getting wrong results.

Crude oil export was around 5 million barrel per day for the period of 1973-78 but following the revolution in 1979 and the war it declined to less than one million barrel per day. After the end of war in 1989 crude oil production and export increased but never reached the pre-revolution level. Having a reasonable price of crude oil, which prevailed, after the war had a significant role to Iran's economic recovery.

Despite a fairly steady trend of crude oil export in recent years, because of increasing oil prices, subsequently crude oil revenues sharply increased and reached to peak amount of 113 billon USD in 2011.

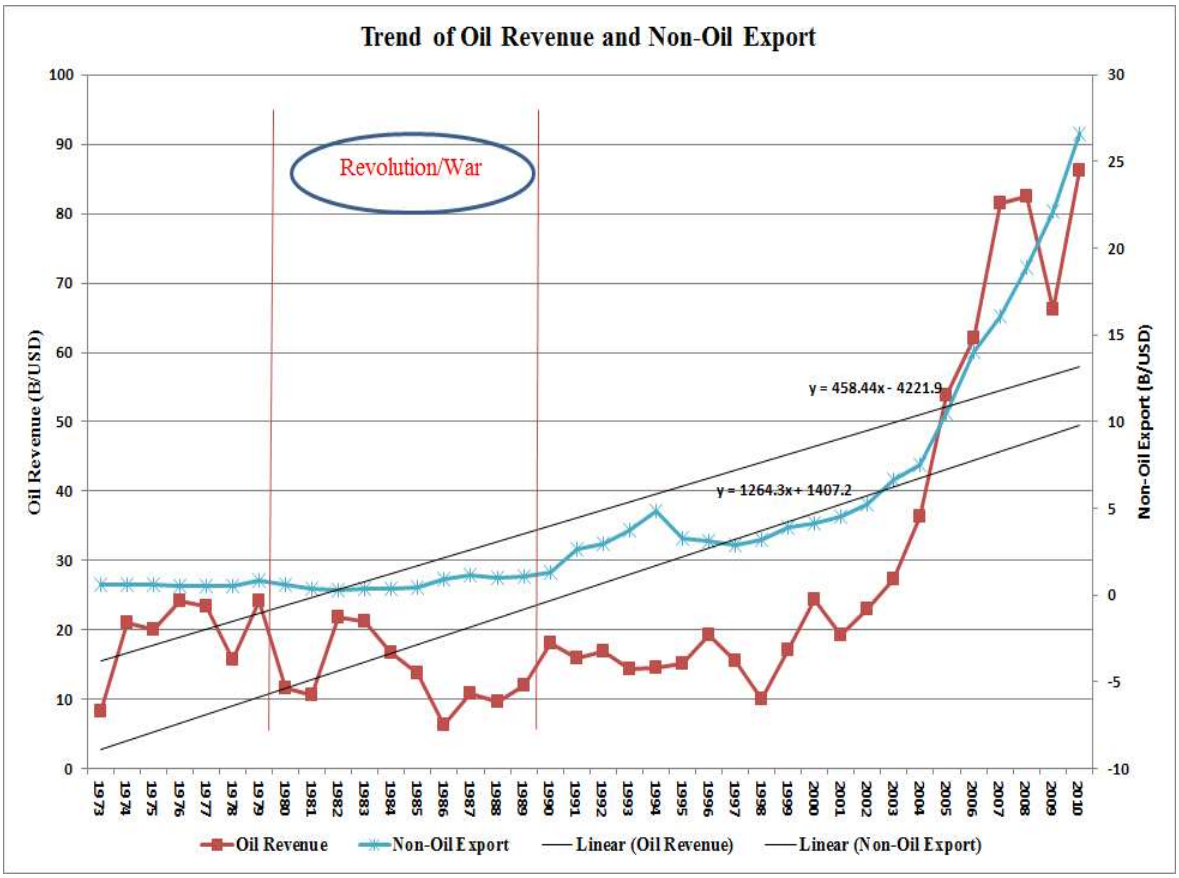
Figure 21



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

In graph 22 the trend of crude oil revenue and non-oil export is shown. Normally when crude oil revenue declines the government tries to increase non-oil exports in order to compensate the decline. But many non-oil products need imported technology and intermediate goods which are less available when oil revenue declines. Despite sharp increase of crude oil revenue after the year 2000, the petrochemical and agricultural sector is the main sources of non-oil export growth.

Figure 22

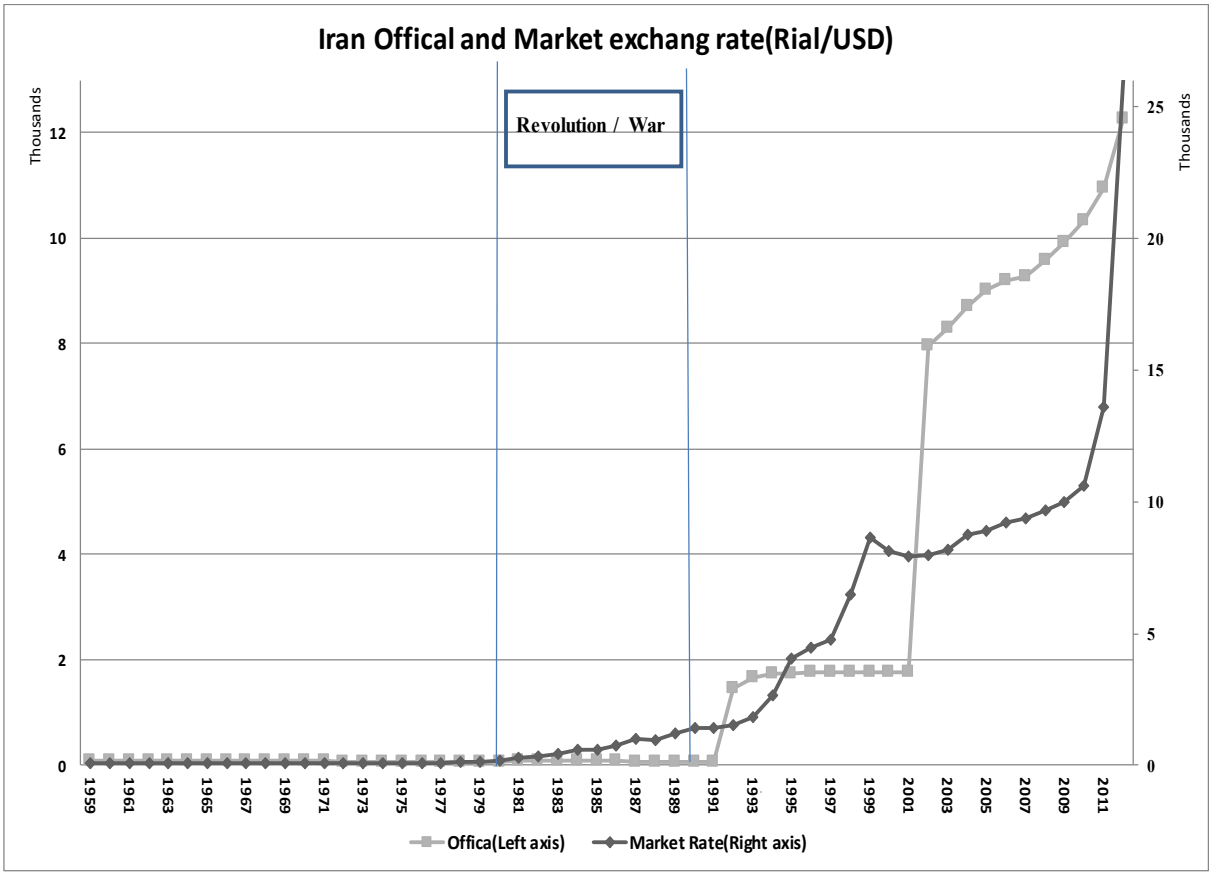


Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-7-The Trend of Exchange Rate

The exchange rate was tightly controlled by the government after revolution. The following graph shows there was not any difference between official and market exchange rate until 1979. But after and because of foreign currency shortage always there was a gap between official and market exchange rate. Crude oil revenues have also had an important impact on the real exchange rate. The government tried to unify exchange rate based on free market rate after war but the process badly managed and caused the inflation crisis. Thus the government again re-established tight management regime of exchange market by controlling foreign trade and the discouraging demand for imports. These controls had a direct relation with oil revenues, which means when the oil revenue declined then the controls, get tighter.

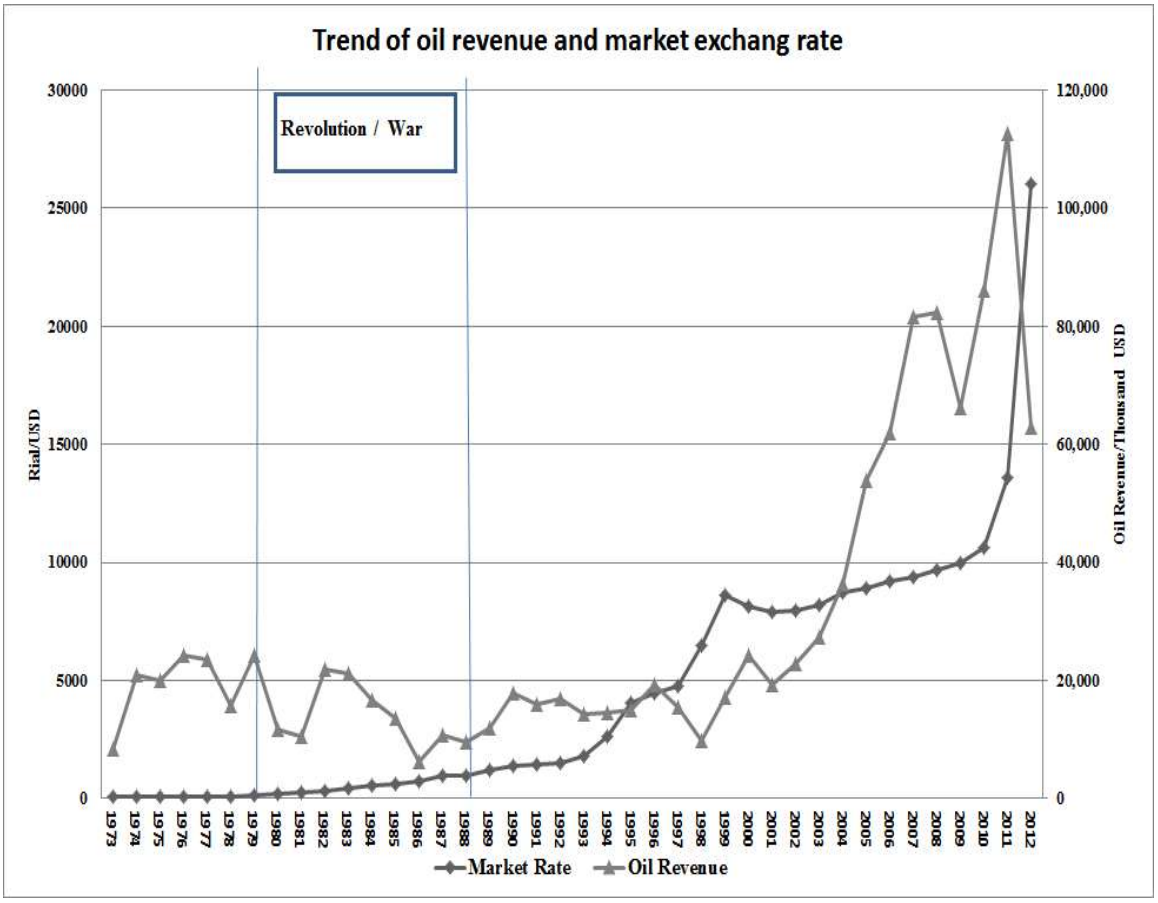
Figure 23



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

Following crude oil price increases after year 2002, the populist administration of Ahmadinejad artificially held exchange rate down by pumping oil revenues into the market. Also in order to control inflation the government increased imports. When sanctions over nuclear issue were established, at the same time oil revenue sharply decreased and fuelled the inflation rate high. Also devaluation of domestic currency in 2011 accelerated the inflation and reached historically high 30% in 2012, despite historically high oil prices. These wrong polices causes Dutch Disease.

Figure 24



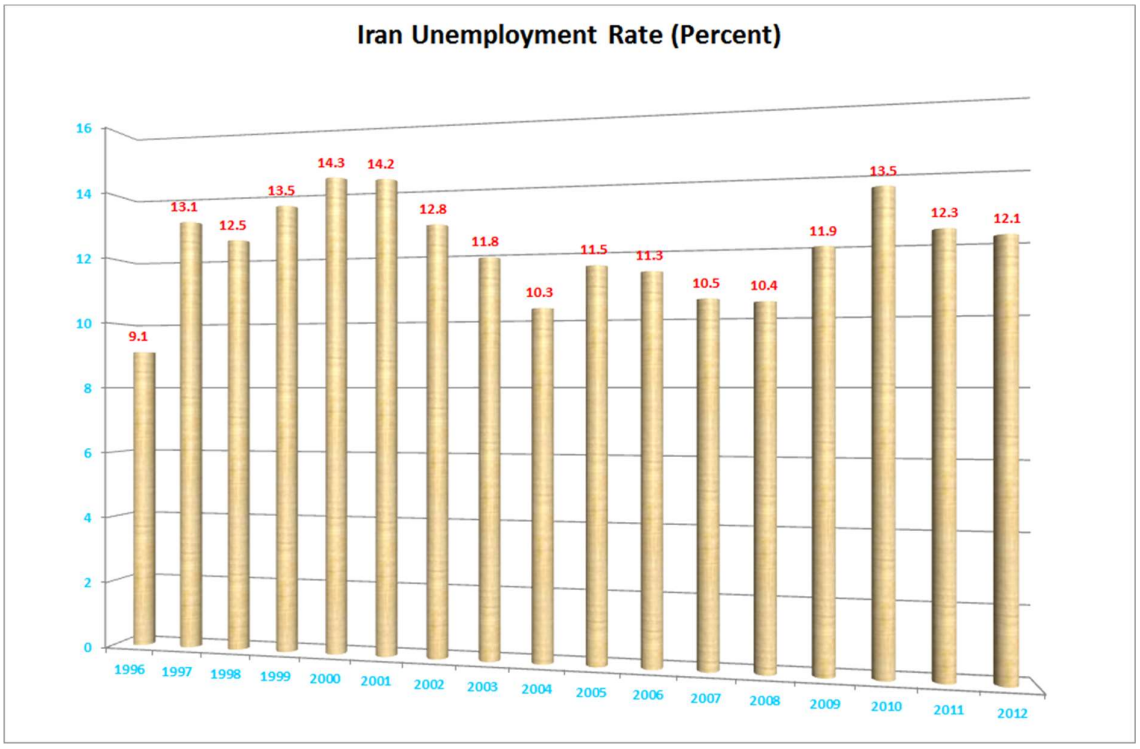
Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-8-Unemployment

One of the big challenges of Iranian government is how to deal with high rate of unemployment. Average unemployment rate for the period of 2000-2012 is about 12 percent. Based on official figure, unemployment rate reached 12.1 per cent in 2012 but independent economic estimations are much higher than this.

Also each year nearly 800,000 new jobseekers enter the market to find job, which puts extra pressure on the government to create new jobs. In these conditions each year many young educated people emigrants abroad to find better job.

Figure 25



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

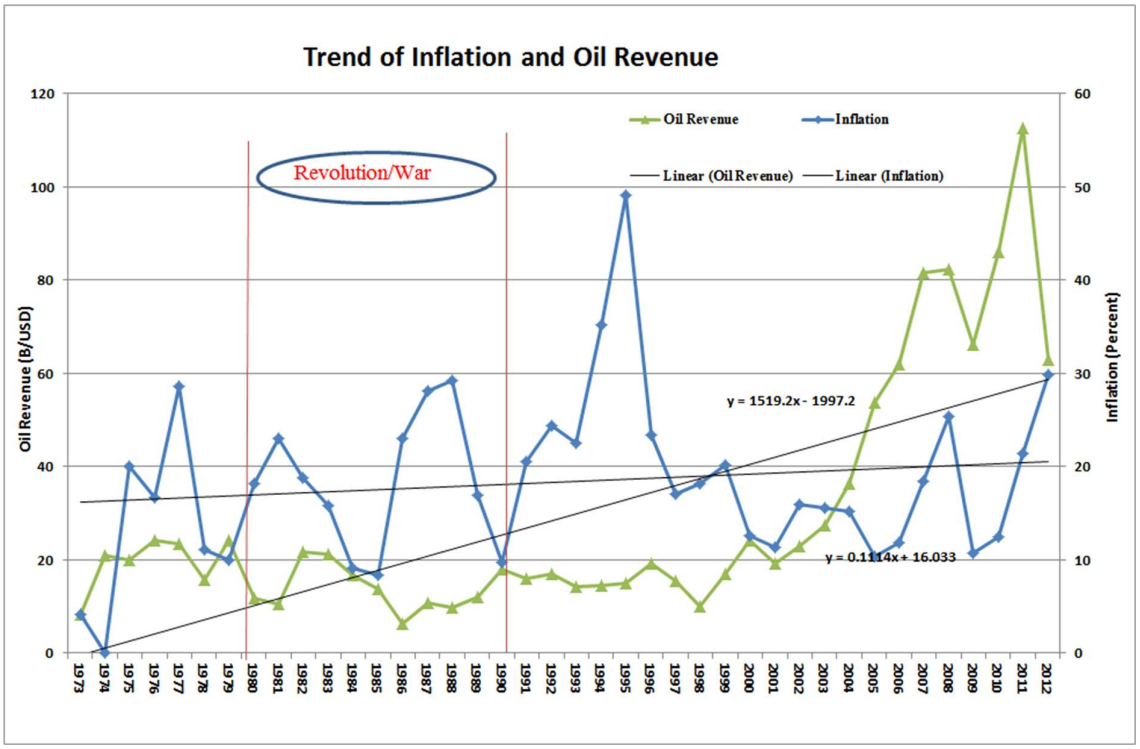
4-9- The Trend of Inflation

Since 1979 high inflation rate (consumer price index) has been one of the main concerns of the government. Although before 1979 the inflation rate was high but after that with some fluctuation it reached its peaks of about 50 per cent on 1995. Although inflation rate is more or less the same in other oil producing countries in the Middle East, during 2000-2012, Iran's economy experienced inflation rates of about 16.2% on average annually.

As Figure 26 shows, the rate of inflation rose sharply in the early 1980s when the economy was struggling with the imposed war and post revolution internal instability and decline in oil revenue due to sharp decrease in oil export. Ending the war, increased oil export and facilitated access to foreign investments thus slightly lowered inflation. But, unifying foreign exchange market based on free market resulted devaluation of the local currency, permitted prices to increase in 1993-94. At the same time sharp increase of money liquidity and imports accelerated the inflation rate. In the following years of 1994, the central bank succeeds to decrease the inflation rate. President Ahmadinejad's populist administration tried to control

inflation by pumping oil revenue into the market and increasing imports but dispute over nuclear power resulted in several sanctions and the government lost more than %50 of its oil revenues. Thus the inflation rate soared in 2012 and reached %30. The main target of president Rouhani's government is to reduce inflation which seems have a reasonable progress in this regard.

Figure 26



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-10-The Income Distribution

The Gini coefficient of Iran income distribution in 60s was around 0.45; in the early years of 70s till 1975 it has increased and in some years reached around 0.50. Gini coefficient from 1979 till mid-1990s, with some fluctuations, has had a decreasing trend and in recent years also had been slightly decreasing reaching 0.38 in 2012. Iran Gini coefficient, like most medium income developing countries, has been higher than that of high income industrialized countries. The ratio of %10 richest to %10 poorest of household income from 1974 till mid 1990s has had a decreasing trend and in recent years with some fluctuations reached 12.9 per-cents in 2012.

Graph 27 shows after the revolution in 1979 the income distribution get better but unofficial figure shows after year 2010 because of high inflation income distribution has significantly worsened.

Figure 27

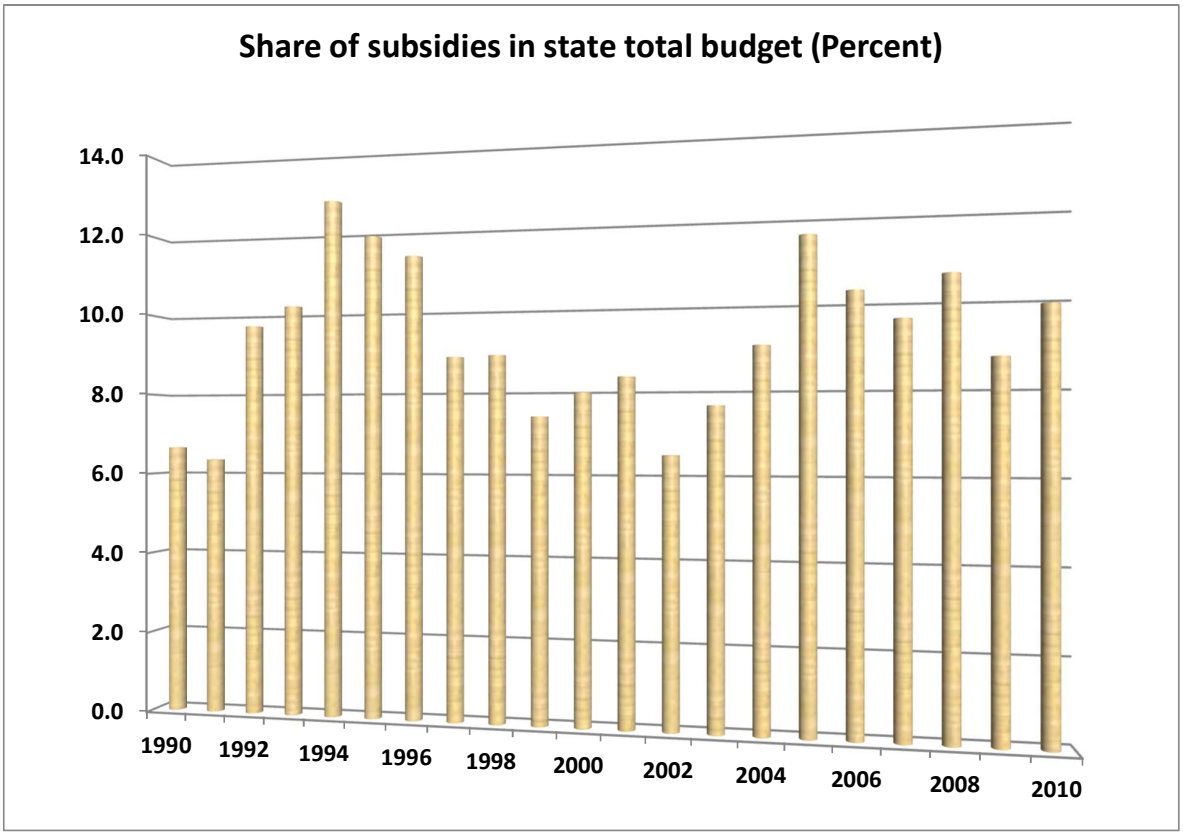
Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-11-Subsidies

In 2010 Iran's leadership came to an agreement on a comprehensive plan for subsidy reform to remove them gradually and distribute cash money to people in order to compensate for people's income loss (two phases of the plan have done already). However, the huge amount of subsidy for energy use, essential food and medicine made it very difficult to estimate its real value. But some independent observers calculated it to be approximately 25 per cent of GDP, which thus represented a main source of the government budget deficit.

The figure 28 shows the share of total subsidies in the total budgets of the government during 1990-2010.

Figure 28



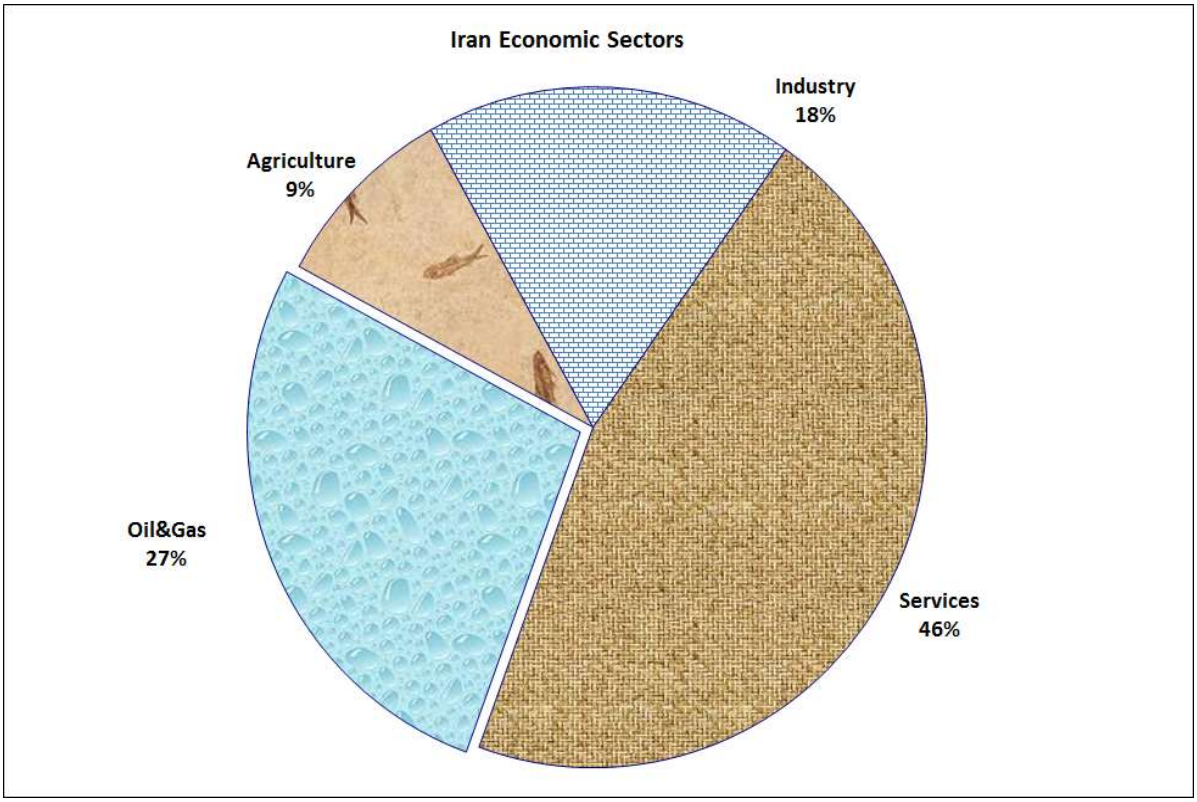
Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-12-Economic Sectors

Iran's economy categorises in four important sectors, based on 2007 statistics, the biggest share belongs to the services including financial services with 46 per-cent of GDP. Oil and gas industry with slightly more than a quarter of GDP is in second place. Industry and agriculture with 18 and 9 per cent respectively are in next places.

Oil and gas industry has got a lot of indirect impact on the economy. For instance, in terms of foreign exchange, crude oil revenue is responsible for about 80 per cent of foreign exchange earnings. Services and agriculture sector create more new jobs than other sectors. However, 85 per cent of non-oil exports belong to agriculture sector.

Figure 29

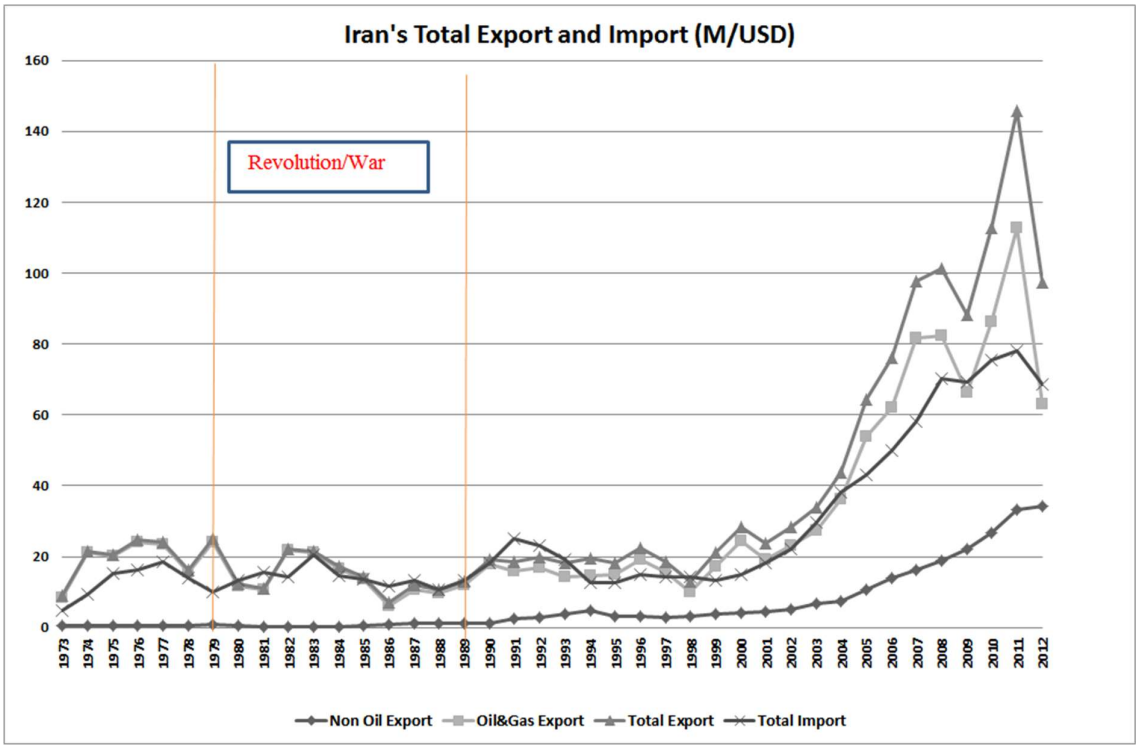


Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-13-International Trade

As shown in the graph below, following the increase of oil revenue in recent years, foreign trade also increased nearly five times for the period of 2000-2011 reaching about $210 billion a year. Also before united nation's sanctions due to high crude oil prices, Iran had positive trade balance for several years.

Figure 30



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

4-14- Iran as an Oil Rentier State

Rentier state term came to economic literature in the early 20s century to refer to the European countries that extended loans to non- European countries. Mahdavy (2009) is used the term as "*a state that receives substantial rents from foreign individuals, concerns or governments.*''[19] In case of Iran oil revenue not only has got driving force of the economy but also has a political influence as well. But why oil revenue called economic rents?

"*Therefore, a rent is at the free disposal of its owner: contrary to an entrepreneur who is pressured by market forces to reinvest the bulk of its income in order to accrue an income in the future, a rentier does not need to do so.*"[20]

Based on some definitions a rentier state is a country in which annual budget is made up by at least 40 per-cent rent. Based on above definition Iran becoming a rentier state since 60s.

[19] Mahdavy, M (1970), ''The Patterns and Problems of Economic Development in Rentier States: The Case of Iran,'' in M. A. Cook, ed., Studies in Economic History of the Middle East*, London*: Oxford University Press
[20] Beck, M (2009), "Oil-rent Boom in Iran?", GIGA Research Programme, page 8

Also oil reliance is measured by the value of fuel-based exports divided by GDP (Ross, 2001). Table 7 shows Index of oil reliant states.

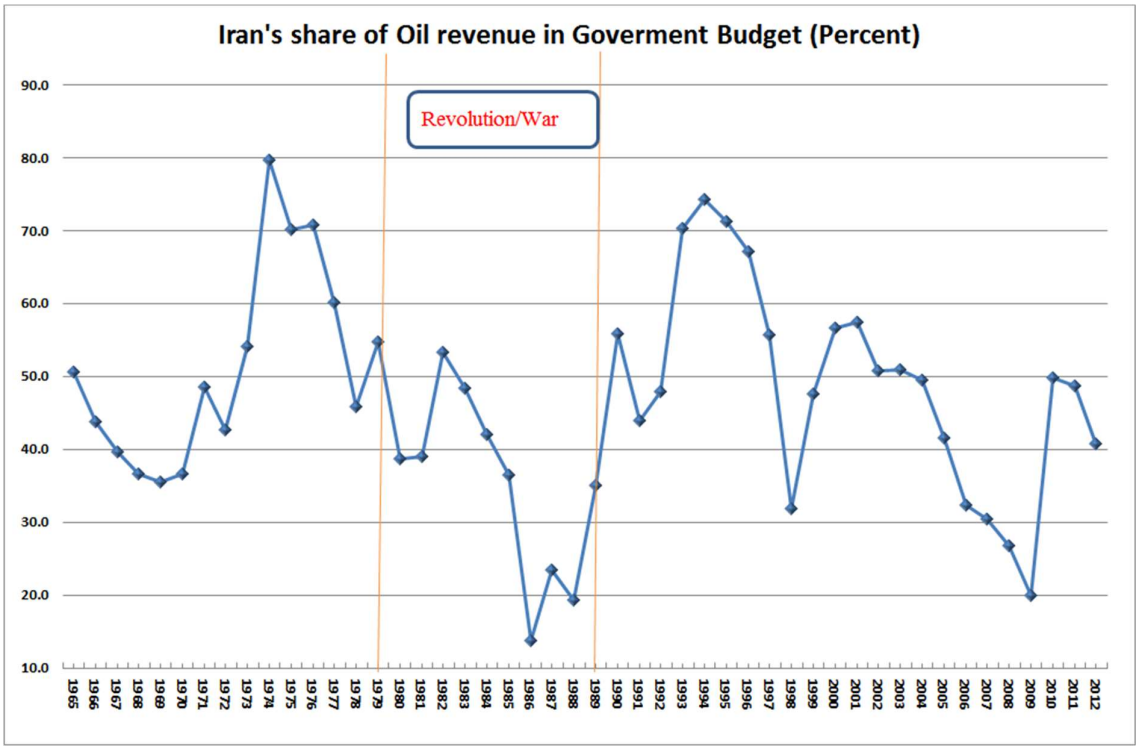
Table 7: Index of oil reliant states

1. Brunei (1994)	47.58
2. Kuwait	46.14
3. Bahrain	45.60
4. Nigeria (1991)	45.38
5. Congo, Dem. Rep.	45.14
6. Angola (1996)	45.00
7. Yemen	38.58
8. Oman	38.43
9. Saudi Arabia	33.85
10. Qatar (1994)	33.85
11. Libya (1988)	29.74
12. Iraq (1983)	23.48
13. Algeria	21.44
14. Venezuela	18.84
15. Syria	15.00
16. Norway	13.46
17. Iran (1983)	***11.95***
18. Ecuador	8.53
19. Malaysia	5.91
20. Indonesia	5.69
21. Cameroon	5.63
22. Lithuania	4.48
23. Kyrgyz Rep. (1996)	4.25
24. Netherlands	3.14
25. Colombia	3.13

Source: Ross, M (2001). "Does Oil Hinder Democracy?" World Politics 53

In rent seeking countries with lack of powerful institutions and democratic structure, those who receives rents mostly uses them in ways most favourable to their interest which is mostly in contrast to good governance. Oil rents are very often used for privilege of the elite and legitimizing authoritarian rule (Elsenhans 1981). In some case -example of Norway- rents may promote high economic growth based on free market and democratic institutions.

Figure 31



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

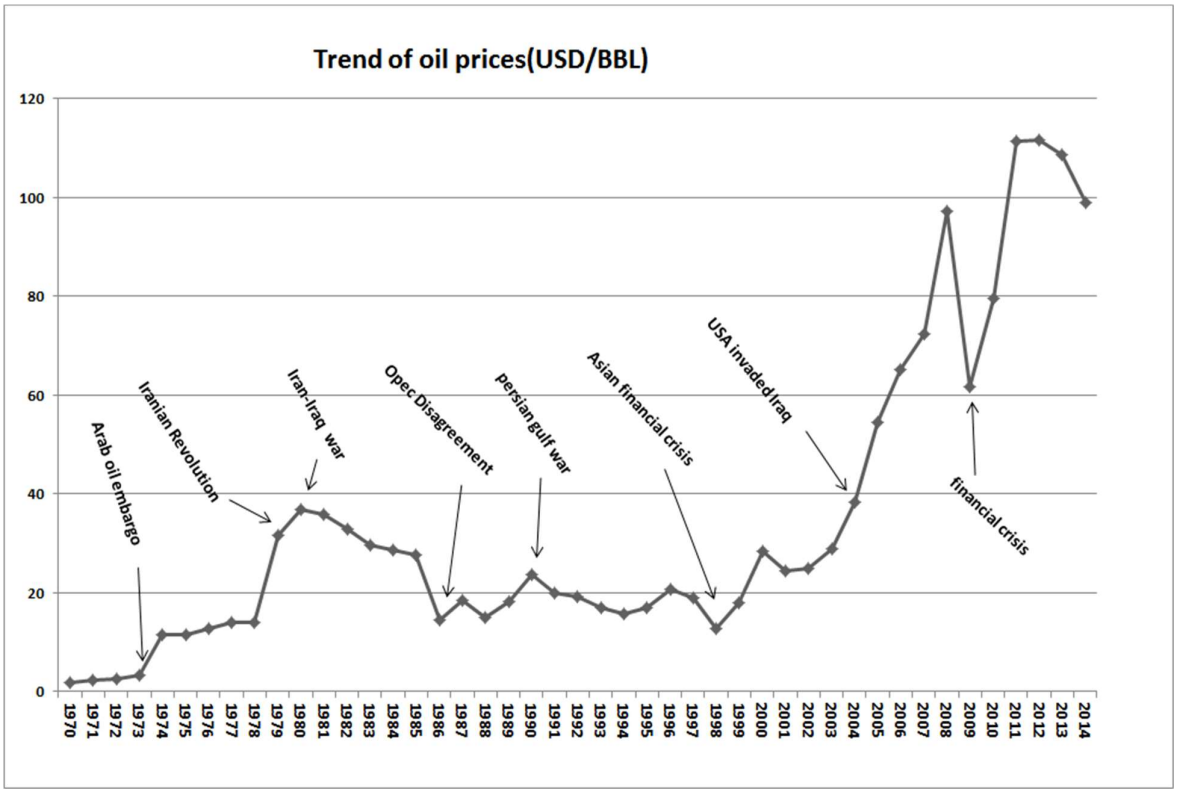
Chapter Three:
Literature Review

Introduction:

After rise of crude oil prices as a result of Arab crude oil producers' embargo in 1973, the impact of oil price shocks came into consideration mostly on developed crude oil importer countries especially USA. But gradually the impact on different economies such as developing oil importer countries and recently developing oil exporter countries became a subject of research and study in economic literature.

Just earlier to this time (1973), in 1971 convertibility of USA dollar to gold was terminated unilaterally by USA. Under the Bretton Woods system US dollar became a leading currency in the world and was adopted as reserve currency by many countries, thus replacing gold. Other countries such as British Pound also adopted floating exchange rate system. Combination of these two events in early 70s created some problems for US economy.

Figure 32



Source: BP statistical review of world energy, 2015

Also there was a common concern that large fluctuations in the real crude oil prices were causing damage to the crude oil importer as well as exporter countries. The analysis of the effects of crude oil price shocks on the economy has been occasioned by changing economic situation and different important events during the time in which the crude oil price shocks happened.

Figure 32 shows crude oil price volatility since 1970. There have been a lot of fluctuations in crude oil prices during the last 40 years of observations since the Arab oil producer's countries put sanction against the West followed by several years of inflation. After that time two further crude oil supply shocks occurred, following Iranian revolution in 1979 and Iran-Iraq war in 1980, both were followed by global recessions. Another event which happened in 1986 with a major effect on crude oil price was disagreement between OPEC countries about crude oil prices. The Iraqi invasion of Kuwait in August 1990 effectively cut around 10 per-cent of world crude oil production from the market and caused crude oil price rise form 20 USD/BBL to nearly 40 USD/BBL. But within six months the crude oil price came back to the normal levels due to some OPEC producers increased production in order to compensate the losses of Iraqi and Kuwaiti supplies. Also two global recessions consist of Asian financial crisis in 1999 and credit crunch in 2008 followed by slowdown of economic growth in several major industrial countries. In 2014 we were facing a drop of crude oil prices up to 40 per cent and resulting in price 60 USD/BBL mostly because of extra supply of old producer and new type of crude oils coming to the oil market after a few year of investment. This new crude oils are called oil shale[21] and oil sand[22]. Downturn of crude oil prices continued in 2015 and 2016.

However, there were a lot of changes in global oil market compared with 70s such as existing strategic oil reserves and emergence of a number of non-OPEC oil producer worldwide.

1- Development of the Empirical Literature

The empirical literature on the macroeconomic impacts of crude oil prices shocks gradually developed as the new phase of the crude oil market began after 1973 crude oil prices shock. One of the first opinions after oil shocks on 1973 was that whether this changes is permanent or temporary of natural energy resource situation.

[21] Oil shale, also known as kerosene shale, is an organic-rich fine-grained sedimentary rock containing kerosene. Mostly can be found in Russia, USA, China and Argentina. Just production in Bakken, Permian Basin, Eagle Ford fields increased from less than 1 million barrel per day in 2007 to 3.83 million barrels per day in 2014.

[22] Oil sands, tar sands or, more technically, bituminous sands, are a type of unconventional petroleum deposit. Oil sands reserves have only recently been considered to be part of the world's oil reserves, as higher oil prices and new technology enable profitable extraction and processing .The huge reservoirs located in Canada and Venezuela

Accordingly, the most important questions were "How would an economy adjust to the new circumstances?" This question provides Rasche *et al*. (1977, 1981) study of the possible idea about reaction of USA economy to the crude oil price shock. They used a Cobb-Douglas production function which takes into account labor, capital and energy resources.

$$Y=Ae^{rt}L^{\alpha}K^{\beta}E^{\gamma}. \qquad (3\text{-}1)$$

The production function estimates enhanced the idea that the new energy prices after 1973 permanently reduced output. However, the estimates revealed that it is not important if we do not account for energy prices before 1973 sample, but as we mentioned it had got critical results to sample after 1973.

"It has been estimated that four to five percentage points of both the higher price level and reduction in national output in 1974 were due to the increased scarcity of energy resources entailed by the quadrupling of OPEC petroleum prices."[23]

The impact of the 1973 oil price shock on real income in eight OECD countries has been calculated by Darby (1982). The estimation is using crude oil prices in an expanded Lucas-Barro real income equation for USA, UK, Japan, Germany, Canada, France and Nederland. These equations were obtained, following Robert Barro (1978), by combining a standard Robert Lucas (1973) aggregate supply function with an aggregate demand function with nominal money, real government spending, and real exports as arguments. The aggregate supply curve has been shifted by oil price shock, causing higher prices and less output. Darby (1982) did not explain the share of three main variables which was involved in the recession after 1973 due to lack of available data. First variable was crude oil price shock, second variable Bretton woods monetary system and third one price control policy for the period of 1971-75.

Rasche *et al.* (1981) studied impact of crude oil price shock on supply side of the economy (rather than demand side) which was completed by James Hamilton (1983). Their study about the role of crude oil price shocks on the USA business cycle by using Granger causality test was a critical point on the research of the macroeconomic effects of crude oil price shocks.

Later Hamilton studied crude oil price shocks in the structure of business cycle and asked this question that why there was not significant economic growth after decline of prices on 1960

[23] Rasche, R.H., Tatom, J.H. (1977)," Energy resources and potential GNP", Federal Reserve Bank of St. Louise Review 59, Page 10.

and 1986? This question raised the issue of possible asymmetric effects of crude oil price shocks. In other word despite of two crude oil prices increase of 70s, a sharp decline in crude oil prices in 1986 raised a new vision of oil price shocks.

Hamilton presented a significant correlation between gross output and oil prices in USA economy. However, he considered the period in which the price of crude oil mostly was upward so he did not pay attention to the situation in period which the crude oil prices decline.

Most of the literature on effect of crude oil price shocks of 90s was directed to the issues for some of OECD countries in terms of size of effect, causality, and asymmetry (Mory 1993 Mork 1989, 1994 Smyth 1993). Meanwhile Mork (1989, 1994) proposed an asymmetric definition of crude oil prices and marked a difference between positive and negative crude oil price changes.

Mory (1993) highlighted asymmetrical effect of oil price shock and noted that oil price increases have negative effect on the economy but oil price decreases are not considerably helpful to the economy at least in short term.

Smyth (1993) supplied an alternative view of asymmetry to that carried out by Mory and Mork *et al*. He was trying to test the hypothesis that the effects of increases and decreases in relative energy prices on output are symmetrical.

"*The major finding is that the relationship between relative energy prices and output is highly asymmetrical. Increases relative energy prices above prices and output is highly asymmetrical. Increases in relative energy prices above previous peak levels have a substantial deleterious effect on output. Decreases in relative energy prices and increases below the previous peak have no effect on output"*[24]

2- The oil importing countries can be affected by crude oil price shocks through four channels

There are few ways that crude oil price shocks can affect crude oil importing economies such as production cost, demand side, monetary policy and asymmetric affect.

2-1-Production Cost

When we consider crude oil price as an exogenous variable thus from a crude oil importing country's point of view increase in the real imported crude oil price is a terms-of-trade shock[25].

[24] Smyth, D. J. (1993)," Energy Prices and the Aggregate Production Function", Energy Economics 15: 105-110.
[25]It is calculated by dividing the value of exports by the value of imports, then multiplying the result by 100. If a country's terms of trade (TOT) is less than 100%, there is more capital going out (to buy imports) than there is coming in. A result greater than 100% means the country is accumulating capital (more money is coming in from exports).

In such cases crude oil enters as an intermediate input in internal production decisions of crude oil importing economies. (Kim *et al*. 1992; Backus *et al*. 2000).

Kim *et al*. (1992) has used McCallum's real business cycle (RBC) models, with relative energy prices entered as an exogenous stochastic process in the production function for USA economy. Regardless of technology shocks, the energy shocks have got a small reduction impact on RBC model but in the Cobb-Douglas case was much more.

Backus *et al*. (2000) extended Hamilton's (1983) view about USA business cycle to international business cycle too. They showed the change in crude oil prices was the main cause of changes in terms of trade in major industrialized countries for the period of 1972-1987. By using dynamic equilibrium model for international business cycle, Backus *et al*. (2000) elaborated that when they control crude oil shocks, the co-movement between the terms of trade and output become less.

"We *find that oil accounts for much of the variation in the terms of trade over the last twenty five years and its quantitative role varies significantly over time.".26*

Rotemberg *et al*. (1996) suspended perfect competition condition of the standard neoclassical growth model in simple aggregative model of output supply. In order to get a clear picture of the amount of reduction in output and real wages by the impact of energy price shock in USA economy. Then they concluded significantly increase the predicted effects of an energy price increase on output and real wages.

2-2- Demand Side

Another channel of crude oil shocks impact on oil importing countries is decreasing demand for goods and services rather than their effects on production costs. For instance, recently Hamilton (2008) emphasized that spending on goods and services by consumers and companies other than energy itself is an important way in which energy price shocks affect the economy.

This view is in line with Lee *et al*. (2002) results on different industry sources of American economy. Their results are based on VAR model and the impulse responses function. Most USA companies not only consider energy price shocks as a shock to their cost of production but also consider energy shocks as a shock to demand for their final products. They showed that for industries which have a large share of oil, in their production cost such as petroleum refinery and industrial chemicals, oil price shocks mainly reduce supply. However, for other

[26] Backus, D., and M. Crucini, (2000), "Oil Prices and the Terms of Trade", Journal of International Economics,

industries like car industry, the oil price shock reduces demand. In other words, oil price shocks reduce supply in oil intensive industry while in other industries reduces demand.
Another view which is most common among policy makers is that economic growth decrease through effects to consumers by decreasing their spending on goods and services because of energy prices increase (Bernanke 2006). This finding is based on this assumption that there is a significant correlation in the long run between the prices of crude oil and retail energy price. Also there are few channels in which changing in energy prices may directly affect consumer expenditures (Edelstein *et al*. 2009):
1-By reducing disposal income, but it is depending on the energy share in consumption.
2-Causing uncertainty about future, thus consumers postponed spending of money especially on energy using durable goods.
Bernanke (1983) extended this view to firm's investments. He concluded that because of uncertainty, consumers start precautionary saving for future unemployment. Although similarly those affects apply to investment expenditures by firms as well. Also there are indirect effects which can cause sectorial shift in the economy by changing consumer and investment behavior. For instance, in car industry even if small changes in energy prices occurs, may have a large impact on the industry by reallocation of labour and capital in the sector and economy. (Hamilton 1988; Bresnahan *et al*. 1993).
"*Automobile firms reacted very quickly to the (oil) shocks by shifting capacity among size classes, so the capacity misallocation was a much less severe problem in the intermediate run.".27*

2-3- Monetary Policy

Another channel that mostly occur in developed oil importing countries to reduce inflationary effect of crude oil shocks when oil price shock happen, is the independent monetary policy response by increasing interest rate. Some studies have addressed the issue e.g. Hooker (1999, 2000) Hamilton and Herrera (2001; H&H) and Bernanke, Gertler and Watson (1997; BGW). The most important study in this regard is BGW (1997). They stated that the Federal Reserve reacted by rising interest rate in order to control inflationary pressure created by crude oil price shock. This policy expanded recession related to crude oil price shock.

[27] Bresnahan, T., and V. Ramey (1993), "Segment Shifts and Capacity Utilization in the U.S. Automobile Industry," American Economic Review, 83, 213-218.

"We find that a substantial part of the recessionary impact of an oil price shock results from the endogenous tightening of monetary policy rather than from the increase in oil prices "[28]
BGW (1997) estimated different situation that Federal Reserve holding constant interest rate by VAR models and concluded that the recessions could be avoided by keeping interest rate constant at the cost of inflation.

2-4- The Role of Asymmetry

The question of asymmetry was raised when oil price shock in 1979 caused recession but falling oil prices in 1986 did not caused economic growth. Before 90s and based on standard models of the transfer of energy price shocks into the economy, the response of real production to either a negative or a positive energy price shock would be exactly the same size. The asymmetry appears because of uncertainty and redistribution effects, so these effects increase the response of macroeconomic aggregates to energy price increases, but reduce the corresponding response to falling energy prices. This situation permits us to explain much larger recessions due to positive crude oil price shocks than standard models.

Popularity of asymmetric effect of crude oil price since 1990 encouraged many researchers to develop this subject (Mork, k 1989; Lee *et al*. 1995, 2002; Hamilton 1996, 2003). In other word earlier than 1990 only positive crude oil price shock was important. Over time researchers have improved this subject and introduced steps of net crude oil price increases. It means if the current crude oil price is more than the maximum price in the past then the consumer reacts to that shock.(Mork 1989, Hamilton 1996). These models describe better the situation when positive oil price shock happen because they created much larger response when we are facing positive oil shock.

There are few channels of asymmetry between oil price shock and GDP. First channel is sectoral shift (Davis *et al*. 2001). They studied the impact of oil price shock on USA job market in industrial sector for the period of 1972-88. Oil prices changes can make shift in different sectors by impact on employment. In short run job market shrinks by oil shock. Job market growth responds asymmetrically to oil price fluctuations.

Second channel is changing demand composition; mostly by changing demand for non-durable goods at short time. But demand on durable goods such as automobile has been affected in long term (Bresnahan *et al*. 1992).

[28] Bernanke, B.S., M. Gertler, and M. Watson (1997), "Systematic Monetary Policy and the Effects of Oil Price Shocks," Brookings Papers on Economic Activity, 1, 91-142.

Third channel is pausing investment; inflation expectation makes uncertainty about future so consumer and firms defer purchase and investment (Hunt *et al*. 2001)

3- Weakening Importance of Oil Price Shocks Over Time

There has been some debate as to why the rise of crude oil price especially for the period of 2003-2008 did not cause a major recession. The term of crude oil price shock has been used to refer to two different issues. Sometimes it marks an unpredictable oil price increase, for example monthly change in the real price of crude oil. Sometimes it is about cumulative result of many small unpredictable changes in the real crude oil price in the same direction often over several years.

Weakening importance of oil price shocks over time addressed in some recent literature such as Edelstein *et al*. (2009) Kilian *et al*. (2009) and Hamilton (2009). Based on Edelstine *et al*. (2009) results there is firm evidence that energy price shock reduced USA consumer spending by changes in precautionary savings, discretionary income, and increase operating cost of energy using durable goods. But the impact is different in 1979 when oil prices increased and in 1986 when oil prices decreased.

For example, the response of real U.S. consumption to an unexpected increase in the price of energy of 1% has dropped from -0.30% prior to 1987 to only -0.08% after 1987. [29]

On the other hand, declining the effects of crude oil shocks can be explained by improving monetary policy as well (Kilian *et al*. 2009).

However, it seems at the same time some other economic elements made oil supply or demand shocks deeper, which affects crude oil importer countries differently. One explanation suggested by Hamilton (2009)[30] is that the crude oil price increase between 2003 - mid 2008 was due to worldwide demand increase. Although previously crude oil price shocks mostly were driven by exogenous crude oil supply shocks in oil producer countries.

Regardless of importance of different crude oil demand shocks which could be either be cyclical or speculative in origin, has explained the weakening of the importance of crude oil shocks, because of:

1- Some previous estimation is sensitive to sample period in run or average oil price shock

2- Structure of demand and supply shock has changed over time

[29] Edelstein, P., and L. Kilian (2009), "How Sensitive Are Consumer Expenditures to Retail Energy Prices?" Journal of Monetary Economics, 56, 766-779.

[30] Hamilton, J.D. (2009), "Causes and Consequences of the Oil Shock of 2007-08," Brookings Papers on Economic Activity, 1, Spring 2009, 215-261.

3- If decline in crude oil price is due to increase in supply the impact in economic growth would be more than when decline is due to weakness of global demand.
4-Strong growth in the global demand for industrial commodities after year 2000

Anyway we need to review the current oil shock models and consider oil price as an endogenous variable rather than existing models which mostly consider oil price as an exogenous variable.

4- Institutional Economics

Institutional economics concentrate on understanding the role of institutions (for example individuals, companies, government bodies, judiciary, military, social norms) in forming economic behaviour.

We are facing countries rich in natural resource that performing differently in terms of development and economic growth in comparison to poor resource countries. The question is that what is the reason? Some observers claim that the main reason for quality of economic performance is differences in the quality of institutions.

For example, the economic growth of poor natural resource countries such as Korea, Singapore and Turkey are better than rich natural resource countries such as Saudi Arabia, Iran, Venezuela, Angola and Nigeria. Although there are some economic growth winners among rich natural resources such as Botswana, Canada, Australia, and Norway. Based on World Bank statistics (1994) among 82 countries just five rich natural resources belong to top 15 per capita incomes.

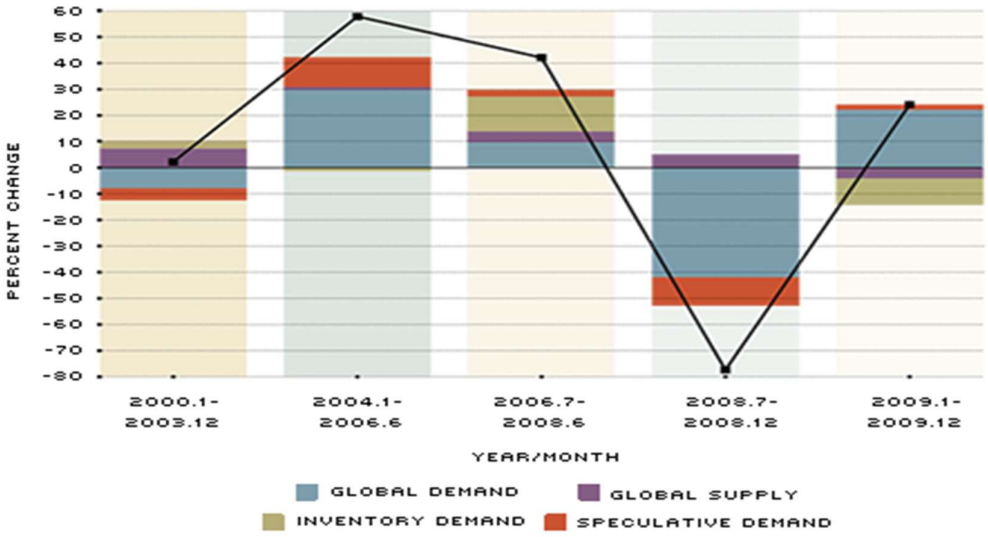
The idea that the rich resource countries preform worse than poor resources countries in terms of economic growth was empirically studied in mostly late 20th century including Auty (1990), Gelb (1988), Sachs *et al*. (1995, 1999), and Gylfason *et al*. (1999).

5- Determinants of the Real Price of Crude Oil in Short and Long Term

Our understanding of determination of crude oil price has changed dramatically in recent years. In 70s the prevailing view was that exogenous crude oil price shocks normally started by crude oil supply problem due to political tension in oil producer countries. But today we know that crude oil supply shocks have no enough power to determine the crude oil price. Although OPEC tries to control the crude oil market by setting up quota system but nowadays it has less control in determining crude oil prices.

The following graph shows the percentage changes of four main contributor of crude oil price for the period of 2001-2009[31].

Figure 33: Main contributors of crude oil price determinations



First contributor is global supply of crude oil which mostly depends on Organization of Petroleum Exporting Countries (OPEC) production level. As shown in the graph global supply has little impact on determination of crude oil price compared with other factors during period under investigation.

Global demand of crude oil is second contributor, after rise in the crude oil price in 2003, providing enough evidence that global demand for crude oil is biggest contributor to determination of global crude oil prices during considered period. Global demand for crude oil heavily depends on economic growth in the world and especially emerging economics such as India and China. Also fluctuations in worldwide economic activity and/or global business cycle cause changes in demand for crude oil.

Third contributor is global oil inventory demand that divided in two categories. A) The long run view, which is creating strategic crude oil reserve to maintain supply of crude oil in case of any shortage in global crude oil supply. These strategic reserves mostly manage by

[31] Juvenal, Luciana; and Petrella, Ivan. "Speculation in the Oil Market." Working Paper 2011-027B, Federal Reserve Bank of St. Louis, January 2012.

industrial oil consuming countries such as OECD[32] countries. B) Short time view, expects future shortage in crude oil supply due to political instability in key oil producing countries that may create extra demand by refineries for storage purpose which cause increase current prices.

Speculation is fourth contributor to determine global oil price in oil futures exchanges (paper market). One of the interesting findings of the recent literature is that speculative demand shocks may have large immediate effects on determination of crude oil price. Somehow, these speculative crude oil demand shocks look like the forms of shocks that in the earlier literature as known exogenous events mostly in the oil producer countries. There is evidence that these regional events surely matter, but not so much through their effect on crude oil production, but through their effect on expectations of future crude oil production cuts.

Also conditions in parallel international markets such as stock markets, gold and currency markets have played an important role in determination of crude oil prices in paper market. When stock markets in industrial countries are in downturn so is international money transfers in oil futures exchanges. On the other hand, oil futures exchanges have opposite direction with value of US Dollar, which means when US dollar gets weaker then the prices in oil market get stronger.

6- How Much Does Speculation Contribute to Oil Price Volatility?

Over the past few years' speculators have expended tens of billions of dollars in USA energy commodity markets. A popular view among professionals and policymakers is that oil price increase for the period of 2003 -2008 has been caused by speculative behavior in oil futures exchanges (paper market), not by market fundamentals. But this view is less accurate as evidenced recently by the fact that oil futures prices responded to much the same economic forces as prices in the physical market.

"We find that the existing evidence is not supportive of an important role of speculation in driving the spot price of oil after 2003. Instead, there is strong evidence that the co-movement between spot and futures prices reflects common economic fundamentals rather than the financialization of oil futures markets."[33]

[32] On 14 December 1960, 20 countries originally signed the Convention on the Organisation for Economic Co-operation and Development. Since then, 14 countries have become members of the Organisation.

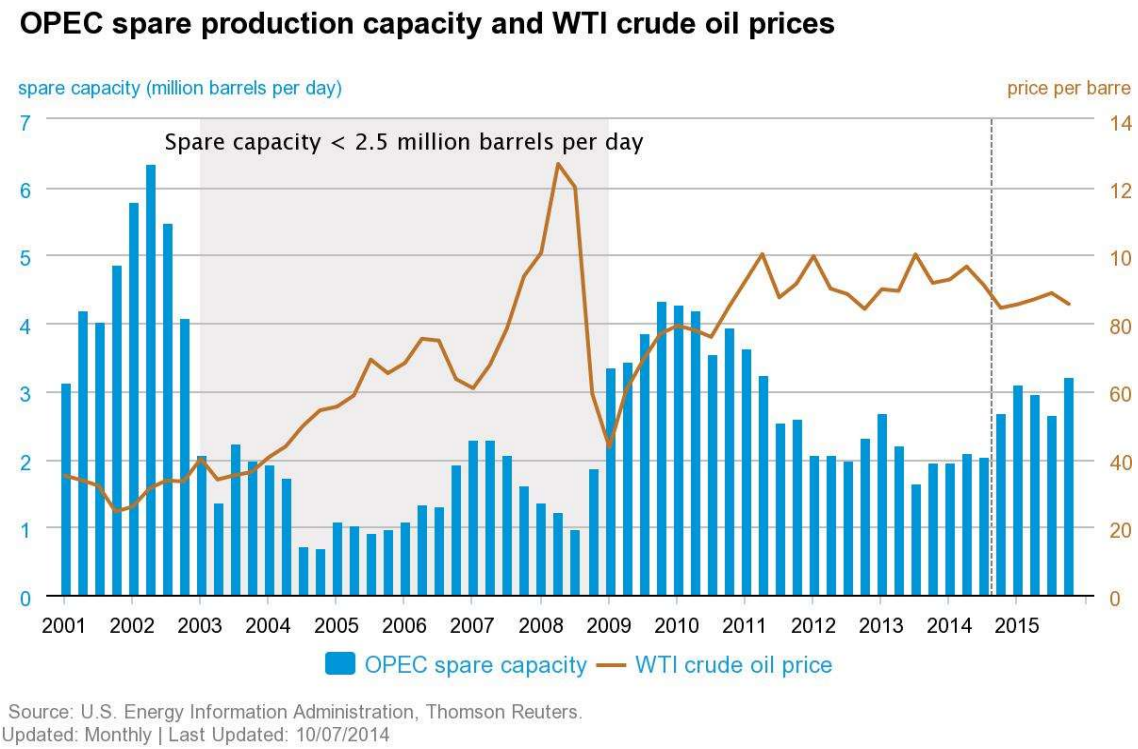
[33] Fattouh,B., Kilian,L. , Mahadeva ,L.(2012) "The Role of Speculation in Oil Markets: What Have We Learned So Far?". The Quarterly Journal of the IAEE's Energy Economics Education Foundation Volume 34, Number 3

The evidence presented below refutes those who would blame speculators.

1-No decline in consumption of crude oil and oil products in response to the higher prices of oil in futures exchanges and physical market due to high global demand for oil during the period under investigation.

2- There is no enough excess capacity of crude oil production in the world especially among OPEC. So when the market gets tight there is no immediate extra supply available to compensate the shortage in the market.

Figure 34



Source: Kule, cliff (2012) "7 Reasons Speculators are Not to Blame for Higher Oil and Gas Prices" http://www.financialsense.com/

3 - Floating oil inventory[34] during the run up period decreased.

4- The price of other energy sources such as different coal which is not traded in futures market had increased as well so we cannot blame speculator in oil paper market for increasing oil prices in oil physical market.

[34] A Floating Production, Storage and Offloading (FPSO) unit is a floating vessel used by the offshore oil and gas industry for the production and processing of hydrocarbons, and for the storage of oil.

5- Oil futures exchanges is different from stock market, in stock market zero sum game is not applicable because in stock market when prices go up every one can gain but in futures exchange zero sum game apply. Meaning that in paper markets there should be one seller and one buyer and the gain of one side is equal to loss of other side.

7-The Effect of Crude Oil Price Fluctuations on Crude Oil Exporting Economies

Since 2000s the impact of crude oil price/revenue fluctuations on developing crude oil exporter countries came into economic literature mostly through use of time series methods.

Most crude oil exporter countries count on oil revenues as their main source of foreign exchange revenue and their government budget. Meanwhile decreasing crude oil revenues due to falling oil prices create serious problem for crude oil producers. Even in this case they are not able to borrow money from abroad easily. Also oil revenue in major oil exporting countries not only has economic impact but also there is a huge political impact as well.

On the other hand, in case of increasing crude oil prices, this leads to a prompt transfer of wealth from oil importers to oil exporter countries. This has different impact in short and long term. These effects depend on government policy as how this additional oil revenue is used. If extra revenue is used internally thus aggregate demand curve moves upward. In case of having potential production capacity, this leads to economic growth otherwise cause inflation and depreciation of the local currency.

At the same time oil revenues could be invested in economy in general and oil industry in particular. In this case if the investments are considerable they will increase demand for others inputs such as labour.

Moreover, most of the oil exporting countries are importer of industrial goods and high technology services so this transmission may lead to inflationary pressure as a result of oil price increase.

However, some of the additional revenues can be spent to import non-durable goods from abroad in order to avoid increasing liquidity. Also they can put the extra money into international financial market in order 1) to use later when in future crude oil prices may decline 2) diversifying the economy; injection of all oil revenue into internal economy is limited so oil exporter must invest some of the revenues in oil importing countries. The good examples of this policy are Saudi Arabia and Kuwait which have done investment in oil industry all over the Europe and Far East.

But usually because of weakness of institutions in oil export countries increasing oil revenue is devastating in long term. Oil revenues have huge political impact in most of the oil export countries called rentier states which is the main obstacle to social, political and economic reforms.

The consequence of sharp decline in crude oil revenue in oil exporting countries is considerable. In this situation major oil export countries struggling with high inflation, low economic growth, unemployment, political unrest and devaluation of local currency.

8- Empirical Evidence

There are some empirical literatures related to our subject that can be summarised as follows. Some of the below literatures will be discussed in details in next chapters separately.

Table 8: Summary of some empirical literature

	Production Function	**Multiple Equation**	**Business Cycle**
linear Regression	Rasche and Tatom,1977,1981; Ram and Ramsey,1989;etc	Bruno and Sachs,1982,85; Hickman,Hunington,1987 Darby,1982;etc	Hamilton,1983,1996,2005; Burbridgand Harrison,1984; Gisser and Goodwin,1986,etc
Asymmetric Relationship Estimation	Smyth,1993		Mork,1989; Mory,1993; Olsen and Mysen,1994; Ferderer,1996; Perry Sadorsky, 1999; MaryG.Finn,2000; Brown and Yücel,2002; Sandrine Lardic,2006; Alessandro Cologni,2007;etc
VAR, VECM, OLS, Panel data			Francois Boye (2001, Ecuador) (2002, Mexico)

			Eltony (2001,Kuwait) Farzanegan (2008,Iran) Iwayemi *et al*. (2007,Nigeria) Pesaran *et al*. (2009,Iran) Jbir (2008,Tunisian) Siami *et al*. (2010,Iran) B. Yang *et al.* (2008,17 oil rich countries) Samadi *et al*. (2009,Iran) Ayadi (2005,Nigeria) Berument *et al*. (2002,MENA Countries) Alavi Rad *et al*. (2006,Iran) Mehrara (2006,Comparative Study) Mehrara (2006,Selected oil exporting) Dehkarsalari *et al*.(2011,Iran) Gausden (2010,UK)Ahmed *et al*.(2011,Malaysia) Cologni *et al*.(2006,G-7 Countries) Jimenez-Rodriguez *et al*.(2004,OECD Countries) Elmi *et al*.(2006,OPEC and OECD) Olomola *et al*.(2006,Nigeria) Ito (2006,Russia) Lee *et al*.(2002,USA
Asymmetric Threshold Model			Mehrara (2011, Iran) Maki *et al*. (2010, Iran) Mehrara (2008, Selected Countries) Kumar (2006, India)
Institutional Economy, Resource Curse, Rent seeking, Dutch Disease			Mehrara (2009,2010,2011, Iran) Bjorvatn *et al*. (2005, Iran) Farzanegan (2010,2011, Iran) Mehlum *et al*. (2006, Selected Countries) Larsen (2005, Norway) Beck (2009, Iran) Musai *et al*. (2011, Iran) Bahramirad *et al*. (2008, Oil Export Countries) Mehrara (2009, Selected Countries) Sadr *et al*. (2008, Oil Exporting Countries) Barro (1991) Sachs and Warner (1995, 1997) Sala-i-Martin (1997) Keikha A *et al*. (2012) Boschini *et al*. (2007) Isham *et al*. (2003) Bjorvatn, K *et al*. (2005) Mohaddes,K and Pesaran,M (2013)

Chapter Four:
The Impact of Oil Revenue Fluctuations on the Macroeconomic Variables of Iranian Economy

Introduction:

The impact of oil price shocks on the macro-economy became popular first in USA after recessions created by tensions mainly in Middle East since 70s. Researchers all carried out studies to find relation between recession and oil shocks, finding being the negative effect on output when booming oil prices occurred. So as a result oil price shocks were responsible for some recessions in developed countries (Hamilton, 1983; Mork, 1989).

However most of the studies on this subject were carried out in developed oil importer countries. We are faced with a different situation in crude oil exporter countries. For instance, in case of a positive oil price shock, oil exporter countries are earning more foreign currency, therefore increasing internal and external demand for goods and services. On the other hand, such positive oil price shocks will cause global inflation and also decreasing demand for crude oil in oil importer countries.

There are a lot of empirical studies on the subject of oil price impact on the economy in developed oil importer countries but we can also find some such studies for developing, oil-exporting countries as well.

This chapter analyses the dynamic relationship between crude oil revenue shocks and major macroeconomic variables of Iranian economy by applying an Autoregressive-Distributed Lag (ARDL), Pesaran Bound test and vector error correction model (VECM), we also check the direction of the causality. This will improve our understanding of how crude oil revenue fluctuations impact key macroeconomic variables and the dynamic response of these variables.

1-Literature Review

As is mentioned in the literature review chapter, there is a separate literature review section in each empirical (mathematical) chapters. A key feature of existing literature in this subject is that it applies mostly to developed oil-importing countries. For developing oil-exporting countries such as Iran, the following studies are in line with the chapter's subject.

Siami *et al*. (2010) studied the effects of crude oil price shocks on output and monetary policy in Iran over the period of 1991Q1-2008Q1. By using a Structural Vector Autoregressive

(SVAR) model for short-run analysis and a Global Vector Autoregressive (GVAR) model for the long run specification relationship between variables. The macroeconomic variables of the model include Crude Oil Price, GDP, Inflation, Exchange Rate, Interest Rate and M1. The research finding shows a crude oil price shock affects M1 in a positive way and interest rate with negative relation. Also at the beginning, the impact of crude oil price shock on interest rate would be negative, but later on at the third quarter it becomes positive. Moreover, a crude oil price shock causes higher inflation and exchange rate.

Yang *et al.* (2008) analysed natural resource booms and economic development for 17 oil-rich countries during 1960-2002. For testing the long run relation between crude oil prices and GDP per capita and investment the Engle-Granger bivariate co-integration procedure, and Error Correction Model (ECM) estimation is employed. Result shows that in the majority of countries under investigations GDP per capita and investment increased following crude oil prices booms. In addition, Engle-Granger causality test shows income is increased by crude oil price boom only in Cameroon and Ecuador. Chad is the only country presenting a negative relationship with world crude oil prices. Regarding investment there is a positive relation between crude oil price boom and investment except in Columbia and Venezuela which presents a negative relation. The results indicate that crude oil booms lead to lower GDP or less investment in only three countries.

The effect of crude oil revenues on economic growth and incomes distribution in Iran during 1971-2006 has been studied by Samadi and Kondory (2009). In this study an econometric growth model was estimated by the Ordinary Least Squares (OLS) method and the result shows that one per-cent change in crude oil revenues cause about 0.07 per cent changes in GNP growth. In addition, co-integration testing by the Autoregressive Distributed Lag (ARDL) method shows that a break period in crude oil revenues will reversal causes an improvement in Gini coefficient.

Mehrara *et al*. (2010) studied the impact of crude oil revenues and investment on economic growth in high and low level of oil revenue by using a threshold error correction model for the period of 1959-2007. The result shows that the impact of low level of oil revenue on economic growth is much more than high level of oil revenue. Also the result shows the threshold of crude oil revenues in Iran is around 37%, in other word if crude oil revenue increases beyond that figure, its positive impact on the GDP, will slowly deteriorate. These results confirm the natural resource curse, during boom periods for crude oil revenues. Also the investment effect on economic growth in low level oil revenue is more significant than high level of the crude oil revenue.

Salehi Esfahani *et al*. (2009) studied oil exports and the Iranian economy by building a quarterly Vector Autoregressive Models with exogenous variables (VARX) for the period of 1979-2006. Where the long run relation of crude oil exports on real output, exchange rate, inflation and money balances are tested. Two long run relations were determined (1) a standard real money demand equation with inflation acting as a proxy for the market interest rate (2) a real output equation in the long run is formed by crude oil exports revenue through their impact on capital accumulation (with considering some assumption, crude oil revenue enters in Cobb Douglas production function). The results more or less support the long run theory. Also due to the less-developed nature of Iran's financial markets, Iranian economy adjusts very quickly to the shocks coming from crude oil export revenues.

Farzanegan *et al.* (2009) studied the effects of oil price shocks on the Iranian Economy. They looked into the dynamic relationship between crude oil price shocks and five important macroeconomic time series comprising industrial output, government expenditure, inflation, real exchange rate and imports by employing VAR models for the period of 1988-2004. The finding shows that crude oil price fluctuations have a significant effect on industrial production, inflation and the real exchange rate. Also the results suggest evidence of an asymmetric impact of fluctuations on crude oil price. Moreover, crude oil price fluctuations have significant impacts on output, in other words, positive(/negative) crude oil price shock will increase(/decrease) the total output. The research finding shows that oil price shocks always have positive impact on Inflation.

Alavi Rad *et al*. (2006) studied the effect of oil exchange receipts on total import in Iran. This research is based on Hemphil (1974), Moran (1989) and Faini *et al*. (1992) results on the effects of foreign exchange restrictions on import demand functions in the developing countries. Johansen, Phillips-Hansen and ARDL approaches were employed for estimation for the period of 1960-2000. Their finding revealed that crude oil revenue, real income and relative prices all significantly determine the behaviour of total import in the long-run and short-run. Quantitative evidence indicates that long-run changes in the availability of real income, relative prices and crude oil revenue explain the growth of total import during the period under investigation. It is also important that the long run income elasticity with three estimation approaches are very similar. Also the estimate shows that total import in Iran has been influenced by real income and crude oil revenue in the short-run.

Ayadi (2005) focuses on the relationship between crude oil price changes and economic development via industrial production in Nigeria. A vector auto regression model is employed

on some macroeconomic time series such as the price of Nigerian bonny light[35] crude oil, real exchange rate, money supply, short term interest rate, consumer price index and finally the index of industrial production for the period of 1980:1 through 2004:4. The result shows that the crude oil price changes affect industrial production indirectly via the real exchange but is not statistically significant. Also the results revealed that industrial production in Nigeria did not increase following crude oil price increase.

Berument *et al.* (2002) studied the impact of crude oil price shocks on the economic growth of selected Middle East and North Africa (MENA) by using Structural Vector Autoregressive (SVAR) model. The 16 selected MENA countries categories in two levels by using the share of oil export and net oil import to the GDP. First level named fuel exporting country and second level called no fuel exporting countries. Fuel export countries including Algeria, Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, UAE and Yemen. The research finding shows just in Algeria, Iran, Iraq, Kuwait, Oman, Qatar and UAE, GDP has been affected positively by world crude oil price increase.

The impact of crude oil export on 21 macroeconomic factors in Ecuador was studied by François Boye (2001). By employing univariate casualty methods in its first part and an econometric structural break test and multivariate VAR impulse response analysis respectively in its last two parts. The causality test shows that crude oil production, real exports and imports is unrelated to that of the crude oil exports. The variance test in the same time leads to the unusual conclusion that the current account balance is exogenous against fluctuations in the international crude oil market. Due to huge number of macroeconomic factors (21 key factors) there are a lot of tests, estimation and analysis of variance in this research. Finally, the results show that crude oil export is not just driving force of the Ecuadorian economy.

François Boye (2002) also analysed oil and macroeconomic fluctuations in Mexico by using univariate casualty methods in its first part and an econometric structural break test and multivariate VAR impulse response analysis respectively in its last two parts. The Granger causality was carried out upon a bivariate vector auto-regressive (VAR) model which shows crude oil production and real GDP is unrelated to the crude oil exports. Based on variance analysis the current account balance cannot be explained by fluctuations in the international crude oil market. Also there is not any structural break in the real sector as a result of fluctuations in crude oil exports. Finally, the finding of the research disproves that crude oil

[35] Main grade of Nigerian crude oil export

exports in Mexico have a significant effect on the Mexican economy.

Eltony (2000) analysed oil price fluctuations and their Impact on the Macroeconomic Variables of Kuwait. A VAR, VECM and Structure VAR (SVAR) Models were all estimated by using 7 key macroeconomic time series including crude oil price, oil revenue, public development expenditure, public current expenditure, consumer price index, money demand (M2) and total import for the period of 1984:1-1998:4. All models show a high degree of mutual relation between major macroeconomic variables. The causality running from crude oil revenues and public current and investment expenditure, towards other time series. In other words, after crude oil revenue the fiscal policy can be used more effectively to stabilize Kuwait's economy.

Katsuya Ito (2010) has employed VAR and VECM model for assessing the impact of oil price volatility on macroeconomic variables such as exchange rate, inflation and GDP in Russian economy. The research finding suggests that Russian economy is extremely dependent to oil price fluctuations. The author's recommendation to protect of the Russian economy in case of falling oil prices is to diversify its key industries by attracting foreign direct investment.

Oil price distortion and their impact on Algerian macroeconomic variables such as real GDP, unemployment rates, inflation, real effective exchange rate and money supply was studied by Bouchaour et al. (2012). By using VECM they showed that oil prices have no significant impact on the most time series during the short term. Result of Variance Decomposition (VDC) analysis and the Impulse Response Function (IRF) shows there is a positive impact of oil prices on GDP and Inflation in the long run. Finally, the finding of the research recommends reducing the dependence on the oil sector by diversification of income sources.

Mendoza *et al*. (2010) studied the asymmetric effects of oil shocks on an oil-exporting economy. The estimation is based on Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model following Hamilton (2003), Lee *et al*. (1995), and Mork (1989) for Venezuelan economy over the period 1984: Q1-2008: Q3. The research finding shows oil shocks have asymmetric effects on output growth for Venezuelan economy.

Mehrara (2008) has employed dynamic panel framework for testing asymmetric effects of positive and negative shocks of oil revenue changes on economic activities for 13 oil-exporting countries by using annual data in the period of 1965–2004. The research finding based on asymmetric effects revealed that negative oil revenue shocks have a greater role than positive oil shocks. While oil negative shock seriously delays economic growth, oil positive shock has limited role to economic growth. In order to suspend effects of oil shocks, the author suggested using of stabilizer and saving oil funds, also diversify of the economy.

2-Methodology and Data

2-1-Methodology

In multivariate time series methods in order to reveal long term relationship between variables, useful models are VAR and VECM. The VAR approach is suitable for this subject because of its ability to describe the dynamic structure of the model as well as its capacity to avoid imposing unreasonable identifying restrictions connected to various economic theories. Despite the main criticism of VAR models which is the lack of theoretical background (Leamer EE. 1985, Cooley T *et al*. 1985).

"…VAR models can be used to determine the existence of Granger-causal orderings even in the absence of any theoretical reason to expect them, the idea being that theorists will regard the outcomes of such exercises as stylized facts requiring subsequent explanation in terms of structural models."[36]

On the other hand, many have opposite idea about VAR models. Because of its ability to support empirically some economic theories, VAR approach became popular in macroeconomics (Blanchard and Watson 1984, Bernanke 1986, among others).

In VAR approach all variables are considered endogenous so it is free of unnecessary restrictions. While in case of testing long term relationship among variables we have to examine of existing co-integration between variables and running vector error correction model. However, Naka *et al*. (1997) was the opinion that unrestricted VAR present better result in short term than VECM.

"*A system of reduced forms with co-integrated variables may be estimated in two ways: as a vector auto-regression in levels, or as a vector error correction model. The latter is a restricted version of the former. If there is co-integration, imposing this restriction will yield more efficient estimates. However, at short horizons, vector error correction estimates are known to perform poorly relative to those from a vector auto-regression."* [37]

Beside liner methodology of oil price shock there is available definition of non-linear of oil price changes. In this study we use both symmetric and asymmetric effect of oil revenues fluctuation instead of oil prices.

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[36] Cooley T, LeRoy S. (1985)." A theoretical measurement: a critique". Journal of Monetary Economics, page 306.

[37] Naka, A., Tufte, D., (1997). "Examining impulse response functions in co-integrated systems". Applied Economics 29, 1593–1603.

The most famous definition of asymmetric of oil price changes is of the opinion of Mork's (1989) as follows:

$$oilr_t^+ = \max (0, (oilr_t , oilr_{t-1})) \quad (4\text{-}1)$$

$$oilr_t^- = \min (0, (oilr_t , oilr_{t-1})) \quad (4\text{-}2)$$

In which the relevant oil prices in time "t" are used to compare the current oil price with a maximum or minimum oil price over the previous quarter for positive or negative oil price shock respectively. In line with available accurate data for other time series we have adopted annually data for oil revenue instead of quarterly oil prices.

Another asymmetric effect of oil price shock was introduced by Lee *et al*. (1995) was of the opinion that a change in oil prices will have a smaller impact on macroeconomic variables when the volatility of oil prices is high. In this respect they used GARCH approach.

Hamilton (1996) introduced another form of non-linear transformation of real oil prices which are called net oil price increase. Hamilton explained that most of the oil price increases are simply corrections of earlier declines, thus it would be suitable to compare current oil price with last four quarter rather than previous quarter. Hamilton (1996) called this as net oil price increase. According to him, net oil price is used to compare the current oil price with a maximum or minimum oil price over the previous four quarters for positive or negative oil price shock respectively as follows:

$$oilr_t^+ = \max [0,((oilr_t) - \max ((oilr_{t-1}),...,(oilr_{t-4}))] \quad (4\text{-}3)$$

$$oilr_t^- = \min [0,((oilr_t) - \min ((oilr_{t-1}),...,(oilr_{t-4}))] \quad (4\text{-}4)$$

Here also we have adopted oil revenue instead of oil prices in last two years because our data is annually.

2-2-Data

Choosing macroeconomic variables is the first step in estimating a model which is important for the analysis. We have chosen five variables which have affected by oil revenue fluctuations

more than other variables based on analysis of Iran's economy in chapter two plus one dummy variable. The notations of these variables are as follows:

GDP= Gross Domestic Product

INF= Inflation rate which calculated by consumer price index

OILR= Oil Revenue

GB= Government Budget

EXC= Market Exchange Rate

IMP= Total Value of Import by Customs

DUM= Dummy variable which takes into account the effects of the Iranian revolution and imposed Iraq-Iran war (1979–1989)

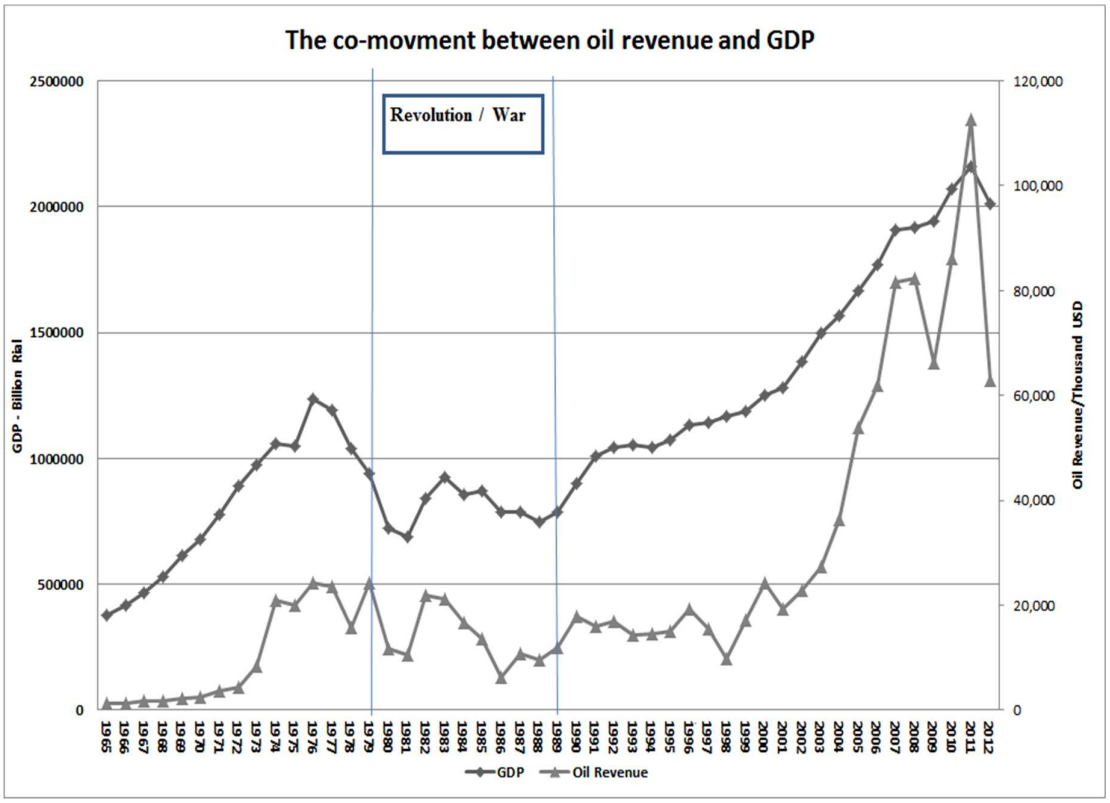
Annually data for the period of 1965-2012 were employed in this study. Main data sources are from economic time series databank of the Central Bank of Iran.

2-2-1-GDP: Gross Domestic Product (Constant Price 2004 =100)

In Iran's national accounts system, GDP is defined as the sum of the market value of all goods and services produced by residents within a country in a given period of time (usually a year). GDP at basic price is derived from deducting the net indirect taxes (or net taxes on products) from the GDP at market price. Net indirect taxes are indirect taxes less subsidies. GDP can be defined in three ways, all of which are conceptually identical. First, it is equal to the total expenditures for all final goods and services produced within the country in a specified period of time. Second, it is equal to the sum of the value added at every stage of production (the intermediate stages) by all the industries within a country. Third, it is the sum of the income of everyone in the country. Quarterly data are available as of 1989 and annual data as of 1960. This variable is on the base of constant prices of 2004, extracted from the Central Bank of Iran online database.

As shown in below graph there is a significant co-movement between oil revenue and gross domestic product for the period of 1965-2012.

Figure 35



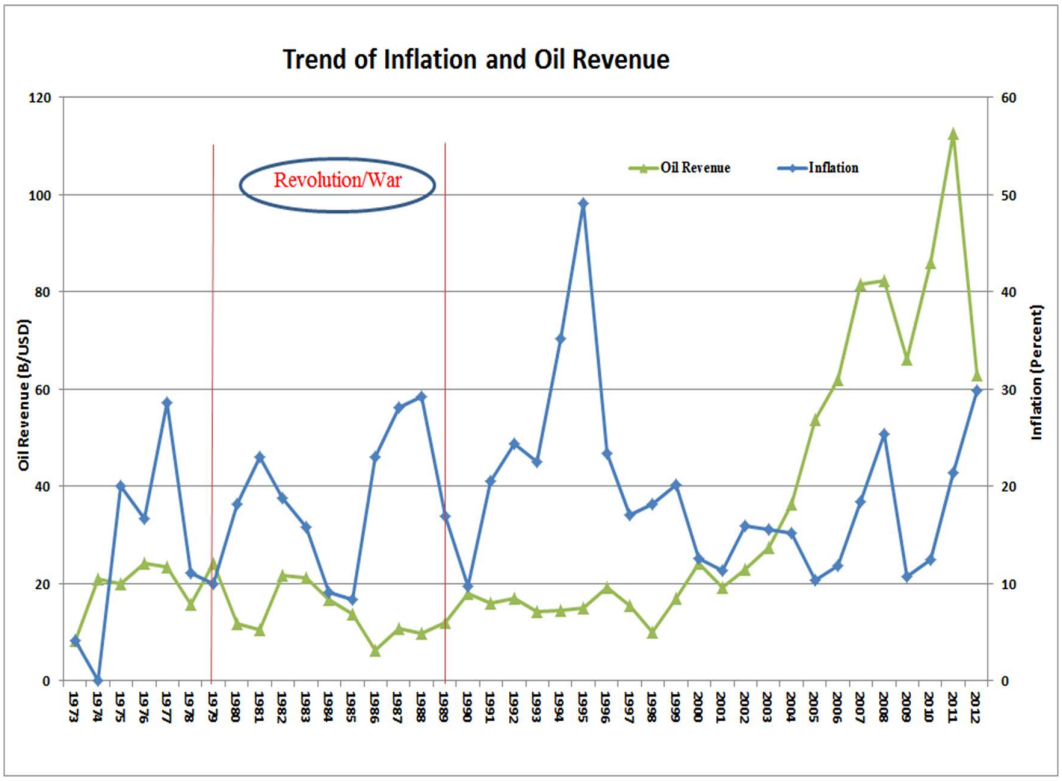
Source: Central Bank of Iran Website, http://tsd.cbi.ir/

2-2-2-INF: Inflation

Inflation rate calculated from consumer price index based on constant price 2004=100.

Consumer price index of goods and services is one of the most important indicators of the inflation rate and the purchasing power of the national currency. This index is used in the planning of welfare and social security projects, adjustment of wages and salaries, and conclusion of bilateral contracts. Consumer price index, which has been issued in Iran for a long period of time, was first calculated according to the base year 1936. Through the last revision in 2004, 359 items of goods and services in the households' baskets were taken into consideration for the change of the base year.

Figure 36



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

Above graph shows the trend of oil revenue and inflation rate for the period of 1973-2012. Theoretically we expect when oil revenues increase the inflation rate should be lower but there is no such a trend in Iran's economy especially in recent years after 2000. The inflation rate during past 4 decades is almost above 10 per cent minimum, also the annual average inflation rate during above mentioned period is 18 per cent; it means the inflation is structural in Iran's economy.[38]

2-2-3-EXC: Exchange Rate (market price)

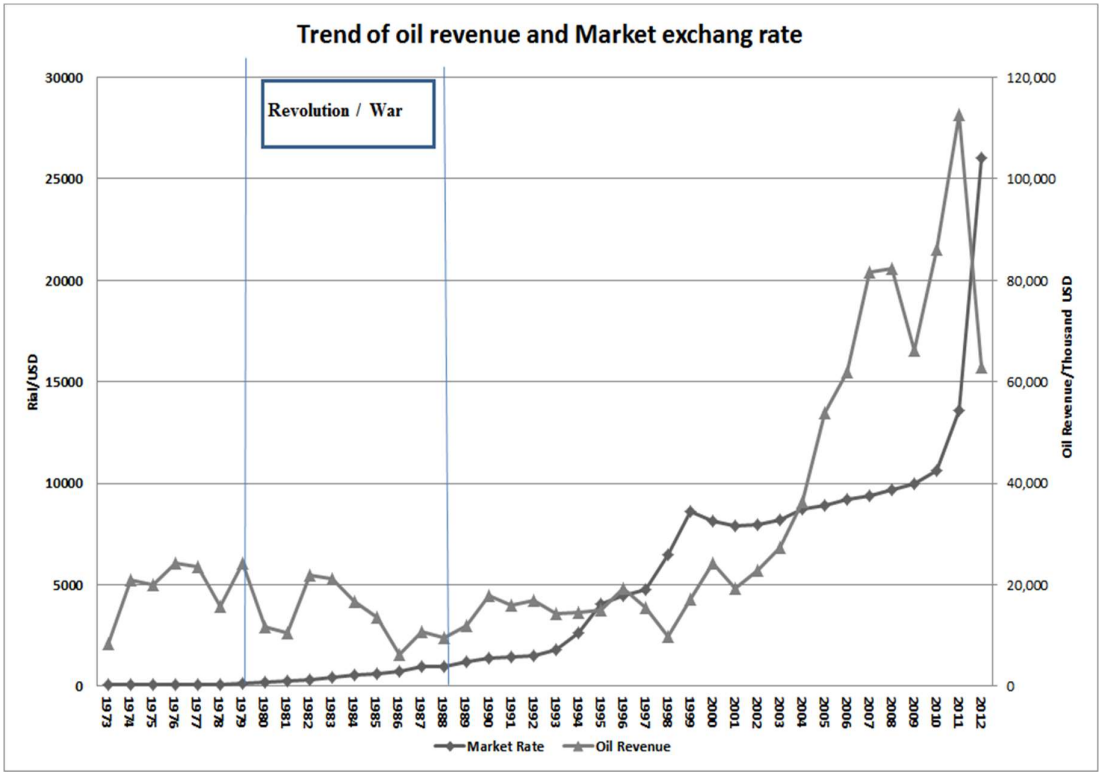
Below graph shows the trend of oil revenue and market exchange rate. There has been different regime in foreign exchange market during 40 years of observations and still there are different exchange rates which are official rate, trade rate and market rate. In other words, foreign

[38] Hosseninasab *et al*. (2010 Farsi)," Fiscal root of inflation in Iran"paxohesh egtesadi, spring 1389

currency market is heavily managed by government in Iran. We are going to test the reaction of market exchange rate for the oil shock by time series model.

The source of this variable in our study is market price (non official rate) of the online portal of time series at the Central Bank of Iran.

Figure 37



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

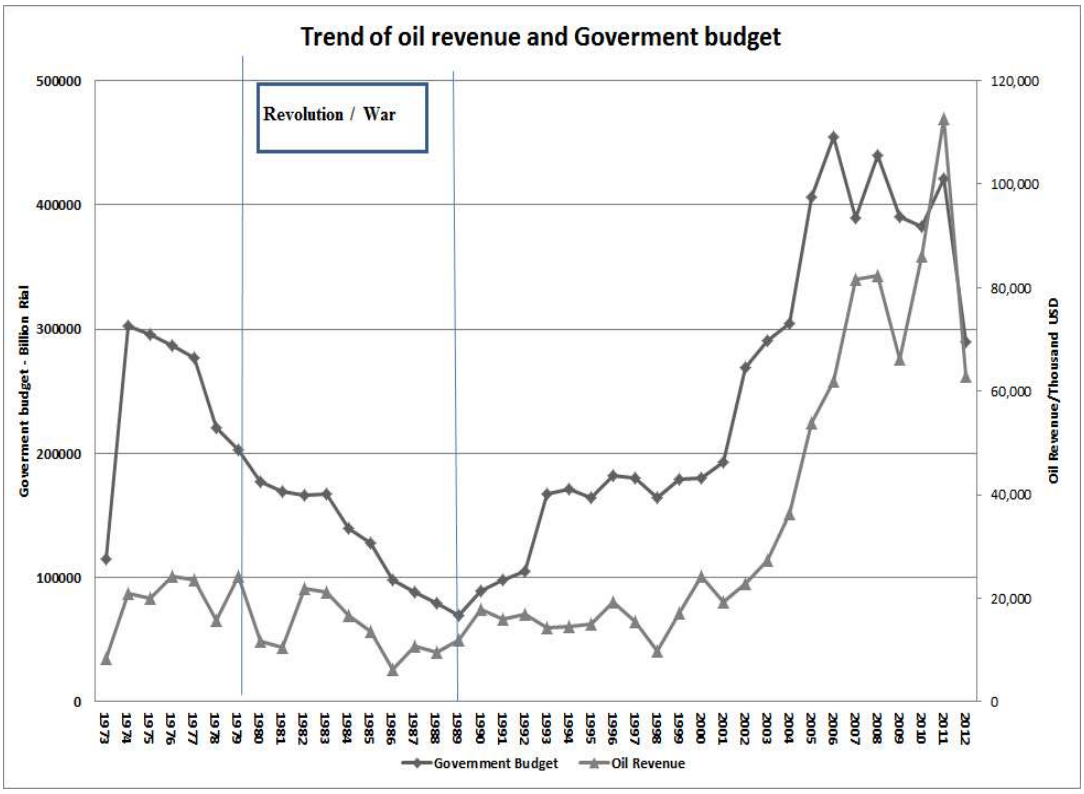
2-2-4-GB: Government Budget

This variable is public consumptions of Iran's government based on real values, extracted from the Central Bank of Iran online database. Normally government total budget issue in two separate categories, current and development expenditures. There is no real government budget data so here we calculated real public budget by using consumer price index.

As shown in below graph there is a significant co-movement between oil revenue and government budget especially in recent years after 2000 when oil revenues sharply

increased. In period of 1973-2012 the annually average ratio of oil and gas revenue in government total budget reached to 47.7% and during 2000-2012 obtained 42%.[39]

Figure 38



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

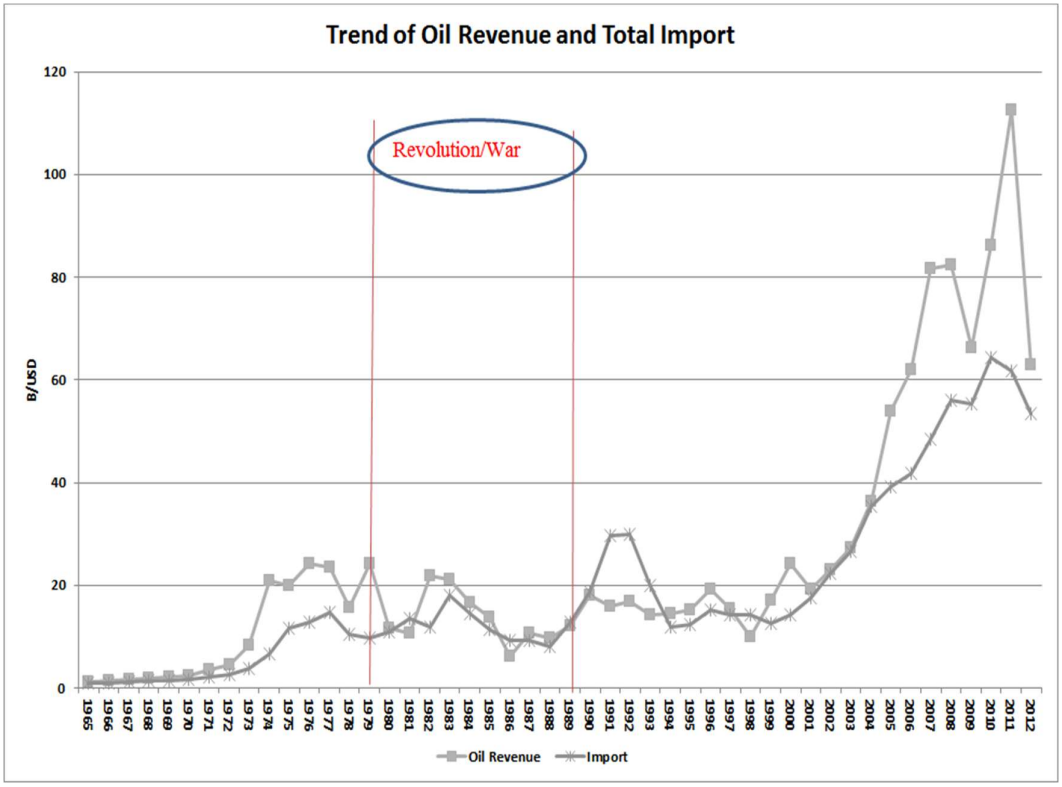
2-2-5-IMP: Total Imports (based on custom data)

Import of goods and services refers to the purchase of goods and services by natural and judicial persons' resident in the country from other countries. According to the national accounts, any transaction of goods between resident and non-resident individuals and organizations is to be recorded at the time of the transfer of ownership from the seller to the buyer. Quarterly data are available from 1988 and annual data as of 1959.Total imports based on US dollar, extracted from the Central Bank of Iran online database. There is a strong co-movement between oil revenues and total imports. After year 2000 till 2010 following increase of oil

[39] Because of sharp decrease of oil prices, the mentioned ratio has reduced significantly in 2015-16.

revenue, total import also increased sharply. Below graph prove our expectation in Iran's economy.

Figure 39



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

2-2-6-OILR: Oil Revenue

This item includes the exports of oil products (including crude oil, gas oil, fuel oil, kerosene, LPG, and other oil products). Data on this item are available on an annual basis as of 1965. Oil revenue is based on US dollar extracted from the Central Bank of Iran online database. As mentioned before we have adopted the following approach of asymmetric oil revenue shocks based on Mork and Hamilton definitions as follows:

MPOILR: Mork positive oil revenue
MNOILR: Mork negative oil revenue
HPOILR: Hamilton positive oil revenue
HNOILR: Hamilton negative oil revenue

2-2-7-Dummy variable

Dummy variable cover Iranian revolution and the imposed Iraq-Iran war, 1979–1989=0 otherwise=1. This period covers a military conflict and therefore a strong presence of state in the economy. Nearly all the key markets and price mechanism were administered by the government.

3-Stationarity Tests

In VAR models there are three issues which cannot be easily solved, first the number of variables second the lag length and third stationarity of variables. In terms of number of the variables we selected most relevant variables as mentioned earlier considering the number of observations and degrees of freedom. Also we should keep in mind that the shorter model is better.

In the next two parts we will discuss lag length selection and stationarity of variables.

3-1-Lag length selection

In terms of lag length decision, it is clear that every additional lag improves the fitness of any regression but reduce the degrees of freedom according to standard regression theory. Therefore, there is a trade-off between number of coefficients estimated and goodness of regression. Here, we have adopted Schwarz information Criterion (SC) criteria in order to determine the optimal lag length as follows:

$$SBC = \ln|\sum| + \frac{pk^2 \ln(T-P)}{T-P} \qquad (4\text{-}5)$$

Where, p= number of lag, k= number of regressors, t= sample size, $\sum$ = variance covariance matrix of the estimated residuals $\sum\hat{}$.

The lag length which results in the smallest Schwarz Bayesian is the optimal lag length.

In order to check stationarity of the variables we employed ADF test (Augmented Dickey and Fuller) and PP (Philips Perron).

The basic characteristics of unit root test are as follows:

Take into account a simple autoregressive AR (1) process:

$$y_t = \rho\, y_{t-1} + x_t'\, \delta + \varepsilon_t \qquad (4\text{-}6)$$

Where "y_t" is a time series, "ρ" and "δ" are factors to be estimated, "x_t" are non-compulsory exogenous regressors such as a constant and trend, and the "ε_t" are white noise. "y" is a non-stationary series if $|\rho| \geq 1$, and the variance of "y" increases over the time."y" is a stationary series If $|\rho| < 1$. Thus, by testing whether the absolute value of "ρ" is exactly less than one, the hypothesis of stationarity can be examined.

3-2-The Augmented Dickey-Fuller (ADF) Test

The standard Dickey-Fuller test is performed by deducting "y_{t-1}" from both sides of the above equation:

$$\Delta y_t = \alpha y_{t-1} + x_t'\, \delta + \varepsilon_t \qquad (4\text{-}7)$$

Where $\alpha = \rho - 1$, $\varepsilon_t \sim$ Normal $(0, \sigma_\varepsilon^2)$ the null and alternative hypotheses is written as follows:

$$H_0: \alpha = 0 \qquad (4\text{-}8)$$

$$H_1: \alpha < 0 \qquad (4\text{-}9)$$

The formal t-ratio for α:

$$t_\alpha = \frac{\hat{\alpha}}{se(\hat{\alpha})} \qquad (4\text{-}10)$$

Where se ($\hat{\alpha}$) is the coefficient standard error, and "$\hat{\alpha}$" is the estimate of "α".

Dickey and Fuller (1979) shows that this statistic does not follow the formal "t" student distribution, and they simulate critical values for different tests and sample sizes. Recently, MacKinnon (1991, 1996) carried out a more comprehensive set of simulations than those calculated by Dickey and Fuller.

Moreover, only if the series is an AR (1) process the simple Dickey-Fuller unit root test mentioned above is valid. In case of higher order lags, the assumption of white noise

disturbances is violated. The Augmented Dickey-Fuller (ADF) test by adding "p" lagged difference builds an AR (p) process as follows:

$$\Delta y_t = \alpha y_{t-1} + x_t' \delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \ldots + \beta_p \Delta y_{p-1} + \vartheta_t \qquad (4\text{-}11)$$

This augmented specification is then used to test H_0 and H_1 hypotheses using the t_α-ratio as follows:

$t_\alpha > ADF$ Critical value THEN not reject null hypothesis (unit root exists)
$t_\alpha < ADF$ Critical value THEN reject null hypothesis (unit root does not exist)

3-3-The Phillips-Perron (PP) Test

Phillips and Perron (1988) suggest another method for testing unit root. The Phillips and Perron method calculates the non-augmented DF test equation mentioned above, and adjusts the t-ratio of the "α" coefficient.
The Phillips and Perron test is based on the statistic:

$$\bar{t_\alpha} = t_\alpha \left(\frac{\gamma_0}{f_0}\right)^{\frac{1}{2}} - \frac{T(f_0 - \gamma_0)(se(\hat{\alpha}))}{2 f_0^{\frac{1}{2}} s} \qquad (4\text{-}12)$$

Where "$\hat{\alpha}$" is the estimate, se ($\hat{\alpha}$) is coefficient standard error and "t_α" the t-ratio of "α", and "s " is the standard error of the test regression. Moreover,"γ_0" is a consistent estimate of the error variance in ($\Delta y_t = \alpha y_{t-1} + x_t' \delta + \varepsilon_t$) (calculated as (T-K) s^2 /T, where "K" is the number of regressors). The remaining term,"f_0", is an estimator of the residual spectrum at frequency zero. When doing PP test, we have the option of including a constant, a time trend, or both.
First, the VAR technique requires stationary data, thus each series should be examined for stationary. Table 9 below gives the stationary test for all the time-series, using the Augmented Dickey-Fuller and Phillips-Parron t-tests over the sample period of 1965-2012. These tests include a constant but no time trend, as recommended by Dickey and Fuller (1979).
For the level series, the ADF test does not reject the null hypothesis of a unit root at 95% confidence level for most variables except Inflation, MPOILR, and HPOILR. The Phillips-

Perron test results are better and five variables are stationary in level. After first differencing, each series rejects the null hypothesis of non-stationary at the 99% levels. It means; all variables have unit roots in first difference and are stationary after first differencing in both tests. According to ADF and PP test results in table 9 below.

Table 9: Unit Root Test Results

	ADF		Phillips- Perron	
Variable	**Level**	**1st diff**	**Level**	**1st diff**
GDP	-0.87	-4.20***	-0.43	-4.20***
INF	-3.81***	-6.14***	-3.82***	-16.80***
IMP	-0.98	-4.33***	0.05	-4.03***
GB	-1.52	-3.02**	-1.68	-5.99***
EXC	1.21	3.71***	2.73*	3.71***
OILR	-0.54	-2.93**	-1.06	-6.32***
MPOILR	-5.21***	-6.14***	-5.16***	-24.06***
MNOILR	-0.06	-8.56***	-4.67***	-5.16***
HPOILR	-5.68***	-7.28***	-5.68***	-27.61***
HNOILR	-1.06	-10.04***	-5.53***	-8.60***

Lag Length: Schwarz info Criterion With intercept but no trend Max lag=9
*** Significance at 1% level.
** Significance at 5% level.
* Significance at 10% level.

4-Granger Causality Test

Correlation does not certainly suggest causation in any significant sense of that word. There are a lot of significant correlations in econometrics, which are clearly irrelevant. Interesting example include a positive correlation between the car accident and the number of the cars which have got umbrella. Obviously the reason of cars accident is not having umbrella, the reason is rainy days which make more cars owners carry umbrella.

Causality concept was introduced by Granger (1969) and has become very common in econometrics. The Granger causality concept tries to explain whether “x” causes “y” by first establishing how much of the current “y” can be explained by past values of “y” and second to see whether adding lagged values of “x” can make the prediction better. However, the coefficients of “x's” must be statistically significant. Usually two ways of causality are used; “x” Granger causes “y” and “y” Granger causes “x”. For example, in macroeconomics we can argue whether GDP that causes the money supply (M) or M that causes GDP.

Granger Causality in the bivariate regressions for (x, y) series as follows:

$$y_t = \alpha_0 + \alpha_1\, y_{t-1} + \ldots + \alpha_1\, y_{t-l} + \beta_1\, x_{t-1} + \ldots + \beta_1\, x_{t-l} + \varepsilon_t \qquad (4\text{-}13)$$

$$x_t = \alpha_0 + \alpha_1\, x_{t-1} + \ldots + \alpha_1\, x_{t-l} + \beta_1\, y_{t-1} + \ldots + \beta_1\, y_{t-l} + \upsilon_t \qquad (4\text{-}14)$$

The presented F-statistics are the Wald statistics for the shared hypothesis:

"$\beta_1 = \beta_2 = \ldots = \beta_l = 0$" for each equation. (4-15)

The null hypothesis is that series "x" does not Granger-cause series "y" and that series "y" does not Granger-cause series "x" in the first and second regression respectively.

4-1-Multivariate analysis

Multivariate Granger causality analysis is presented by making a vector autoregressive model "VAR" model with "L" time lags as follows:

$$X(t) = \sum_{\tau=1}^{L} A_\tau X(t-\tau) + \varepsilon(t), \qquad (4\text{-}16)$$

Where ε (t) is a white Gaussian random vector. A time series "X_i" is called a Granger cause of another time series "X_j" if at least one of the elements A_τ (j, i) for τ =1,…,L is significantly larger than zero.

Table 10 shows Granger casualty test of oil revenue with different definitions.

Table 10: Granger-causality test results

Variable	OILR	MPOILR	MNOILR	HPOILR	HNOILR
INF	1.02	2.29	0.14	2.03	0.21
EXC	5.75***	8.77***	4.00**	7.79***	8.22***
GDP	3.02**	2.79*	2.34*	3.03*	1.77
GB	2.94**	5.07***	1.88	1.41	1.91
IMP	0.22	0.28	3.42**	0.59	3.19**

Notes:

Null hypothesis: oil revenue shocks do not Granger-cause of other variables
The variables INF, MPOILR, and HPOILR are in level and other variables are in first differences.
Lag length =2
*** Significance at 1% level. ** Significance at 5% level. * Significance at 10% level.

The empirical results highlight the causality mostly running from the oil revenues to other variables as we expected. Above table clearly shows causality from oil revenue to Exchange Rate (EXC), Gross domestic product (GDP) and Government Budget (GB) but in case of Inflation (INF) and Total Import (IMP) is not significant.

Moreover, in asymmetric definitions of oil revenue shocks casualty running form oil revenue to exchange rate is significant but in case of inflation the relationship is not again significant. The reason is that there has been structural inflation in Iran at least since 1979 revolution. It means when oil revenue is high the main reason for inflation is increasing liquidity which mostly comes from expanding government budget. On the other hand, when oil revenue is low, government budget shows deficit which is normally covered by borrowing money form central bank. Both situations result in increasing liquidity in the economy.[40]

5-Emprical Results

5-1-Simple OLS Regression

Since our first concern is to see the relationship of GDP as a dependent variable with the oil revenue as an independent variable, here we present a simple OLS regression. The property analysis of the variables showed that GDP and OILR are both stationary after first difference

[40] Hosseninasab *et al*. (2010 Farsi)," Fiscal root of inflation in Iran" paxohesh egtesadi, spring 1389

so we use first difference of variables rather than level. Dummy variable cover Iranian revolution and the imposed Iraq-Iran war, 1979–1989=0 Otherwise=1

We run simple OLS regression as follows:

$$GDP_t = C+\alpha_1\ OILR_t+\alpha_2\ DUM + \varepsilon \qquad (4\text{-}17)$$

The result is in line with our expectations; the coefficient of oil revenue is positive and significant. Also overall regression is significant with 22.5 F statistics and 50 R-squared. Tentatively it means oil revenue has a positive impact on GDP in Iranian economy during 48 years of observations.

$$DGDP_t = -26840 + 4.37\ DOILR_t+71214\ DUM \qquad (4\text{-}18)$$

(-1.42) **(5.47)** **(3.36)**

F=22.5 R-squared=50

5-2-Vector Autoregressive (VAR), Vector Error Correction (VECM) and Autoregressive Distributed Lag (ARDL) models

The vector auto-regression is usually used for predicting systems of mutually connected time series and for examining the dynamic effect of random disturbances on the system of variables. The VAR concept is based on lagged form of every endogenous variable in the system as follows:

$$y_t = A_1\ y_{t-1}+ \ldots + A_P\ y_{t-P} + B\ x_t + \varepsilon_t \qquad (4\text{-}19)$$

Where "x_t" is a vector of independent variables, "y_t" is a "k" vector of dependent variables, A_1, . . . , A_P and "B" are matrices of coefficients, and ε_t is a vector of innovations. Since we only have lagged value of independent variables on the right side of the equations, OLS estimations are efficient and consistent.

The estimates of individual coefficients in VAR do not have a direct interpretation despite even if all of the equations have high R-squares and F statistics.

Important point of VAR model is whether using time series in levels or in first differences. Hence most time series have unit roots and are non-stationary, the question of using time series either in levels or differencing arises.

Although some researchers have tried to deal with this criticism of VAR approach such as Blanchard and Watson (1984) and Bernanke (1986) with creating procedures, called the structural vector auto-regression (SVAR) approach, some others are not happy with VAR methodology. In order to solve this problem Hamilton (1994) suggested two options and explained weaknesses and strengths of both options. He suggested that one should First estimate VAR in levels and ignore the non-stationarity of variables then check "t" and "F" statistics for testing the models. Hamilton (1994) stated:

"Even if the true model is a VAR in differences, certain functions of the parameters and hypothesis tests based on a VAR in levels have the same asymptotic distribution as would estimates based on differenced data."

A second option is estimating VAR by differencing non-stationary variables. In this case differencing improves performance, if differencing is true in VAR but loses useful information. However perhaps some linear combinations of the series are stationary so there are co-integration vectors in the system. As argued by Fuller (1976), Sims (1980) and Doan (1992) in case of having co-integration between variables, we lose useful information by differencing in VAR.

Another question is that whether using unrestricted VAR where the variables in the VAR are co-integrated, which one is better: to use unrestricted VAR or VECM. If the series are co-integrated, they move together in the long run. A VAR in first differences, although properly specified in terms of covariance-stationary series, will not capture those long-run tendencies. However, Naka *et al*. (1997) believe that unrestricted VAR have better results than VECM in the short-term. By the way estimating a VAR in the levels in the case of co-integration may lead to the omission of important constraints.

Fuller (1976) has argued that differencing a variable throws information away while producing no significant gain.

Traditional methods of estimating cointegrating relationships, such as Engle-Granger (1987) or Johansen's (1991, 1995) method, or single equation methods such as Fully Modified OLS, or Dynamic OLS either require all variables to be I (1), or require prior knowledge and specification of which variables are I (0) and which are I (1).

To ease this problem, Pesaran and Shin (1999) showed that cointegrating systems can be estimated as ARDL models, with the advantage that the variables in the cointegrating relationship can be either I (0) or I (1) and even without needing to pre-specify which are I (0) or I (1).

Pesaran and Shin also note that unlike other methods of estimating cointegrating relationships, the ARDL representation does not require symmetry of lag lengths; each variable can have a different number of lag terms.

ARDLs are standard least squares regressions which include lags of both the dependent variable and explanatory variables as regressors (Greene, 2008). Although ARDL models have been used in econometrics for decades, they have gained popularity in recent years as a method of examining long-run and cointegrating relationships between variables (Pesaran and Shin, 1999).

An ARDL is a least squares regression containing lags of the dependent and explanatory variables. ARDLs are usually denoted with the notation ARDL(p,q_1,…,q_k), where p is the number of lags of the dependent variable, q_1 is the number of lags of the first explanatory variable, and q_k is the number of lags of the k-th explanatory variable.
An ARDL model may be written as:

$$y_t = \alpha + \sum_{i=1}^{p} \gamma_i \, y_{t-i} + \sum_{i=1}^{k} \sum_{i=0}^{q_i} X_{j,t-i} \; \beta_{j,i} + \varepsilon_t \qquad (4\text{-}20)$$

Some of the explanatory variables, X_j , may have no lagged terms in the model ($q_i = 0$). These variables are called static or fixed regressors. Explanatory variables with at least one lagged term are called dynamic regressors.
To specify an ARDL model, we must determine how many lags of each variable should be included (i.e. specify p and q_1 ,…, q_k). Fortunately, simple model selection procedures are available for determining these lag lengths. Since an ARDL model can be estimated via least squares regression, standard Akaike, Schwarz and Hannan-Quinn information criteria may be used for model selection. Alternatively, one could employ the adjusted R2 from the various least squares regressions.
Thus, following Pesaran and Shin (1999) argument, the ARDL Bounds test was utilized here.

5-2-1-Bounds Testing

Using the cointegrating relationship obtained from Equation (4-20), Pesaran, Shin and Smith (2001) describe a methodology for testing whether the ARDL model contains a level (or long-run) relationship between the independent variable and the regressors.

Pesaran, Shin and Smith provide critical values for the cases where all regressors are I (0) and the cases where all regressors are I (1), and suggest using these critical values as bounds for the more typical cases where the regressors are a mixture of I (0) and I (1).

Two asymptotic critical values bounds provide a test for cointegration when the independent variables are I(d) (where 0<d<1): a lower value assuming the regressors are I (0), and an upper value assuming purely I (1) regressors. If the F-statistic is above the upper critical value, the null hypothesis of no long-run relationship can be rejected irrespective of the orders of integration for the time series. Conversely, if the test statistic falls below the lower critical value the null hypothesis cannot be rejected.

Finally, if the statistic falls between the lower and upper critical values, the result is inconclusive. The approximate critical values for the F-test were obtained from Pesaran, 1997, p.478).

It is very important to note that we estimate the model by Eviews 9 software, and the existence of a long-run relationship among the variables is determined by using bounds test. The calculated F-statistic is compared with the critical value indicated that the null hypothesis of no co-integration is rejected. Our results show that there is a long-run relationship among the variables.

Table 11: Bounds Test for Co-Integration Analysis

Critical value	Lower Bound Value	Upper Bound Value
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Note: Computed F-statistic: 10.16 (Significant at 1% marginal values). For oilr
Computed F-statistic: 9.48 (Significant at 1% marginal values). For mpoilr
Computed F-statistic: 5.48 (Significant at 1% marginal values). For mnoilr
Computed F-statistic: 7.16 (Significant at 1% marginal values). For hpoilr
Computed F-statistic: 6.94 (Significant at 1% marginal values). For hnoilr

Since our first concern is to see the impact of oil revenue shock to important macroeconomic variables of Iranian economy and after showing existence of long-run relationship among the variables, we can achieve this by running Vector Error Correction Model(VECM).

5-3- Vector Error Correction Model linear definition (symmetric)

The error correction model (ECM), first introduced into the econometric literature by

Sargan (1964) and then by Davidson *et al*. (1978) has been a competent alternative to the VAR model. The main characteristic of ECMs as compared with the VARs is the notion of an equilibrium long-run relationship and the introduction of past disequilibria as explanatory variables in the dynamic behaviour of current variables. The recent revival in the popularity of the ECMs has been based on the demonstration by Granger and Weiss (1983) that if two variables are integrated of order 1, and are co-integrated, they can be modelled as having been generated by an ECM.

A vector error correction (VEC) model is a restricted VAR designed for use with non-stationary time series that are known to be co-integrated; a lagged error-correction term is added to the relationship.

At the beginning Engle and Granger (1987) indicated the possibility of having unit root for linear combination of two or more non-stationary series in long term by using co-intergration. To elaborate we use a simple example: consider a two-time series with one co-integrating equation and no lagged difference. The co-integrating equation is:

$$y_{2,t} = \beta y_{1,t} \qquad (4\text{-}21)$$

The corresponding VEC model is:

$$\Delta y_{1,t} = \alpha_1 \left(y_{2,t-1} - \beta y_{1,t-1}\right) + \varepsilon_{1,t} \qquad (4\text{-}22)$$

$$\Delta y_{2,t} = \alpha_2 \left(y_{2,t-1} - \beta y_{2,t-1}\right) + \varepsilon_{2,t} \qquad (4\text{-}23)$$

In this simple model, the only right-hand side variable is the error correction term. In the long run equilibrium, this term is zero. However, if "y_1" and "y_2" deviate from the long run equilibrium, the error correction term will be nonzero and each variable adjusts to partially restore the equilibrium relation. The coefficient "α_i" measures the speed of adjustment of the i-th endogenous variable towards the equilibrium.

Anyway there is no strong interpretation of coefficient in VECM models so Sims (1980) proposed the impulse response functions and forecast error variance decompositions in order to analyses the impact of unexpected policy shocks on the macroeconomic variables in a more convenient and comprehensive way.

5-3-1-Impule Response Function

In VECM the impulse response function shows the quality response of the time series in the

model to exogenous shocks, i.e. oil revenues shocks. We can investigate this in the framework of asymmetric impulse response functions as well in order to separate the impact of exogenous negative shocks from the exogenous positive shocks.

By using impulse response shocks in vector auto-regression, an exogenous shock to the variable not only affects the variable but also because of the dynamic lag structure of vector auto-regression transmitted to all of the other dependent variables. If the innovations "ϵ_t" are contemporaneously uncorrelated, interpretation of the impulse response is straight forward. The i-th innovation "$\epsilon_{i,t}$" is simply a shock to the i-th endogenous variable "$y_{i,t}$". Innovations, however, are usually correlated, and may be viewed as having a common component which cannot be associated with a specific variable. In order to interpret the impulses, it is common to apply a transformation "P" to the innovations so that they become uncorrelated:

$$\upsilon_t = P\,\epsilon_t \sim (0, D) \qquad (4\text{-}24)$$

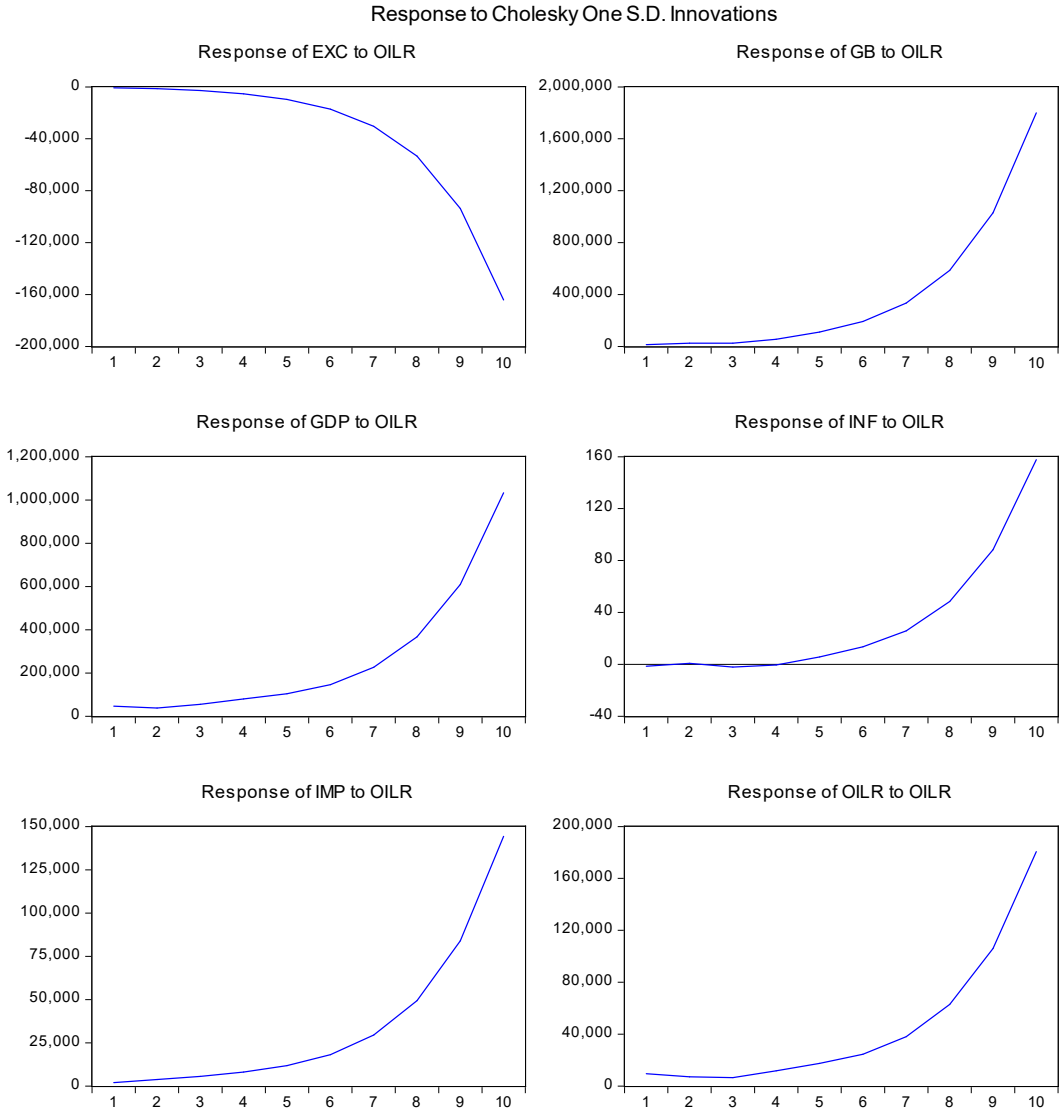
Where "D" is a diagonal covariance matrix.

To investigate the response of the Iranian macroeconomic variables, symmetric and asymmetric oil revenues as shock variables have been utilized. Additionally, we include dummy revolution and war variable to capture exogenous shocks.

In VECM models, the vector of endogenous variables, according to the first Cholesky ordering, consists of oil revenue with different definitions (oilr, mpoilr, mnoilr, hmpoilr, hnoilr), market exchange rate (exc), government expenditures (gb), gross domestic product (gdp), inflation (inf) and total import (imp)

Since our first concern is to see the reaction of the system to the shocks given to the oil revenue, the figure 40 shows Impulse Response Functions (IRFs) for one standard innovation in oil revenue (symmetric) for the period of 1965-2012 in ten times period. An inspection of figure reveals that innovation in oil revenue gradually increases GDP, government budget, inflation and total import but decrease exchange rate, which all are within our expectation. When oil revenue shock happens total import increases and government spending including current and development budget increase via selling more foreign exchange in the market. On the other hand, and because of extra supply of foreign currency in the market, exchange rate decrease. Moreover, following the government expansion of fiscal policy, GDP increases and also because of limitation of internal production capacity, Dutch disease happen and inflation increase.

Figure 40: Impulse response function of oil revenue shocks (VECM)



5-3-2-Variance decomposition analysis

While impulse response functions in the vector auto-regression follows the effects of a shock to one endogenous variable on the other time series through lag structure, variance decomposition separates the variation in an endogenous variable into the component shocks to the vector auto-regression. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the vector auto-regression.

In other words the variance decomposition shows the quantity of information each variable contributes to the other variables in the auto-regression, i.e. it shows how much of the forecast error variance of each of the variables can be described by exogenous shocks to the other variables.

We can also check the forecasting error variance decomposition to decide the size of the movements in the time series that are due to shocks in their own series as contrary to shocks in other variables, including oil revenues.

Variation in macroeconomic time series due to the variation in oil revenues is our interest in this research. That is to say, at the beginning the variations in all of the variables are usually explained by the variables' own trends.

Table below shows Variance Decomposition of oil revenue shock. Oil revenue shocks explain about 28% variation of the fluctuations in the effective exchange rate, 38.5% of fluctuations in the GDP, 22.5% of fluctuations in total import and 13% of fluctuations in government budget for the first year after shock. At the same time oil revenue shocks account for just 3.6 - 13% of variances of inflation. It means we are facing structural inflation in the long run regardless of oil revenue shocks. The main source of inflation in Iran is liquidity, which comes from the government budget deficit. One per-cent increase in government budget deficit causes 3% increase in inflation.[41] However, the estimated models shows that oil revenue explain much of variance of GDP,Total Import and Exchange rate as we expected.

[41] Hosseninasab *et al*. (2010 Farsi)," Fiscal root of inflation in Iran" paxohesh egtesadi,spring 1389

Table 12: Variance decomposition of oil revenue shock-VECM

	EXC	GDP	GB	INF	IMP
1	28.06	38.55	12.85	3.60	22.53
2	17.19	25.53	18.94	3.02	32.46
3	14.63	25.05	11.70	5.59	35.98
4	14.33	29.18	12.26	2.85	34.39
5	14.15	30.11	14.44	5.31	28.64
6	13.96	27.17	14.55	9.01	22.92
7	13.85	23.07	14.17	10.73	19.09
8	13.80	19.60	13.98	11.88	16.81
9	13.77	17.19	13.90	12.68	15.48
10	13.75	15.71	13.83	13.13	14.72

6- Nonlinear specification

There is an asymmetric definition of oil revenue shock, as we explained earlier, first check Mork (1989) definition:

6-1-Mork (1989) definition

In order to check the asymmetric impact of oil revenue shocks we run VECM based on Mork definition as follows:

$oilr_t+ = \max(0, (oilr_t , oilr_{t-1}))$ Mork positive oil revenue growth (MPOILR) (4-25)

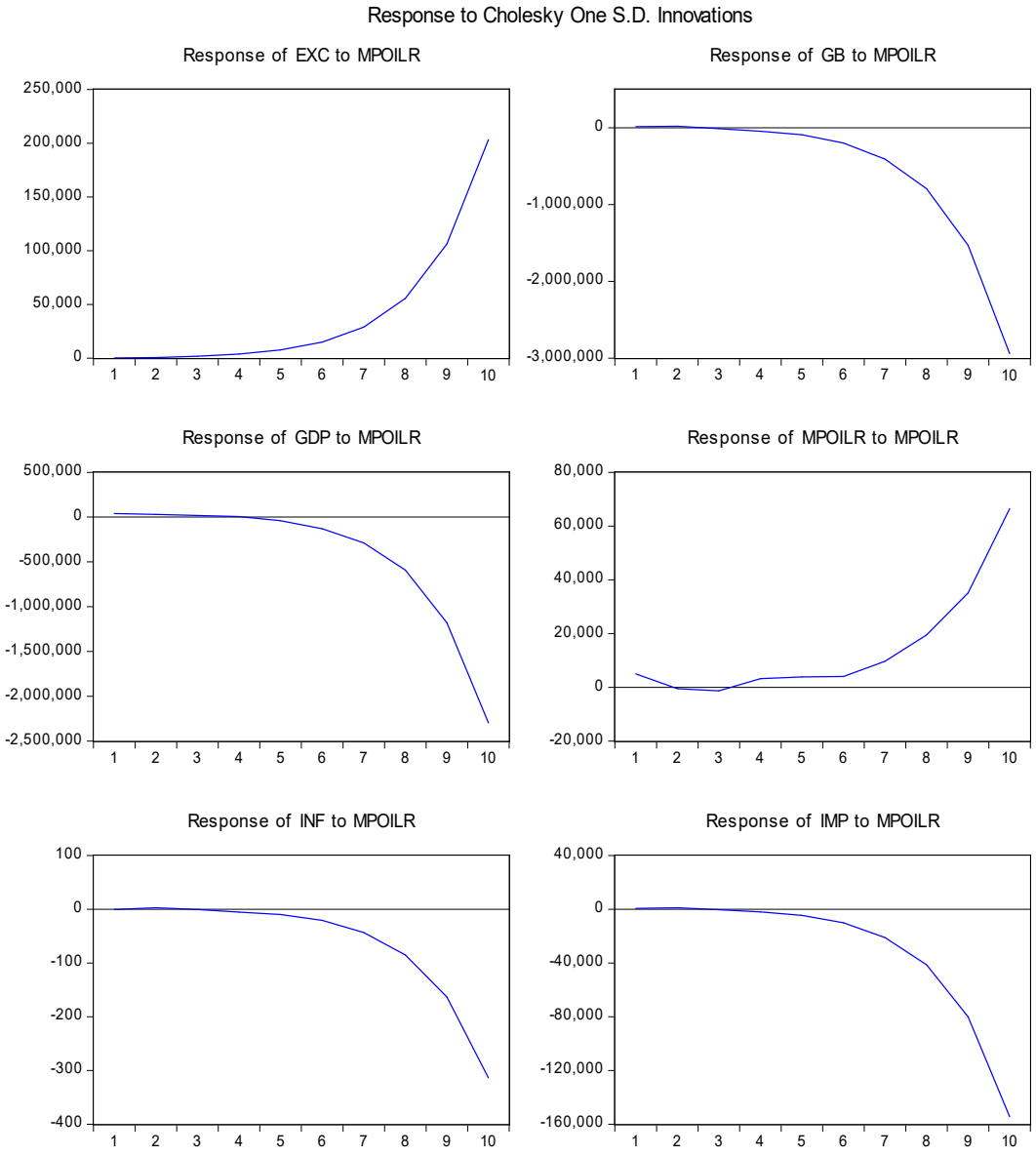
$oilr_t- = \min(0, (oilr_t , oilr_{t-1}))$ Mork negative oil revenue growth (MNOILR) (4-26)

6-1-1- Mork (1989) positive oil revenue shock

The graph 41 shows the impulse responses to one standard deviation shocks to a positive oil revenue growth in a one standard error band. The IRFs are estimated for the period 1965-2012. Exchange rate response to a shock on positive changes in real oil revenue is positive and lasts until the end of period. The decreasing response of inflation after initial shock is significantly

different from zero but decreases gradually. Finally, the response of government budget, GDP and total import to a one standard deviation shock to positive oil revenue changes is significantly different from zero and decreases gradually.

Figure 41: Impulse response function of MPOILR shocks (VECM)



Variance decomposition of Mork positive oil shock-VECM model shows oil revenue positive shocks explain about 27.5% of fluctuations in the GDP, 2% of fluctuations in total import and 12% of fluctuations in government budget for the first year after shock. While oil revenue shocks account for just a negligible percentage of variances of inflation and exchange rate.

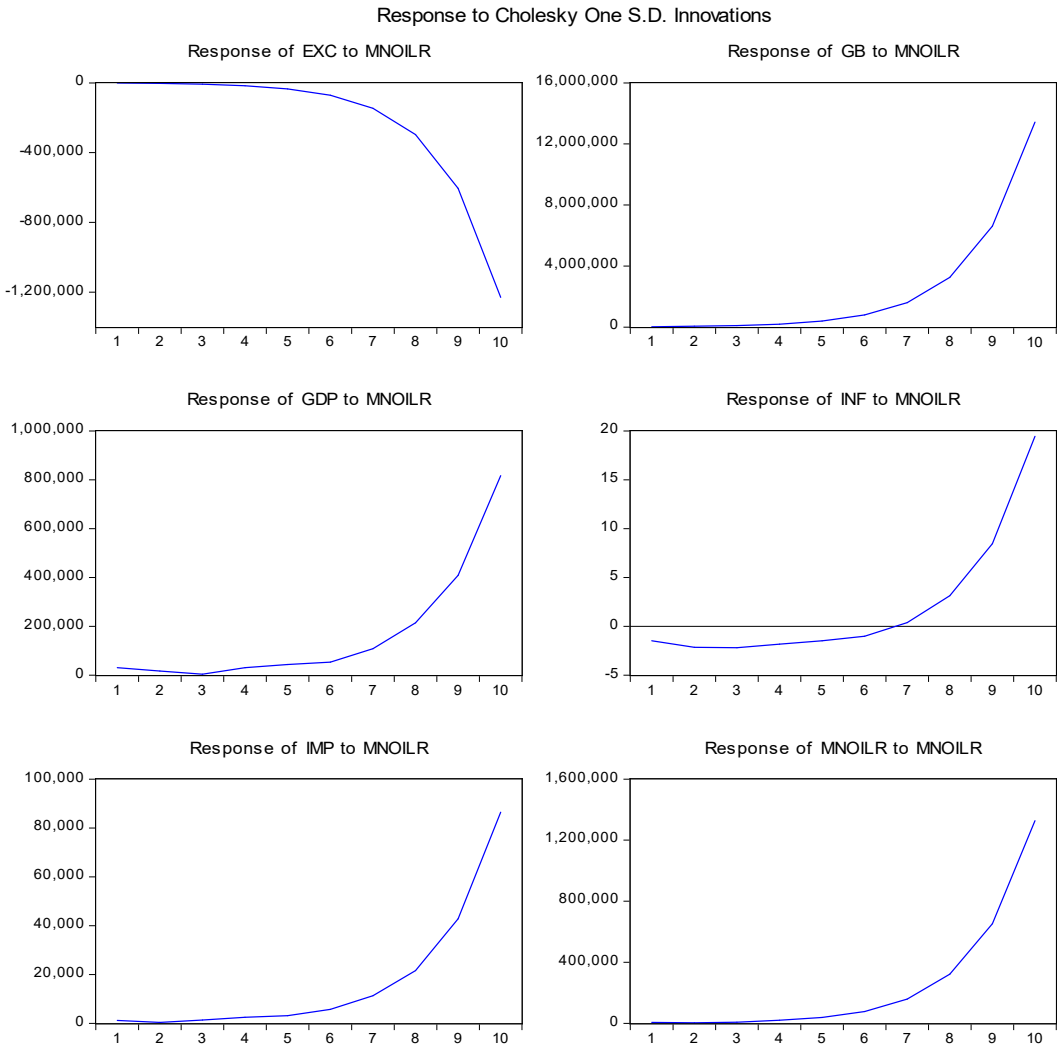
Table 13: Variance decomposition of Mork positive oil shock-VECM

	EXC	GDP	GB	INF	IMP
1	0.005	27.49	12.55	0.44	2.07
2	2.00	16.30	11.37	4.83	2.42
3	4.55	8.89	4.07	2.83	1.066
4	5.26	3.88	3.83	5.17	1.57
5	5.49	2.09	3.83	5.03	2.48
6	5.73	2.94	4.62	5.17	3.75
7	5.87	4.03	5.33	5.72	4.79
8	5.92	4.83	5.63	5.89	5.34
9	5.96	5.36	5.78	5.92	5.63
10	5.97	5.66	5.88	5.95	5.81

6-1-2- Mork (1989) negative oil revenue shock

Here we explain the responses of variables to negative changes in real oil revenue. The impulse response results are out of line with our expectations, GDP, INF, IMP and GB increased while exchange rate reduced because of oil revenue negative shock.

Figure 42: Impulse response function of MNOILR shocks (VECM)



Also variance decompositions negative oil revenue shocks explain for about 64% variation of the fluctuations in the effective exchange rate, 18% of fluctuations in the GDP, 9% of fluctuations in total import and 31% of fluctuations in government budget for the first year after shock. While oil revenue shocks account for just 3% of variances of inflation.

Moreover, according on Mork positive and negative oil revenue shocks results not prove asymmetry in oil revenues shocks in Iranian economy.

Table 14: Variance decomposition of Mork negative oil shock-VECM

	EXC	GDP	GB	INF	IMP
1	64.41	18.18	30.87	3.13	9.34
2	60.47	8.99	56.05	4.59	3.55
3	57.72	5.73	62.68	4.94	4.11
4	57.27	7.26	63.38	4.68	7.02
5	57.11	9.84	61.70	4.28	9.71
6	56.91	12.53	59.42	3.82	17.00
7	56.83	23.04	58.10	3.36	31.30
8	56.81	39.74	57.48	4.51	44.53
9	56.79	50.62	57.13	12.61	52.09
10	56.78	55.40	56.94	32.88	55.32

6-2-Robustness tests, Hamilton (1996) Definition

In order to recheck the results in Mork oil revenue shock we run the models based on Hamilton oil price shock definitions as follows:

$oilr_t^+ = \max [0,((oilr_t) - \max ((oilr_{t-1}),...,(oilr_{t-4}))]$ Hamilton positive oil revenue growth (HPOILR). (4-27)

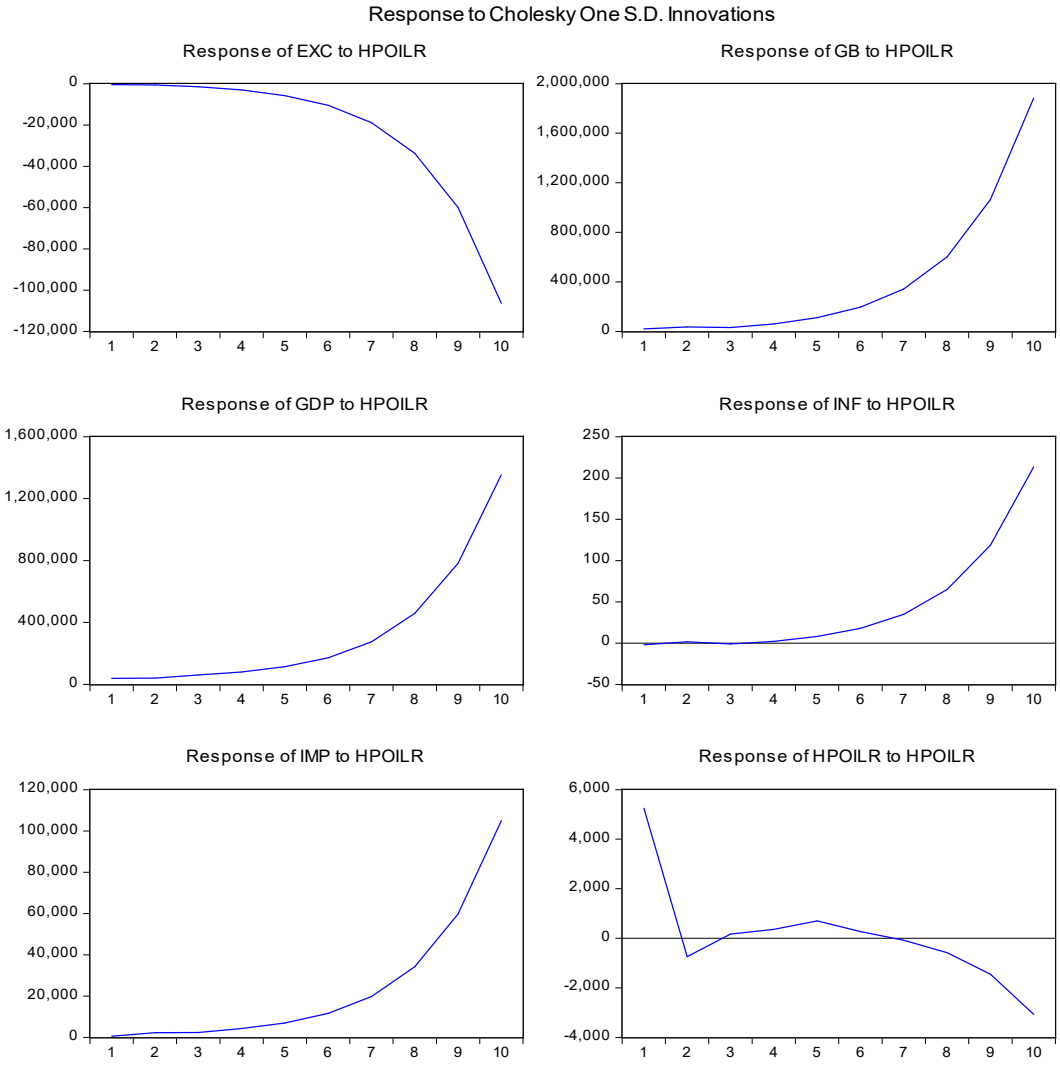
$oilr_t^- = \min [0,((oilr_t) - \min ((oilr_{t-1}),...,(oilr_{t-4}))]$ Hamilton negative oil revenue growth (HNOILR). (4-28)

6-2-1-Hamilton (1996) positive oil revenue shock

The graph 43 shows the impulse responses to one standard deviation shocks to a positive oil revenue growth in a one standard error band. Exchange rate response to a shock on positive changes in real oil revenue is negative and lasts until the end of period. The increasing response of inflation after initial shock is significantly different from zero but increase gradually. Finally,

the response of GDP, government budget and total import to a one standard deviation shock to positive oil revenue changes is significantly different from zero and increasing gradually.

Figure 43: Impulse response function of HPOILR shocks (VECM)



Variance decomposition of Hamilton positive oil shock model shows oil revenue positive shocks explain about 25% variation of the fluctuations in the GDP, 1.77% of fluctuations in total import and 22% of fluctuations in government budget for the first year after shock. While oil revenue shocks account for just a small percentage of variances of inflation and exchange rate.

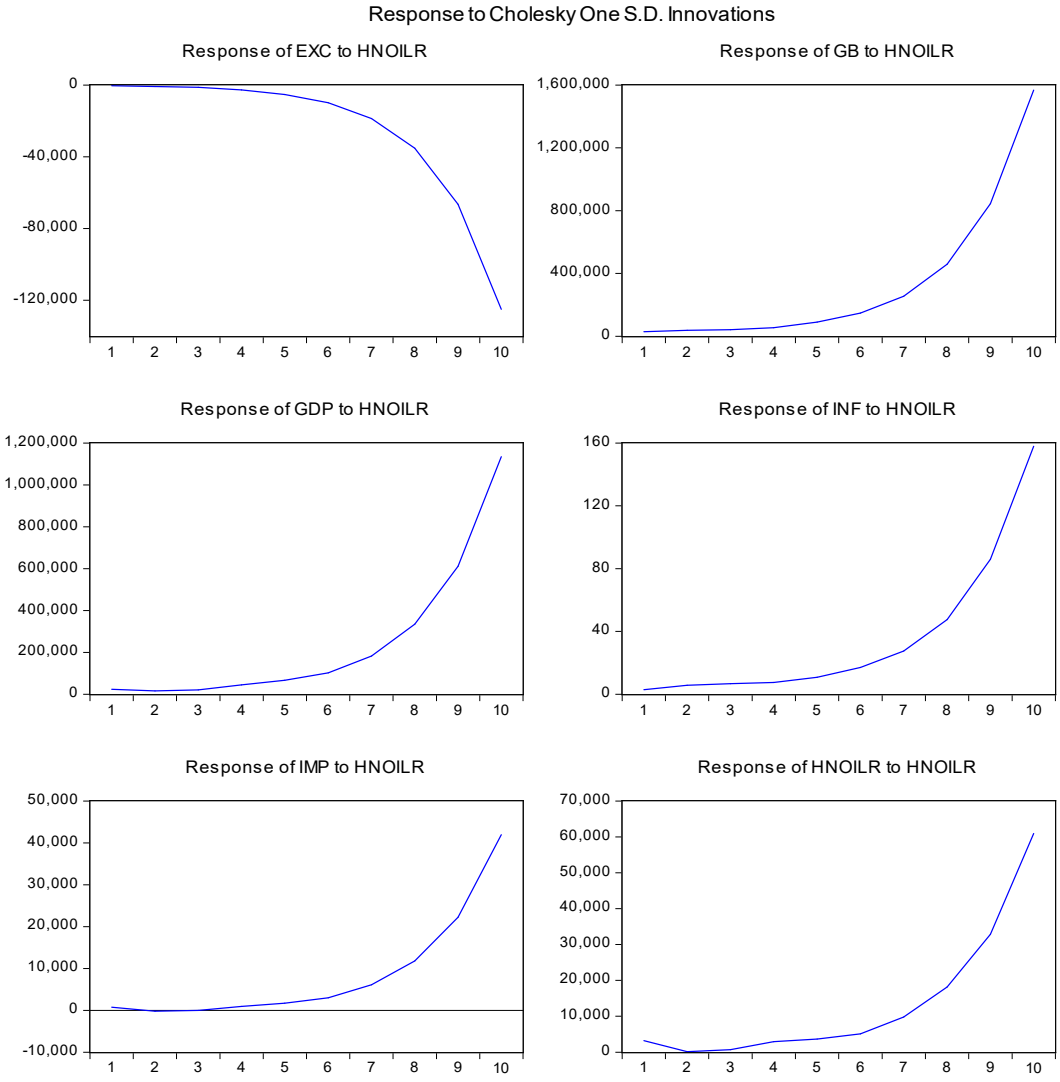
Table 15: Variance decomposition of Hamilon positive oil shock

	EXC	GDP	GB	INF	IMP
1	9.09	25.32	22.27	5.45	1.77
2	3.82	18.90	23.72	4.17	8.31
3	3.61	18.69	10.40	2.29	6.25
4	3.79	15.77	6.46	1.15	5.99
5	3.92	11.82	5.25	1.97	5.56
6	3.97	8.56	4.73	2.85	5.08
7	4.00	6.55	4.42	3.34	4.68
8	4.02	5.42	4.25	3.63	4.42
9	4.03	4.80	4.16	3.81	4.26
10	4.04	4.47	4.11	3.91	4.17

6-2-2- Hamilton (1996) negative oil revenue shock

Here in figure 44 we explain the impulse responses to one standard deviation shocks to a negative oil revenue growth in a one standard error band. The response of the exchange rate to decreasing real oil revenue is negative. The response of GDP, INF, IMP and GB increased to a shock in negative oil revenue changes is positive and lasts until the end of the period.

Figure 44: Impulse response function of HNOILR shocks (VECM)



Based on table 16 variance decomposition of Hamilton negative oil shock-VECM model shows oil revenue negative shocks explain about 9.7% variation of the fluctuations in the effective exchange rate, 11% of fluctuations in the GDP, 3.48% of fluctuations in total import and 40% of fluctuations in government budget for the first year after shock. While oil revenue shocks account for just 10% of variances of inflation.

The final results based on Mork and Hamilton oil revenue shock definition not proves asymmetric effect of oil revenue shocks in Iranian economy.

Table 16: Variance decomposition of Hamilton negative oil shock-VECM

	EXC	GDP	GB	INF	IMP
1	9.69	11.10	40.59	10.38	3.48
2	4.93	5.75	38.33	26.34	1.16
3	2.85	4.51	20.96	32.87	0.57
4	2.50	5.78	10.37	23.35	0.79
5	2.42	5.07	6.10	12.66	1.18
6	2.31	3.66	4.09	7.03	1.44
7	2.26	2.98	3.09	4.38	1.79
8	2.23	2.66	2.65	3.22	2.04
9	2.22	2.44	2.44	2.71	2.12
10	2.22	2.33	2.33	2.47	2.16

7-Conclusion

This chapter analyses the dynamic relationship between crude oil revenue shocks and major macroeconomic variables of Iranian economy by applying ARDL Bound test and vector error correction model (VECM), we also check the direction of the causality. According to various graph analysis we have chosen the most important variables which have high correlation with oil revenue fluctuations namely GDP, inflation, government budget, exchange rate and total import.

The empirical results highlight the causality mostly running from the oil revenues to other variables as we expected. The result clearly shows causality from oil revenue to exchange rate, gross domestic product and government budget but in case of inflation and total import is not significant.

Simple OLS regression between GDP as a dependent variable and oil revenue as an independent variable shows the coefficient of oil revenue is positive and significant. Also regression in overall is significant with 22.5 F statistics and 50 R-squared. Tentatively it means oil revenue has got positive impact on GDP in Iranian economy during 48 years of observations.

Since our variables are mix stationary at I=0 and I=1 and based on Pesaran et al (1999,2001) approach we did ARDL Bound test to determine the co-integration among the variables. After establishing long run relation between time series we did symmetric and asymmetric VECM analysis between above mentioned time series. The results of Impulse response function and Variance decomposition in VECM in liner model shows that oil revenue have serious impact on most of the variables. More specifically Iranian economy has benefitted from oil revenue in terms of economic growth. Moreover, oil revenue shocks during period under investigation increased government budget, total import and decreased exchange rate. But in case of inflation we are facing structural inflation in the long run regardless of oil revenue shocks in Iran. In other words, when oil revenue shock happens total import increases and government spending including current and development budget increase via selling more foreign exchange in the market. On the other hand, and because of extra supply of foreign currency in the market, exchange rate decrease. Moreover, following the government expansion of fiscal policy, GDP increases and also because of limitation of internal production capacity, Dutch disease happen and inflation increase. This conclusion is not surprising and is actually consistent with what is expected in a country in which the government is the sole owner of the main income source, the oil and gas industry.

The results of VECM asymmetric effect of oil revenue shocks in Iranian economy based on Mork (1989) and Hamilton (1996) oil revenue shock definitions not proves asymmetric effect of oil revenue shocks on Iranian economy. The impulse response function and variance decomposition analysis results are out of line with our expectations.

Chapter Five:

Institution, Oil Revenue and Economic Growth in Iran

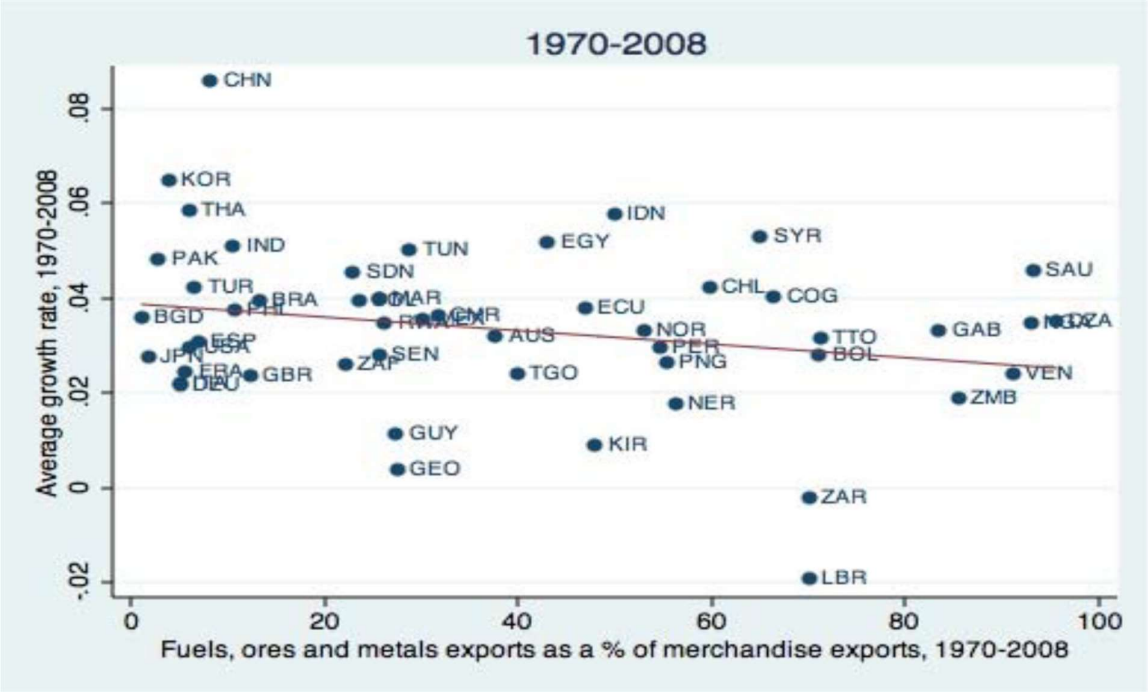
Introduction

According to public opinion and economic theory massive natural resource revenue in general and oil revenue in particular should contributed to economic growth and development. But in practice much evidence proves the opposite and some natural resource-rich countries suffer from "resource curse" rather than "resource blessing". However, some evidence shows that for a few countries that managed well received a "blessing".

1-Relationship between natural resource endowment and economic growth

Below figure shows cross section of countries for the period of 1970-2008. On the horizontal axis total natural resource export as a percentage of total export is shown and the vertical axis shows average growth rate in different countries.

Figure 45: Statistical relationship between natural resource exports and growth



Source: Frankel, Jeffrey (2010) "The Natural Resource Curse: A Survey" Discussion Paper 2010-21, Cambridge, Mass, Harvard Environmental Economics Program,

There is negative correlation between natural resources endowment and economic growth but it is not strong. In an obvious manner, we can name China and Korea as an example of good economic performance and low natural resource. In contrast Venezuela and Zambia do not show a positive correlation between natural resource endowment and economic growth. There are still countries with big natural resource exports avoided the curse and enjoyed the blessing such as Indonesia, Malaysia, Botswana and Chile.

Also the table below shows GDP per capita performance of oil and non-oil countries in different regions in 1975 and 2007. The economic performances of non-oil producer countries in Mideast and North Africa (MENA) and Sub Saharan African regions are better than oil producer countries in the same regions. Annual growth of GDP per capita in Sub Saharan and MENA oil producer countries for the period of 1975-2007 is about -0.30 and -2.30 per-cent respectively while for non-oil producer countries in same regions estimated to 0.20 and 2.70 per-cent.

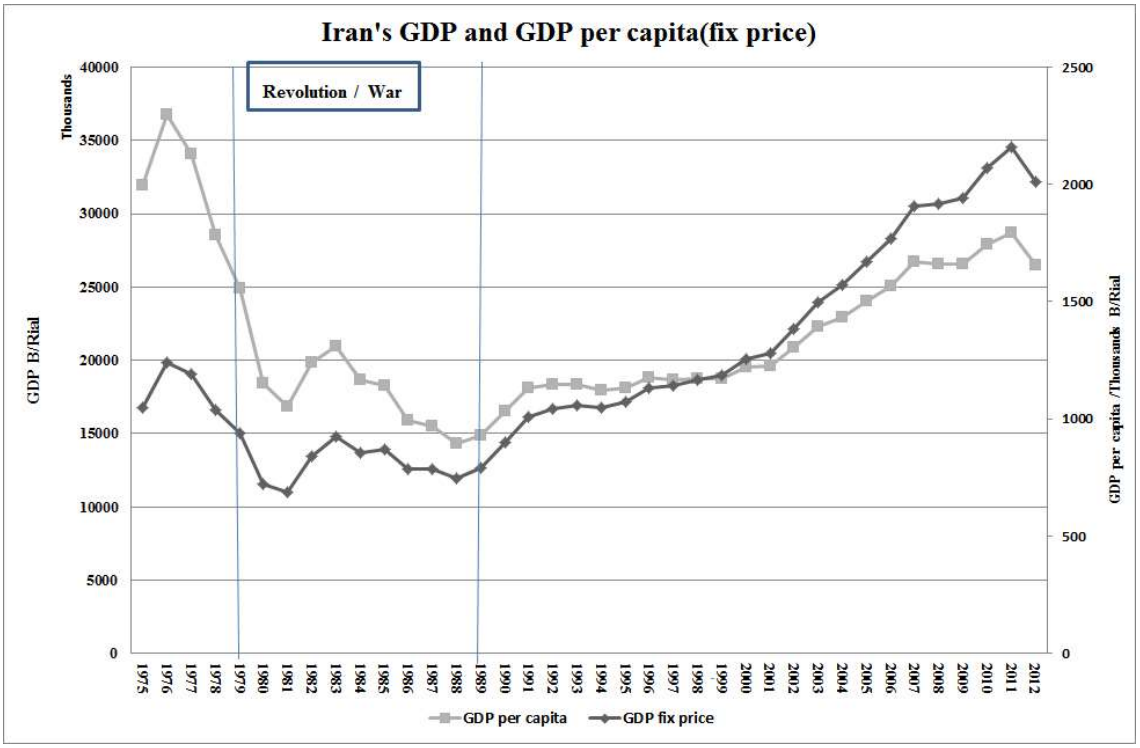
Table 17: GDP per capita in different regions

Region	**Oil producer countries**			**Non-oil countries**		
	GDP per Capita 1975 USD	**GDP per Capita 2007 USD**	**Average of annual growth %**	**GDP per Capita 1975 USD**	**GDP per Capita 2007 USD**	**Average of annual growth %**
Sub Saharan	1453	1283	-0.30	1685	1827	0.20
MENA	11076	2694	-2.30	2446	4590	2.70
Latin& Caribbean	3589	5230	1.40	4569	5434	0.50
Iran(M/Rial)	32	26	-0.5			

Source: Author and Kianpoor, S. (2010)," Review of oil stabilization fund in Iran and other countries" in Farsi

Iran's annual GDP per capita growth for the period of 1975-2007 as shown in the figure below is about -0.5 per-cent. The period witnessed revolution and war, which obviously damaged economic growth badly. If we change the period under investigation to 1990-2012 the annual GDP per capita growth is about 2.6 per-cents. At least we can claim that in normal political conditions in Iran the oil revenue has not hindered economic growth.

Figure 46 :



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

As mentioned before countries rich in natural resources comprise both losers and winners in the field of economic growth. There is a new concept that the main reason for these different experiences is in the quality of institutions. For instance, as you can see in below table growth losers, such as Ecuador, Niger, Zambia, Sierra Leone, Angola, are all natural resource-rich but have poor institutional quality. While many economic growth winners such as Canada, Australia, and Norway are rich in natural resources with strong institutional quality. Also the Asian economic tigers are all natural resource-poor with good economic growth performance.

Table 18: Economic growth performance in 10 natural resource-rich countries

Countries	Growth 1975–1998	Main resource	Institutional quality
Botswana	4.99	Diamonds	0.706
Chile	3.71	Copper	0.668
Norway	2.82	Crude Petrol	0.966
Australia	1.97	Minerals	0.932
Canada	1.73	Minerals	0.974
Ecuador	−0.79	Crude Petrol	0.592
Niger	−1.45	Minerals	0.520
Zambia	−1.94	Copper	0.434
Sierra Leone	−2.05	Diamonds	0.406
Congo, Democratic Rep.	−5.39	Ores and Metals	0.232

Source: Boschini, A.D., Pettersson, J., Roine, J., (2007) "Resource curse or not: a question of appropriability". Scandinavian Journal of Economics 109, 593-617.

2-Definition of Institutions:

There is a different definition and categories of institutions as follows:

Douglass C.North was an American economist known for his work on economic and institutions. He was the co-recipient (with Robert William Fogel) of the 1993 Nobel Memorial Prize in Economic Sciences. In the words of the Nobel Committee, North and Fogel were awarded the prize "for having renewed research in economic history by applying economic theory and quantitative methods in order to explain economic and institutional change."

Douglass C. North (1991) defines institutions:

"Institutions are the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights)."[42]

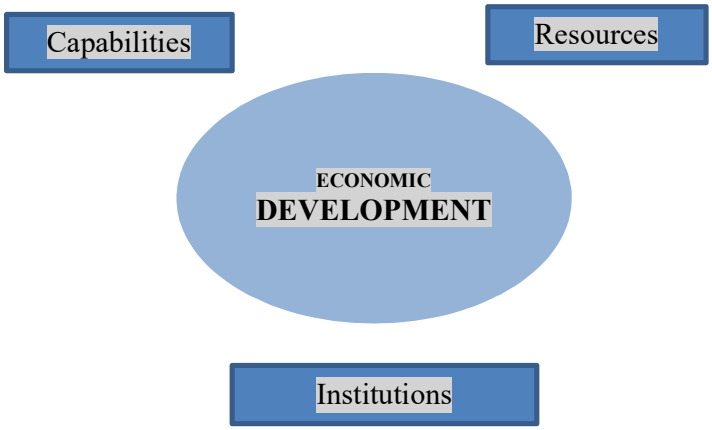
Geoffrey M. Hodgson (2006) believes institutions are systems of established and embedded social rules that structure social interactions. There are also differences between Social Structures, Rules, Organizations, Habituation, Conventions and Institutions.

[42]North, D. (1991), "Institutions", Journal of Economic Perspectives, Volume 5, Number 1

"... we may define institutions as systems of established and prevalent social rules that structure social interactions. Language, money, law, systems of weights and measures, table manners, and firms (and other organizations) are thus all institutions[43] ".

Uwem Essia (2012) believes institutions are one of main factors which shape economic development alongside with capabilities and natural resources. Institutions differ noticeably across countries and change over time depending on what the society distinguishes to be right or suitable. Institutions are created, raised, sustained or changed by people, and fundamentally change during growth procedure. Natural Resources have three main attribute consisting of A) usefulness B) limited availability and C) possible for using up. Capabilities such as Manpower, Technology, Management and Entrepreneurship make up the dynamic human capitals which push forward institutions and natural resource utilization. However, the basic necessary for creating the proper capabilities are good education and healthcare.

Figure 47: Dimensions of Economic Development



Source: Essia,U (2012), "Oil Revenue and Development Performance in Nigeria: Cursed By Resources, Institutions or Capabilities?" British Journal of Economics, Finance and Management Sciences

Acemoglu *et al*. (2008) distinguished three types of institutional characteristics:

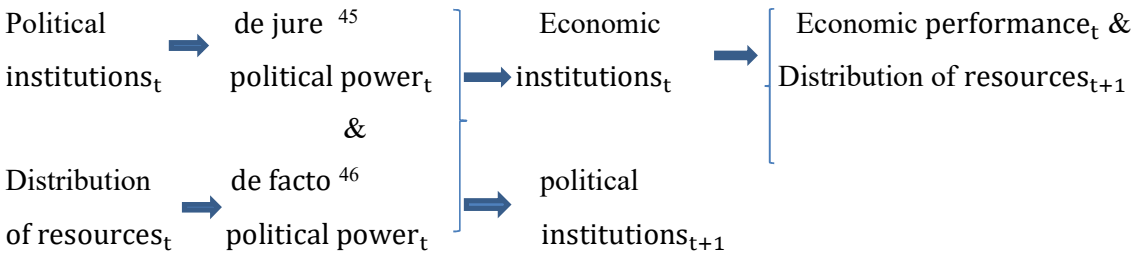
A) Economic institutions; they form the encouragement of important economic actors in society. Determine by history and chance, at the end of the day, economic institutions are collective choices of the society B) Political power and political institutions; because of different profit of individuals and groups, leads to a conflict of interest among various groups and individuals over the choice of economic institutions, and the political power of the different groups will be the deciding factor. Examples of political institutions include the form

[43] Geoffrey M. Hodgson (2006)," What Are Institutions?", Journal of economics issues

of government, for example, democracy versus dictatorship or autocracy, and the extent of constraints on politicians and political elites. C) Political institutions, similar to economic institutions. The role of institutions in growth and development determine the constraints on and the incentives of the key actors, but this time in the political sphere.

"…economic institutions are collective choices that are the outcome of a political process. The economic institutions of a society depend on the nature of political institutions and the distribution of political power in society."[44]

Acemoglu, Johnson, and Robinson (2005) summarized this framework with the following diagrammatic:



Also Acemoglu *et al*. (2005)[47] believe in three fundamental causes of economic growth and cross-country differences in economic performance. 1) Economic Institutions; Economic institutions are the basic cause of different shape of economic growth. It is based on the idea that humans themselves decide to organize their societies that determines whether or not they succeed. 2) Geography; this context emphasizes differences in geography, climate and ecology that determine both the preferences and the opportunity set of individual economic agents in different societies. 3)Culture; Culture is observed as a basic determinant of the values, preferences and beliefs of individuals and societies and, the argument goes, these differences play a key role in shaping economic performance.

[44]Acemoglu, D and James Robinson (2008) "The Role of Institutions in Growth and Development" The International Bank for Reconstruction and Development / The World Bank

[45] De jure political power refers to power that originates from the political institutions in society.

[46]This type of de facto political power originates from both the ability of the group in question to solve its collective action problem and from the economic resources available to the group (which determines their capacity to use force against other groups).

[47] Acemoglu, D., *et al*. (2005)." Institutions as the fundamental cause of long-run growth" Working Paper 10481 National bureau of economic research

3-A Brief comparison of Iranian and Turkish economy

As a comparison, Iran and Turkey are very similar together. Both countries have almost an equal population, geographically located in same area and culturally both are Muslim. Iran is much richer than Turkey in terms of natural resource but economic performance of Turkey has been much better than Iran during the period under investigation. The question is that what is the reason of better economic performance of turkey despite lower levels of natural resources? The answer might be in better institution quality in Turkey.

In below table you can find macroeconomic indicators of Iran and Turkey in years 2000, 2005 and 2010. Since 2000s Turkish economy has been one of the fastest growing economies in the world despite poor natural resources. Turkey was facing inflation crisis from 80s to early 2000s due to financial market weakness, weak institutions, corruption, and big budget deficit. The inflation rate decreased from 39 to 8 per-cents for the period of 2000-2005. Inflation rate remain more or less stable during the rest of the decade on one digit till now.

Iran's economy suffers a lot of high inflation rate and after sharp decrease in recent years still is in double digits. Turkey started to move fast toward a market based economy in the 1980s but the main key economic reforms happened at the end of year 2001 in some important sectors, such as fiscal, regulatory, exchange rate, monetary policy and privatization. Turkey started to grow fast after economic reform and in spite of poor natural resources; the country has tried to increase their competitive benefits in the industrial area. Also having strategic geopolitical position and partnerships with European countries has helped to boost its exports. Turkey total export in 2010 is about 118 B/USD while Iran total export is about 79 B/USD with %80 per-cent oil and gas. Also GDP per capita in turkey is nearly two time of Iran's per capita GDP.

Table 19: Macroeconomic indicators of Iran and Turkey

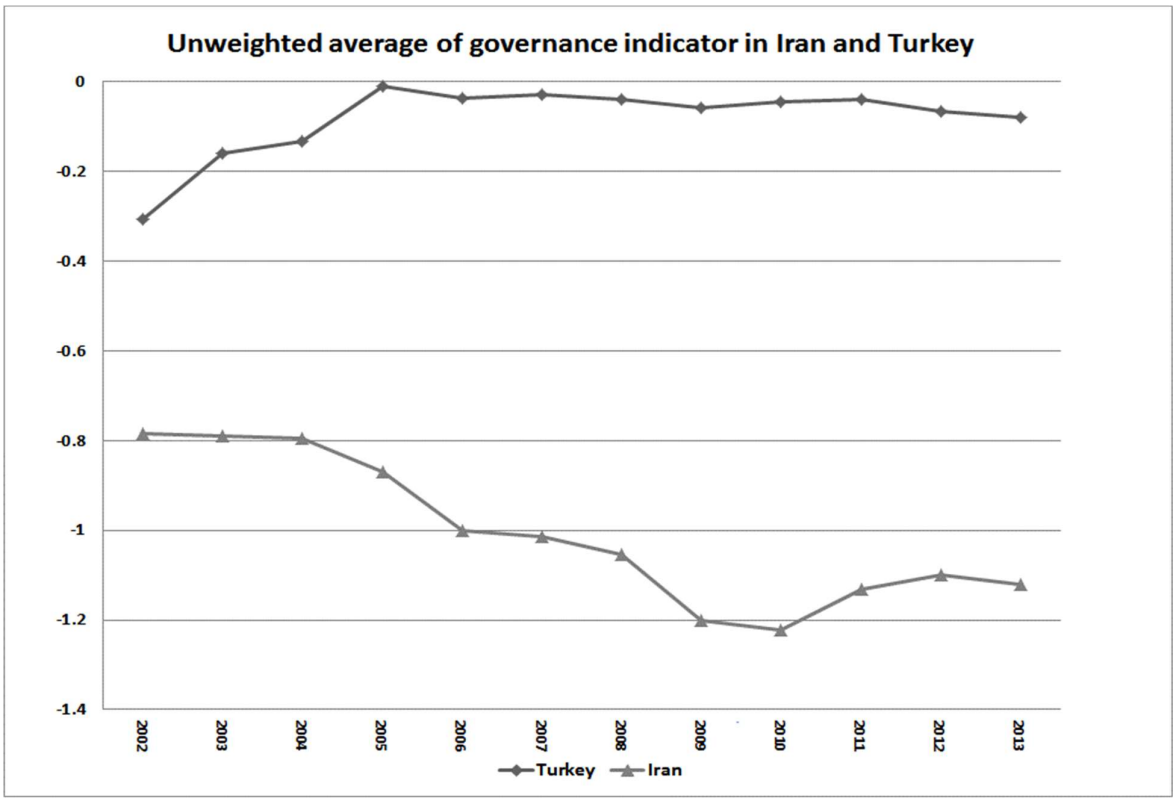
Country	Iran			Turkey		
Year	**2000**	**2005**	**2010**	**2000**	**2005**	**2010**
Population (million)	65.3	69.7	73.9	63.6	68.1	72.7
Total GDP (billion USD)	96.5	188	496.2	266.5	482.7	817.3
Real GDP growth (%)	4.6	5.1	1.8	6.7	8.4	9
GDP Per Capita (USD)	1550	2754	6445	4189	7088	10015
Inflation Rate	16	13.5	14.6	39	8.1	8.6
Unemployment Rate	11.8	12	14.6	7.3	9.3	12.4
Total Exports (B/ USD)	25	38.8	78.7	26.9	69.6	117.4

Source: World Bank (2012) and IMF (2012) - Azarhoushang, A and Rukavina,M (2014) "Resource curse:a comparative study", Institute for International Political Economy Berlin

In terms of institutions you can find below graph unweighted average of six governances indicator (World Bank 2014) in Iran and Turkey during 2002-2013, individual indicator graphs are shown in appendix A. The index estimated (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance) in six indicators: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. (see Appendix A)

Institutional indicators in Turkey are better than Iran either individually or unweighted average especially in recent years.

Figure 48: Unweighted average of six governance indicator in Iran and Turkey during 2002-2013[48]



Source: The Worldwide Governance Indicators, World Bank 2014

4-Corruption Perceptions Index

Another index is corruption perception index by Transparency International (TI) which defines corruption as the misusage of centred power for private benefit. This definition contains corrupt actions in both the government and private sectors. The Corruption Perceptions Index (CPI) ranks countries according to the perception of corruption in the public sector. The CPI is an accumulate indicator that mixes different type of information about corruption, making it possible to compare countries.

The index is a "poll of polls". It has been prepared using many sources, including two surveys from the World Competitiveness Yearbook, Institute for Management Development, Lausanne; one from the Political & Economic Risk Consultancy Ltd, Hong Kong; one by Gallup International; two assessments by DRI/McGraw-Hill Global Risk Service and the

[48]See Appendix A

Political Risk Services, East Syracuse, NY; plus finally a survey conducted at Göttingen University via internet (http://www.unigoettingen.de) which gives contributors the possibility for anonymous contributions and also directly approaches employees of multinational firms and institutions.

Based on below table for the period of 2003-2014 corruption index deteriorated in Iran but improved in Turkey while both countries were equal in the index in 2003. Iran corruption index rank is 136 among 146 counties in 2014. Norway's index is much better than Iran and Turkey.

Table 20: Corruption Perceptions Index[49]

	Iran	Turkey	Norway
2003	3.0	3.1	8.8
2004	2.9	3.2	8.5
2005	2.9	3.5	8.9
2006	2.7	3.7	8.8
2007	2.5	4.1	8.7
2008	2.3	4.6	7.9
2009	1.8	4.4	8.6
2010	2.2	4.4	8.6
2011	2.7	4.2	9.0
2012	2.8	4.9	8.5
2013	2.5	5.0	8.6
2014	2.7	4.5	8.6

Source: Transparency International, www.transparency.org

5-The channels through which large natural resource revenue causes poor economic performance

Many economic development theories believe that revenue accumulation is necessary for investment. So development is restricted by scarcity of investment (W.W. Rostow 1960).

[49] Transparency International is a global movement with one vision: a world in which government, business, civil society and the daily lives of people are free of corruption. Through more than 100 chapters worldwide and an international secretariat in Berlin.

"During the (economic growth) take-off, the rate of effective investment and savings may rise from, say, 5% of the national income to 10% or more"[50].

Rostow (1960) also mentioned that in early stage of the take off the investment; technically the investment ratio must be high, for example, in Canada before the 1890's and Argentina before 1914. Thus massive oil revenue can compensate the scarcity of capital and foreign exchange to generate the required investment.

On the other hand, some have opposite views and believe saving more will not lead to investment because saving in local currency may not allow capital imports which require foreign exchange (Marquez 1985).

"*…in summary we find that foreign exchange constrains adversely affect growth possibilities for LDSc because of the resulting reduction in the speed of adjustment of capital formation consistent with targeted growth rates."*[51]

In practice many resource-rich countries have experienced low economic growth and less poverty reduction than poor natural resource countries. This has been known as resource curse case in economics literature. But this is not a strict rule; we can find countries which are not suffering from natural resource revenues. In this part we try to answer the more interesting question, i.e. what are the transmission channels between natural resource revenues and poor economic performance.

This section shows the transmission channels between natural resource revenues and economic failure. Six strands are discussed as follows:

1- Dutch disease

2- Declining of natural resource revenue's purchase power

3- Expanding government interference in the economy

4- Corruption and rent seeking

5- Spending natural resource revenues

6- Institutions and development

5-1-Dutch Disease

In 1960, followed by discovery of natural gas in the Netherlands the term Dutch Disease first entered into the economic literature. Because of sharp increase in foreign exchange revenue causes depreciation in exchange rate and which increases import of tradable goods.

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[50] Rostow, W. (1960). The Stages of Economic Growth, Cambridge: Cambridge University Press. Page 4

[51] Marquez, J. (1985). 'Foreign exchange constraints and growth possibilities in the LDCs', Journal of Development Economics, page 20

Dutch Disease normally focuses on short run implications of a temporary natural resource discovery; thus it is not suitable for major crude oil exporting countries such as Iran. Empirical support for this is provided by Sachs and Warner (1995,1998,1997a,1997b,2001), Barro, R. (1991), Sala-i-Martin, *et al*. (1997, 2003), Khalid S.Alkhelaiwi (2001), Arman (1998), Neary and van Wijnbergen (1986), Corden (1984),selected specifically for courtiers by Fardmanesh (1991), Wijnbergen (1984), Ecuador and Mexico François Boye (2001,2002) , Bolivia (Auty and Evia 2001), Venezuela (Rodriquez & Sachs 1999).

However, the meaning of Dutch Disease has changed over time and sometimes covers all the associated aspects of negative economic effects related to 'resource curse'. Sachs and Warner (1998) firmly believe that resource rich countries experience some sort of harmful effects on economic performance in long term. However, they found only two countries namely Malaysia and Mauritius to be exceptional. Nevertheless, in some short time periods resource rich countries did grow faster than resource poor ones.

"*The resource booms in Bolivia, Mexico and Venezuela did not permanently raise the level of per-capita GDP, and were followed by a growth slowdown rather than increase. The resource boom in Ecuador appears to have raised the level of GDP initially but was not followed by faster growth."*[52]

Crowding out or natural resource movement effects is another side effect of Dutch Disease. When an oil, gas or mineral investment project relative to the whole economy is considerable, thus the economy finds it hard to protect the other elements needed to develop. This fact is particularly related to not big countries when investment focused on specific region. This also happen in the transition economies when new large tradable investment has wiped out current productive base (Buffie 1986, 1993).

"*Foreign investment in the high-wage manufacturing sector crowds out domestic capital on a greater than one-for-one basis and lowers the level of manufacturing sector employment in the long-run. By contrast, foreign investment in an enclave sector or in the primary export sector crowds in domestic capital and unambiguously reduces underemployment."*[53]

We can summarize the consequences of sharp increase in natural resource global prices which is known as Dutch Disease in the literature as follows:

[52] Sachs, J.D. and Warner, A.M. (1998). 'The Big Push, Natural Resource Booms and Growth', mimeo, January.
[53] Buffie, E.F. (1993). 'Direct foreign investment, crowding out and underemployment in the dualistic economy', Oxford Economic Papers, 45.

• Real exchange rate appreciation which deteriorates the foreign trade structure and causes a further decline in internal production of the manufacturing sectors. In other words, increase in value of the local currency encourages import of foreign goods

• A decrease in the price of tradable goods and services followed by increase in imports

• An increase in government spending

• An increase in the price of non-tradable goods such as housing that is not internationally traded.

• Reducing the profitability of the tradable sector, followed by stagnation and decline of this sector's share of national production[54]

• The resource movement effect which draws labour out of industrial sectors in favour of booming and non-tradable sectors. In other word a resultant transfer of labour and land out from tradable sector to nontrade and natural resource sector because of more attraction return.

• Volatility in natural resource price or end of commodity boom, normally causes current account deficit.

• The spending effect which causes resource revenues to be expended on current consumption and on non-tradable goods

5-2- Declining of natural resource revenue's purchase power

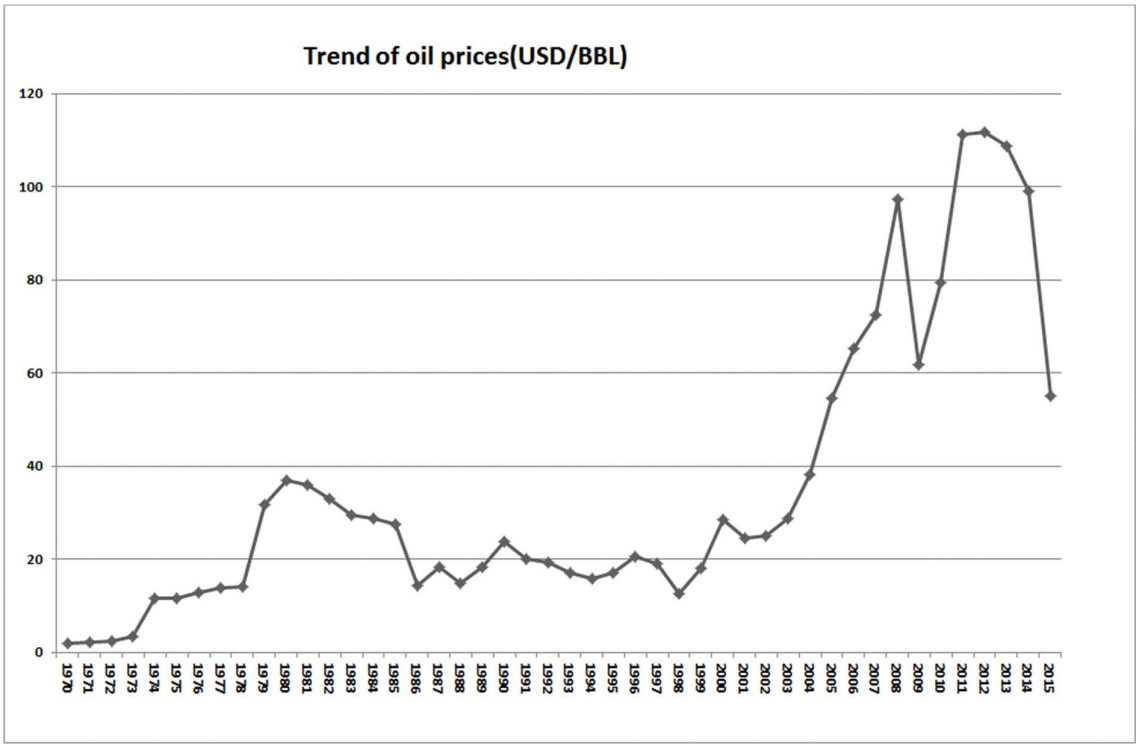
In long term import power of capital goods in rich natural resources or oil exporter countries became less and less. This issue of declining terms of trade[55] limit investment power of natural resource exporter countries. As shown in graph below there has been massive volatility in oil prices during 45 years. The nature of this commodity made its prices unpredictable.[56] Thus managing fluctuation of oil revenues followed by changes in global oil prices, challenges the ability of any government and could go some way to explain a resulting poor economic performance (Auty 1998). However, fluctuating of oil revenues in case of ineffective stabilising policy by government, creates problems for government macro-economic management.

[54] Arabmazar Yazdi. A *et al*. (2014)," An Investigation in to the Effects of Oil Revenues on Tradable Sector in OPEC Countries" International Journal of Basic Sciences & Applied Research. Vol., 3 (SP), 50-55, 2014

[55] It is calculated by dividing the value of exports by the value of imports, then multiplying the result by 100. If a country's terms of trade (TOT) is less than 100%, there is more capital going out (to buy imports) than there is coming in. A result greater than 100% means the country is accumulating capital (more money is coming in from exports). (www.investopedia.com)

[56] Pay attention to chapter 3 section 5, Determinants of the Real Price of Crude Oil in Short and Long Term

Figure 49: Trend of oil prices (USD/BBL)



Source: bp statistical review of world energy 2015

5-3- Expanding government interference in the economy

Natural resource in general and oil & gas reserves in particular in most countries belong to the government. The revenues also go to the government so this fact encourages more government intervention. Sometimes the public also puts pressure on the governments to make quick decisions which are mostly bad decisions. In other words, imprecise natural resources revenues spending policy makes problems.

The political nature of the natural resource curse or blessing, relating to the role of the government spending is discussed by McMahon (1997) and Mikesell (1997). The example of good government decisions that made natural resource blessing and avoid the worst excesses of 'resources curse 'is in Botswana (Sarraf *et al*. 2001)

"*The adoption of sound economic policies and the good management of windfall gains have allowed Botswana to continuously manage growth and to become one of the great success stories of developing countries*".[57]

In case of resource curse Venezuela is good example which had bad government management that caused the problems (Mikesell 1997)

5-4- Corruption and rent seeking

Another measure of natural resource curse goes for Corruption and Rent Seeking (Gylfason 2001). He believes that the major reasons why resource-based production can prevent economic growth over long periods are: Dutch disease, lack of education, rent seeking, corruption, import protection and economic policy failures.

Corruption and rent seeking sometimes are considered to be the same phenomenon but they are different. However, sometimes the difference becomes somewhat vague. Simple meaning of corruption is stealing from public purse in illegal ways and always harmful for economic growth. Increased corruption delay economic development (Leite *et al*., 1999).

"The existence of corruption always reduced growth compared to the non-courruption case, this negative effect exhibited some nonlinearities, being more pronounced in less developed economies."[58]

Rent seeking is somehow normal reaction of people to take advantage of public purse mostly in legal ways. Obviously rent seeking is larger in countries with big oil and gas revenues because when public purse is bigger than the leaked money, it is less noticeable.

Moreover, in high-rent seeking countries the natural resource leads to political change and even war to control of the money coming from natural resources, whereas in low-rent seeking countries the rulers must encourage people to create wealth.

Natural Resource wealth may worsen the quality of institutions, since it permits rulers to suppress opposition, escape responsibility and fight against modernization (Isham, *et al*.., 2003). Natural resource wealth also encourages politicians to prevent industrial and institutional progress, which can make weaker their power (Acemoglu *et al*., 2006).

[57] Sarraf, M. & Jiwanji, M. (2001). 'Beating the resource curse: the case of Botswana', The World Bank Environmental Economics Series, Paper No.83.

[58] Leite, C. and Weidmann, J. (1999). 'Does Mother Nature Corrupt – Natural resources, corruption and economic growth', IMF Working Paper 99/85, Washington D.C.: International Monetary Fund.

In some cases, corruption and rent seeking is even worse than Dutch Disease such as in Nigerian economy and Congo (Acemoglu *et al*.., 2004).
There is also large and growing literature on the role of rent seeking in the economy (see Lane and Tornell 1995, 1996; Leite and Weidmann 1999).

5-4-1-Channels for rent seeking in Iran

Channels for rent seeking in Iran normally happen:
1- Development projects: Over estimation of the cost of public projects by government employee. The difference between the official cost of the project and the actual cost may then be divided between contractors and bureaucrats. (Bjorvatn,K *et al*. 2005)
2- Subsidized loans; these are normally run by public banks to lend money to special people who have good connections in the bureaucratic system.
3- Tariffs: having special discount on custom tariffs or monopoly on some importing goods
4- Smuggling or import by semi state organizations.
5-Having special relation with key parts of decision maker organizations to get important economic decisions in advance
6- Using ideology as an excuse to many illegal acts

Based on table below we can summarise oil exporter countries political systems (Eifert,B *et al*. 2002). Iran will be classified in Paternalistic Autocracy.

Table 21: Political Economy Classification of Oil Export countries

	Political Features	Institutional Implications	Economic Implications
Mature Democracy:	-stable party system -range of social consensus -strong, competent, insulated bureaucracy -competent, professional judicial system -highly educated electorate	-long horizon -policy stability, transparency -high competitiveness, low transactions costs -strong private / traded sector, pro-stabilization interests vis-A-vis pro-spending interests	-savings likely -expenditure smoothing, stabilization - rents transferred to public through government-provided social services and insurance or direct transfers
Factional Democracy:	-government and parties often unstable relative to interest groups -political support gained through clientelistic ties and provision of patronage -wide social disparities, lack of consensus -politicized bureaucracy and judicial system	-short horizon -policy instability, non-transparency, high transactions costs -strong state role in production -strong interests attached directly to state expenditures; politically weak private non-oil sector and pro-stabilization interests	-savings very difficult -pro-cyclical expenditure; instability -rents transferred to different interests and to public through subsidies, policy distortions, public employment
Paternalistic Autocracy:	-stable government; legitimacy originally from traditional role, maintained through rent distribution -strong cultural elements of consensus, clientelistic and nationalistic patterns -bureaucracy provides both services and public employment	-long horizon -policy stability, non-transparency -low competitiveness, high transactions costs -strong state role in production -strong interests attached directly to state expenditures; weak private sector	-pro-cyclical expenditure, mixed success with stabilization -risk of unsustainable long-term spending trajectory leading to political crisis -little economic diversification
Reformist Autocracy	-stable government, legitimized by development -social range of consensus towards development -constituency in non-oil traded sectors -insulated technocracy	-long horizon -policy stability, non-transparency -drive for competitiveness low transactions costs -strong constituency for stabilization and fiscal restraint	-expenditure smoothing, stabilization -state investment complementary to competitive private sector -active exchange rate management to limit Dutch disease
Predatory Autocracy	-unstable government, legitimized by military force of arms -lack of consensus building mechanisms -bureaucracy exists as mechanism of rent capture and distribution; corrupt judicial system -little or no civic counterweight	-short horizon -policy instability, non-transparency -low competitiveness, high transactions costs -spending interests strong vis-a-vis private sector or pro-stabilization interests	-no savings -highly pro-cyclical expenditure -very high government consumption, rent absorption by elites through petty corruption and patronage, capital flight

Source: Eifert,B *et al*. 2002 "The Political Economy of Fiscal Policy and Economic Management in Oil-Exporting Countries "The World Bank Africa Regional Office, Office of the Chief Economist October 2002

5-5- Spending natural resource revenues

Usually, investments made by natural resource-rich countries are not in productive side of economy so this often leads to problems. Investment policies mostly follow three dimensions, subsidy, import substitution and growing protectionism by tariff regime which encourage

emergence of rent seeking groups. At the same time continuing natural resource revenues unsupported to create competitive productive industries which is essential for technological progress.

"In terms of political influences, Brazil's attempts to remove protection for uncompetitive sectors were blocked by rent seeking groups".[59]

Moreover, the prospect of large oil and gas revenue encourage governments to borrow funds in order to make more investments. This fact worsens the problems because the loan must be repaid by considering fluctuation of foreign exchange conversion factor. In this regard Mexico is the classic example (Usui 1997)

"This difference suggests that Indonesia succeeded in sterilizing a part of the oil bonanza, while the Mexican government spent all of the oil revenues indiscriminately, and, still more, accelerated its spending by heavy foreign borrowing."[60]

5-6 -Institutions and development

This part of literature regarding poor economic performance of countries with abundant oil and gas reserves has been debated among economists.

A fundamental factor regarding economic progress is the quality of institutions which determine economic performances. In other words, the best macroeconomic and microeconomic policy recommendations in case of weak institution are worthless. Among institutions, geography, and trade in affecting income levels around the world, the quality of institutions "trumps" everything else (Rodrik *et al*. 2003).

For instance, (Isham *et al*. 2003) believes institutional capacities have a significant role in economic growth in countries abundant natural resource. He believes there is also a difference between "Point Resource" and "Diffuse" economies in terms of economic growth in same institutions quality[61]. They showed that situation in "Point Resource" economies is worse than "Diffuse" economies.

[59]Sarraf, M. & Jiwanji, M. (2001). 'Beating the resource curse: the case of Botswana', The World Bank, Environmental Economics Series, Paper No.83

[60] Usui, N. (1997). 'Dutch disease and policy adjustments to the oil boom: a comparative study of Indonesia and Mexico', Resources Policy, 23(4).

[61] "Diffuse" economies, which have relied primarily on animals and agricultural produce grown on small family farms (*e.g.*, rice and wheat)· "Point source" economies, which have relied primarily on fuels, minerals, and plantation crops (*e.g.*, sugar)· "Coffee and cocoa" economies, which have relied primarily on these two commodities (classifying them as either "point source" or "diffuse" proved problematic since these crops can be grown either on plantations or small family farms, but since these tree crops rely on a long time scale and are

"…we show that "point source" and "coffee/cocoa exporting" countries do worse across an array of governance indicator… as countries with natural resource exports that are "diffuse" do not show the same strong differences-and have had more robust growth recoveries"[62]

On the other hand, Acemoglu *et al*. (2001) point out that while weak economic performances can be explained by institutions, this is because of differences in colonial-policy which are not easily distinguishable from the impact of natural resource abundance.

"Europeans adopted very different colonization policies in different colonies, with different associated institutions. In places where Europeans faced high mortality rates, they could not settle and were more likely to set up extractive institutions."[63]

A natural resource wealth in presence of weak institutions push entrepreneurs toward rent seeking activities since those activities are more profitable than productive one. It depends on the nature of institutions, i.e. whether they are production friendly institutions or rent grabbing-friendly institutions (Mehlum *et al*., 2006). On the other hand, strong institutions encourage people to productive activities. We can name countries with rich natural resource with strong institutions such as Norway, Botswana, Australia and Iceland. Also countries with rich natural resources, weak institutions and economic performance such as Venezuela, Congo, Colombia

In some cases, even weak institutions destroyed over control of natural resources by political groups, rebels and internal conflicts. In other word democracy and quality of governance is limited by existing of natural resource (Ross 1999). Nations with economic institutions of higher quality are more capable of managing their resource revenue and turning it into positive economic growth. The most important findings about better economic institutions as follows:

1-Rule of law

2- Transparency and accountability.

3- Increases efficiency by eliminating barriers to entrepreneurial activity

4- Reduce incentives for rent-seeking and corruption,

6-Literature review:

In the first of several follow-up studies such as Barro (1991) Sachs and Warner (1995,1997)and Sala-i-Martin (1997) regarding natural resource abundance, institutions quality as determinants

immobile, they are potentially susceptible to rent extraction from small holders via marketing boards) 'point' resources such as mining and rents derived from 'diffuse' sources such as peasant farming. (Isham *et al*. 2002)

[62]Isham, J., Woolcock, M., Pritchett, L. and Busby, G. (2003). 'The Varieties of Rentier Experience: How natural resource endowments affect the political economy of economic growth', Unpublished mimeo.

[63]Acemoglu D., Johnson S., and Robinson J. (2001). 'The colonial origins of comparative development: an empirical investigation', American Economic Review, 91(5).

of economic growth the scope of debate has widened as we shall see below.

Sachs and Warner (1997) have argued that there was an opposite correlation between natural resource intensity and growth for the period of 1970 -90. The list of additional variables in their study includes initial GDP, openness policy (foreign trade and investment), investment rates, human capital accumulation rates, changes in the external terms of trade, government expenditure ratios, terms of trade volatility, and the efficiency of government institutions. They also found that weak institutions and poor economic policies-and especially lack of openness to international markets-slow economic growth. They pointed out that the indicators over which societies have control-such as trade policy and quality of institutions-seem to be the most significant for growth. The authors found that nations that have carried out strong economic reforms have seen high rates of economic growth.

Leong,M and Mohaddes,K (2011) studied the impact of natural resource rents and their volatility on GDP growth under changing institutional quality. Using Generalized Method of Moments (GMM) dynamic panel estimator for the period of 1970 - 2005 for 112 countries. They found that while natural resource rents increase real GDP per capita, their volatility use a negative impact on GDP growth. Hence, they claim that fluctuations, rather than natural resource itself, lead to resource curse. But higher institutional quality can help compensate some of the negative fluctuations effects of natural resource rents. Natural resource rich countries can make better the management of fluctuation in natural resource income by improving institutions and creating sovereign wealth funds or stabilization funds.

The impact of oil revenue fluctuations, institutions and of several important macroeconomic indicators in Nigeria has been studied by Ushie, V. *et al*. (2013). They have employed VAR model over the period of 1970 - 2008. The time series variables have included real output growth, inflation, real exchange rate, oil revenues, fiscal deficit (measure of fiscal policy as a percentage of GDP), money supply (M2) growth (a proxy for monetary policy stance), interest rate as well as an index to capture institutional quality. The research finding supports the general view that fluctuations in crude oil revenues have resulted in inflation, lower output growth and real exchange rate overvaluation in Nigeria. Moreover, institutional variable is found to be very significant. This finding is in line with the normal estimation of fiscal performance in Nigeria during oil revenue increase as being forwarded by domestic institutional dynamics.

Keikha A *et al*. (2012) analysed institutional quality, economic growth and fluctuations of oil prices in oil dependent countries by using a panel co-integration approach and error-correction model for 32 oil rich countries covering the period of 1975-2010. The aim of the paper is to

study of fluctuations of oil prices impacts on economic growth of oil dependent countries with regards to institutional quality. The result shows that there is a negative relation between fluctuations of oil prices impact on economic growth and institutional quality index. In other word the impact of fluctuation is avoided by countries with adequately good institutions.

Hooshmand M. *et al*. (2013) case study of selected oil exporting countries focused on oil rents, institutions and financial development. In this study, direct and indirect impact of the oil rent on financial development is examined by using GMM for 17 selected oil exporting countries, over the period of 2002-2010. So the aim of the study is to investigate whether the oil rents weakens the financial development in oil dependent economies? Based on the empirical evidence and researches, the majority of oil dependent countries have the low level of financial development. The result suggests that oil rent has had a negative effect on financial development and has provided the context of the weakening financial markets in two direct and indirect (through institutional quality channel and weakening it) ways. Also the result indicates that there is a positive and significant relationship between institutional quality and financial development. So improving the institutional quality is a necessary and essential condition to enhance financial development.

Boschini *et al*. (2007) had a hypothesis that natural resources have a negative impact on economic development only under weak institutions. They examined the hypothesis by using cross-sectional data for 80 nations for the period of 1975 -98. They also studied the impact of different types of natural resource and concluded that there is significant difference between the impacts of certain types of natural resources. In other words, natural resources such as gold, silver, and diamonds which are easy to store, transport or smuggle, and can easily be sold, have a stronger negative impact on economic growth. They also tested models with several measures of natural resources: value of primary exports; value of exports of ores, metals, and fuels; value of mineral production not including fuels; and value of production of gold, silver and diamonds all as a percentage of GNP or GDP. As a robustness test, the authors run a two-stage, least squares model to account for the potentially endogenous nature of institutions. They used settler mortality-as suggested in Acemoglu *et al*. (2001) - as an instrument for institutions using latitude as an exogenous instrument; the results do not change significantly.

"Our results indicate that a sufficient improvement in institutional quality turns resource abundance into an asset rather than a curse. Furthermore, we have shown the type of natural resources a country possesses to be of crucial importance".[64]

Mehlum *et al*. (2006) disputed that institutional quality is conclusive for avoiding the curse of natural resources. They have employed cross-sectional data for 87 nations for the period of 1965-90. They tested an OLS model, dependent variable: GDP growth and with different variables including institutional quality as independent variables with various robustness tests. *"Countries rich in natural resources constitute both growth losers and growth winners. We claim that the main reason for these diverging experiences is differences in the quality of institutions."*[65]

Isham *et al*. (2003) analysed that how natural resource export structures affect the political economy of economic growth with data for over 60 nations for the period of 1975 - 1997. They distinguish between "point source" natural resources such as oil, minerals, coffee and "diffuse" natural resources such as livestock and agricultural product. They claim that natural resources affect the quality of institutions and that institutions in turn have an impact on economic growth. They first estimate the impact of natural resources, five exogenous instruments (ethnic fractionalization, predicted trade share, latitude, English language, European languages) and a number of standard independent variables on a number of measures of institutional quality: rule of law, political stability and violence, government effectiveness, absence of corruption, regulatory framework, and property rights and rule based governance. Then they estimate the impact of these measures of institutions and the rest of the growth independent variables on economic growth. The estimates confirm their hypothesis: point-source resources have a negative impact on institutions while diffuse resources do not because generate lower rents.

Bjorvatn, K *et al*. (2005) studied oil and rent seeking in Iran. In countries with weak institutions, obviously rent seeking activities make a lot of extra expense for the economy normally in two ways. A) Through direct impact of the natural resources wasted in the rent seeking activities. B) Rent seeking destroy firms' investment determination, and encourage corruption. In this context Iran as an oil rentier state is a good example because of its political system which is much split into factions.

[64] Boschini, A.D., *et al*. (2007)." Resource curse or not: a question of appropriability". Scandinavian Journal of Economics 109, 593-617.

[65] Mehlum, H. *et al*. (2006) "Institutions and resource curse". Economic Journal 116, 1-20

Mohaddes,K and Pesaran,M (2013) studied the impact of oil revenues on the Iranian economy over the past hundred years, in the period of 1908-2010. It is argued that although oil discovered more than 100 years ago in Iran but its serious consequence in the Iranian economy started early 60s. They show the oil revenue has had both blessing and curse role on Iranian economy. Oil revenue cause output growth but oil revenue fluctuations can have adverse effect on economy through inflation rate. Negative impact of oil price fluctuations accelerated by lack of appropriate institutions, proper fiscal policy and rent seeking.

7- Empirical model and data

There is no doubt that economic policy in Iran have been heavily formed and influenced by the legal structure that was put in place after the revolution. For instance, respecting private property, private and public sectors have serious constrains which were stipulated in Article 44 of constitution. The Iranian lawmakers have ever since the early 20 century felt committed to keep an open eye on the consequences of foreign participation in Iran. So as a result limits to foreign involvement and foreign ownership ban have been in place in the economy.

The main assumption of this section is that the oil revenues have a positive effect on economic performance, but better quality of institutions increases that. The hypothesis is whether quality of institution has a significant impact on economic growth or not? The hypothesise will be tested by using different variables for institutions, oil dependency and oil abundance.

There are several research papers about impact of institutions such as Sachs and Warner (1997), Mehlum *et al*. (2005a), Boschini *et al*. (2007), summary of results are given the following table. The main difference of between their research and our methodology here is that they selected number of countries by using panel data cross section countries not particular country. Based on Sachs and Warner (1997b) and Boschini *et al*. (2007) results, institutions quality has positive impact on economic growth while Melhum *et al*. (2005) results disagree.

Table 22: Effects of resource dependence and institutional quality on economic growth in selected countries

Annual growth in real GDP per capita	Sachs and Warner (1997b)	Mehlum, Moene and Torvik (2005)	Boschini ,Pettersson and Roine (2007)[66]
Initial income	-1.28 (6.65)	-1.26 (6.70)	-2.21(0.377)
Openness	1.45 (3.36)	1.66 (3.87)	0.504(0.274)
Resource dependence	-6.69 (5.43)	-14.34 (4.21)	-6.39(4.08)
Institutional quality	0.6 (0.64)	-1.3 (1.13)	6.76(1.96)
Investments	0.15 (6.73)	0.16 (7.15)	0.087(0.026)
Interaction term	-	15.40 (2.40)	4.15(6.15)
Number of countries	87	87	80
Adjusted R2	0.69	0.71	0.63

7-1- Econometric Specification

Following Boschini *et al*. (2007), Mehlum *et al*. (2006) and Ushie *et al*. (2013), the basic specification for our econometric analysis and description of the variables as follows:

$$GDP\_G_t = \alpha_1 GDP\_G_{t-1} + \alpha_2 GFCF\_GDP_t + \alpha_3 OILR\_G_t + \alpha_4 INF_t + \alpha_5 DUM + \beta_1 NR + \beta_2 IQ + \beta_3 (INTER) + \varepsilon t \quad (5\text{-}1)$$

[66] They use four different measures of natural resources to capture a gradual increase in physical and economical appropriability. Here just we quoted of primary exports to GNP. The other measures including OrMetExp, which includes exports of ores and metals as a share of GDP, MinProd, the share of mineral production in GNP, Midas Prod, is the value of production of gold, silver and diamonds (industrial as well as gemstone) as a share of GDP.

Table 23: Description of the variables:

Variable	Description
$\mathbf{GDP-G_t}$	GDP growth rate, independent variable
$\mathbf{GDP\_G_{t-1}}$	lag of the dependent variable to control for the dynamic path of economic growth
$\mathbf{GFCF\_GDP_t}$	gross fixed capital formation as a ratio of real GDP
$\mathbf{OILR\_G_t}$	oil revenues growth
$\mathbf{INF_t}$	inflation rate, as a measure of macroeconomic instability
DUM	a dummy variable for Iran-Iraq war ,for period of 1979-1989=0 otherwise=1
NR	Natural resource abundance and dependence, the main proxies for oil dependency. In three scenarios including 1)share of oil exports in total exports (oilex_texp), 2)oil value added in total GDP (oilgdp_gdp) and 3) oil revenue in total government budget(oilr_gbud)
IQ	refers to Institution Quality(IQ) with different sources including EFW,PRS,WGI
INTER	is an interaction term of oil dependence and/or abundance variable with an index of institution quality (NR*IQ)
ε	is the error term which is assumed to be independent from other regressors

The table below shows summary of expected sign of variables in regression and source of variables. Based on economic theory lag of the independent variable, gross fixed capital formation and oil revenue growth have positive effect on economic growth so α_1 , α_2 and α_3 should be positive. Inflation rate, as a measure of macroeconomic instability has negative effect on economic growth, thus we expect α_4 to have negative sign. By definition the war and revolution dummy variables must have positive sign. In terms of natural resource abundance independent variables including share of oil exports in total exports (oilex_texp), oil value added in total GDP (oilgdp_gdp) and oil revenue in total government budget (oilr_gbud) we believe β1 should be negative in case of resource curse or positive in case of resource blessing. Also β2 should be positive to confirm the standard finding that good institutional quality is beneficial for growth.

The most critical coefficient is β3 which is for the interaction between natural resources and institutional quality INTER=NR×IQ. Recently economists have paid more attention to interactions between institutions and resource wealth in their analysis of the natural resource

curse. Most of these studies are cross-country analyses, e.g. Boschini *et al*. (2007), Mehlum *et al*. (2006),Brunnschweiler and Bulte (2008), and Iimi (2007).

However, how these institutions influence the relationship between natural resources and growth is country specific (Bjorvatn and Selvik, 2008). Resources are only problematic if institutional quality is poor. Thus β3 the coefficient, should be positive and-if it is to reverse the resource curse- have an absolute value larger than β1. This would mean that as long as institutional quality is good enough, natural resources will have a positive net effect on economic growth (Boschini *et al*. 2007).

Table 24: Hypothesized effects of independent variables

Independent variable	coefficient	Expected sign	Source
GDP_G_{t-1}	α_1	+	CBI
GFCF_GDP	α_2	+	CBI
$OILR\_G_t$	α_3	+	CBI
INF_t	α_4	-	CBI
Dummy	α_5	-	0=1979-1989;otherwise 1
NR(Oil exports / total exports)	β_1	+/-	CBI
NR(Oil GDP / total GDP)	β_1	+/-	CBI
NR(Oil revenue/total budget)	β_1	+/-	CBI
IQ	β_2	+	EFW Index&WB&PRS
INTER(IQ*oil abundance)	β_3	+	CBI&EFW&WB&PRS

This study uses annual time series data on Iranian economy over the period from 1970 to 2012. All data were obtained from various issues of the central bank of Iran (CBI) website, while the measure of institutional quality is the Fraser Institute's Economic Freedom of the World (EFW index) from EFW website. In robustness tests we will consider two other measurements for institutional quality as follows:

1-Worldwide Governance Indicators (WGI) from World Bank.

2-Political Risk Services (PRS) from PRS website.

7-2-Structure of the EFW index[67]

The EFW has scores dating back to 1970, thus matching the starting point of the other time series. The EFW index measures the degree of economic freedom present in five major areas:

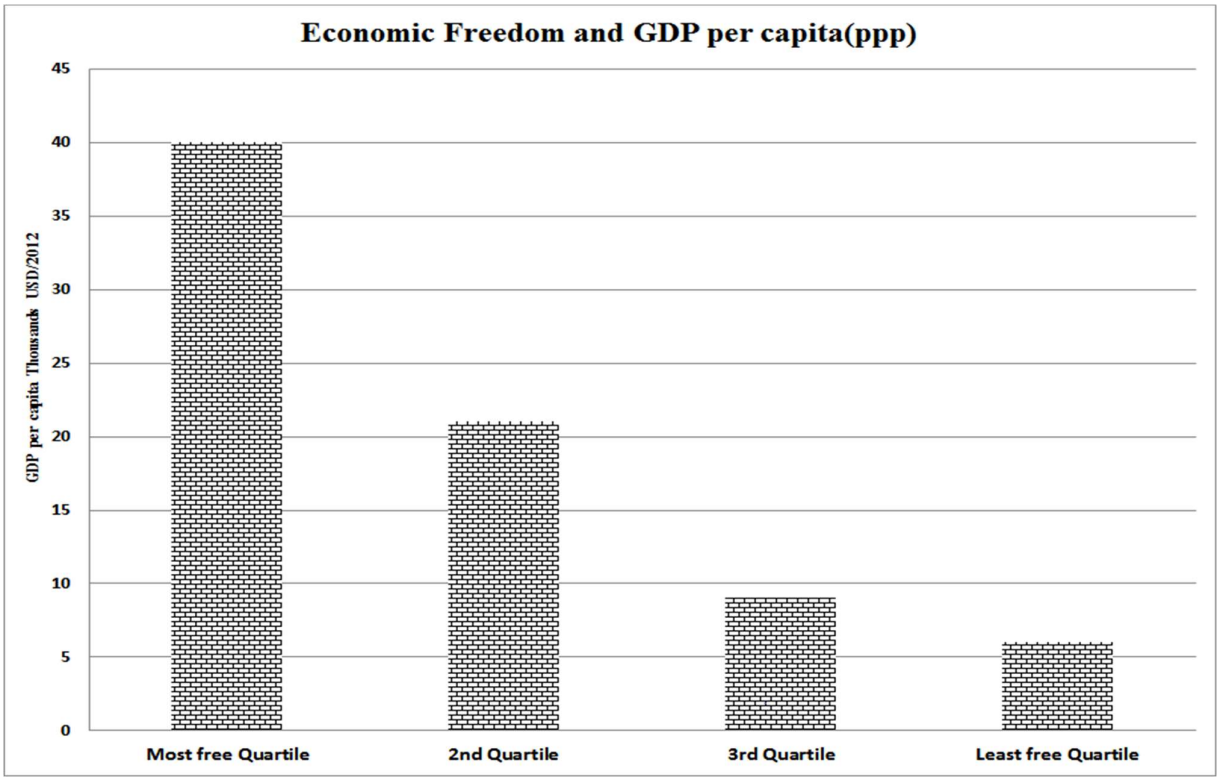
[67]For more details, see Appendix B

Size of Government, Legal System and Security of Property Rights, Sound Money, Freedom to Trade Internationally and Regulation.

Within the five major areas, there are 24 components in the index. Many of those components are themselves made up of several sub-components. In total, the index comprises 42 distinct variables. Each component and sub-component is placed on a scale from 0 to 10 that reflects the distribution of the underlying data. When sub-components are present, the sub-component ratings are averaged to derive the component rating. The component ratings within each area are then averaged to derive ratings for each of the five areas. In turn, the five area ratings are averaged to derive the summary rating for each country.

Also based on the EFW report there is strong positive relation between Life Expectancy at Birth, Life Satisfaction, Political Rights, Income of the Poorest 10%, Political Stability, Control of Corruption and Economic Freedom Quartiles. As shown in the figure below in freest courtiers the per capita income is significantly higher than least free countries.

Figure 50



Source: The Fraser Institute, The world Band, World Development Indicators 2013

7-3-Unit Root Test

In terms of econometric analysis, following Boschini *et al*. (2007), Mehlum *et al*. (2006) the model will be estimated with Ordinary Least Squares (OLS) methods. The entry point is formal testing of the stationarity of variables in order to avoid spurious regression estimates.

First we have to see the property of time series, thus each series should be examined for stationarity. The table below gives the stationarity test for all the time-series, using the augmented Dickey-Fuller and Phillips-Parron t-tests over the sample period of 1970-2012. These tests include a constant but no time trend, as recommended by Dickey and Fuller (1979). According to ADF and PP tests for the level series, the ADF and PP test does not reject the null hypothesis of a unit root at 99% confidence level for most variables except INF, GDP_G, and OILR_G. After first differencing, each series rejects the null hypothesis of non-stationarity at the 99% levels. It means; all variables are stationarity after first differencing in both tests.

Table 25: ADF and PP tests of time series

	ADF		**Phillips- Perron**	
Variable	**Level**	**1st diff**	**Level**	**1st diff**
GDP-G	-4.05***	-8.00***	-4.06***	-10.32***
INF	-3.81***	-6.14***	-3.82***	-16.80***
OILR_G	-6.65***	6.42***	-6.64***	-16.33***
GFCF_GDP	-3.10**	-6.55***	-3.21**	-9.37***
OILR_GBUD	-2.83*	-6.79***	-3.02**	-6.79***
OILE_TEXP	-0.37	-5.68***	0.10	-5.96***
OILGDP_GDP	-2.01	-6.59***	-2.17	-6.60***
IQ-EFW	-1.87	-3.29**	-1.41	-3.30**
INTER1-EFW	-2.03	-3.65***	-1.73	-3.54**
INTER2-EFW	-1.58	-2.78*	-1.80	-5.1***
INTER3-EFW	-2.41	-6.07***	-2.51	-6.05***

Lag Length: Schwarz info Criterion
With intercept but no trend
*** Significance at 1% level. ** Significance at 5% level. * Significance at 10% level.

7-4- Estimations and Primary Result

The tables below show the direct and indirect effects of oil abundance and institution on real economic growth. we have separated these tables by using different natural resource abundance definitions.

Table 26: OLS results based on IQ-EFW

Variable/Specifications	Oil Exports / Total Exports	Oil GDP / Total GDP	Oil revenue/Total Budget
C	-4.8(-0.58)	-0.14(-0.01)	0.76(0.10)
GDP_G_{t-1}	0.16(1.05)[1.7]	0.25(1.80)[1.52]	0.25(1.78)[1.52]
GFCF_GDP	0.10(0.42)[1.49]	0.03(0.12)[1.53]	0.004(0.01)[1.42]
$OILR\_G_t$	0.14(3.50)[2.9]	0.08(2.40)[2.6]	0.08(2.4)[2.3]
INF_t	-0.001(-0.01)[1.46]	-0.06(-0.54)[1.36]	-0.08(-0.70)[1.34]
D(OILE_TEXP)	-0.21(-0.16)[29]	-	-
D(OILGDP_GDP)	-	1.87(1.90)[30]	-
D(OILR_GBUD)	-	-	0.77(1.64)[36]
D(IQ_EFW)	13.0(0.52)[78]	13.34(2.75)[3]	13.9(2.66)[3.5]
D(INTER1_EFW)	-0.056(-0.2)[125]	-	-
D(INTER2_EFW)	-	-0.33(-1.78)[33]	-
D(INTER3_EFW)	-	-	-0.14(-1.67)[35]
DUM	2.76(1.04)[1.33]	1.83(0.69)[1.38]	2.02(0.76)[1.37]
R2	0.57	0.59	0.58
F	5.33	5.90	5.70
LM	0.33	0.27	0.15
RESET	0.14	0.38	0.31
Observation	42	42	42

Note: Dependent variable: real per capita GDP growth rate. Period: 1970-2012; "t" value within ( ) parentheses VIF within [ ] brackets; LM is Breusch-Godfrey Serial Correlation LM Test ("F" form, p-value for OLS) which shows the probability of null hypothesis (no auto-correlation in residuals) acceptance (p values larger than 0.05 means acceptance of null hypothesis); RESET is Ramsey test (using powers of the independent variables) for omitted variables. The p-value of RESET tests the H0: model has no omitted variables (p-values larger than 0.05 means acceptance of null hypothesis (model has no omitted variables).

As shown in table above some of the t statistics of variables are insignificant. One of the reasons is correlation between independent variables. We can check this by variance inflation factor (VIF)[68] and also by estimating correlation between independent variables. Both methods have the same results and indicate high correlation between interaction variable (INTER=NR*IQ) and natural resource abundance variable (NR).

In statistics, multicollinearity (also collinearity) is a phenomenon in which two or more predictor variables in a multiple regression model are highly correlated. So long as the underlying specification is correct, multicollinearity does not actually bias results; it just produces large standard errors in the related independent variables. More importantly, the usual

[68] In multiple regression, the variance inflation factor (VIF) is used as an indicator of multi-collinearity. Computationally, it is defined as the reciprocal of tolerance: $1 / (1 - R^2)$. Various recommendations for acceptable levels of VIF have been published in the literature. Perhaps most commonly, a value of 10 has been recommended as the maximum level of VIF (e.g., Hair, Anderson, Tatham, & Black, 1995; Kennedy, 1992; Marquardt, 1970; Neter, Wasserman, & Kutner, 1989). The VIF recommendation of 10 corresponds to the tolerance recommendation of .10 (i.e., 1 / .10 = 10). However, a recommended maximum VIF value of 5 (e.g., Rogerson, 2001) and even 4 (e.g., Pan & Jackson, 2008) can be found in the literature.

use of regression is to take coefficients from the model and then apply them to other data. If the pattern of multicollinearity in the new data differs from that in the data that was fitted, such extrapolation may introduce large errors in the predictions (Chatterjee *et al*. 2000)

Also Damodar Gujarati (2003) regarding multicollinearity believes:

"Leave the model as is, despite multicollinearity. The presence of multicollinearity doesn't affect the efficacy of extrapolating the fitted model to new data provided that the predictor variables follow the same pattern of multicollinearity in the new data as in the data on which the regression model is based".[69]

Since we do not want to use our model for prediction so we follow Gujarati's advice and disregard the multicollinaratiy in the model.

The Durbin–Watson statistic is a test used to detect the presence of first-order serial correlation (a relationship between values separated from each other by a given time lag) in the residuals (prediction errors) from a regression analysis. The Durbin-Watson statistic is not appropriate as a test for serial correlation in this case, since there is a lagged dependent variable on the right-hand side of the equation. LM is Breusch-Godfrey serial correlation LM test which shows the probability of auto-correlation in residuals for lagged depended variables. Our LM tests result shows there is no auto-correlation in residuals. In other word, we can accept that in most specifications our main findings are immune to the possible autocorrelation of residuals. Also RESET is Ramsey test (using powers of the independent variables) for omitted variables. The Ramsey test indicates that we do not have a serious problem with an omitted variable bias in most specifications.

We can summarize the results as follows:

1-The effects of variables almost are in line with our expectations and economic theory.

2- The lagged term of growth has a positive effect on current growth.

3-An increase in GFCF_GDP has a positive effect on growth in all specifications.

4-The oil revenue growth rate has positive and significant effects on growth in all estimations.

5-Inflation as an indicator of macroeconomic instability has negative effects on growth.

6- The effect of revolution and war dummy is significantly positive in all specifications.

7- The coefficient of natural resource abundance in two definitions (OILGDP_GDP) and (OILR_GBUD) is positive and one definition (OILE_TEXP) is negative. It means natural resource abundance in case of Iranian economy in two definitions are blessing and in one definition is curse.

[69] Gujarati, D.(2003)" Basic Econometrics "(4th ed.). McGraw−Hill. pp. 363–363.

8- The "institution" has positive and significant effects on growth in all estimations. It means that good institutional quality is beneficial for growth.

9- The most critical coefficient is β3 which is for the interaction between natural resources and institutional quality INTER=NR×IQ. Recent papers by Mehlum *et al*. (2006), and Boschini *et al*. (2007) suggest that the interaction between resources and institutional quality matter. Resources are only problematic if institutional quality is too poor. Thus β3 the coefficient, should be positive and-if it is to reverse the resource curse- have an absolute value larger than β1. This would mean that as long as institutional quality is good enough, natural resources will have a positive net effect on economic growth. The marginal impact of a unit increase in the oil abundance variable on economic growth is *β1+β3(Institution).* (Boschini *et al*. 2007)

In our model and in all specifications β3 is negative which means despite positive effect of institutional quality on growth, we see that the resource curse is stronger the weaker of the institutional quality.

10-The R-squared criteria show that a significant portion of changes in the real economic growth of Iran can be explained by included explanatory variables.

11-F statistics in all specification are significant; it means our models overall are significant

8-Robustness test: by WGI and PRS as an institutional quality indicator

In robustness tests we will consider two other measurements for institutional quality as follows: Worldwide Governance Indicators (WGI) from World Bank and Political Risk Services (PRS) from PRS website.

8-1-The Worldwide Governance Indicators (WGI)

The worldwide governance indicators project constructs aggregate indicators of six broad dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption. The six aggregate indicators are based on 31 underlying data sources reporting the perceptions of governance of a large number of survey respondents and expert assessments worldwide. Details on the underlying data sources, the aggregation method, and the interpretation of the indicators, can be found in the WGI methodology paper, Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi (2010).

In order to check the property of the variables, we employed the augmented Dickey-Fuller and Phillips-Parron t-tests over the sample period of 1996-2012. As recommended by Dickey and Fuller (1979) these tests include a constant but no time trend. Table below gives the stationary

test results for all time-series. Based on ADF and PP tests each series rejects the null hypothesis of non-stationarity at the 95% level. In other words; all-time series are stationary after first differencing in both tests.

Table 27: ADF and PP tests of time series

	ADF		Phillips- Perron	
Variable	**Level**	**1st diff**	**Level**	**1st diff**
IQ-WGI	-2.71*	-3.53***	-0.58	-3.35***
INTER1-WGI	-2.99**	-3.17***	-1.30	-3.85***
INTER2-WGI	-1.39	-4.22***	-1.30	-3.26**
INTER3-WGI	-2.93*	-4.08***	-2.93*	-6.02***
IQ-PRS	-1.05	-3.28***	-1.38	-3.28***
INTER1-PRS	-0.74	-3.05***	-0.73	-2.90**
INTER2-PRS	-2.48	-3.96***	-1.80	-3.96***
INTER3-PRS	-2.88*	-3.80***	-2.87*	-5.94***

Lag Length: Schwarz info Criterion
With intercept but no trend
*** Significance at 1% level. ** Significance at 5% level. * Significance at 10% level.

Table 28 shows the final result of our estimations based on different natural resource abundance definitions.

Table 28: OLS results based on IQ-WGI

Variable/Specifications	Oil Exports / Total Exports	Oil GDP / Total GDP	Oil revenue/Total Budget
C	13.2(1.12)	9.6(0.79)	18.2(1.4)
GDP_G_{t-1}	0.10(0.34)1.24	0.29(0.98)1.31	0.20(0.74)1.15
GFCF_GDP	-0.199(-0.49)1.14	-0.08(-0.20)1.38	-0.35(-0.82)1.70
$OILR\_G_t$	0.036(0.55)9.5	-0.008(-0.166)4.53	0.07(2.55)1.87
INF_t	-0.31(-1.52)2.66	-0.31(-1.44)2.88	-0.47(-2.47)2.40
D(OILE_TEXP)	-1.58(-1.20)78.95		
D(OILGDP_GDP)		0.07(0.05)61.76	
D(OILR_GBUD)			-0.56(-1.7)34.14
D(IQ-WGI)	146.05(1.55)65.84	4.8(0.16)6.04	34.3(1.6)3.49
D(INTER1-WGI)	-1.80(-1.52)99.53		
D(INTER2-WGI)		-0.53(-0.40)55.42	
D(INTER3-WGI)			-0.45(-1.50)29.06
R2	0.74	0.73	0.76
F	3.2	3.13	3.60
LM	0.93	0.43	0.10
RESET	0.72	0.88	0.20
Observation	16	16	16

Note: Dependent variable: real per capita GDP growth rate. Period: 1996-2012; "t" value within ( ) parentheses VIF within [ ] brackets; LM is Breusch-Godfrey Serial Correlation LM Test ("F" form, p-value for OLS) which shows the probability of null hypothesis (no auto-correlation in residuals) acceptance (p values larger than 0.05 means acceptance of null hypothesis); RESET is Ramsey test (using powers of the independent variables) for omitted variables. The p-value of RESET tests the H0: model has no omitted variables (p-values larger than 0.05 means acceptance of null hypothesis (model has no omitted variables).

The results are more or less similar to first model except following:

1-The oil revenue growth rate has positive effect on growth just in two estimations.

2- Natural resource abundance coefficient shows that in two definitions negative (curse) and in one definition positive (blessing).

3- Despite the fact GFCF_GDP variable has a negative coefficient in all specifications.

The most important variable is Institutions quality which has positive sign in all estimations.

8-2-Political Risk Services International Country Risk Guide (PRS)

The International Country Risk Guide includes a Political Risk Index, which in turn consists of 12 components measuring various dimensions of the political and business environment facing firms operating in a country. We use data from December reports of each year.

Table 29: OLS results based on IQ-PRS

Variable/Specifications	Oil Exports / Total Exports	Oil GDP / Total GDP	Oil revenue/Total Budget
C	10.9(1.01)	8.44(0.87)	15.47(1.63)
GDP_G_{t-1}	0.32(0.82)2.38	0.13(0.37)1.97	0.366(1.31)1.35
GFCF_GDP	-0.23(0.38)1.36	-0.02(-0.05)1.28	-0.39(-1.04)1.45
$OILR\_G_t$	0.11(1.06)24.88	0.021(0.38)7.49	0.10(3.27)2.51
INF_t	-0.32(-1.7)2.24	-0.28(-1.74)1.87	-0.38(-2.69)1.51
D(OILE_TEXP)	1.68(1.23)88.98	-	-
D(OILGDP_GDP)	-	2.56(1.52)121	-
D(OILR_GBUD)	-	-	0.57(1.08)99.54
D(IQ-PRS)	238(1.12)28.32	87(0.89)6.5	-11.39(-0.15)4.29
D(INTER1-PRS)	-3.5(-1.50)121.2	-	-
D(INTER2-PRS)	-	-3.94(-1.27)134	-
D(INTER3-PRS)	-	-	-1.18(-1.31)102.8
R2	0.75	0.77	0.78
F	3.50	3.89	4.08
LM	0.82	0.55	0.93
RESET	0.42	0.30	0.79
Observation	16	16	16

Note: Dependent variable: real per capita GDP growth rate. Period: 1970-2012; "t" value within ( ) parentheses VIF within [ ] brackets; LM is Breusch-Godfrey Serial Correlation LM Test ("F" form, p-value for OLS) which shows the probability of null hypothesis (no auto-correlation in residuals) acceptance (p values larger than 0.05 means acceptance of null hypothesis); RESET is Ramsey test (using powers of the independent variables) for omitted variables. The p-value of RESET tests the H0: model has no omitted variables (p-values larger than 0.05 means acceptance of null hypothesis (model has no omitted variables).

The results of current model also prove outcomes from first and second models.

In overall the most important finding is that natural resource abundance and quality of institution have positive impact on economic growth in Iran.

9-Oil revenue impact on institution quality

We have seen the impact of institutions quality on economic growth in Iranian economy. Now we can raise this question that whether natural resource revenue in general or oil revenue in particular causes bad institutions?

Isham, *et al*., (2003) believe that natural resource wealth may worsen the quality of institutions, since it permits rulers to suppress of the opposition, escape responsibility and fight against modernization. Acemoglu *et al*., (2006) concluded natural resources wealth also makes it easy

and beneficial for politicians to prevent industrial and institutional progress, which can weaken their power.

Cabrales *et al*. (2007) have a unique idea about democracy and institutions:

"More democratic countries tend to have better institutions and are therefore less likely to be cursed by natural resources. But empirical findings also suggest a reverse causality"[70]

The comprehensive research in this regards belongs to Ross (2001). He uses pooled time-series cross- national data from 113 states between 1971 - 1997 to explore three aspects of the oil-impedes-democracy claim. By using regression below Ross (2001) concluded that oil, mineral and Islam have negative impact on democracy but income and being member of OECD have positive impact on democracy.

$$\text{Regime}_{i,t} = a1 + b1(\text{Oil}_{i,t-5}) + b2(\text{Minerals}_{i,t-5}) + b3(\text{Log Income}_{i,t-5}) + b4\ (\text{Islam}_i\ ) + b5(\text{OECD}_i\ ) + b6(\text{Regime}_{i,t-5}) + b7(\text{ Year 1 }) \ldots + b33(\text{ Year 26 }) \qquad (5\text{-}2)$$

Also we can find more regarding resources negative through their effect on corruption or on institutional quality in Leite and Weidmann (1999), Sala-i-Martin and Subramanian (2003).

In order to investigate this issue that whether oil revenues cause poor quality of institutions in Iran we employed three available criteria to evaluate institutional quality(IQ).

First IQ-PRS Institutional Quality based on Political Risk Services available data (1996-2013) recommended by Mehlum *et al*. (2006), Saches and Warner (1997), Subramanian *et al*. (2002). Second IQ-WGI Institutional Quality based on World Governor Indicator of world bank available data 1996-2012. Third IQ-EFW Institutional Quality based on Economic Freedom of Fraser institute available data 1970-2012 recommended by Ushie *et al*. (2013).

In graphs below we can see institutional quality in horizontal and oil revenues in vertical axes. Also correlation between two variables calculated.

The first two graphs clearly show negative relation between institutional qualities based on WGI and PRS and oil revenues. Also correlation between oil revenue and institutional qualities based on WGI and PRS calculated -0.82 and -0.74 respectively. It means higher oil revenue in Iran worsen institutional quality.

The last graph which shows relation between institutional qualities based on EFW and oil revenues do not support above idea (Correlation 0.54). The reason may be because of EFW index (as we mentioned earlier and based on appendix B descriptions) is mixed up with different economic criteria, so we cannot consider it as pure institutional quality criteria.

[70] Cabrales, A and Hauk,E (2007) "Democracy and the curse of natural resources"

Figure 51:

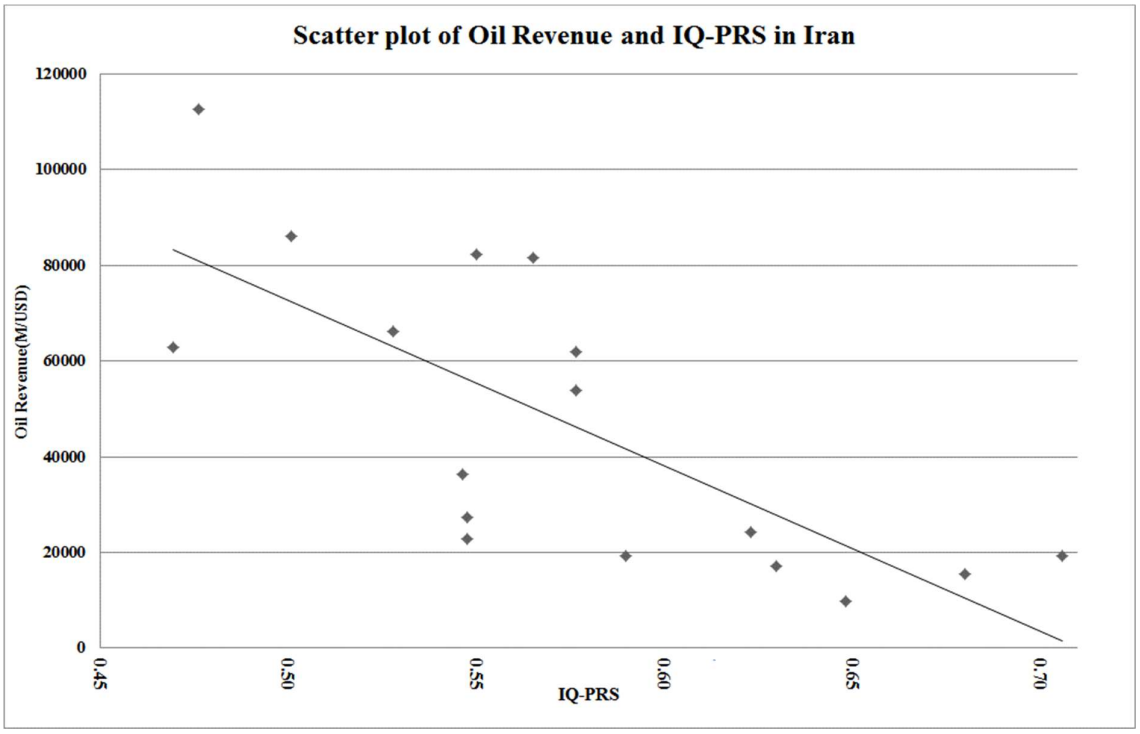


Figure 52:

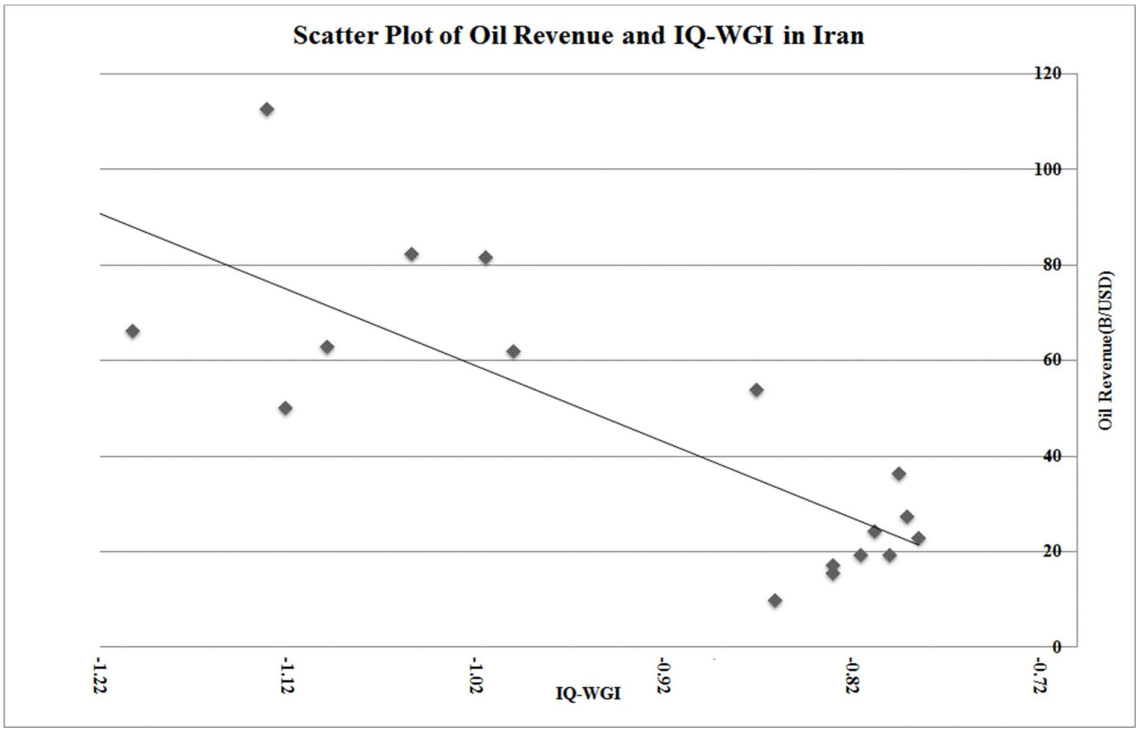
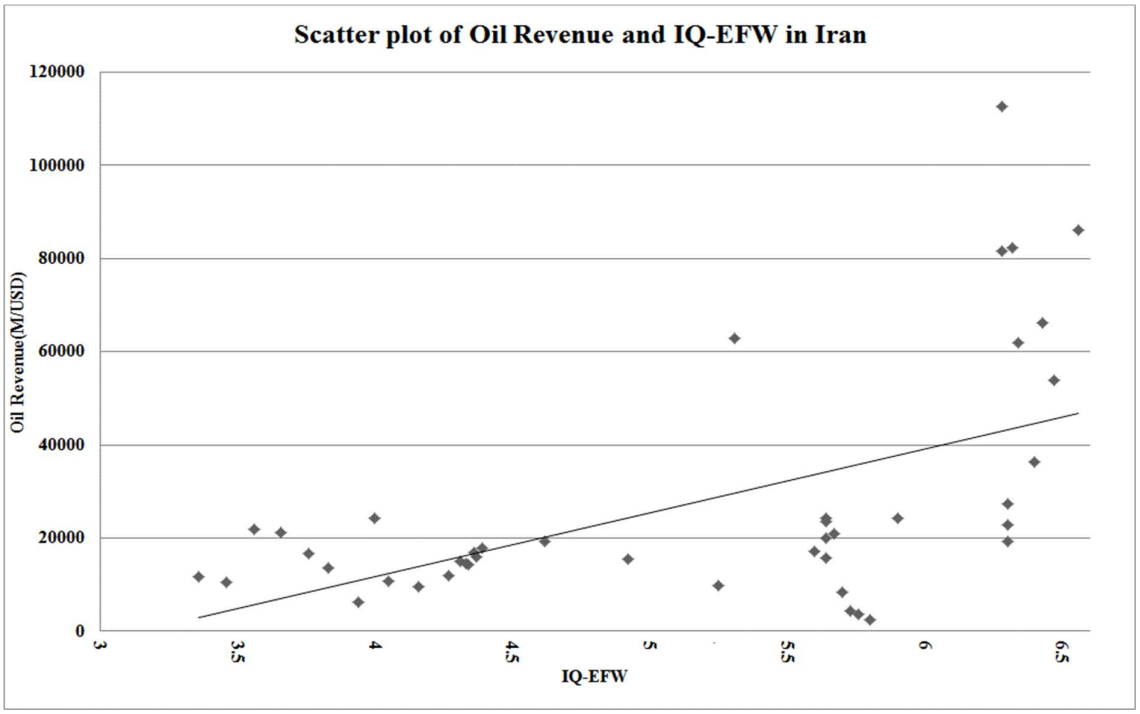


Figure 53:



10-Conclusion

According to public opinion and economic theory massive natural resource revenue in general and oil revenue in particular should contribute to economic growth and development. But in practice much evidence proves the opposite and some natural resource-rich countries suffer from "resource curse" rather than "resource blessing". However, some evidence shows that for a few countries that managed well received a "blessing".

Transmission channels between natural resource revenues and economic failure in six strands are discussed as follows:

1- Dutch disease

2- Declining of natural resource revenue's purchase power

3- Expanding government interference in the economy

4- Corruption and rent seeking

5- Spending natural resource revenues

6- Institutions and development

There is a new concept that the main reason for these different experiences is in the quality of institutions (Acemoglu *et al*. 2001, Sachs and Warner 1997, Mehlum *et al*. 2005a, Boschini *et al*. 2007, Rodrik *et al*. 2003, Isham *et al*. 2003). For instance, growth losers such as Ecuador,

Niger, Zambia, Sierra Leone, Angola, are all natural resource-rich but have poor institutional quality. While many economic growth winners such as Canada, Australia, and Norway are rich in natural resources with strong institutional quality. Also the Asian economic tigers are all natural resource-poor with good economic growth performance.

Following Boschini *et al*. (2007), Mehlum *et al*. (2006) and Ushie *et al*. (2013), the basic specification for our econometric analysis for Iran as follows:

$$GDP\_G_t=\alpha_1 GDP\_G_{t-1} + \alpha_2 GFCF\_GDP_t + \alpha_3 OILR\_G_t + \alpha_4 INF_t + \alpha_5 DUM + \beta_1 NR + \beta_2 IQ + \beta_3(INTER) + \varepsilon t \quad (5\text{-}3)$$

In main estimation we employed Economic Freedom of the World (EFW) for institution quality but in robustness tests we consider two other measurements for institutional quality, Worldwide Governance Indicators (WGI) from World Bank and Political Risk Services (PRS) from PRS website.

Overall the most important finding in all models is that coefficient of natural resource abundance β_1 and β_2 coefficient of quality of institution β_2 have positive impact on economic growth. It means that good institutional quality is beneficial for growth. The most critical coefficient is β3 which is for the interaction between natural resources and institutional quality INTER=NR×IQ. Resources are only problematic if institutional quality too poor. Thus β3 the coefficient, should be positive and-if it is to reverse the resource curse- have an absolute value larger than β1. This would mean that as long as institutional quality is good enough, natural resources will have a positive net effect on economic growth. The marginal impact of a unit increase in the oil abundance variable on economic growth is *β1+β3(Institution).* (Boschini *et al*. 2007).

In our models and in all specifications β3 is negative it means despite of positive effect of institutional quality on growth but we see that the resource curse is stronger the weaker the institutional quality**.** In overall the most important finding is that natural resource abundance and quality of institution have positive impact on economic growth in Iran.

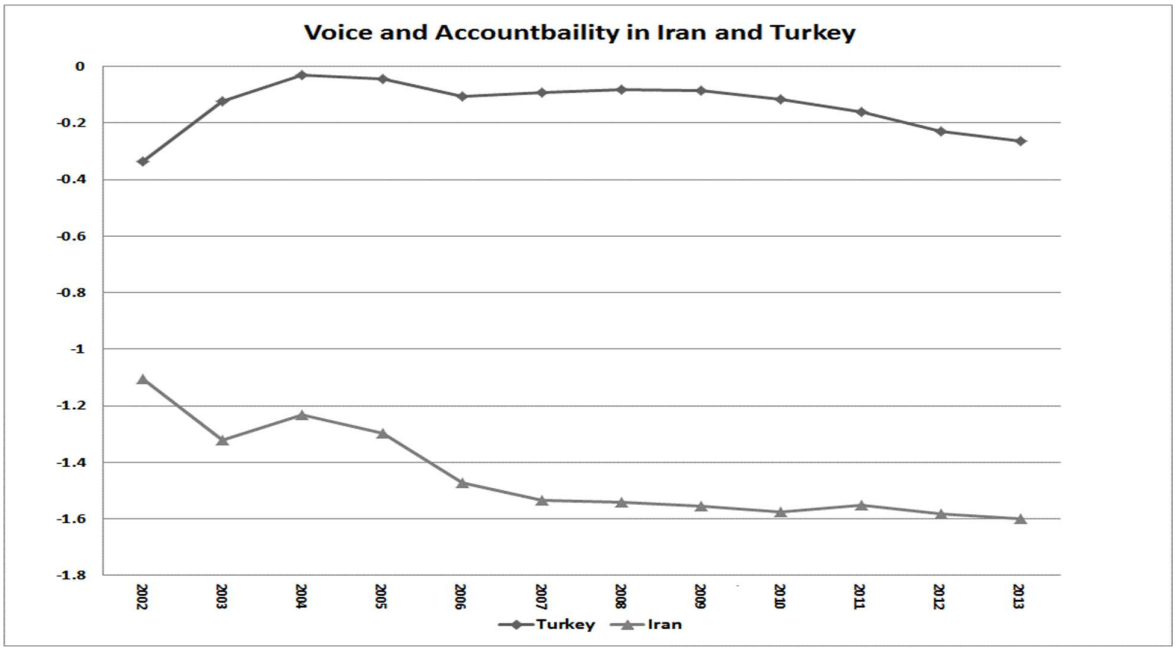
We have seen the impact of institutions quality on economic growth in Iranian economy. Now we can raise this question that whether natural resource revenue in general or oil revenue in particular causes bad institutions?

According to graphs analysis and calculated correlation between institutional quality (different definitions WGI, PRS and EFW) and oil revenues, the result shows higher oil revenue in Iran worsen institutional quality.

Appendix A:

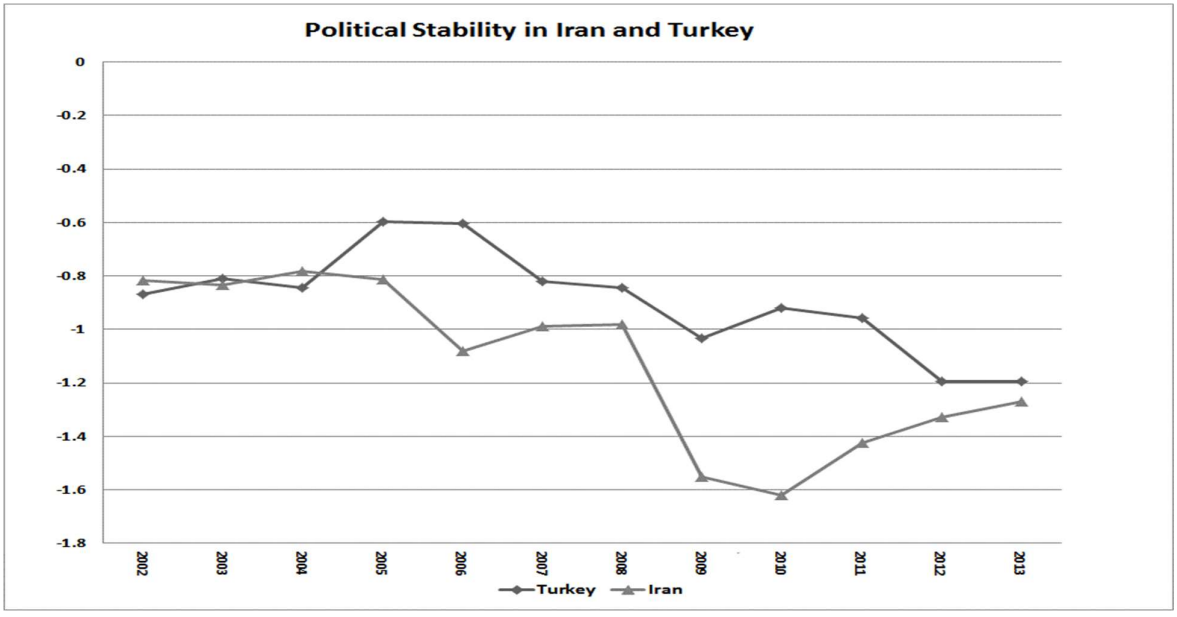
Voice and Accountability: Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

Figure 1:



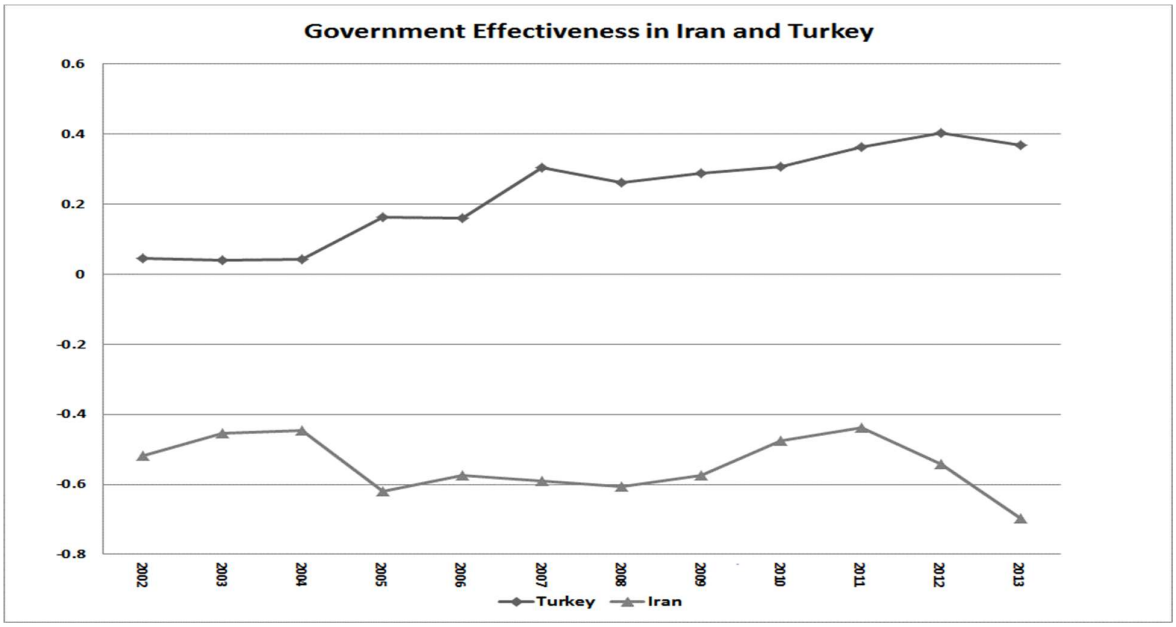
Political Stability and Absence of Violence/Terrorism: Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

Figure2:



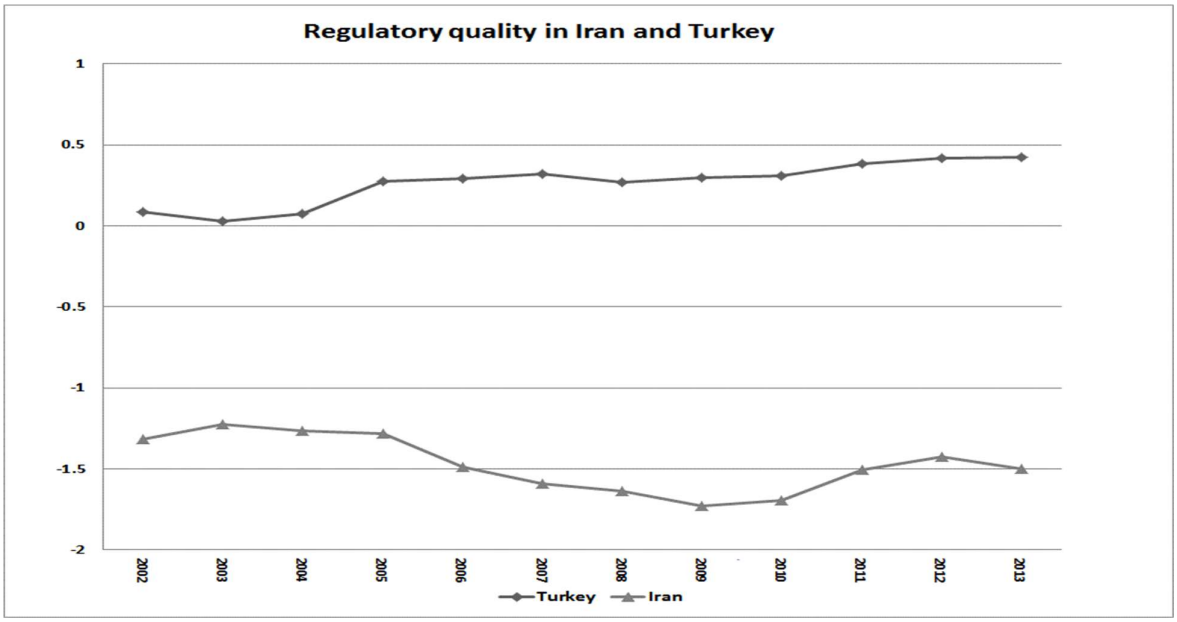
Government Effectiveness: Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

Figure 3:



Regulatory Quality: Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Figure 4:

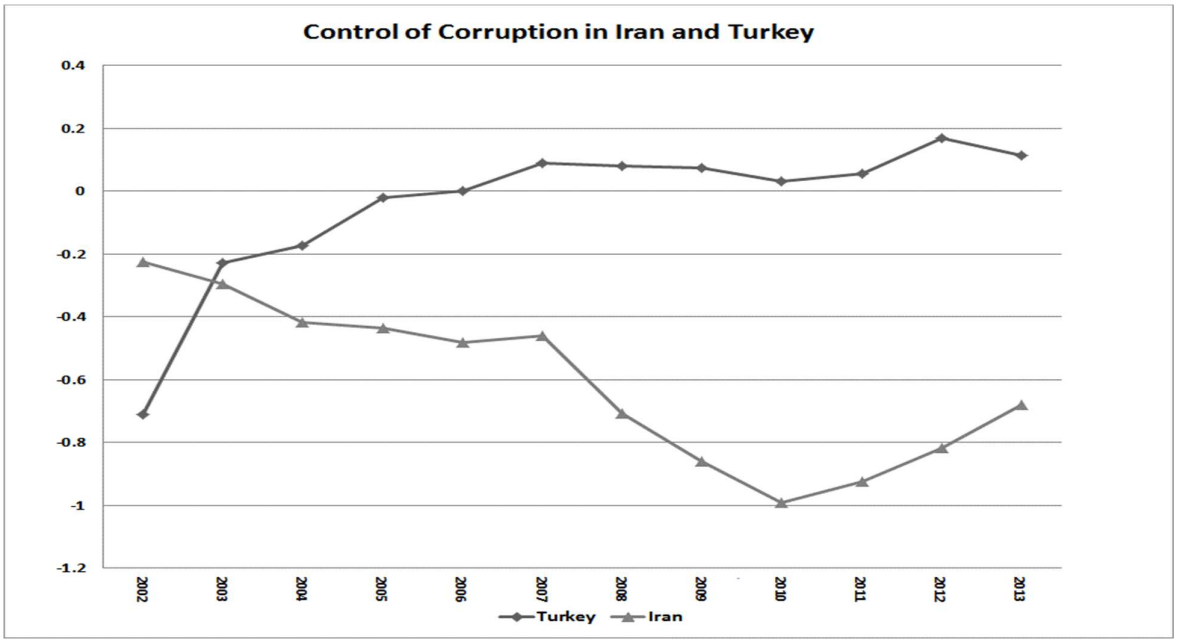


Rule of Law: Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Figure 5:

Control of Corruption: Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Figure 6:



Appendix B:

Institution Quality: Areas, Components, and Sub-components of the EFW Index

1. Size of Government

- A. Government consumption
- B. Transfers and subsidies
- C. Government enterprises and investment
- D. Top marginal tax rate
  - (i) Top marginal income tax rate
  - (ii) Top marginal income and payroll tax rate

2. Legal System and Property Rights

- A. Judicial independence
- B. Impartial courts
- C. Protection of property rights
- D. Military interference in rule of law and politics
- E. Integrity of the legal system
- F. Legal enforcement of contracts
- G. Regulatory restrictions on the sale of real property
- H. Reliability of police
- I. Business costs of crime

3. Sound Money

- A. Money growth
- B. Standard deviation of inflation
- C. Inflation: most recent year
- D. Freedom to own foreign currency bank accounts

4. Freedom to Trade Internationally

- A. Tariffs
  - (i) Revenue from trade taxes (% of trade sector)
  - (ii) Mean tariff rate
  - (iii) Standard deviation of tariff rates
- B. Regulatory trade barriers
  - (i) Non-tariff trade barriers
  - (ii) Compliance costs of importing and exporting
- C. Black-market exchange rates
- D. Controls of the movement of capital and people

(i) Foreign ownership/investment restrictions

(ii) Capital controls

(iii) Freedom of foreigners to visit

5. Regulation

A. Credit market regulations

(i) Ownership of banks

(ii) Private sector credit

(iii) Interest rate controls/negative real interest rates

B. Labour market regulations

(i) Hiring regulations and minimum wage

(ii) Hiring and firing regulations

(iii) Centralized collective bargaining

(iv) Hours regulations

(v) Mandated cost of worker dismissal

(vi) Conscription

C. Business regulations

(i) Administrative requirements

(ii) Bureaucracy costs

(iii) Starting a business

(iv) Extra payments/bribes/favouritism

(v) Licensing restrictions

(vi) Cost of tax compliance

Chapter Six:

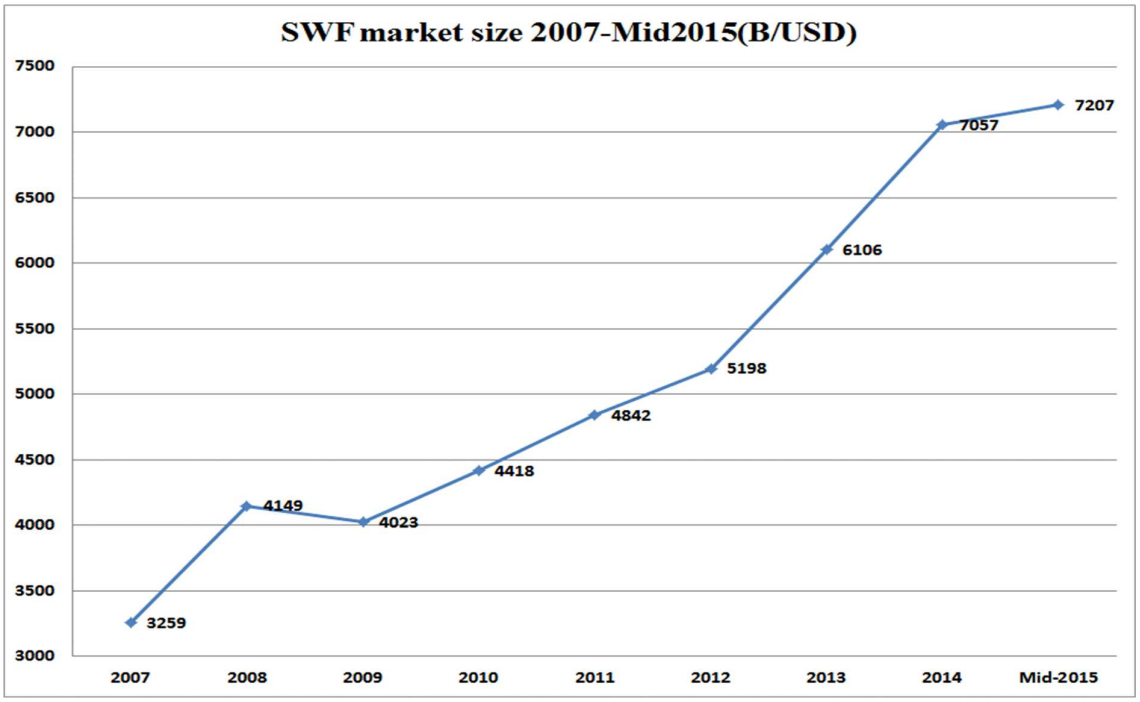
Stabilization and Savings Funds to Manage Natural Resource Revenues

Introduction:

Managing natural resources revenue has been a serious issue in resources rich countries. Policy makers can use the receipts for the long-term sustainable economic development by adopting suitable fiscal policy.

One popular solution that several natural resource rich countries have chosen to avoid these problems is creating some sort of stabilisation fund. The function of these funds is either to set aside a certain amount of revenue for future generations or act as a fiscal instrument to stabilize their economy. The number of countries that established or contemplate establishing national wealth funds has risen rapidly since mid-2000. Sovereign Wealth Funds (SWFs) market size is one of the fastest growing markets in terms of assets. Total assets of SWFs with more than 120% growth has grown from 3259 to 7207 B/USD in less than 8 years for the priod of 2007 till Mid-2015.

Figure 54: SWFs market size 2007-Mid2015



Source: http://www.swfinstitute.org/sovereign-wealth-fund-rankings/

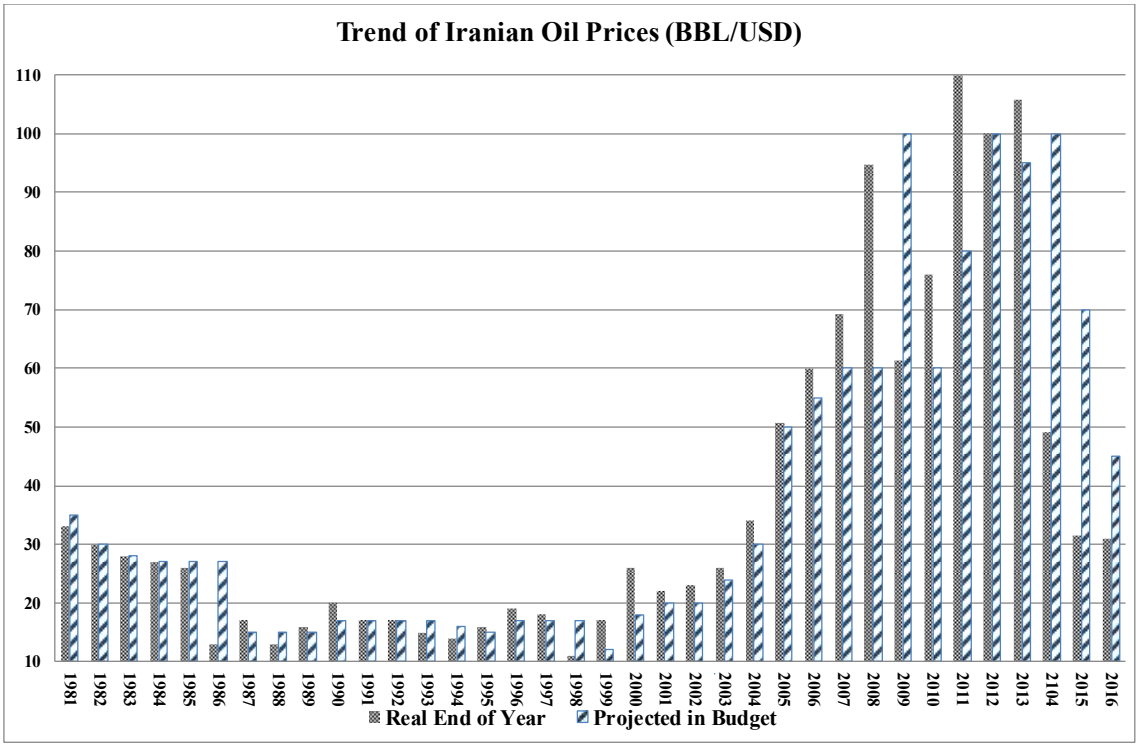
1-Consequence of Natural Resource Revenues

The historical performance of most natural resource-rich countries has been disastrous and these countries have been struggling with following:

1- Economic growth on average is slower than that of countries with poor natural resource and more diversified economies.

2- Fluctuations in global commodity prices cause long term fiscal programme to become more complicated. This makes fluctuations in government budget worse and subsequently leads to deficits and unsustainable fiscal policy. Pro-cyclical fiscal policies, lead to increased expenditures during sharp increase natural resource prices. These additional spending have afterwards proved to be difficult to control during downward movement of prices, thus leading to increased deficits, as well as sustainability concerns.

Figure 55: Trend of Iranian oil prices



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

As shown in the above graph there is a big difference between projected oil prices in Iran's government annual budget and real oil prices (real oil prices for 2016 until March) especially in years after 2000.

3- Dutch disease and increase in value of the local currency due to the high resource revenue will affect competitiveness and leads to diminished export diversification.

4- Large and low quality investments create the opportunity for stealing from public purse. These decisions involve some countries in large infrastructure projects with lower than average returns, and provided opportunities for corruption and rent seeking.

5- Rent seeking state, encourages corruption and even civil wars.

6- Widespread poverty.

7- Natural resource revenues reduce the pressure on governments to earn money by tax. Thus natural resource revenue weakens the rulers' responsibility and may lead to autocracy.

2-Definition of Sovereign Wealth Fund and stabilization fund[71]

Several definitions have been introduced for such funds since the first establishment in 1953 in Kuwait. Table below shows several definitions of sovereign wealth fund and stabilization fund.

Table 30: Definition of Sovereign Wealth Funds and Stabilization Funds

Christopher Balding	A **sovereign wealth fund** is a pool of capital controlled by a government or government related entity that invests in assets seeking returns above the risk free rate of return.
Monk (2008)	sees SWFs as government owned and controlled (directly or indirectly) investment funds that have no outside beneficiaries or liabilities (beyond the government or the citizenry in abstract) and that invest their assets, either in the short or long term, according to the interests and objectives of the sovereign sponsor.
Ang (2010)	Defines them as "a mechanism for moving country's savings and investments from present to the future."
Fotak and Megginson	**Sovereign wealth funds** (are) a pool of domestic and international assets owned and managed by government to achieve a variety of economic and financial objectives, including the accumulation and management of reserve assets, the stabilization of macroeconomic effects and the transfer of wealth across generations. **Commodity stabilization funds** are national investment funds whose main purpose is to offset revenue declines due to falling commodity prices or production levels… **State budget stabilization funds**…first of all, political interference is a potential problem, most easily solved by imposing restrictions on deposits and withdrawals of funds; second, budget stabilization funds for US states appear to require more funding, casting doubt on the commonly held belief that most stabilization funds are currently overcapitalized.
International Monetary Fund	**Sovereign wealth funds** (are) special investment funds created or owned by government to hold foreign assets for long term purposes. **Stabilization funds**…are set up by countries rich in natural resources to insulate the budget and economy from volatile commodity prices (usually oil). The funds build up assets during the years of ample fiscal revenues to prepare for leaner years. **Savings funds** (are) intended to share wealth across generations. For countries rich in natural resources, savings funds transfer non-renewable assets into a diversified portfolio of international financial assets to provide for future generations or other long

[71] For more details, see Appendix A

	term objectives. **Reserve investment corporations** are funds established as a separate entity either to reduce the negative cost-of-carry of holding reserves or to pursue investment policies with higher returns. **Development funds** allocate resources for funding priority socioeconomic projects, such as infrastructure. **Pension reserve funds** have identified pension and/or contingent-type liabilities on the government's balance sheet.
Blundell-Wignall,Hu, and Yermo	**Sovereign Wealth Funds** are pools of assets owned and managed directly or indirectly by governments to achieve national objectives.
McKinsey Global Institute	**Sovereign wealth funds**…have diversified portfolios that range across equity, fixed income, real estate, bank deposits, and alternative investments, such as hedge funds and private equity. **Central banks…primary investment objective is** stability, not the maximization of returns. They hold foreign reserves mainly in the forms of cash and long term debt, currently largely US Treasury bills. **Government investment corporations**…invest directly into domestic and foreign corporate assets, shunning the portfolio investment approach of sovereign wealth funds. (and) operate like private equity funds that actively buy and manage companies, either alone or with a consortia of other investors.
Edwin Truman Institute for International Economics	The broadest definition of a sovereign wealth fund (SWF) is a collection of government-owned or government-controlled assets. Narrower definitions may exclude government financial or nonfinancial corporations, purely domestic assets, foreign exchange reserves, assets owned or controlled by subnational governmental units, or some or all government pension funds.
Organization for Economic Cooperation and Development	**Sovereign Wealth Funds** (SWFs) are pools of assets owned and managed directly or indirectly by governments to achieve national objectives. They may be funded by: *(i)* foreign exchange reserves; *(ii)* the sale of scarce resources such as oil; or *(iii)* from general tax and other revenue. There are a number of potential objectives of SWFs, which are not always easy to attribute to a particular fund; and some funds may have more than one of the distinguishable objectives. Some of these are: *(i)* to diversify assets; *(ii)* to get a better return on reserves; *(iii)* to provide for pensions in the future; *(iv)* to provide for future generations when natural resources run out; *(v)* price stabilisation schemes; *(vi)* to promote industrialisation; and *(vii)* to promote strategic and political objectives. **Social Security Reserve Funds** (are) set up as part of the overall social security system, where the inflows are mainly surpluses of employee and/or employer contributions over current pay outs, as well as, in some cases, top up contributions from the government via fiscal transfers and other sources. **Sovereign Pension Reserve Funds** refers to those funds which are established directly by the government (completely separated from the social security system), and its financial inflows are mainly from direct fiscal transfers from the government. Unlike the first type of reserve fund, those within this category have been set up by governments to meet future deficits of the social security system.
Martin Weiss-Congressional Research Service	**Sovereign wealth funds** are investment funds owned and managed by national governments.

Source: Author and Balding,C (2008), "A Portfolio Analysis Of Sovereign Wealth", University of California Irvine

Despite this background, SWF roles practically are classified into:

1-It is a public account to save extra revenue when natural resource revenues sharply increase in order to control government expenditures (Balding 2012). In other words, savings funds for future generations, which aim to convert non-renewable assets into a more diversified portfolio of assets and soften the effects of Dutch Disease.

2- Smoothens negative shocks on government revenue and expenditure due to significant declines in natural resource revenues. In other word buffers the fluctuations in government spending. Stabilization funds, where the primary objective is to insulate the budget and the economy against commodity price swings

3- Clear rules of funds on capital formation and investment (Villafuerte *et al*., 2010). International reserve investment corporations, established to increase the return from official reserves.

4- Development funds, which typically help fund socio-economic projects or promote industrial policies that might raise a country's potential GDP growth.

5- Contingent pension reserve funds, which provide for contingent pension liabilities on the government's balance sheet, but are funded from sources other than individual pension contributions

Most funds, like National Development Fund of Iran (NDFI), have multiple objectives. Moreover, in theory, if a natural resource rich country applies suitable fiscal policy to manage natural resources fluctuations, there is no necessity to establish such funds.

Many factors are involved in understanding of how SWFs operate and function such as: value creation for investors, investment strategies, tactics and styles of their activism, performance, governance and alternative assets.

3-How Might Resource Curse Be Avoided – The Theory and the Practice

Eventually different ways to avoid negative impact of natural resource revenue are analysed as follows:

1- Diversifying the economy away from dependence on oil, gas and mineral exports

2- Sterilising the incoming revenue

3- Political reforms might be needed to carry out the necessary policies to avoid negative impacts.

4- Lump sum distributions of natural resource earning

5- The use of stabilisation and oil funds

Since the government has no control over natural resources prices and revenues but can influence the impact of the revenues, one radical solution is not to explore and leave natural resource in the ground (Ross,M 2001).

"We believe the best course of action for poor states would be to avoid export-oriented extractive industries altogether and instead work to sustainably develop their agricultural and manufacturing sectors — sectors that tend to produce direct benefits for the poor, and more balanced forms of growth".[72]

Not only this cannot be serious option but also from a commercial viewpoint earlier production of natural resource means higher present value of future revenue flows.

There are several ways to avoid negative impact of natural resource revenues in general and oil revenues in particular.

3-1- Diversification

One of the main reasons of poor economic performance in oil exporting countries is lack of investment in alternative industries. In other word diversification is a clear solution to reduce the dominant rule of oil industry in the economy and protection against international market fluctuations (Ross 2001).

The investment policy chosen by the government will have a vital role in proper diversification the economy. Normally government investment is in less productive industries while private sector investment mostly intended for high rate of return sectors but this not all the story.

Since the early 70s oil-exporting countries have invested a lot of money to diversify their economy to get rid of dependency to oil revenue. But because of those investments mostly have been in inefficient and uncompetitive sectors the results have been disappointing. The investment in alternative industries should accompany trade liberalisation policy with rest of the world plus free floating exchange rate regime. Botswana is a success story of public sector investment (Sarraf *et al*. 2001)[73]. Also Malaysia is a good example of export orientation industrialization by proper public investment policy.

3-2-Revenue Sterilisation

The most important issue in case of big natural resource revenues is microeconomic management to avoid quick spend of the revenue and create huge aggregate demand in the

[72]Ross, M. (2001). 'Extractive Sectors and the Poor',Oxfam America .www.oxfamamerica .org

[73]Sarraf, M. & Jiwanji, M. (2001). 'Beating the resource curse: the case of Botswana', Environmental Economics Series, Paper No.83.

economy alongside with exchange rate appreciation (especially in case of having high internal inflation rate). Budget surplus can be managed by creating some sort of funds however the management of the fund is the main issue in this regard. Botswana and Malaysia in their development policy adopted significant depreciation of the real exchange rate policy.

In order to avoid overvalued exchange rate, investing funds' assets abroad would be a suitable policy. For instance, state oil fund of the republic of Azerbaijan (SOFAZ) made a portfolio of investment in 2009 consisting of 67% in European region,18.2% of the Fund's investments were allocated to the North American region. Furthermore 3.2% and 11% to Asian Pacific region and other international financial institutions respectively.

Also Indonesia is a good example of success in balancing the budget by stabilising spending linked into management of the exchange rate (Usui 1996).

"*Our results indicate that exchange rate adjustment had a significant impact on expansion of tradable sectors, especially the manufacturing sector, by reversing the real exchange rate."*[74]

Furthermore, government should avoid increasing borrowing money by doing collateral contract with predicted oil revenue in future. In this regards we can pay attention to very recent experience of Indonesia which did not borrow money but Mexico did (Usui 1997).

3-3-Political Reforms

Four kinds of political changes are advised as suitable for encouraging a 'blessing' of natural resource revenue.

1-The first is to develop democracy as a pre-condition for good economic performance. In this situation the government have to satisfy public interests. However, while democracy is an optimal way but is not the only route. For example, Malaysia and Botswana with one party democracy have shown good performance in economic development.

2- Secondly there is a need to eliminate corruption and rent seeking. Corruption and rent seeking have different meaning in different countries. Pre-condition in this regard is getting consensus on definition of corruption and rent seeking.

3- Having a developmental government ideology with strong elite group whose interests would be in line with the population's interests.

4- The last one is creating institutional ability to perform the necessary policy to deliver development, but not to a limited private group. They should push the economy towards a

[74] Usui, N. (1996). 'Policy adjustments to the oil boom and their evaluation: The Dutch disease in Indonesia', World Development, 24(5).

market-based system connected into the global economy. In this regard at the beginning free market policy may not be an appropriate policy and need government intervention.

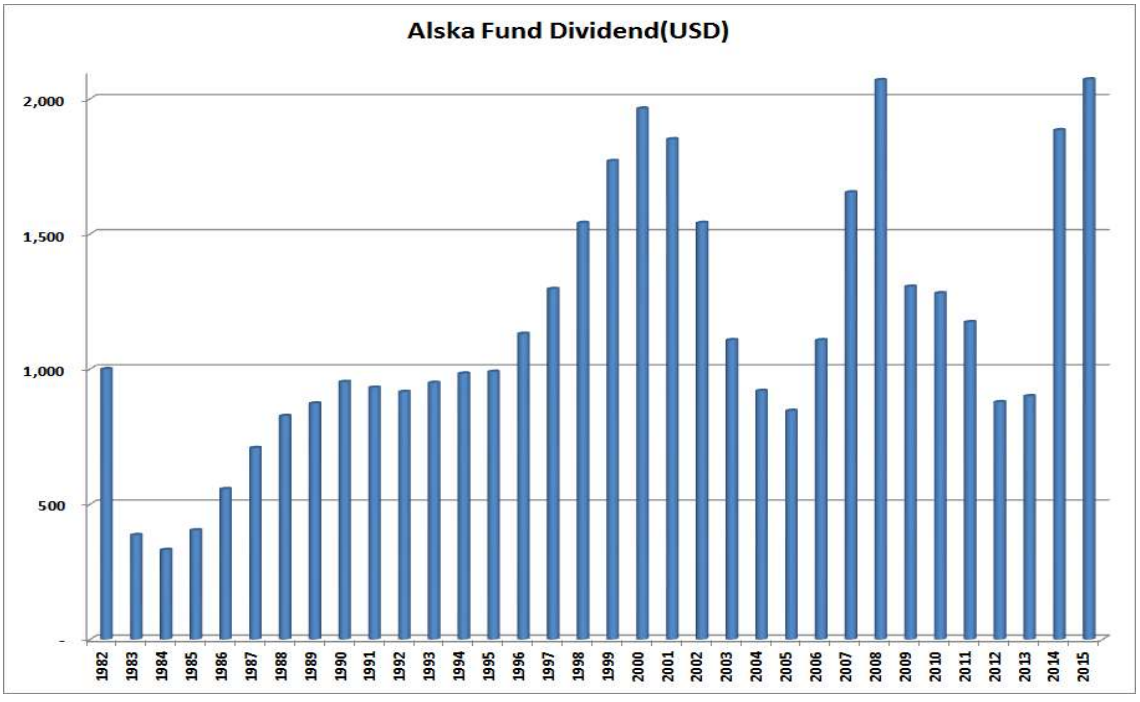
3-4-Lump Sum Distribution

The Alaska Permanent Fund saves revenue from the state's oil sector. Based on Alaska state law the fund acts on behalf of Alaskans and must allocate 50% of the investment return on an equal per capita basis[75]. The idea is that the Alaskans know how to use their money better than does their state. The citizens can review all monthly transaction of the fund to check the total amount of dividend.

Definitely this gives citizens to feeling that they are part of the system and real stakeholders in the Fund. There is the same advice for other oil producer such as Nigeria and Iraq[76] which are suffering from corruption and rent seeking by some researchers (Sala-I-Martin *et al*. 2003, Birdsall *et al*. 2004).

"*In Nigeria waste and corruption from oil rather than Dutch disease has been responsible for its poor long run economic performance."*[77]

Figure 56: Alaska Fund Dividend



Source: http://www.apfc.org/home/Content/dividend/dividend.cfm

75 How the amount is calculated: Add Fund Statutory Net Income from the current plus the previous four fiscal years. Multiply by 21%. Divide by 2. Subtract prior year obligations, expenses and FOUND program operations Divide by the number of eligible applicants.

76 Birdsall,N and Subramanian, A(2004),"Saving Iraq from its oil" International Monetary Fund

77 Sala-I-Martin, X, and Subramanian, A. (2003). "Addressing the Natural Resource Curse: An Illustration from Nigeria." IMF Working Paper WP/03/139.

3-5-Stabilisation and Oil Funds

Suppose that an oil dependent economy normally is investing certain amount of money but suddenly because of oil price increase the country has got 30% more money that can be invested. This goal cannot be achieved easily because this would need that the country quickly employ and train a big number of unskilled and skilled workers and also import materials which is not easily achievable.

In addition, if the price of oil afterwards falls to its prior level, the investments have to be cut, which also has a lot of consequences. These arguments introduce savings and stabilization funds that can reduce the effect of oil price volatility and subsequently investment volatility.

Without suitable policies that save revenues in stabilisation funds, foreign resource inflows may disrupt the efficiency or sustainability of budget outcomes. In some literature stabilisation fund is considered to be used in a comprehensive meaning to refer to all of those types of natural resource-based funds that try to absorb natural revenue fluctuations. A distinction must be made with SWFs, which act as investment funds and whose primary purpose is to increase the assets of a country and stabilisation fund. Not all SWFs are commodity-based or are created for stabilisation purposes. In some cases, the stabilisation fund is the precedent for SWF – once the stabilisation fund has enough assets to fulfil its stabilising function.

There is general agreement about having sustainable growth in natural resource countries. Because when the market is facing extra spending that arise from fluctuating government revenues the economic impacts of excess aggregate demand leads to inflation and a high tendency to import. At the same time deficient aggregate demand is likely to cause falling real product, unemployment and falling real income.

Averting fluctuation of resource revenues can be implemented in several different ways.

1-Trying to somehow stabilise the global natural resource prices. For instance, in oil market, OPEC has tried to determine oil prices for several years. This policy is no longer a serious and practical option especially in recent years.

2- Another option is using futures exchange to lock in expected price. In this regard national oil producer countries facing political and practical problems. For instance, involving in paper markets (futures exchange) is acceptable as long as the final result is positive, otherwise there are bounds to be criticism.

3- Another solution is to create some form of revenue fund. Such funds can have three functions:

A) Investing the extra revenues outside the domestic economy.
B) The fund can also be used to maintain revenues by setting a target price for balancing government budget. If global prices are higher than target price, then the fund absorbs extra revenue and vice versa.
C) Finally, such funds can be used to put assets aside for next generations.

In recent years the role of such funds has become very debatable. Some of the arguments pro such funds for example in Chile and Indonesia and against such funds for instance in Venezuela (Fasano 2000, Usui 1997, Hausmann 1995). The following presented positive and negative side of Funds.

3-5-1-On the positive side of funds:

1- Significant role for accumulation of assets for future use. There can be advantages in setting aside the commodity funds for specific good causes such as education, health, or retirement support for a future generation (while seeking to avoid ad hoc extra budgetary spending). For example, we can mention recent usage of SWFs assets as follows:
"… very significant capital injection of $40 billion the SWFs made into various US financial institutions during the early stages of the recent financial crisis, which could be viewed as having helped the US and the global economy avoid a harder fall and a deeper recession (Aslund, 2007; GM). Banks that received SWFs capital injections did have better capital adequacy ratios after the financial crisis than non-SWFs backed banks (Anderloni & Vandone, 2012)." [78]
2- By not spending the revenue they can improve monetary policy impact when prices are high
3- Oil funds can help to prevent rent seeking and corruption.

3-5-2-On the negative side of funds:

1- Having Funds itself is not a guarantee of a proper macro-economic management and may lead to undermine the basic monetary discipline. Two standard recommendations in this regards are that the funds be transparently and professionally run.

[78] Bader Alhashel (2015)," Sovereign Wealth Funds: A literature review", Journal of Economics and Business 78 (2015) 1–13

2- Having many changes in the funds operation to satisfy political will. For most countries, it would be best to have rules dictating the cap on spending out of the fund.
3- Having funds with considerable assets always creates an incentive for corruption and rent seeking.
4- Control of the fund grants may lead to the internal conflict.
5-Whether due to weak design or lack of powerful institutions, stabilisation funds have been vulnerable to political power.

4-Literature review:

Sugawara, N (2014) studied stabilization funds in resource-rich countries. The paper examines the effect of stabilization funds on the volatility of government expenditure in natural resource rich countries. He employed a panel data set of 68 natural resource rich countries over period of 1988–2012. The outcomes find that stabilization funds help to moderate government expenditure. Volatility in government expenditure with stabilization fund is 13% less than without this fund. Also the result revealed that not only political institutions and fiscal rules are serious elements in decreasing the government expenditure volatility but also the size of economy, diversified exports, real sector management, and financial markets are important.
Fasano, U (2000) has reviewed the experience of oil stabilization and saving funds in selected countries, consisting of Chile, Kuwait, Norway, Oman and Papua New Guinea, as well as seven natural resource rich comparable countries.
The study analyses the impact of the Oil Stabilization and Saving Funds on public spending by using time-series analysis and structural break tests. It shows that government spending in presences of stabilizer fund is less correlated with natural resource revenue compared with countries without stabilizer found. Also countries with more cautious spending policies tend to create stabilization funds.
"…*not surprising that stabilization schemes have been more successful in countries with a strong commitment to fiscal discipline and sound macroeconomic management."*[79]

Natural resource dependence, volatility and economic performance in Venezuela: the role of stabilization fund has been examined by Clemente *et al*. (2002). They studied impact of

[79] Fasano, U (2000)" Review of the Experience with Oil Stabilization and Saving Funds in Selected Countries", IMF Working Paper

different type of stabilization funds to reduce the macroeconomic volatility in presence of oil price shock, by using a general equilibrium model. The author has employed two alternative funds alongside with current available fund in Venezuela which is Macroeconomic Stabilization Investment Fund (FIEM). The study shows that performance of FIEM to reduce volatility in case of positive oil shock is worse than alternative funds. On the other hand, in case of negative oil shock both FIEM and alternative funds perform well in order to reduce the volatility.

"… there are trade-offs in reducing macroeconomic volatility among different indicators such as growth, the real exchange rate, consumption, investment and producer prices. In considering the rules for a stabilization fund, policy makers will need to set priorities in reducing volatility amongst different indicators and sectors."[80]

Merlevede *et al*. (2009) focused on oil price, Dutch disease and stabilisation fund in Russia. By using a dynamic open macroeconomic model based on the data over the period of 1995-2007. The result shows that Russian economy is vulnerable to negative oil shocks. The authors argue that such negative shocks can be smoothened by changes in fiscal policies, such as taxation and oil stabilization fund (OSF). On the other hand, the Russian economic success is subject to oil price increase gradually.

"… The Russian economy is vulnerable to downward oil price shocks. We substantiate two mechanisms that mitigate the economic effects of oil price shocks, namely the stabilisation brought by the Oil Stabilisation Fund and the Dutch disease effect."81

Balding (2008) studied a portfolio analysis of sovereign wealth funds. To address this issue he reviewed the holding data of some of the largest sovereign wealth funds for instance in Singapore and Norway. Hence, he raised this question that whether economic analysis builds sovereign wealth funds' portfolios and allocation of assets in geographic regions? He concluded, sovereign wealth funds have been acting as rational economic agents not only in their asset selections but also diversification over assets and geographic regions as well. Also the result shows sovereign wealth funds do not have a significant impact on the international financial markets.

[80] Clemente,L *et al*. (2002)" Venezuela Natural Resource Dependence, Volatility and Economic Performance in Venezuela: the Role of a Stabilization Fund" Andean Competitiveness Project

[81] Merlevede, Bruno, Koen Schoors, and Bas van Aarle. (2009). "Russia from Bust to Boom and Back: Oil Price, Dutch Disease and Stabilisation Fund." Comparative Economic Studies 51(2): 213–241.

"…there is little reason to believe that sovereign wealth funds are large relative international investors or have a large impact on international financial markets"[82]

Dyck and Morse (2011) introduced a comprehensive study of sovereign wealth fund portfolios for the period of 1999–2008. By looking at investments made in public equities, private firms, and real estate. They concluded sovereign wealth fund's public investment pursues two goals A) an objective of financial portfolio building with diversified holdings B) a developmental goal, looking for sovereign wealth fund investments to impact the internal development path. An interesting result is that sovereign wealth funds attempt to hedge economic risk by different ways and focus more on particular sectors, such as finance, transportation, energy, and telecommunication.

Bagattini (2011) analysed the political economy of stabilisation funds: measuring their success in resource-dependent countries. He studied key macroeconomic fiscal variables pre and post period of twelve countries that have stabilization funds and then estimates the impact of the funds using a panel data over 1992–2007. He also establishes a pre- and post-stabilisation fund table was associated with fiscal success, with a range from 0 to 6, where 6 indicate maximum success. The results are shown in table below.

Almost every country in the sample, regardless of its fiscal situation earlier to the establishment of a stabilisation fund, has since seen better performance except Chad; Kazakhstan is the best performance with improved fiscal performance. The result shows that fiscal improvement of Iran's performance is not significant.

Table 31: Pre- and post-stabilisation fund success. Six-point scale, 1992–2007

	Pre-SF	Post-SF	Change
Kazakhstan	1.0	3.7	2.7
Trinidad & Tobago	2.0	3.0	1.0
Algeria	2.5	3.4	0.9
Ecuador	2.5	3.4	0.9
Russia	2.6	3.5	0.9
Peru	1.0	1.8	0.8
Nigeria	2.5	3.3	0.7
Azerbaijan	2.0	2.4	0.4
Iran	***2.8***	***3.0***	***0.2***
Chad	2.4	2.3	-0.1
Average	2.4	2.8	0.4

[82] Balding, C. (2008). "A portfolio analysis of sovereign wealth funds". Available at SSRN 1141531.

Some other interesting results of Bagattini (2011) as follows:

1- Having stabilisation funds leads to better fiscal performance.

2- The governance of stabilisation funds is the most important element affecting their success.

3- Also the funds work best when they are relatively strict and less vulnerable to take over by politicians.

Devlin,j,(2004) studied stabilization fund cross section among 71 countries. The result shows that establishing funds can moderate government spending. In some countries such as Norway and Chile the fund's assets generate up to 3 per-cents more on fixed capital formation as a share of GDP in addition to reduction of volatility in government spending, and lower government spending. This depends on country-specific circumstances. He concluded Funds are clearly not a secure of fiscal stability.

5-The Background of the Oil Stabilization Fund (OSF) and National Development Fund of Iran (NDFI)

According International Monetary Fund (IMF) 2012, Iran like other natural resource-rich developing countries face the challenges of converting natural resource revenue into other type of assets that support maintained development, while also looking for mechanisms to avoid the impact of fluctuations in natural resource revenues (IMF, 2012).

Since 2000, when Iran established its Oil Stabilization Fund (OSF) to manage the oil revenue, the country has started on developing the needed institutions to address these issue. The Fund had two main missions, first to save a portion of oil revenues for next generations through making productive investments and second support non-inflationary budget financing and build shock absorber for future shocks. The performance of the fund showed that the OSF has not achieved its main stabilization and sterilization goals. Due to this fact National Development Fund of Iran (NDFI) was created in the 5th development plan in 2010 in order to save the shares of next generations and transform a part of oil revenues wealth to productive investments. The new fund's staff should be independent of any political interest and operate based on the investment ethics of the NDFI. All activities such as strategies, policies, rules and laws, procedures, return, provision of funds, withdrawals and expenses shall be transparent and will be announced to the public. The NDFI is a part of SWFs that response first transforming a part of the oil revenues to suitable investments and second saving the share of next generations.

At the same time the OSF remains in place with two main tasks first keeping the annual budget balanced and second transferring 50% of OSF end of year balance to NDFI regularly. Accordingly, 20% of oil income is to be transferred to the NDFI and this percentage to increase 3% annually until the end of 5th five-year economic development plan. This share will reach to 32% by the end of 2016.

The new fund is to extend 50% of its financial facilities to private, cooperative and non-governmental sectors and 20% to attract more foreign investment. The remaining 30% is invested (in capital markets) abroad.

Investment by NDFI in the following projects is acceptable: Investment in industrial production plans, investment in mine exploration, oil, gas, petrochemical, water, electricity, energy, housing, agricultural, natural resources, environmental protection, transportation, communication and information technology, export of goods or services, export of technical services, engineering, plans relying on technology, tourism, hotel management, health and treatment training programs.

6-OSF and NDFI Performance

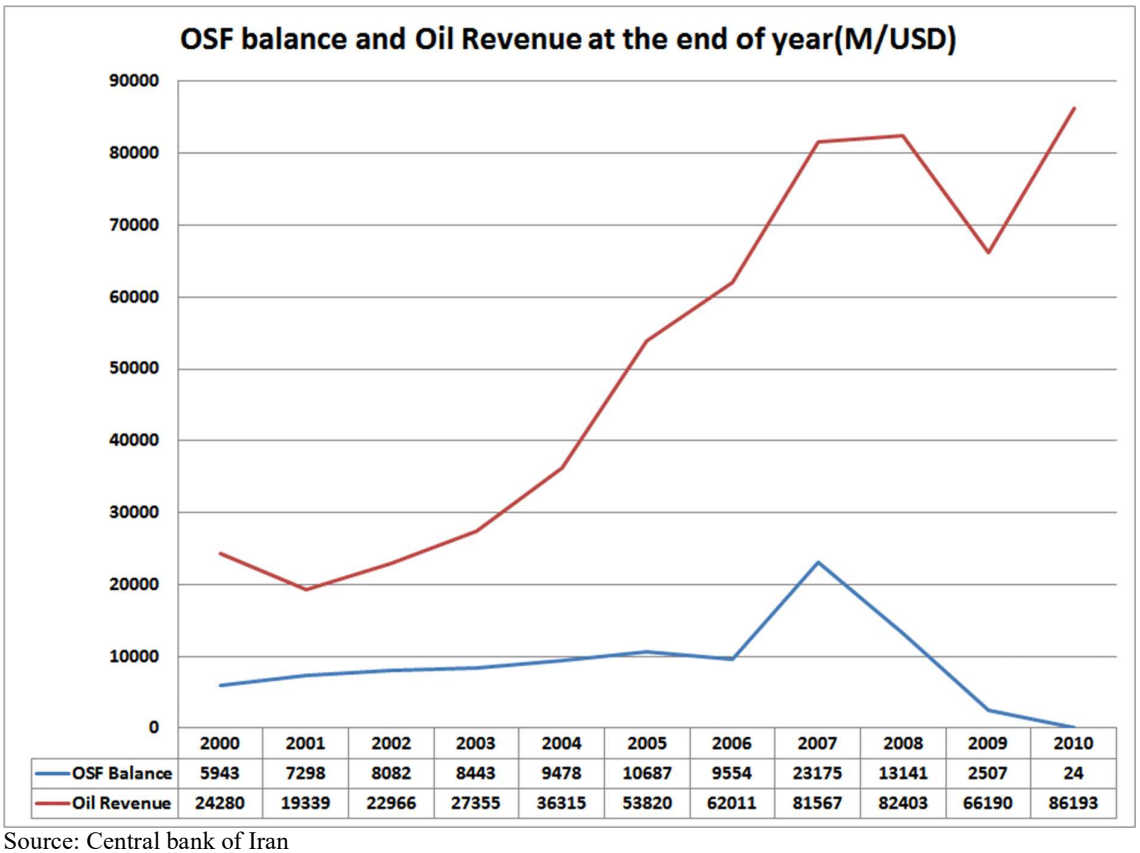
As shown in below table and figure the total performance of OSF until 2005 when president Ahmadinejad took power was acceptable but after that time the outflow sharply increased. OSF end of year balance increased from 23.1 Billion USD to only 24 Million USD for the period of 2007-2010 despite historical high annual oil revenue. It means president Ahmadinejad alongside with his populist policy spent oil revenue by either distributing cash money in different means or increasing import of goods in order to reduce inflation. On other hand due to weak of other supervisor organizations there was not strong control of his illegal acts.

Table 32: OSF Performance 2000-Mid2007 (M/USD)

	2000	2001	2002	2003	2004	2005	2006	Mid-2007
Beginning	-	5943	7298	8082	8443	9478	10686	9555
Inflow	5943	1848	5596	5400	10207	12806	21174	12322
Outflow	-	814	5128	5436	9427	11985	23273	13987
End Balance	5943	7298	8082	8443	9478	10686	9555	8706

Source: Central bank of Iran

Figure 57: OSF balance and oil revenue at the end of year



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
OSF Balance	5943	7298	8082	8443	9478	10687	9554	23175	13141	2507	24
Oil Revenue	24280	19339	22966	27355	36315	53820	62011	81567	82403	66190	86193

Source: Central bank of Iran

Oil stabilization fund in Iran has been created mainly for two main purposes. First filling budget deficit gap in case of oil revenue decrease, second investment. But the performance showed %90 of funds' assets was spent in annual budget and just 10% was allocated to investment. According to below table, NDFI received USD 54.6 billion over the period of 2010-mid 2013. Of this sum, the outflow of the fund was USD 19.77 billion and USD 33.2 billion was available in mid-2013 in the fund. The fund received its highest inflow in 2011 amounting to USD 21 billion. But Ahmadinejad's administration during his presidency has taken the major part of asset in NDFI for two purposes:

1- Mehr-e-Emam Reza fund to build cheap property for poor people

2- Faster return to investment in small industries in order to create jobs

Both ambitious projects were unsuccessful because of mismanagement and lack of budget.

Table 33: NDFI Statement of Performance from 2010-mid 2013

	Fund Inflow (USD billion)	% of Total Inflow	Fund Outflow (USD billion)	Ending Balance (USD billion)
2010	14.104	26	-	14.104
2011	20.782	38	4.6	30.286
2012	15.084	27	11.305	32.436
Mid 2013	4.63	9	3.866	33.2
Total	54.6	100	19.771	

Note: Total assets in the NDFI are the total fund inflow (over years) +/- any profit or loss in investments made.
Source: Iran Investment Monthly, Turquoise Partners, November 2013 - Volume 8, No 86

Also for the period of 2011-Mid2013 NDFI allocated USD 21,546 million to mining and industry (including the gas, oil and petrochemical industries), USD 566 million to housing and construction, USD 233 million to water and agriculture, USD 686 million to transportation and USD 193 million on the export of technical services.

Table 34: Composition of fund allocated to approved plans by sector (2011 – Mid 2013)

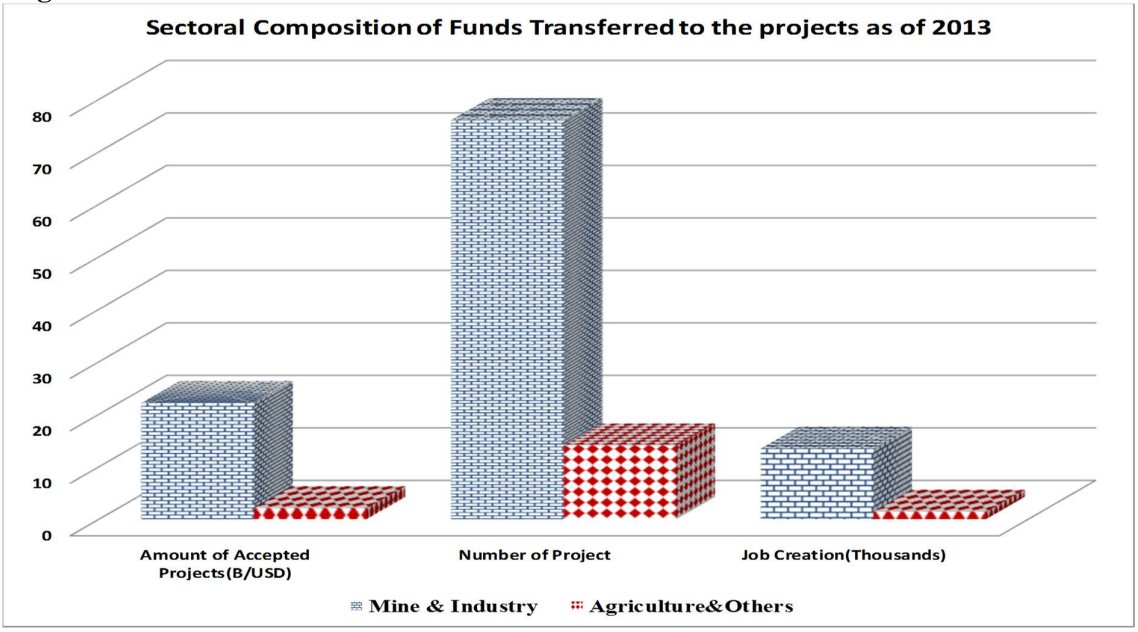
	2011		2012		Mid-2013			
Sector	No. of approved projects	Value (USD m)	No. of approved projects	Value (USD m)	No. of approved projects	Value (USD m)	Total (USD m)	% Total
Mine and Industry	75	1516	157	16784	61	3245	21545	92
Housing and Construction	22	369	17	197	0	0	566	2
Water and Agriculture	16	208	4	24	0	0	232	1
Transportation	0	0	2	292	3	393	685	3
Export of Technical Services	0	0	1	190	1	3	193	1
Other	0	0	6	1292	2	41	170	1
Total	113	2093	187	17616	67	3682	23391	100

Source: Turquoise Partners (2013)," Iran Investment Monthly". November 2013 - Volume 8, No 86

As shown below figure since the inception of NDFI in year 2010 until Feb 2013 almost 24 billion USD was allocated to the projects of which the share of mining and industry (including oil and gas) and agriculture & other sectors was 91 and 9 per-cent respectively.

In terms of job creation by NDFI's investments, the share of mine and industry with 13400 jobs allocated 91 per-cent of total job. However, agriculture & other sectors with 1400 job just got 9 per-cent of total job creation.

Figure 58:



Source: NDFI Web site, Statistical report as of Feb 2013, www.en.ndf.ir

7-Public fund and Sovereign wealth fund in the world

In Table below we see a list of the largest public funds. The total assets managed by the ten largest public funds amounts to about 8944 billion USD. The largest one belongs to Social Security Trust Funds of USA with assets of about 2789 billion USD. The second one is Government Pension Investment Fund of Japan with assets of about 1100 billion dollars. As shown in the table the third largest public fund is oil sovereign wealth fund which belongs to Norway with assets of 863 billion dollars.

Table 35: List of largest public funds in mid-2015

Rank	Fund	Country	Type	Assets(B/USD) Dec 2014
1	Social Security Trust Funds	USA	National Pension	2789
2	Government Pension Investment	Japan	National Pension	1100
3	Government Pension Fund	Norway	Sovereign Wealth Funds	863
4	Abu Dhabi investment authority	UAE	Sovereign Wealth Funds	773
5	SAMA Foreign holdings	Saudi Arabia	Sovereign Wealth Funds	757
6	China investment corporation	China	Sovereign Wealth Funds	652
7	SAFE investment company	China	Sovereign Wealth Funds	567.9
8	Kuwait invetment authority	Kuwait		548
9	National pension of Korea	South Korea	National Pension	455
10	Stitching pension funds	Netherlands	Public Pension	440
11	Federal retirement thrift	USA	Public Pension	439

Source:http://www.swfinstitute.org/sovereign-wealth-fund/

There are more than 100 oil producing countries in the world but less than 50% of these are oil exporters, most of which are classified as developing countries. At the present almost all oil exporter countries have used stabilization fund for their natural resource revenues. In below table we see a list of the largest oil SWFs. The total assets managed by oil SWF amounts to about 4126 billion USD which is 75% of total 78 SWF assets. While the majority of countries with SWFs are natural resource-rich countries with mainly oil as their main natural resource, but some countries like China have three funds none of which are commodity related funds. Also the US has eight SWFs, managing assets totalling 128 billion USD, the largest of which is the Alaska Permanent Fund with assets of about 53 billion USD. The sources of capital for the US SWFs are commodities ranging from oil, gas, to minerals.

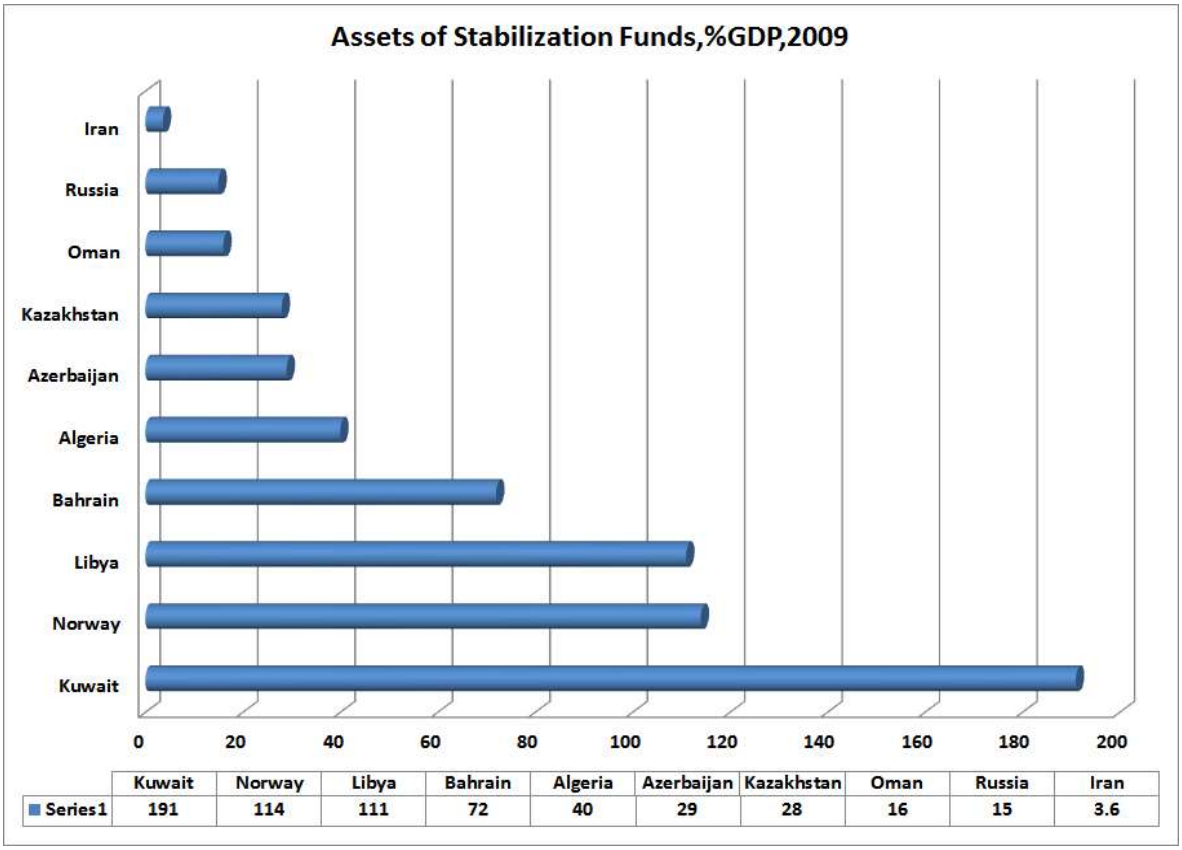
Table 36:List of largest oil SWF in mid 2015

Country	SWF	Assets (b/usd)	Inception	Transparency index
Norway	Government Pension Fund	873	1990	10
UAE-Abu Dhabi	Abu Dhabi investment authority	773	1976	6
Saudi Arab	SAMA Foreign holdings	671.8	n/a	4
Kuwait	Kuwait investment authority	592	1953	6
Qatar	Qatar investment authority	256	2005	5
Abu Dhabi	Abu dhabi investment	110	2007	n/a
Kazakhstan	Kazakhstan National fund	77	2000	2
Russia	Reserve fund	76.8	2008	5
Russia	National wealfare fund	75.7	2008	5
UAE-Abu Dhabi	Intl.petrolum investment	66.3	1984	9
UAE-Abu Dhabi	Mubaddle sevelopment co.	66.3	2002	10
Libya	Libayn investment authority	66	2006	1
Iran	National development fund	62	2011	5
Alaska	Alaska permenant fund	53	1976	10

Source: http://www.swfinstitute.org/sovereign-wealth-fund/

Below figure shows the assets of stabilization fund as a percentage of each country's GDP in 2009. The percentage shares range from more almost 200 per-cent for Kuwait to 3.6 per-cents for Iran. The mentioned ratio in Middle East and Central Asia is high compared with other parts of the world, which means funds are large players both internationally and domestically.

Figure 59:Assets of stabilization funds,%GDP

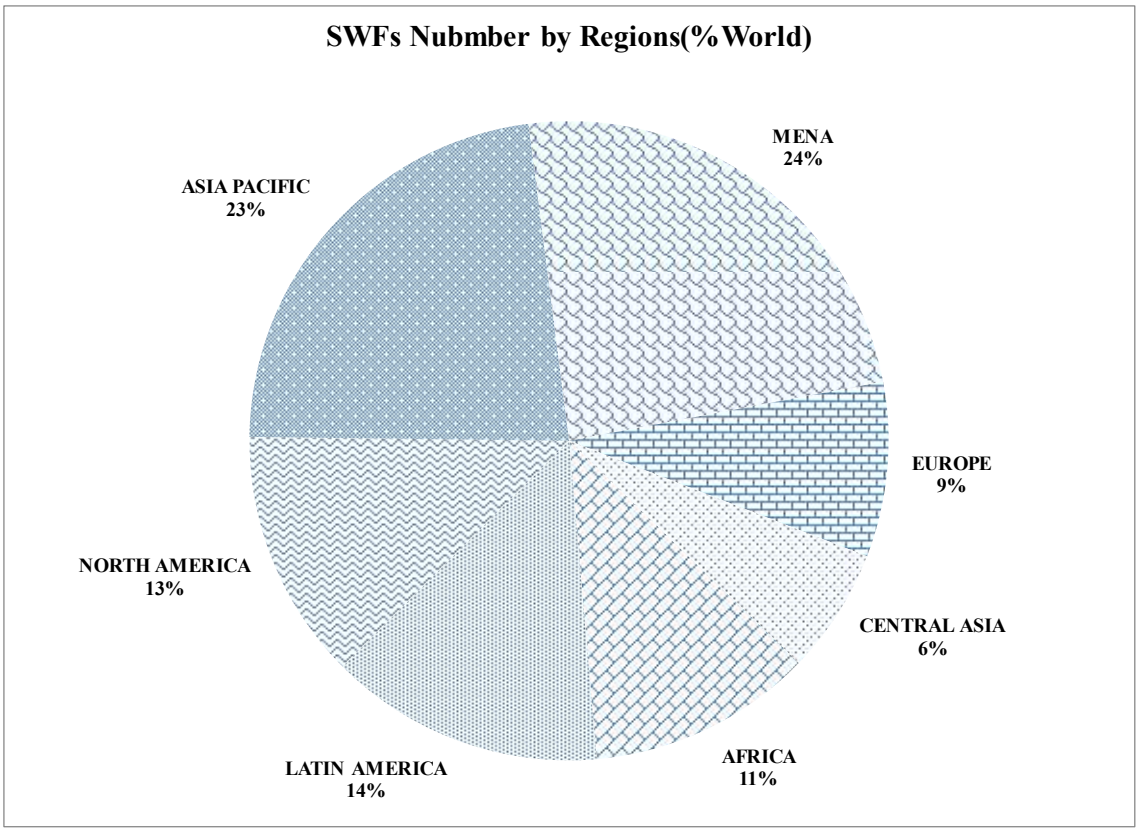


Source: Sugawara, N (2014), 'From Volatility to Stability in Expenditure: Stabilization Funds in Resource-Rich Countries' International Monetary Fund

8-Geographical distributions of SWFs

Below graph shows distributions of SWFs in the world. Most of them located in MENA and Asia Pacific region together with 47%, followed by North and Latin America with 27%. Africa, Europe and Central Asia with 11%, 9 and 6% per-cent respectively.

Figure 60: SWFs number by regions

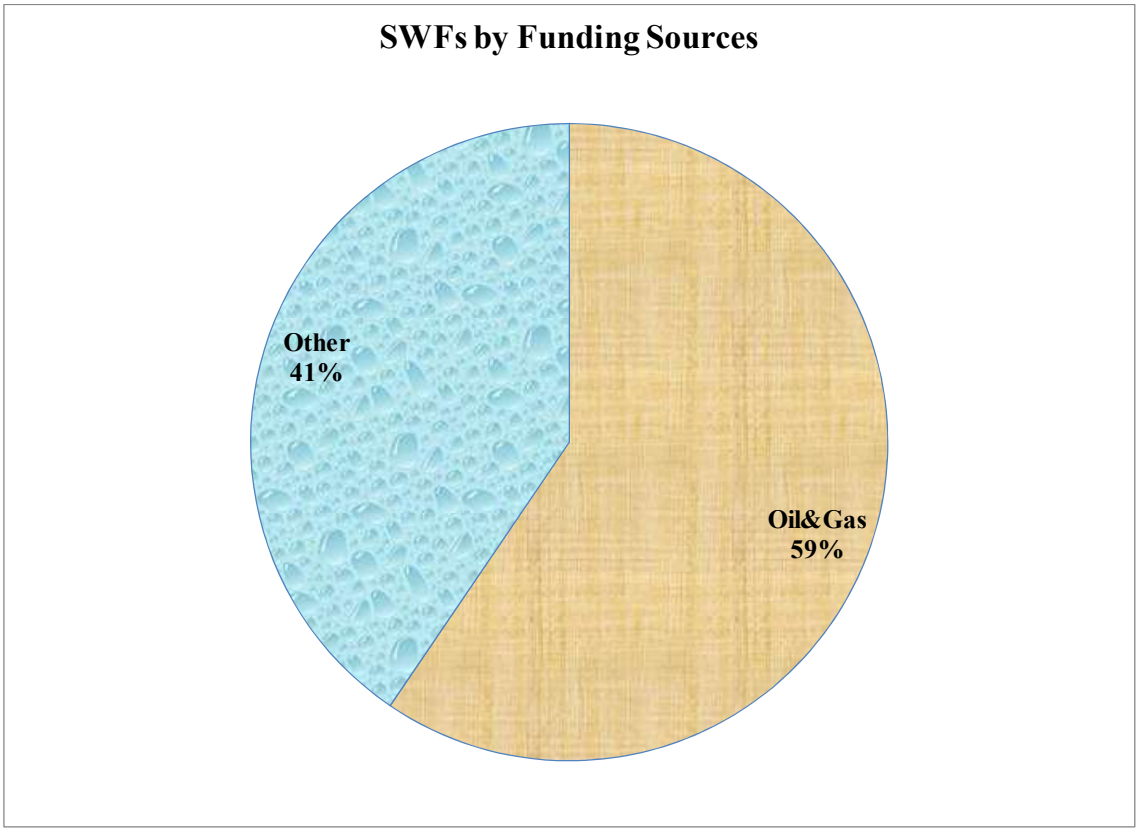


Source: http://www.swfinstitute.org/

9-SWFs funding source

SWFs have been established for different reasons. In terms of source of assets, below graph shows SWFs usually distinguish in two categories. A) Commodity based SWFs are generally funded by either direct natural resource export revenue or tax on natural resource. Almost 60% of SWFs assets come from oil and gas revenues such as Norway, Russia or Persian Gulf states. B) Non-commodity based SWFs are funded normally by excess foreign exchange reserve located mostly in China, and other Asian countries.

Figure 61: SWFs by funding sources

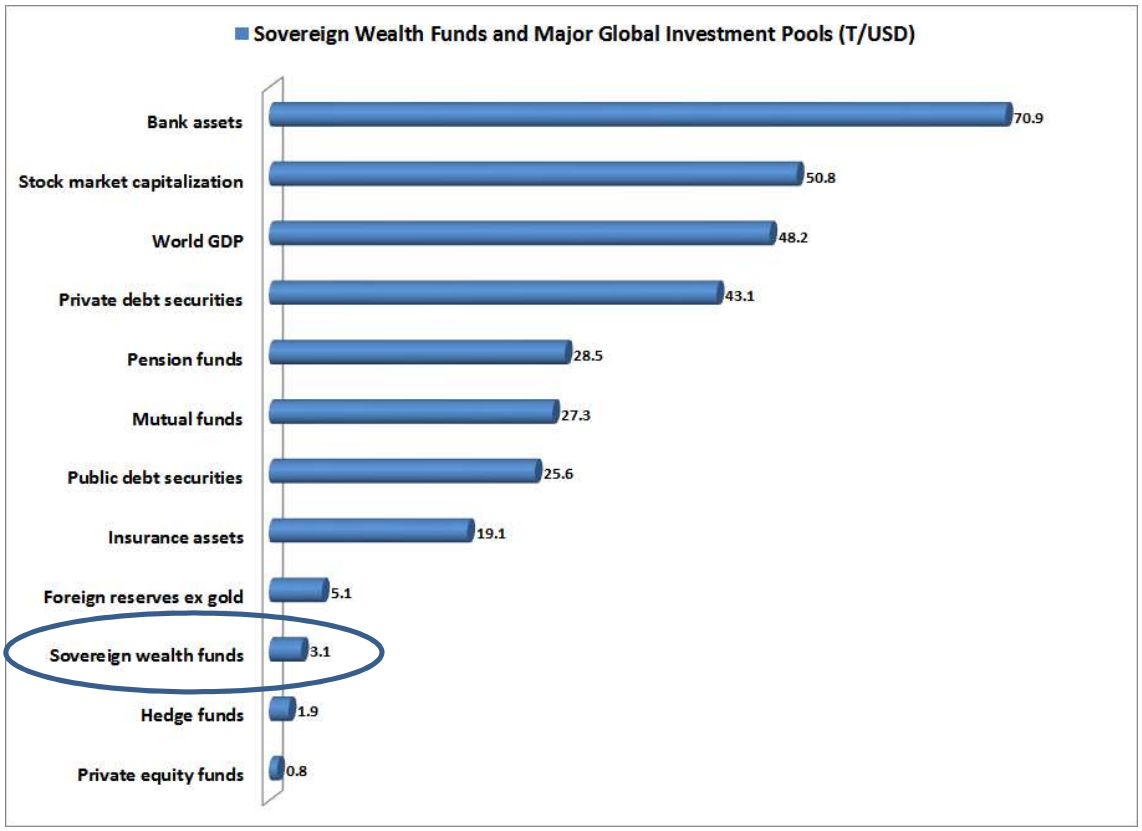


Source: http://www.swfinstitute.org/

10-SWFs and major global investments

SWFs with 3.1 trillion USD have come to play a significant role among investors in terms of the size of assets. As shown in figure below, SWF asset holdings now amount to much less than the funds under management by mutual funds, pension funds, insurance companies and public debt security with 20-30 trillion USD assets each. Also less than the 5.1 trillion USD in central bank foreign reserve holdings. But they are more than the 1.9 trillion USD under management by hedge funds and almost 1 trillion USD by private equity groups.

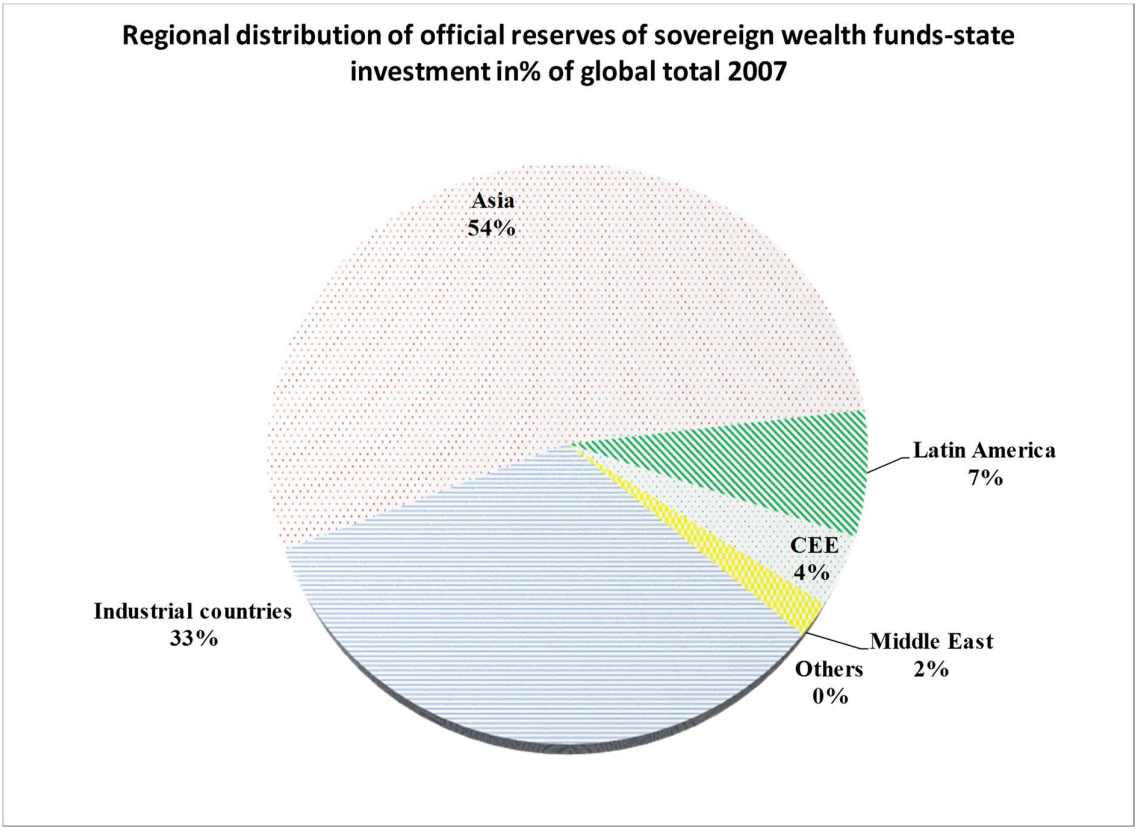
Figure 62:Sovereign wealth funds and major global invesments pools



Source: Aizenman,J (2008),"Sovereign Wealth Funds: Stylized facts about their determinants and governance" National bureau of economic research

Below graph shows regional distribution of total official reserve of SWFs that estimated about 4.2 trillion USD. Industrial countries and Asian countries absorb 87% of Sovereign wealth funds-state investment while share of the other part of the world in only 13%.

Figure 63: Regional distribution of official reserves of sovereign wealth funds



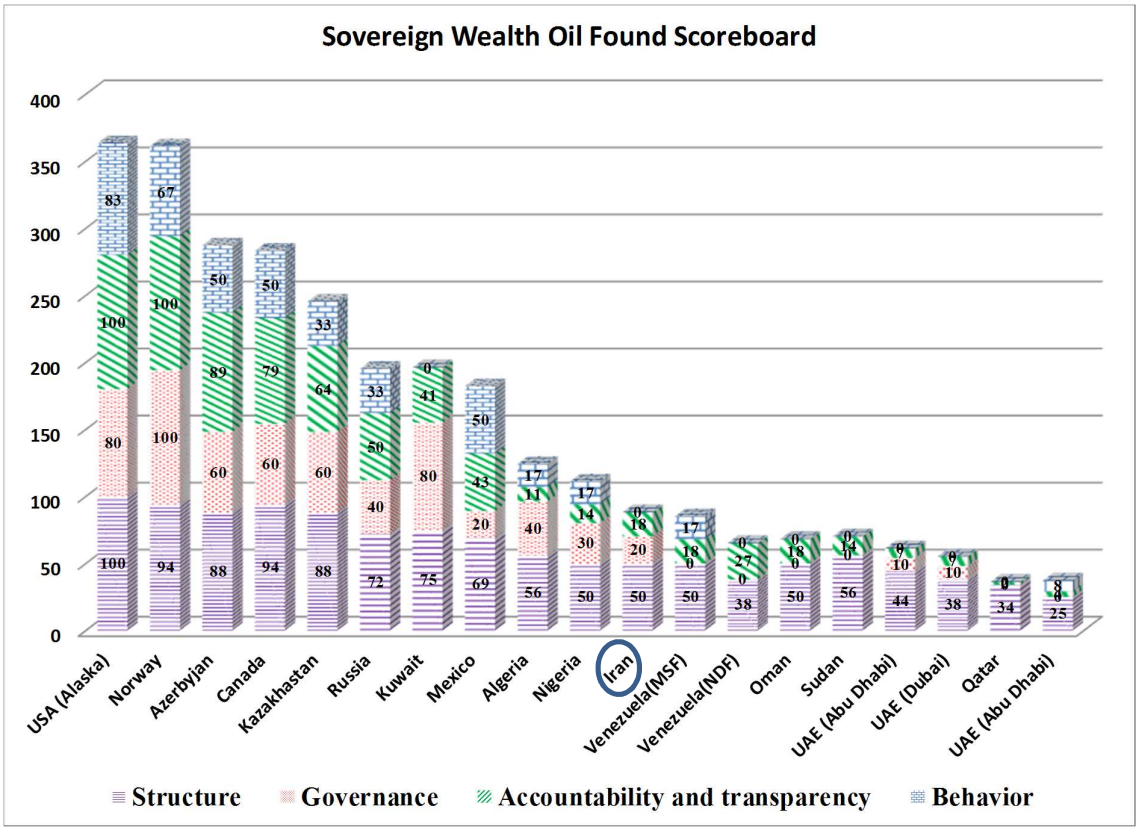
Source: Deutsche Bank research (2007)," Sovereign wealth funds-state investment on the rise",

11-SWFs performance scoreboards

In order to compare the performance of SWFs, this part describe of the 2009 version of 19 SWF scoreboards for 16 countries (Truman, 2010). The scoreboard considers four areas of SWF characteristics, namely, structure, governance, accountability and behaviour. (for more details, see Appendix B)

Graph below shows summary sovereign wealth fund scoreboard (percent of maximum possible points) in each category in selected oil exporter countries. Norway is the only country whose score in the governance area is 90 per-cents of the maximum score. Alaska fund scores for structure and accountability is highest. Iran has got 50, 20, 18 and 0 per-cents of the maximum score for structure, governance, accountability and behaviour respectively.

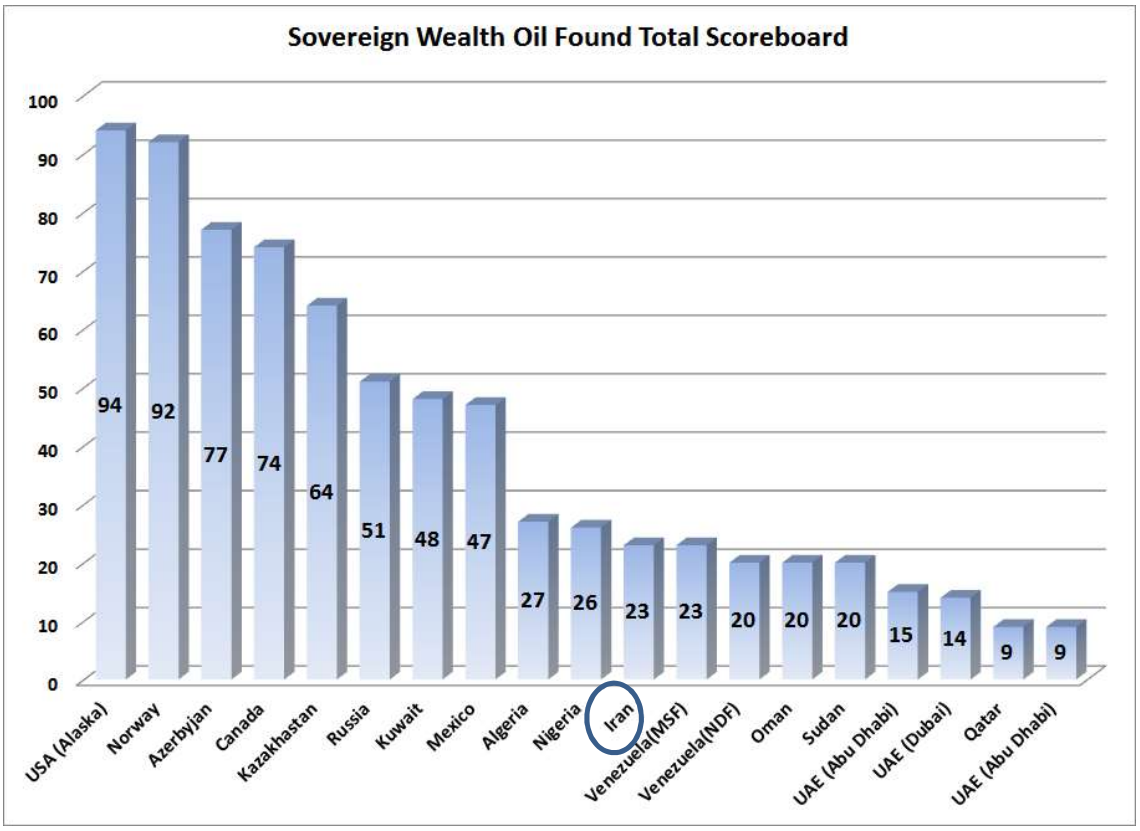
Figure 64: Sovereign wealth oil funds scoreboard



Source: Truman, E (2008), "A Blueprint for Sovereign Wealth Fund Best Practices" Peterson Institute for international economics

The graph below shows total percent of maximum possible points (out of 33 points) of Sovereign wealth oil found. In general, among oil SWFs the Alaska oil fund and Norway have got the highest score and Iran get 7.5 points out of 33 points it means 23 percent of maximum possible points (for more details, see Appendix C) is lower than Nigeria and Algeria.

Figure 65: Sovereign wealth oil found total scoreboard



Source: Truman, E (2008), "A Blueprint for Sovereign Wealth Fund Best Practices" Peterson Institute for international economics

However, the pensions SWFs have higher scores than the non-pension SWFs. Scores for the pension SWFs range from 95 to 77, and 10 of the non-pension SWFs have scores above 60. This demonstrates that non-pension SWFs can, and some do, follow practices as rigorous as pension SWFs

12-Empirical model and data

12-1-Pre and post stabilisation fund macroeconomic variables growth in Iran

One way for judging stabilization fund's performance is comparing pre and post stabilisation fund macroeconomic variables growth.

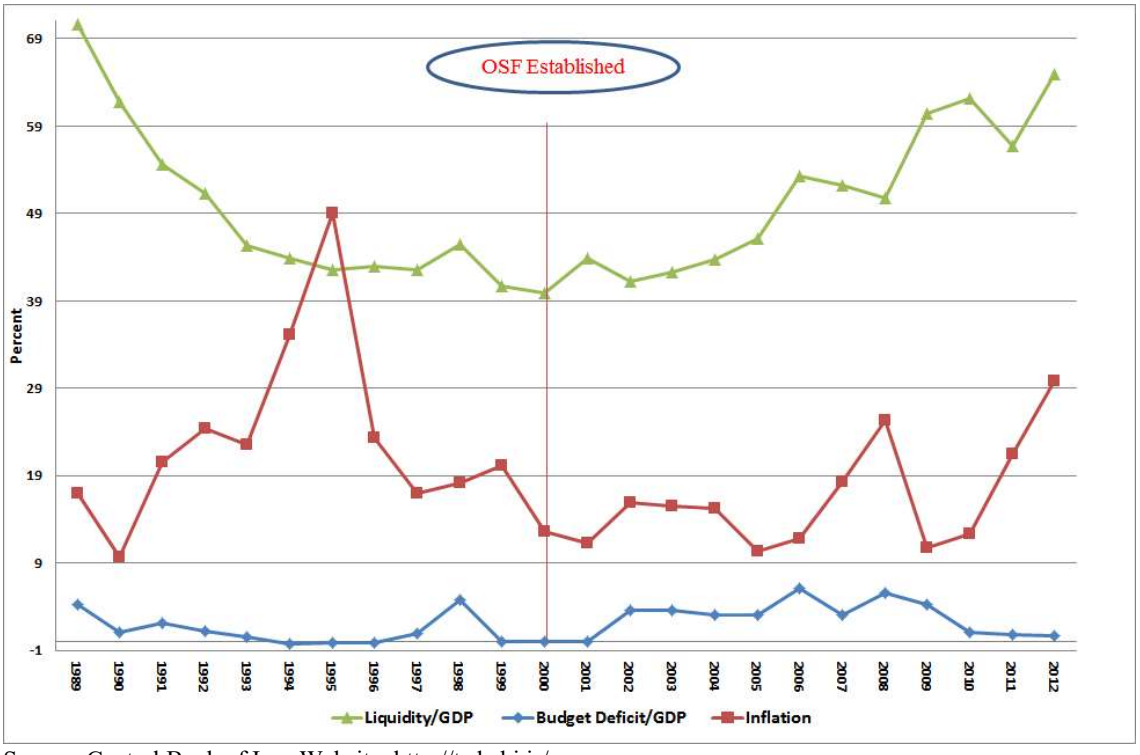
The most important variable in this regard is inflation rate as a proxy of stability of the economy pre and post stabilization fund. As shown in the graph below inflation rate decreased by 31 per-cents after stabilization fund was established in year 2000 in Iran. In the same period under investigation liquidity and government budget deficit as a ratio of GDP increased. This means

the government has limited access to oil revenues which causes higher budget deficit. The government compensates the deficit by using central bank assets at the expense of higher liquidity/GDP ratio.

Table 37: Pre- and post-stabilisation fund fiscal performance in Iran

Title/Time	Pre-SF Annual average%	Post-SF Annual average%	Change %
Inflation	23.4	16.2	-31
Liquidity (%GDP)	49.3	50.6	2.6
Deficit(% of GDP)	1.35	2.70	100
Expenditures (% of GDP)	18.7	19.3	3
Revenues (% of GDP)	17.3	16.6	-4
Non-resource revenues (% of GDP)	8.5	7.9	-7

Figure 66: Trend of Liquidity, Budget deficit and inflation



Source: Central Bank of Iran Website, http://tsd.cbi.ir/

The Government total revenues as a ratio of GDP decreased by 4 per-cent post stabilization fund.

The non-resource revenue as a ratio of GDP is estimated to have decreased by 7 per cent annual average post stabilization fund. This result in Iran can be interpreted as appearance of new resource revenues, which relieved pressure on government to increase its revenue collection from non-resource areas, such as direct taxation. Also government expenditures, measured as per cent of GDP, increased by 3 per-cent in Iran.

12-2- Econometric Specification

Models and Data:

Following Shabsigh, G *et al*. (2007) and Mehrara, M *et al*. (2012) assume an oil exporter country's macro volatility (V_t^{NF}) without an oil fund as follows:

$$V_t^{NF} = X_t' \beta + \varepsilon_t \qquad (6\text{-}1)$$

Where "X_t"consists of observed covariates and" ε_t" is a residual uncorrelated with "X_t". The macro volatility with a stabilization oil fund as follows:

$$V_T^F = V_T^{NF} + \delta \qquad (6\text{-}2)$$

Where "δ" is the coefficient of interest, which is expected to be negative, showing the effect of stabilization oil fund on volatility. With the use of a dummy variable "D^F" which takes one if an stabilization oil fund is in present and zero otherwise, we can see:

$$V_t = X_t' \beta + D_t^F \delta + \varepsilon_t \qquad (6\text{-}3)$$

The basic specification for our econometric analysis for single country as follows:

$$INF_t = \alpha_1 INF_{t-1} + \alpha_2 LIQ\_G_t + \alpha_3 OILR\_G_t + \alpha_4 GDP\_G_t + \alpha_5 DUM\_F + \alpha_6 DUM + \varepsilon \qquad (6\text{-}4)$$

Table below shows summary of description and expected sign of the variables in regression.

Table 38: Description and expected sign of the variables

Variable	Description	Expected sign
$\mathbf{INF_t}$	Inflation rate, as a measure of macroeconomic instability	dependent variable
$\mathbf{LIQ\_G_t}$	Real Money liquidity growth	+
$\mathbf{INF_{t-1}}$	lag of the dependent variable to control for the dynamic path of instability	+
$\mathbf{GDP\_G_t}$	Real GDP growth rate	-
$\mathbf{OILR\_G_t}$	Oil Revenue Growth	-
DUM_F	Refers to fund dummy variable to investigate fund effects on volatility takes on 1 for years with fund otherwise=0	+/-
DUM	A dummy variable for revolution and Iran-Iraq war ,for period of 1979-1989=0 otherwise=1	+
$\boldsymbol{\varepsilon}$	Is the error term which is assumed to be independent from other regressors	

12-2-1-Unit Root Test

First we have to see the property of time series, thus each series should be examined for stationarity. Table below gives the stationarity test for all the time-series, using the Augmented Dickey-Fuller and Phillips-Parron t-tests over the sample period of 1974-2012. These tests include a constant but no time trend, as recommended by Dickey and Fuller (1979). According to ADF and PP tests for the level series, the ADF and PP tests do not reject the null hypothesis of a unit root at 99% confidence level for all variables. This means that all variables are stationary in level in both tests.

Table 39: ADF and PP tests of time series

	ADF		Phillips- Perron	
Variable	**Level**	**1st diff**	**Level**	**1st diff**
GDP_G	-4.07***	-8.44***	-4.06***	-12.74***
INF	-3.81***	-6.14***	-3.82***	-16.80***
OILR_G	-6.65***	6.42***	-6.64***	-16.33***
LIQ_G	-6.04***	-6.64***	-6.11***	-17.3***

Lag Length: Schwarz info Criterion
With intercept but no trend
*** Significance at 1% level. ** Significance at 5% level. * Significance at 10% level.

12-2-2- Estimations and Primary Result

Table below shows the effect of most important variables plus stabilization fund on inflation rate.

Table 40: OLS results

Variable/Specifications	Coefficient
C	16(5.4)
INF_{t-1}	0.13(3.02)
LIQ_G_t	-0.53(-4.75)
$OILR\_G_t$	0.039(3.14)
GDP_G_t	-0.19(-2.24)
DUM_F	-2.6(-3.08)
DUM	6.20(2.16)
R2	0.58
F	7.24
LM	0.22
RESET	0.08
Observation	39

Note: Dependent variable: inflation rate. Period: 1974-2012;"t" value within ( ) parentheses ; LM is Breusch-Godfrey Serial Correlation LM Test ("F" form, p-value for OLS) which shows the probability of null hypothesis (no auto-correlation in residuals) acceptance (p-values larger than 0.05 means acceptance of null hypothesis); RESET is Ramsey test (using powers of the independent variables) for omitted variables. The p-value of RESET tests the H0: model has no omitted variables (p-values larger than 0.05 means acceptance of null hypothesis (model has no omitted variables).

As shown in the table above most of the t statistics of variables are significant. Our LM tests result shows there is no auto-correlation in residuals. In other words, we can accept that in most specifications our main findings are immune to the possible autocorrelation of residuals. Also the Ramsey RESET test indicates that we do not have a serious problem with an omitted variable bias in most specifications.

We can summarize the results as follows:

1-The lagged term of inflation has a positive effect on current inflation.

2-The Liquidity growth has negative effect on current inflation, which is not in line with our expectation

3-An increase in oil revenue growth has a positive effect on inflation rate

4-GDP growth as an indicator of macroeconomic performance has negative effects on inflation.

5- The effect of revolution and war dummy is significantly positive. This means that during revolution and war the inflation rate is higher than in peace time.

6- The most important variable is dummy-fund. It shows negative correlation between the existence of stabilization fund and inflation rate. In other word if stabilization fund is in place then the significance of inflation rate as a measure of macroeconomic instability is diminished.

13-Institutional Quality and Fund Score

We have studied the impact of oil stabilization fund on inflation rate as a proxy of instability in Iranian economy by two methods. Both method proves that having oil stabilization fund reduced inflation rate in Iran. Now we want to study the relation between institutional quality

and performance of stabilizer fund. In other word we raise this question that whether institutional quality has any influence on stabilization funds' performance?

Many countries have made a mistake by assuming that having funds itself will automatically stabilize expenditure (Devlin and Lewin 2002). Also careful use of fund requires appropriate governance structures and institutional design based on transparency and accountability, which are not easily accessible to developing countries (Hill 1991, Bjerkholt 2002).

Sugawara, N (2014) studied stabilization funds in resource-rich countries. The paper examines the effect of stabilization funds on the volatility of government expenditure in natural resource rich countries. He employed a panel data set of 68 natural resource rich countries over period of 1988–2012. The results show that stabilization funds tend to moderate government expenditure. The government expenditure volatility with stabilization fund is 13% less than main estimation. Also the result revealed that not only political institutions and fiscal rules are serious elements in decreasing the government expenditure volatility but also the size of economy, diversified exports, real sector management, and financial markets are important.

Following Sugawara (2014) we employed fund score as a proxy for fund performance based on Truman (2008) for 16 oil fund countries consists of USA(Alaska), Norway, Azerbaijan, Canada, Kazakhstan, Russia, Kuwait, Mexico, Algeria, Nigeria, Iran, Venezuela (MSF), Qatar, Oman, Sudan and UAE (Abu Dhabi).

For institutional quality we employed three different sources first IQ-WGI Institutional Quality based on World Governor Indicator of world bank. Second IQ-PRS Institutional Quality based on Political Risk Services recommended by Mehlum *et al*. (2006) Saches and Warner (1997), Subramanian *et al*. (2002). Third IQ-EFW Institutional Quality based on Economic Freedom of Fraser institute (Ushie *et al*. 2013).

Graphs below show institutional quality in horizontal and fund score in vertical axes. Also correlation between two variables are calculated.

The graphs clearly show positive relation between institutional qualities based on WGI, PRS, EFW institutional quality and fund score in 2008. Also correlation between fund score and institutional qualities based on WGI, PRS and EFW are 0.54, 0.58 and 0.40 respectively. It means higher institutional quality resulted in better fund score.

Figure 67:

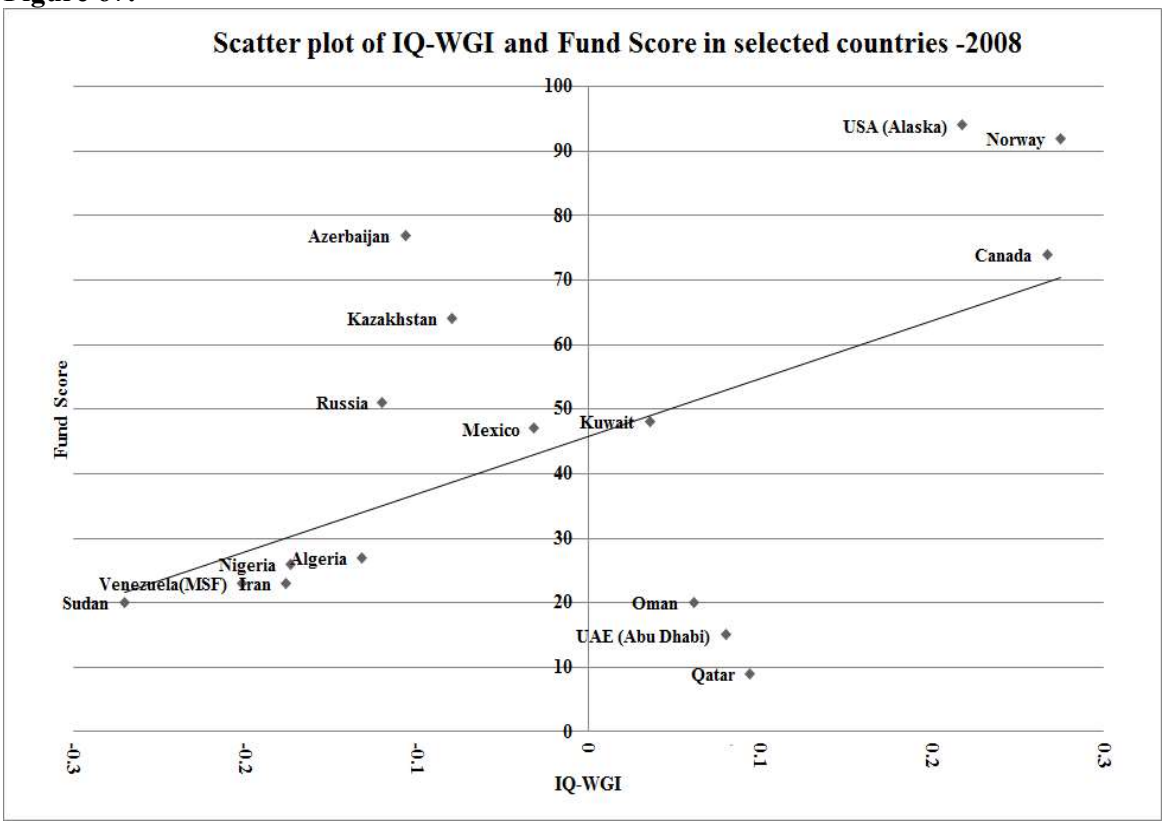


Figure 68:

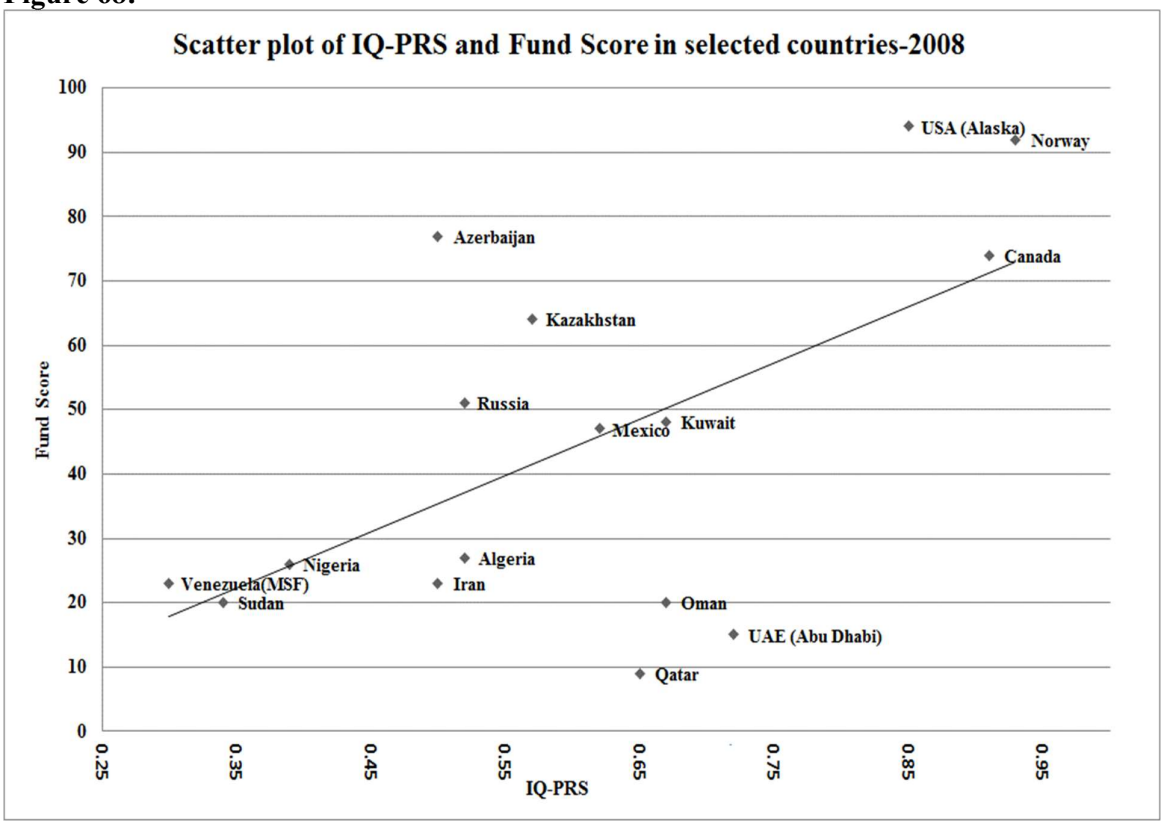
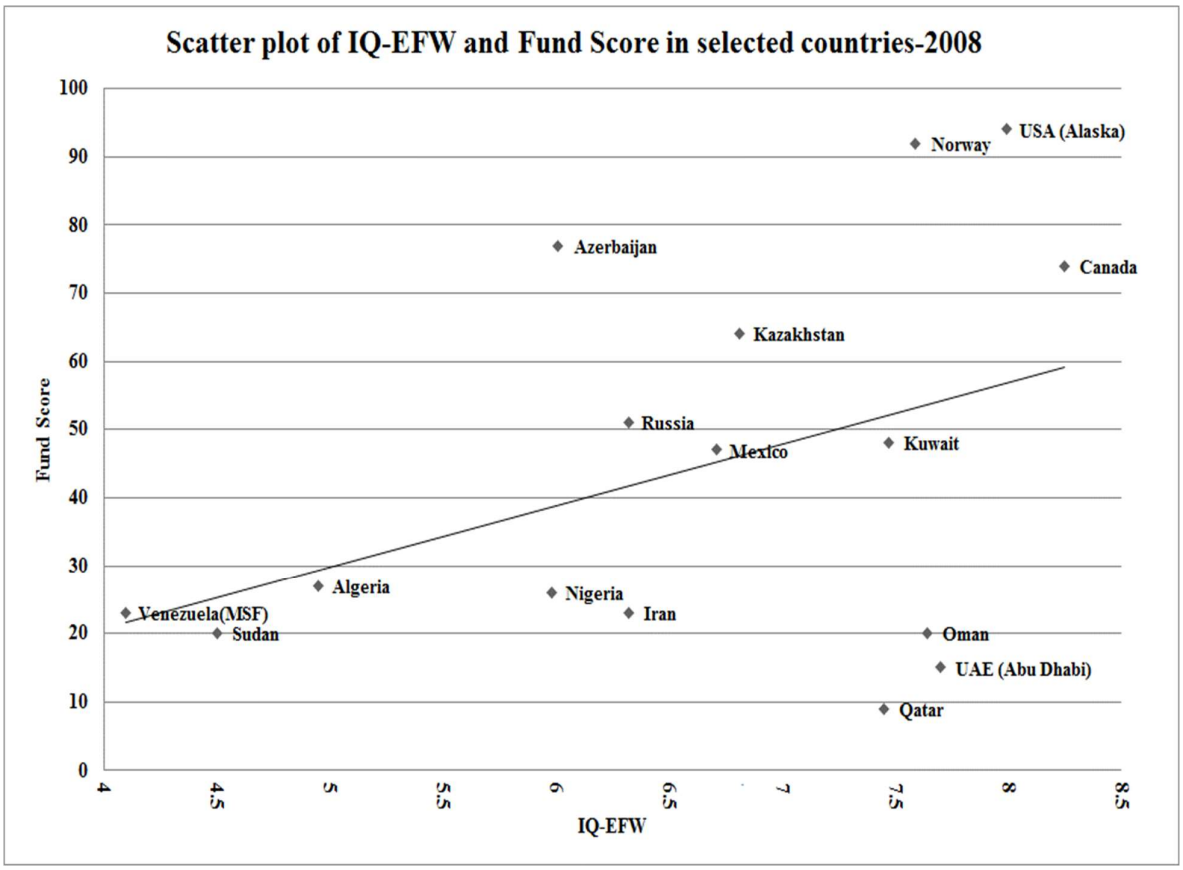


Figure 69:



14-Conclusion

Managing natural resources revenue has been a serious issue in resources rich countries. Policy makers can use the receipts for the long-term sustainable economic development by adopting suitable fiscal policy.

Eventually different ways to avoid negative impact of natural resource revenue are analysed as follows:

1- Diversifying the economy away from dependence on oil, gas and mineral exports (Ross 2001).

2- Sterilising the incoming revenue (Usui 1996,7).

3- Political reforms might be needed to carry out the necessary policies to avoid negative impacts.

4- Lump sum distributions of natural resource earning (Sala-I-Martin *et al*. 2003, Birdsall *et al*. 2004).

5- The use of stabilisation and oil funds (Bader Alhashel ,2015).

One popular solution that several natural resource rich countries have chosen to avoid these problems is creating some sort of stabilization fund. The function of these funds is either to set aside a certain amount of revenue for future generations or act as a fiscal instrument to stabilize their economy. The number of countries that established or contemplate establishing national wealth funds has risen rapidly since mid-2000. Sovereign Wealth Funds (SWFs) market size is one of the fastest growing markets in terms of assets. SWFs roles practically are classified into:

1-It is a public account to save extra revenue when natural resource revenues sharply increase in order to control government expenditures (Balding 2012). In other words, savings funds for future generations, which aim to convert non-renewable assets into a more diversified portfolio of assets and soften the effects of Dutch Disease.

2- Smoothens negative shocks on government revenue and expenditure due to significant declines in natural resource revenues. In other word buffers the fluctuations in government spending. Stabilization funds, where the primary objective is to insulate the budget and the economy against commodity price swings

3- Clear rules of funds on capital formation and investment (Villafuerte *et al*., 2010). International reserve investment corporations, established to increase the return from official reserves.

4- Development funds, which typically help fund socio-economic projects or promote industrial policies that might raise a country's potential GDP growth.

5- Contingent pension reserve funds, which provide for contingent pension liabilities on the government's balance sheet, but are funded from sources other than individual pension contributions

Since 2000, when Iran established its oil stabilization fund (OSF) to manage the oil revenue, the country has started on developing the needed institutions to address these issue. The Fund had two main missions, first to save a portion of oil revenues for next generations through making productive investments and second support non-inflationary budget financing and build shock absorber for future shocks. The performance of the fund showed that the OSF has not achieved its main stabilization and sterilization goals. Due this fact National Development Fund of Iran (NDFI) was created in the 5th development plan in 2010 in order to save the shares of next generations and transform a part of oil revenues wealth to productive investments.

One way for judging about stabilization fund's performance is comparing pre and post stabilisation fund macroeconomic variables growth. The most important variable in this regard is inflation rate as a proxy of stability of the economy pre and post stabilization fund. Iran's

inflation rate 31 per-cents decreased after stabilization fund established in year 2000. In the same period under investigation liquidity and government budget deficit as a ratio of GDP increased. This means the government has limited access to oil revenues which causes higher budget deficit. The government compensates the deficit by using central bank assets at the expense of higher liquidity/GDP ratio.

In our econometric analysis we consider inflation rate, as a measure of macroeconomic instability as a dependent variable. The most important variable is dummy-fund (DUM_F) refers to stabilization fund dummy variable to investigate fund effects on volatility takes on 1 for years with fund otherwise=0. It shows that the negative correlation between the existence of stabilization fund and inflation rate. Based on our estimations $\alpha_5 = -2.6$ it means if stabilization fund is in place then inflation rate as a measure of macroeconomic instability reduced.

We have studied the impact oil stabilization fund on inflation rate as a proxy of instability on Iranian economy in two methods. Both method proves that having oil stabilization fund reduced inflation rate in Iran.

Now we want to study the relation between institutional quality and performance of stabilizer fund. In other word we raise this question that whether institutional quality has any contribution on stabilization funds' performance?

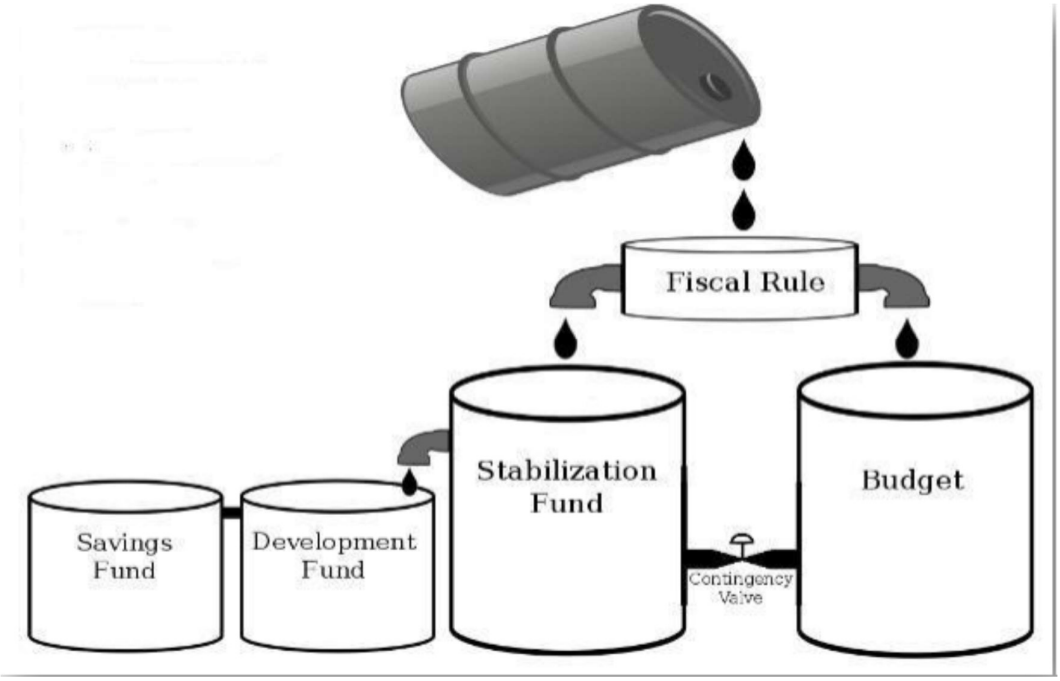
Many countries have made a mistake by assuming that having funds itself will automatically stabilized expenditure (Devlin and Lewin 2002). Also careful use of fund requires appropriate governance structures and institutional design based on transparency and accountability, which are not easily accessible to developing countries (Hill 1991, Bjerkholt 2002).

In this regard we employed three different sources for institutional quantity, first World Governor Indicator of world bank, second Political Risk Services recommended by Mehlum *et al*. (2006) Saches and Warner (1997), Subramanian *et al*. (2002) and third Institutional Quality based on Economic Freedom of Fraser institute (Ushie *et al*. 2013).

The result shows high correlation between fund score and institutional qualities based on different sources shows higher institutional quality resulted better fund score in selected countries in 2008.

For developing economies with rich natural resource wealth, we recommend a simple policy framework for using SWFs. We think resource rich countries can benefit from setting up three separate SWFs over time: 1) a stabilization fund; 2) a development fund; and, lastly, 3) a saving fund. As the graphic below suggests, the SWFs directs a country’s commodity wealth through

a fiscal rule. Most of the natural resource wealth will likely go into the government budget, but some will also be directed into different types of commodity funds on a stumbled basis.



Source: Dixon and Monk (2011)[83]

[83]Dixon and Monk (2011) "Rethinking the sovereign in sovereign wealth funds" Royal Geographical Society (with the Institute of British Geographers)

Appendix A:

Table 1: Attributes of stabilisation funds

Purpose	i. Stabilisation ii. Savings iii. Curtail spending iv. Economic diversification v. combination of those reasons
In/outflow rules: reference	i. Commodity price threshold (e.g. Chile) ii. Revenue level threshold(e.g. Alaska), iii. All resource revenues(e.g. Norway or Timor-Leste), iv. Fixed amount(e.g. iran), v. Discretionary vi. Other (budget surplus, privatisation proceeds, etc.)
In/outflow rules: target	i. Fund size/savings level ii. Government expenditure level iii. None
Relationship to budget	i. Within budget framework (virtual/financing fund) ii. Extra-budgetary
Institutions: operational	i. Ministry of Finance/Treasury ii. Central bank iii. Committee of experts iv. Independent agency v. Civil society
Institutions: accountability	i. Horizontal accountability: independent officials who receive reports on fund portfolio performance ii. Vertical accountability: the reporting responsibilities of the fund management structure up to the Ministry of Finance iii. Both iv. None
Institutions: transparency	i. Full reporting/auditing ii. Partial reporting/auditing iii. No reporting/auditing
Use of resources: asset management	i. Per cent of assets invested in international portfolio ii. Risk level of portfolio
Use of resources: earmarking	i. Earmarking of all resources ii. Earmarking of part of the resources iii. No earmarking of resources
Use of resources: purpose	i. Stabilisation/budget financing ii. Debt reduction iii. Social expenditure iv. Transfer to local government(s) v. National emergencies vi. Dividends/income
Discretion by head of state	i. Total ii. Some iii. None
Size	i. Total assets ii. Asset ratios (to GDP, exports, government revenue)

Source:Bagattini,G.Y(2011) "The Political Economy of Stabilisation Funds: Measuring their Success in Resource-Dependent Countries" IDS Working paper 356

Appendix B:

Scoreboard for Sovereign Wealth Funds

Structure: This category covers the basic structure of each SWF. What is the fund's objective? Where does it obtain its funding? How are its earnings used? Is it well-integrated with the fiscal system of the country? Does it have a clearly stated investment strategy? Is the fund separate from the country's international reserves? An SWF's high score on the elements in this category provides confidence to the citizens of the home country and of countries where the fund may invest that the activities of the fund are transparent.

Governance: The governance category covers the respective roles of the government and fund managers in conducting the operations of an SWF and also the use of corporate governance and ethical guidelines as part of those activities.

Accountability and Transparency: Accountability to the citizens of the home country of the SWF as well as to the citizens and government of the countries in which it invests, and participants in financial markets more generally, should be the principal motivating objective of SWF best practices. Transparency about the fund's structure and operations is a means toward this broader end. Consequently, the elements included in this category are crucial to the overall compliance of an SWF with the blueprint for SWF best practices.

Behaviour: The last category focuses on the investment behaviour of the funds. It combines aspects of risk management with features that may be of concern to market participants because of the potentially large scale of SWF investment activities. Consequently, the selection of elements is somewhat more judgment based and potentially controversial.

This appendix presents the elements of the scoreboard described in the policy brief. For each of the 33 questions, if the answer is an unqualified yes, we score it as "1." If the answer is no, we score it as "0." However, partial scores of 0.25, 0.50, and 0.75 are recorded for many elements, indicated by (p) in the descriptions below. The four categories in the scoreboard are listed below with subcategories where relevant. The words in bold are keyed to the results presented in table A.1 for each SWF on each element.

Structure

1. Is the SWF's objective clearly communicated? (p)

Fiscal Treatment

2. Is the source of the SWF's funding clearly specified? (p)
3. Is nature of the subsequent use of the principal and earnings of the fund clearly stated? (p)
4. Are these elements of fiscal treatment integrated with the budget? (p)
5. Are the guidelines for fiscal treatment generally followed without frequent adjustment? (p)

Other Structural Elements

6. Is the overall investment strategy clearly communicated? (p)
7. Is the procedure for changing the structure of the SWF clear? (p)
8. Is the SWF separate from the country's international reserves?

Governance
9. Is the role of the government in setting the investment strategy of the SWF clearly established? (p)
10. Is the role of the managers in executing the investment strategy clearly established? (p)
11. Are decisions on specific investments made by the managers? (p)
12. Does the SWF have in place and publicly available guidelines for corporate responsibility that it follows? (p)
13. Does the SWF have ethical guidelines that it follows? (p)

Transparency and Accountability
Investment Strategy Implementation

14. Do regular reports on investments by the SWF include information on the categories of investments? (p)
15. Does the strategy use benchmarks? (p)
16. Does the strategy limit investments based on credit ratings? (p)
17. Are the holders of investment mandates identified?

Investment Activities
18. Do regular reports on the investments by the SWF include the size of the fund? (p)
19. Do regular reports on the investments by the SWF include information on its returns? (p)
20. Do regular reports on the investments by the SWF include information on the geographic location of investments? (p)
21. Do regular reports on the investments by the SWF include information on the specific investments? (p)
22. Do regular reports on the investments by the SWF include information on the currency composition of investments? (p)

Reports
23. Does the SWF provide at least an annual report on its activities and results? (p)
24. Does the SWF provide quarterly reports? (p)

Audits
25. Is the SWF subjected to a regular annual audit? (p)
26. Is the audit published promptly? (p)
27. Is the audit independent? (p)

Behaviour
28. Does the SWF indicate the nature and speed of adjustment in its portfolio? (p)
29. Does the SWF have limits on the size of its stakes? (p)
30. Does the SWF not take controlling stakes? (p)
31. Does the SWF have a policy on the use of leverage? (p)
32. Does the SWF have a policy on the use of derivatives? (p)
33. Are derivatives used primarily for hedging?

Appendix C:

Table: Iran's fund score-2008

Iran get 7.5 points out of 33 points, it means 23 percent of maximum possible points.

Structure

Fiscal treatment								
Objective stated	Source of funding	Use of fund earnings	Integrated with budget	Guidelines Followed	Investment strategy	Changes in the structure	Separate from international reserves	Subtotal
1	1	0.5	0	0	0	0.5	1	4

Governance						Transparency and accountability Investment strategy implementation			
Role of government	Role of managers	Decisions made by managers	Guidelines for corporate responsibility	Ethical guidelines	*Subtotal*	Categories	Benchmarks	Credit ratings	Mandates
0.5	0.5	0	0	0	1	0	0	0	1

Transparency and accountability

Investment activities					Reports		Audit			
Size	Returns	Location	Specific Investments	Currency composition	Annual	Quarterly	Audited	Published	Independent	*Subtotal*
0.5	0.5	0	0	0	0.5	0	0	0	0	2.5

Behavior

				Derivatives			
Portfolio adjustment	Limits on stakes	No controlling stakes	Policy on leverage	Policy on derivatives	For hedging only	*Subtotal*	GRAND TOTAL
0	0	0	0	0	0	0	7.5

Source: Truman, E (2008), "A Blueprint for Sovereign Wealth Fund Best Practices" Peterson Institute for international economics

Chapter Seven:
Conclusion, Implications and Directions for Future Research

7-1-Conclusions

Since the appearance of crude oil in Iran in early 20th century, and especially after 70s, it has played a large part in the economic and political scene in the country. From the economic point of view, crude oil revenue has become the dominant factor in the economy. Iran depends heavily on oil revenue; nearly 80% of its export income comes from crude oil exports, as does, on average about 45% of its government budget.

Over the past five decades or so the ratio of Iran's crude oil export revenues/GDP with many fluctuations, has reached %16.4 in 2012. The annual average of this ratio since 1959 amounted to 18.3 % reaching 20.6% during 2000-2012 period. In years 2014-15-16 because of lower oil price and export decline the ratios mentioned has gone down.

Because oil revenue is such a major source of income for the government of Iran, oil revenue volatility has serious effects on the economy. By analysing its role, we can identify the effects of crude oil revenue and learn lessons from the past in order to avoid making the same mistake of misusing oil revenue in the future.

Iran has one of the biggest oil and gas reserves in the world, which has not been developed well. While recoverable oil reserves are estimated to be 10% of world oil reserves the production is just 5% of world production. In case of natural gas, the situation is worse because Iran having %17 of proven world natural gas reserves produces just 6% of world output, which is mostly consumed domestically.

Crude oil export was around 5 million barrel per day for the period of 1973-78 but following the revolution in 1979 and the Iran-Iraq war it declined to less than one million barrel per day. After the end of the war in 1989 crude oil production and export increased but never reached the pre-revolution level. Having a reasonable price of crude oil, which prevailed, had a significant role to Iran's economic recovery after the war. Despite a fairly steady trend of crude oil export in recent years, because of increasing oil prices, subsequently crude oil revenues sharply increased and reached to peak amount of 113 billon USD in 2011.

However, inflation rate is more or less high in oil producing countries in the Middle East but especially since 1979 revolution, high inflation rate (consumer price index) has been one of the main concerns of the government of Iran. Although before 1979 the inflation rate was high, it reached its peaks of about 50% in 1995. In period of 2000-2012, Iran's economy experienced inflation rates of about 16.2% on average annually.

The exchange rate was tightly controlled by the government after the revolution. There was no difference between official and market exchange rate until 1979. But afterwards and because of foreign currency shortage there was always a gap between official and market exchange rate. Crude oil revenues have also had an important impact on the real exchange rate. The government tried to unify the exchange rate based on free market rate after the war but the process badly managed and caused the inflation crisis. Thus the government again re-established tight management regime of exchange market by controlling foreign trade and discouraging demand for imports. These controls had a direct relation with oil revenues, which means when the oil revenue declined the controls, became tighter.

Crude oil revenue is of utmost importance of Iranian economy. For instance, many industries need foreign currency in order to import intermediate goods and technology to be able to produce their product. There is a significant correlation between crude oil revenue and total import as well as non-oil export.

The main target in this study is to estimate to what extent oil revenue fluctuations can impact key macroeconomic variables of Iranian economy by using econometric models. To achieve this a long run macroeconomic model for a major oil export economy was constructed using ARDL Bound test and Vector Error Correction Model (VECM) that includes the long run relations and interrelationships between the different time series. Also incorporated were linear and nonlinear specification in two different nonlinear functional oil revenue shock forms. The nonlinear functional forms are the asymmetric functional form of Mork (1989) and the net oil price increase of Hamilton (1996).

Our next objective in this study was to answer the following question: why is natural resource revenue a blessing in some countries and a curse in others, which was investigated by carrying out an analysis of institutions. The final objective was to find out the role of sovereign wealth fund in order to reduce the negative impact of natural resource revenue fluctuations.

There have been a lot of fluctuations in crude oil prices during the last 40 years ago since the Arab oil producer's countries put sanction against the West followed by several years of inflation. After that time two further crude oil supply shocks occurred, following Iranian revolution in 1979 and Iran-Iraq war in 1980, both were followed by global recessions. Another event which happened in 1986 with a major effect on crude oil price was disagreement between OPEC countries about crude oil prices. The Iraqi invasion of Kuwait in August 1990 effectively cut around 10 per-cent of world crude oil production from the market and caused crude oil price rise form 20 USD/BBL to nearly 40 USD/BBL. But within six months the crude oil price came back to normal levels because some OPEC producers increased production in order to

compensate the losses of Iraqi and Kuwaiti supplies. Also two global recessions consisting of Asian financial crisis in 1999 and credit crunch in 2008 was followed by slowdown of economic growth in several major industrial countries. Crude oil prices started 2015 relatively low, ended the year lower. Crude oil prices ended 2015 below $40 per barrel, the lowest level since early 2009. Spot prices for the international crude oil benchmark Brent averaged $52/b in 2015, 53% below the level in 2014 and 49% below the average price over 2010-14. The downturn trend in crude oil prices continued in 2016 mostly because of extra supply and new type of crude oils coming to the oil market after a few year of investment. This new crude oils are called oil shale and oil sand. However, there were a lot of changes in global oil market compared with 70s such as existing strategic oil reserves and emergence of a number of non-OPEC oil producers worldwide.

After the rise of crude oil prices as a result of Arab crude oil producers' embargo in 1973, the impact of oil price shocks mostly on developed crude oil importer countries especially USA came into consideration. But gradually the impact on different economies such as developing oil importer countries and since 2000s developing crude oil exporter countries became a subject of research and study in economic literature.

There are few channels through which crude oil price shocks can affect crude oil importing economies such as production cost, demand side, monetary policy and asymmetric affect. Most crude oil exporter countries count on oil revenues as their main source of foreign exchange revenue and their government budget. Meanwhile decreasing crude oil revenues due to falling oil prices create serious problem for crude oil producers. In this case they are also not able to borrow money from abroad easily. Also oil revenue in major oil exporting countries not only has economic impact but also there is a huge political impact as well.

On the other hand, in case of increasing crude oil prices, this leads to a prompt transfer of wealth from oil importers to oil exporter countries. This has different impacts in short and long term. These effects depend on government policy as how this additional oil revenue is used. If extra revenue is used internally thus aggregate demand curve moves upward. In case of having potential production capacity, this leads to economic growth otherwise cause inflation and then depreciation of the local currency. At the same time oil revenues could be invested in economy in general and oil industry in particular. In this case if the investments are considerable they will increase demand for others inputs such as labour. Moreover, most of the oil exporting countries are importer of industrial goods and high technology services so this transmission may lead to inflationary pressure as a result of which oil price increases.

However, some of the additional revenues can be spent on importing non-durable goods in order to avoid increasing liquidity. Also they can put the extra money into international financial market in order 1) to use it later when in future crude oil prices may decline 2) diversifying the economy: injection of all oil revenue into internal economy is limited so oil exporter must invest some of the revenues in oil importing countries.

The consequence of a sharp decline in crude oil revenue to oil exporting countries is considerable. In this situation major oil export countries struggle with high inflation, low economic growth, unemployment, political unrest and devaluation of local currency.

In empirical chapters first we have chosen the most important variables which have high correlation with oil revenue fluctuations namely GDP, inflation, government budget, exchange rate and total import.

The Granger causality test results highlight the causality mostly running from the oil revenues to other variables as we expect. The result clearly shows causality from oil revenue to exchange rate, gross domestic product and government budget but in case of inflation and total import it is not significant.

Simple OLS regression between GDP as a dependent variable and oil revenue as an independent variable shows the coefficient of oil revenue is positive and significant. Also regression overall is significant with 22.5 F statistics and 50 R-squared. Tentatively it means oil revenue has had positive impact on GDP in Iranian economy during 48 years of observations.

Regarding asymmetric impact of crude oil price, there has been some debate as to why the rise of crude oil price especially for the period of 2003-2008 did not cause a major recession.

Since our variables are mix stationary at I=0 and I=1 and based on Pesaran et al (1999,2001) approach we did ARDL Bound test to determine the co-integration among the variables. After establishing long run relation between time series we did symmetric and asymmetric VECM analysis between above mentioned time series. The results of Impulse response function in liner model shows that oil revenue have serious impact on most of the variables

More specifically Iranian economy has benefitted from oil revenue in terms of economic growth. Moreover, the results indicated that shocks to oil revenues are found to be very important in explaining most of the forecast errors variance of GDP.

Also oil revenue shocks during period under investigation increased government budget, total import and decreased exchange rate. But in case of inflation we are facing structural inflation in the long run regardless of oil revenue shocks in Iran. In other words, when oil revenue shock happens total import increases and government spending including current and

development budget increase via selling more foreign exchange in the market. On the other hand, and because of extra supply of foreign currency in the market, exchange rate decrease. Moreover, following the government expansion of fiscal policy, GDP increases and also because of limitation of internal production capacity, Dutch disease happen and inflation increase. This conclusion is not surprising and is actually consistent with what is expected in a country in which the government is the sole owner of the main income source, the oil and gas industry.

The results of VECM asymmetric effect of oil revenue shocks in Iranian economy based on Mork (1989) and Hamilton (1996) oil revenue shock definitions not proves asymmetric effect of oil revenue shocks on Iranian economy. The impulse response function and variance decomposition analysis results are out of line with our expectations.

Weakening importance of oil price shocks over time is addressed in some recent literature such as Edelstein *et al*. (2009) Kilian *et al*. (2009) and Hamilton (2009). Based on Edelstine *et al*. (2009) results, there is firm evidence that energy price shock reduced USA consumer spending by changes in precautionary savings, discretionary income, and increased operating cost of energy using durable goods. But the impact was different in 1979 when oil prices increased and in 1986 when oil prices decreased.

According to public opinion and economic theory massive natural resource revenue in general and oil revenue in particular should contribute to economic growth and development. But in practice much evidence proves the opposite and some natural resource-rich countries suffer from "resource curse" rather than "resource blessing". However, some evidence shows that for a few countries that managed their natural resources well it was a "blessing".

Transmission channels between natural resource revenues and economic failure in six strands are discussed as follows:

1- Dutch disease

2- Declining of natural resource revenue's purchase power

3- Expanding government interference in the economy

4- Corruption and rent seeking

5- Spending natural resource revenues

6-Institutions and development

We are facing countries rich in natural resource which perform differently in terms of development and economic growth in comparison to poor resource countries. The question is that what is the reason?

For example, the economic growth of poor natural resource countries such as Korea,

Singapore and Turkey are better than rich natural resource countries such as Saudi Arabia, Iran, Venezuela, Angola and Nigeria. Although there are some economic growth winners among rich natural resources such as Botswana and Canada, based on World Bank statistics (1994) among 82 countries just five rich natural resources belong to top 15 per capita incomes. The idea that the rich resource countries preform worse than poor resources countries in terms of economic growth was empirically studied in mostly late 20th century including Auty (1990), Gelb (1988), Sachs *et al*. (1995, 1999), and Gylfason *et al*. (1999).

There is now a new approach according to which the main reason for these different experiences is in the quality of institutions (Acemoglu *et al*. 2001, Sachs and Warner 1997, Mehlum *et al*. 2005a, Boschini *et al*. 2007, Rodrik *et al*. 2003, Isham *et al*. 2003). For instance, growth losers such as Ecuador, Niger, Zambia, Sierra Leone, are all natural resource-rich but have poor institutional quality. At the same time economic growth winners such as Australia and Norway are rich in natural resources with strong institutional quality. Also the Asian economic tigers are all natural resource-poor with good economic growth performance.

Chapter five has assessed the impact of institution quality in Iranian economic growth (dependent variable).

In our main estimation we employed Fraser Institute's Economic Freedom of the World Index (EFW) for institution quality but in robustness tests we consider two other measurements for the institutional factor, Worldwide Governance Indicators (WGI) from World Bank and Political Risk Services (PRS) from PRS website.

In overall the most important finding in all models is that the coefficient of quality of institution β_2 have positive impact on economic growth. This means good institutional quality is beneficial for growth. The most critical coefficient is β3 which is for the interaction between natural resources and institutional quality INTER=NR×IQ. Resources are only problematic if institutional quality is too poor. Thus β3 the coefficient, should be positive and-if it is to reverse the resource curse- have an absolute value larger than β1. This would mean that as long as institutional quality is good enough, natural resources will have a positive net effect on economic growth. The marginal impact of a unit increase in the oil abundance variable on economic growth is β1+β3(Institution). (Boschini et al. 2007).

In our models and in all specifications β3 is negative which means despite positive effect of institutional quality on growth the resource curse is stronger the weaker the institutional quality. In overall the most important finding is that natural resource abundance and quality of institution have positive impact on economic growth in Iran.

Now we raise this question that whether natural resource revenue in general or oil revenue in

particular causes bad institutions?

According of graphical analysis and calculated correlation between institutional quality (different definitions WGI, PRS and EFW) and oil revenues, the result shows higher oil revenue in Iran worsen institutional quality.

Managing natural resources revenue has been a serious issue in resources rich countries. Policy makers can use the receipts for the long-term sustainable economic development by adopting suitable fiscal policy.

Eventually different ways to avoid negative impact of natural resource revenue are analysed as follows:

1- Diversifying the economy away from dependence on natural resources (Ross 2001).

2- Sterilising the incoming revenue (Usui 1996,7).

3- Political reforms might be needed to carry out the necessary policies to avoid negative impacts.

4- Lump sum distributions of natural resource earning (Sala-I-Martin *et al*. 2003, Birdsall *et al*. 2004).

5- The use of stabilisation and oil funds (Bader Alhashel ,2015).

One popular solution that several natural resource rich countries have chosen to avoid these problems is creation some sort of stabilization fund. The function of these funds is either to set aside a certain amount of revenue for future generations or act as a fiscal instrument to stabilize their economy. The number of countries that established or contemplated establishing national wealth funds has risen rapidly since mid-2000. Sovereign Wealth Funds (SWFs) market is one of the fastest growing markets in terms of assets in the world. SWFs roles practically are classified into:

1-It is a public account to save extra revenue when natural resource revenues sharply increase in order to control government expenditures (Balding 2012). In other words, savings funds for future generations, which aim to convert non-renewable assets into a more diversified portfolio of assets and soften the effects of Dutch Disease.

2- Smoothens negative shocks on government revenue and expenditure due to significant declines in natural resource revenues. In other word buffers the fluctuations in government spending. Stabilization funds, who's the primary objective is to insulate the budget and the economy against commodity price swings

3- Establish clear rules of funds on capital formation and investment (Villafuerte *et al*., 2010).

International reserve investment corporations, established to increase the return from official reserves.

4- Development funds, which typically help fund socio-economic projects or promote industrial policies that might raise a country's potential GDP growth.

5- Contingent pension reserve funds, which provide for contingent pension liabilities on the government's balance sheet, but are funded from sources other than individual pension contributions

Since 2000, when Iran established its oil stabilization fund (OSF) to manage the oil revenue, the country has started on developing the needed institutions to address these issues. The Fund had two main missions, first to save a portion of oil revenues for next generations through making productive investments and second support non-inflationary budget financing and build shock absorber for future shocks. The performance of the fund showed that the OSF has not achieved its main stabilization and sterilization goals. Due to this fact National Development Fund of Iran (NDFI) was created in the 5th development plan in 2010 in order to save the shares of next generations and transform a part of oil revenues wealth into productive investments.

One way for judging stabilization fund's performance is comparing pre and post stabilisation fund macroeconomic variables growth. The most important variable in this regard is inflation rate as a proxy of stability of the economy pre and post stabilization fund. Iran's inflation rate 31 per-cents decreased after stabilization fund established in year 2000. In the same period under investigation liquidity and government budget deficit as a ratio of GDP increased. This means the government has limited access to oil revenues which causes higher budget deficit. The government compensates the deficit by using central bank assets at the expense of higher liquidity/GDP ratio.

In chapter six we investigated the impact of having stabilization fund (dummy variable) on inflation rate, as a measure of macroeconomic instability as a dependent variable.

The most important variable in our model is dummy-fund (DUM_F) which refers to stabilization fund dummy variable to investigate the fund effects on volatility it takes on 1 for years with fund otherwise=0. It shows the negative correlation between the existence of stabilization fund and inflation rate. Based on our estimations $\alpha_5 = -2.6$ which means if stabilization fund is in place then inflation rate as a measure of macroeconomic instability is reduced.

We have studied the impact oil stabilization fund on inflation rate as a proxy for instability in Iranian economy by two methods. Both method proves that having oil stabilization fund reduce inflation rate in Iran.

Now we raise this question that whether institutional quality has any effect on stabilization funds' performance?

Many countries have mistakenly assumed that having funds itself will automatically stabilized expenditure (Devlin and Lewin 2002). Also careful use of fund requires appropriate governance structures and institutional design based on transparency and accountability, which are not easily accessible to developing countries (Hill 1991, Bjerkholt 2002).

In this regard we employed three different sources for institutional quantity, first World Governor Indicator of world bank, second Political Risk Services recommended by Mehlum *et al*. (2006) Saches and Warner (1997), Subramanian *et al*. (2002) and third Institutional Quality based on Economic Freedom of Fraser institute (Ushie *et al*. 2013).

The result shows high correlation between fund score and institutional qualities based on different sources shows higher institutional quality resulted better fund score in selected countries in 2008.

7-2-Policy Implications

The findings of this research have important implications for future policy as following:

1-Since oil revenues has considerable portion of foreign exchange the government should diversify foreign exchange revenues by promoting non-oil export and tourism.

2- The government should also diversify annual budget earning by increasing tax revenue. For the first time in 2016 because of low oil prices the government tax revenue exceeds oil revenue in annual budget.

3-Rregarding institutional quality we cannot recommend anything because current political situation in Iran and Middle east limit fundamental improvements in this regard.

4- Based on current political situation believe that the actions of the current administration in improving stabilisation fund are on the right path and that the enhancement of institutional quality started by former reformist president Khatami should continue.

7-3-Directions for Future Research

As there are only a limited number of comprehensive studies on this subject in Iran, this study may be extended in the following ways.

1-This dissertation may be extended by employing other methods. Future research should focus on panel data techniques with the possibility of a larger country group.

2- Employing other variables or data sources or using weekly and monthly data.

3- Another extension can be made by investigating the effects of rent-seeking and corruption.

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