Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 12, Issue 8 July, 2021: 6289 – 6305

Research Article

The Short-term and Long-run Effects of Oil revenue fluctuations on Iran's trade balance with using the vector error correction model (VECM) approach

Hossein Motavali Habibi[1] , Gholamreza Zamanian[2] , Javad Herati[3]

1. PHD student in Economics, University of Sistan and Baluchestan
2. Associate Professor, Department of Economics, University of Sistan and Baluchestan
3. Assistant Professor, Department of Economics, University Bojnord

Abstract

The direct impact of oil price and oil income fluctuations on government budgets and economy have been the general characteristics of oil exporting countries in recent decades. In Iran, the vast majority of government revenues are oil revenues. One of the main factors behind the volatility of oil revenues and trade balance in recent years has been economic sanctions. Given the importance of achieving the goals of internal and external economy stability in economic planning, in this study using a Vector Auto Regression (VAR) to investigate the effects of long-term fluctuations in oil revenues (The Hodrick-Prescott filter has been used to extract the cyclical component (fluctuating) of oil revenues) on the level of GDP and trade balance (respectively, as internal and external stability index) during the period 1992 to 2019 has been tested. The long-term relationship estimates indicate a negative relationship between oil revenue fluctuations and trade balance. The Vector Error Correction Model (VECM) has also been used to link the short-run volatility of variables to their long-run equilibrium values. The results of the long-term relationship estimation indicated that there is a significant relationship between the three trade balance and GDP and oil revenue fluctuations.

Findings of the shock-response function also show that a sudden shock in the endogenous variables of the research increases the level of trade balance and this effect gradually decreases over time. On the other hand, the effect of the sudden shock of GDP changes indicates that this variable in the short run has a inverse relation and in the long run, has a direct with the trade balance.

Key words: oil revenues fluctuations, Economic sanctions, VAR model, Vector Error Correction Model (VECM)

1. Introduction

The Short-term and Long-run Effects of Oil revenue fluctuations on Iran's trade balance with using the vector error correction model (VECM) approach

The economies of oil-exporting countries, such as Iran, are heavily influenced by oil prices and export earnings. This issue has been considered by economists with the first sharp fluctuation of oil prices, which is now known as the first oil shock in 1973 (Eghbali and Halfi, 2005).

Oil and its revenues have had a wide range of direct and indirect effects on the economies of oil-exporting countries. In relation to Iran, which has 10.6% of the world's oil reserves and is the second largest producer among the Organization of the Petroleum Exporting Countries (OPEC, 2015), about 50% of total foreign exchange earnings come from oil exports. Also, due to the fact that oil revenues belong to the government, a large part of the government's annual budget is dependent on oil. Estimates show that between 40 and 50 percent of the government's annual budget is provided by oil exports; therefore, most of the public and private investment sources are obtained from oil exports. In addition, oil sales account for approximately 34% of Iran's GDP; (Berkashli, 1398).

Statistical observations indicate that one of the most important sources of government spending is oil revenues. Economic data of Iran shows that government spending is cyclical with oil prices and government investment fluctuates due to the fleeting positive shocks of the exchange relationship (relative increase in oil prices) and the positive shocks of the exchange relationship through fiscal policy with the government cycle is one of the most important factors. It causes macroeconomic turmoil and imbalances. (Jalali Naeini and Naderian, 2016)

Also, since the price and amount of oil sales in these economies is considered an exogenous variable and its determination is outside the scope of the national economy, and on the other hand, macroeconomic activities are particularly sensitive to oil shocks, so any fluctuations in It can affect the national economy. Among the fluctuations, changes in the price index of goods and services, the level of production, which is greatly affected by the activities of government sectors, changes in production costs, changes in trade balance and changes in exchange rates (Nematollahi and Tabatabai, 1390).

The expansion of Iran's oil and gas sector, dependence on new technologies for oil exploration, development and production, and the country's urgent need for foreign exchange earnings from oil and gas exports have made it a key part of making US sanctions more effective. And the European Union to be exploited (Fishing and Berkeley, 2012, p. 17). US officials believe that Iran's energy sector is one of the most vulnerable sectors in the Iranian economy, as approximately 80% of government revenue depends on oil sales (Katzman, 2009, p. 2).

The United States knows that Iran's economic structure is based on the oil-based economy and injects its required currency into the country's economy with the currency obtained from the sale of oil; Therefore, with the help of the European Union to change Iran's behavior in the nuclear program, it tries to cut off Iran's source of income and disrupt the country's economic arteries, and by imposing oil sanctions, effectively deprives Iran of most of its income and prevents the dollar from entering Iran. To prevent. (Mosalla Nejad, 1394)

In view of the above, it is raised how and to what extent the impact of fluctuations in the country's oil revenues, which are often due to economic sanctions, has affected the country's trade balance as one of the macroeconomic variables, so that it can be adopted. Necessary measures controlled the negative effects of economic sanctions on the country's trade.

In the present study, using a self-explanatory (VAR) model to investigate the long-term effects of oil revenue fluctuations (Hudrick-Prescott filter was used to extract the cyclical (volatile) component of oil revenues) on production levels and trade balance (respectively). The title of Internal and External Stability Index) is discussed. The structure of this research consists of 5 sections. After this introduction, in the second part, the theoretical foundations of the impact of economic sanctions (fluctuations in oil revenues) on the internal and external stability of the Iranian economy are briefly presented. Then in the third part, the model and method of research will be specified. Then, in the fourth section, the experimental results and finally in the fifth section, summaries and suggestions are presented.

2- Theoretical foundations and structure of the model

2-1. Export embargo

"Sanctions" are part of the international diplomacy that governs the world today, which is used by sanctions countries as a civilian tool to force the governments of the target countries to carry out the desired response. Economic sanctions mean the reduction or cessation, or threat of cessation of normal economic, trade and financial relations with the target country by the government of the sanctioning country. "Normal" relations in this definition means relations in a state without sanctions. In fact, sanctions are an economic weapon in the field of civilian struggle that transcends diplomacy from dialogue and takes action (Fadaei and Derakhshan, 1394, p. 4, quoted in Euler, 2007). The "sanctioning" entity may be the government of one or more countries, such as the United States, or an international organization, such as the United Nations. A "target country" is a country that has been directly affected by sanctions policies. "Foreign policy goals" refers to a change in the political behavior of the target country that the sanctioning country pursues explicitly or implicitly (Hofbaro et al., 2007, p. 3).

Export sanctions are similar to the imposition of an "optional export restriction" (VER) by the sanctioning country. The country's import market is the target of the mirror developments of the embargoed country's export market. Here we assume that the global supply and demand for the boycotting country goods determines the market price for the target country. In the export embargo, the supply supply of the target country is affected. Export sanctions lead to an increase in world prices, which leads to higher prices and lower prices for the goods of the sanctioning country in the target country. Manufacturing companies in the country benefit from export sanctions because in parallel with the boycott of this market by foreign companies, the sale of domestically produced goods increases. Producers in the sanctioned country will face lower incomes, which is a cost to the government of the sanctioning country.

The amount of curve transfer and the final effects depend on the amount of trade and economic relations between the sanctioning country and the target country. Also, the demand for goods of the sanctioning country in the target country determines the ultimate welfare loss that the target country will suffer. Charts (1) and (2) show post-sanction markets for the sanctioning country and the target country.

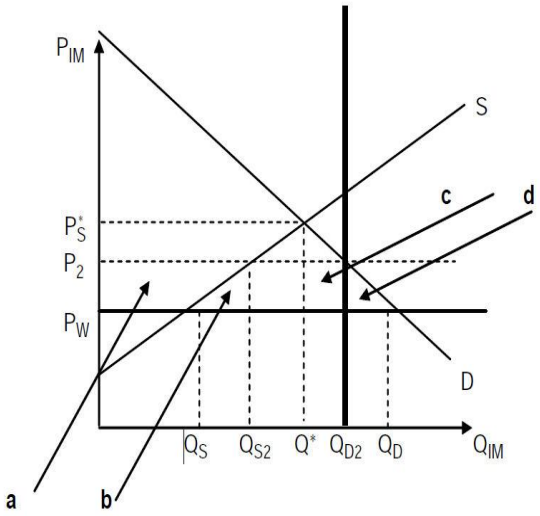

Figure 1- Import country of the target country (Euler, 2007, 16-18).

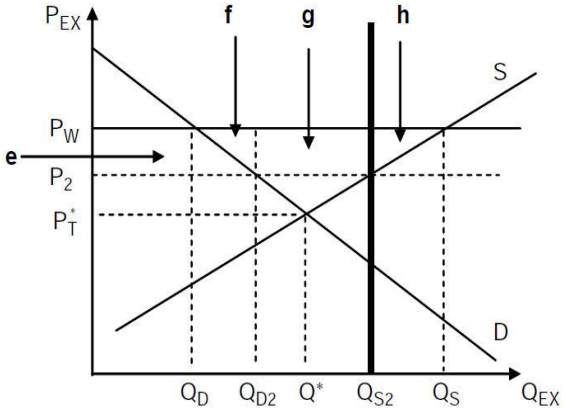

Figure 2 - Export market of the sanctioning country (Ibid., P. 17).

The net effect of welfare on both economies is again negative. Area a represents the profit of the producers of the target country, and areas b, c and d represent the welfare loss of the consumers of the target country. Export embargo is like imposing a deliberate export quota on the embargoing country. Area e represents the benefit of consumers and areas f, g and h indicate the loss of producers from this embargo in the embargoing country. Certain goods of strategic importance are usually exported by the sanctioning country. These goods include medicine, technology and physical capital, development aid, military weapons, etc. (Ibid., P. 18).

2-2. Trade balance

Trade balance is one of the international parameters of economics which is one of the main concepts in international trade. The first economic transaction that took place at the international level was the commodity-to-commodity transaction, which means trade and trade balance. During the 1950s and 1960s, when theories were formed in macroeconomics, because most foreign economic transactions were specific

to the commodity trade, economic models considered only the trade balance as a factor of analysis in the foreign sector.

On the other hand, trade balance as one of the policy tools in the external dimension of the economy is in the form of development strategies and programs. Iran is a country whose most important feature of the foreign sector is the presence of oil as a major export commodity. Given that the resources from exports are allocated to imports, the fact that the major part of exports is oil exports, the foreign sector in the Iranian economy has been particularly affected, so that the imbalance in On the one hand, this sector can be offset by oil revenues, and on the other hand, due to the unpredictability of foreign exchange revenues, unexpected imbalances are created along with the decrease or increase in oil prices and oil revenues. Therefore, one of the prominent features of Iran's foreign sector is its strong dependence on oil revenues (Yazdani and Nourafkan, 2015).

As stated in the introduction, oil revenue is the most important part of the foreign exchange earnings of the Iranian economy. Thus, fluctuations in world oil prices have a significant and negligible effect on foreign exchange earnings and the external balancing of the economy. Oil prices are determined by external factors outside the sphere of influence of domestic economic and political policies. The most important factors affecting oil prices are economic factors, monopoly factors and political factors. Economic factors include the supply and demand of oil and the cost of production of this product. Exclusive agents refer to the requirements of participation in the OPEC framework in market regulation and participation with large oil companies in the process of oil production and supply. In addition, political factors arise from the political confrontations of producing and consuming countries and their efforts to maintain their interests in this field. Given this set of factors, oil export earnings are highly uncertain and unpredictable, and fluctuations in oil revenues, foreign exchange earnings, and the external sector of the economy are unexpectedly affected. The effect of oil revenue fluctuations on the trade balance is such that a sudden rise in oil prices (and consequently oil revenues) increases the monetary value of exports at once and pushes the trade balance in a positive direction and in contrast to the decline in oil revenues , Reduces the monetary value of exports and leads the trade balance to the negative.

On the other hand, rising oil prices can have an adverse effect on the trade balance of oil-exporting countries, because although rising oil prices lead to increased foreign exchange earnings from oil exports, in contrast to countries that are major importers of the product. Petroleum products such as gasoline and semi-industrial and industrial products are from other countries, rising oil prices can lead to increased currency outflows and deficits in the trade balance (Nematollahi et al., 2009).

Creating a short-term positive shock to oil prices can have a strong positive effect on imports and increase imports, but in the long run, although this positive effect persists, it gradually decreases, because in the short run With the increase in oil prices, on the one hand, foreign exchange earnings increase, and on the other hand, the increase in oil prices increases the money supply and, consequently, increases demand. In the long run, with the decrease in foreign exchange earnings, imports and consequently the nominal value of imports decrease and on the other hand, the price index increases, which in total these two factors can reduce the real value of imports (Samadi et al., 2009). .

Also, the higher the price of oil and the longer it lasts, the greater its effects on the macro economy. Oil-exporting countries, like oil-consuming countries, are not immune to the consequences of oil crises. Rising oil prices in exporting countries stimulate both supply and demand, but because of energy support systems

in some countries, it is the only stimulus to demand. The sudden rise in oil prices has important implications (rising prices, rising imports and the creation of the Dutch disease) in their economies. Oil-exporting countries, despite their abundant natural wealth and large incomes from this resource, often have not yet achieved the desired economic growth and development. Some researchers have considered the wealth of oil and the increase in revenues from rent or sale as a disaster for these countries (Akani, 2007).

In general, an increase in oil revenues under certain conditions can improve the trade balance of oil-exporting countries, but for oil-importing economies, oil price shocks are generally

Thus, the response of consumption to an exogenous decrease in income depends on what share of this change in income is permanent. A temporary decrease in income will not be accompanied by an equal reduction in consumption, whereas if the decrease in income is permanent, it will be equal to a decrease in consumption. Thus, if the change in income is temporary, the investment will change slightly, but if the change in income is expected to be permanent, the amount of change in investment will be large. As a result, the question of "whether the changes and shocks to income are permanent or temporary" is important.

The second view, which has been considered in some studies and models of real business cycles such as Mendoza (1991) study, indicates that productivity and constant income shocks are an incentive for economic units to invest and save. To reduce consumption. Proponents of this view argue that increasing productivity (the real supply-side momentum) explains long-term revenue growth and changes in revenue cycles and trade balance. According to this view, permanent changes in income will affect the trade balance (Weselkova and Hervat, 2008).

In the present study, the Blanchard-Coa technique was used to decompose income shocks into two groups, temporary and permanent.

In this method, the variables must be selected in such a way that both or at least one of them is anonymous, because the variables (0) I do not have a permanent component. This method cannot be used if both variables are constant. If it is possible to use this method, eventually both variables will appear mana in the model (Akbari Fard and Kooshesh, 2009).

3. Research literature

There have been limited domestic studies in the field of trade balance and most studies have focused on imports and exports separately. In contrast, extensive foreign studies can be found in the field that continue to both groups.

3-1. Internal and external studies are mentioned.

The following table summarizes the domestic and foreign research with its results.

Table 1: Research literature (internal and external study)

Researcher	Title Research	Results
Mehravar and Oskooi (2006)	Investigating the Dynamic Effects of Oil Shocks on the Economics of Four Oil	the degree of oil price extraction in Saudi Arabia and Kuwait relative to Iran and Indonesia is lower. Also, the price of oil is the

	Exporting Countries (Iran, Indonesia, Kuwait and Saudi Arabia) Using data from 1960-2003,	most important source of fluctuations in GDP and imports in Saudi Arabia and Iran, while in Indonesia the momentum of imports is the main source of changes in these two variables.
Behboodi et al. (2009)	The effect of oil price instability on GDP in Iran	According to the instantaneous reaction functions, the oil price shock has a negative effect on production and in the whole period under review it is below its permanent level. In the long run, oil price variables have a positive effect and oil price instability has a negative effect on GDP.
Jahani and Khodaparast (2019)	Investigating the effect of global shocks of crude oil prices and gold prices on the Iranian stock market	The reaction of the stock price index in the Tehran Stock Exchange to the global gold price shock is more severe than the global oil price shock. Finally, due to the impact of the Iranian stock market on global variables such as fluctuations in world crude oil prices and world gold prices, investors' stock insurance against sudden fluctuations and shocks is recommended.
Seyed Anam Hassan et al. (2012)	Investigating the causality between trade balance and oil price shocks in Pakistan for the period 1975-2010	The results show that there is a significant negative relationship between oil prices, exchange rates and trade balance in Pakistan.
Lee (2011)	The effect of oil price shocks on trade imbalances between Asian countries Singapore and Japan for the period 1999-2011	The results show a cause-and-effect relationship between oil prices and trade imbalances.
Effing et al. (2010)	Investigating the relationship between oil price shock and current account balance in Nigeria in 1970-2008	The results show that the oil price shock in the short run has a significant effect on the current account balance.
Madsen (2002).	Investigating the causal relationship between Bombay stock price index and macroeconomic variables such as exchange rate, foreign exchange reserves and trade balance	In his study, he examined the variables of exchange rate, foreign exchange reserves and trade balance as variables affecting the Indian stock price index on a monthly basis for the period April 1990 to March 2001. The results showed that there is no causal relationship between these macro variables and the stock price index
Gubata et al. (2019)	Oil Price Fluctuations and Economic Growth: Evidence	Oil price instability has a negative and statistically significant effect on the economic growth of OECD countries in the sample. And

	from Advanced Economies Using Data Over a Century	oil-producing countries are negatively affected by oil price uncertainty.
Ahmad, Bato and Kalhor (2017)	Analysis of Relationships between Oil Price Shocks and Macroeconomic Indicators: SAARC	Region Evidence The results of this study show that macroeconomic factors are sensitive to even minor oil price shocks and have different economic consequences for countries and They have an area. The results of empirical evidence also show that each country in a study group based on their independent policies, macroeconomic principles, sectoral constructions and internal heterogeneity responds differently to oil price shocks.

By reviewing the literature, it is clear that most of the studies conducted on oil price fluctuations and its impact on macroeconomic indicators of oil-producing countries have been done. In addition to prices, the present study emphasizes the change in the volume of oil sales, which is an important and determining factor of oil revenue and the reason for this is the use of US oil sanctions policy by Iran and European countries in recent years, especially from The year is 2011. In 2011 and the first few months of 2012, with the cooperation of EU countries and the United States against our country, important sanctions were imposed, especially on the purchase of oil, along with financial sanctions. A new round of oil sanctions against Iran began on November 5, 2018, after the US unilateral withdrawal from the UN Security Council, and continues to this day.

4. Methodology and statistical bases

The data used in this research is annual and in the period of 1371-1391, which is obtained from the data of the time series of the Central Bank and the Statistics Center. The selection of model variables is based on previous studies in this case.

4-1.Presentation of model:

In the following, we first examine the significance of the variables used in the model. Calculating the degree of accumulation of variables in the model and whether their degree of accumulation is 1 or 2 will be to avoid possible problems in creating false regression.

In this study, the vector error correction model (VECM) was used to test the causal relationship between the model variables. One of the reasons for choosing this model is that often, economic variables, in addition to exogenous variables, are also affected by their intermittent values. The multivariate vector error correction model selected in this study to estimate the relationship between trade balance (X-I), oil revenue fluctuations (OIL-VOLATILITY), and non-oil gross domestic product (GDP) is as follows:

$$X\text{-}I = f(GDP, OIL\text{-}VOLATILITY) \quad (1)$$

Where oil revenue fluctuations are calculated by the Hudrick-Prescott filter. If we write this equation logarithmically-linearly, it can be represented as follows:

$$X\text{-}I= \alpha_0 + \alpha_1 OIL_{VOLATILITY} + \alpha_2 GDP + \varepsilon_0 \quad (2)$$

4-1-1.Single root test

In modern econometrics, most economic variables have mean and non-significant variance, which leads to a false regression with a high R ^ 2 and a significant t-statistic, but this regression may be economically meaningless (Granger 1974). However, if the set of variables is also stacked and there is a long-run relationship between the variables, reliable and inferred estimates can be obtained. In this study, a generalized Dickiofuller test was used to detect the variability of variables.

4-1-2. Co-accumulation analysis

In the economic literature, different methods are proposed to test the existence of a long-run relationship between variables. One of the most famous of these is the parasite and granger method, which was introduced by him in 1991. Also, the method of maximum straightening, which was expressed by Johansson Vivilius in 1990, is very widely used, which has been used in the present study. The vector autoregression (VAR) model can be defined as follows to show the co-integration test:

$$X_t = A_1 X_{t-1} + \cdots + A_K X_{t-K} + \mu + \varepsilon_t \quad (3)$$

Here X is a vector n × 1 of the variables I (1) and μ is a vector of constant values and ε_t is also part of the model perturbation. Using the expression Δ = 1-L, Equation (2) can be expressed as an error correction form.

$$\Pi \Delta X_t = \Pi X_{t-k} + \Gamma_1 \Delta X_{t-k+1} + \cdots + \Gamma_{k-1} X_{t-k+1} + \mu + \varepsilon_t \quad (4)$$

In the above equation, $\Gamma_i = -(I - A_1 \dots A_i)$ ، $(i = 1, \dots, k-1)$ ،$\Pi = -(I - A_i - \cdots - A_k)$ ،I), I single matrix, $A_i (i = 1, \dots, k)$The coefficient vector and k also show the number of interrupts used in the model.

Equation (3) is the first difference form of the VAR model to which the sentence ΠX_ (t-k) has been added. π is a matrix that contains information about the long-run relationship between variables. The rank of the matrix π represents the number of long-run linear relationships between the variables. This matrix can be decomposed as Π = αβ, where α represents the matrix of coefficients of the error correction expression. These coefficients represent the rate of adjustment toward the long-run relationship, and β is the matrix of long-run coefficients. Thus, the Johansson co-integration test is based on the π matrix (which represents long-run relationships between variables and includes an error correction section). If the order of the matrix π is complete, we can say that the Xt vector is stable. But if the matrix rank is zero, then the variables are not stacked and there is no long-term relationship between the variables, and the error correction model becomes an initial VAR model. Johansson and Eusilius (1990) introduced the following two statistics to test the number of co-integration vectors:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln\left(1 - \widehat{\lambda_i}\right) \quad (5)$$

$$\lambda_{max}(r, r+1) = -T \ln\left(1 - \hat{\lambda}_{r+1}\right) \quad (6)$$

So that (λ_i) از is the expression of the estimated values of the characteristic roots obtained from the estimation of the matrix π, which are also called special values, and T is the number of observations that can be used in estimating.

The first statistic relates to the assumption of zero that the number of co-integration vectors is less than or equal to r. The competing assumption in this case is that the number of co-integration vectors is greater than r. Based on the above, it can be easily understood that if λ_i = 0, then λ_trace will be equal to zero. The greater the number of characteristic roots from zero, the more negative the value of ln⟦(1-λ^_i) و and therefore the larger the statistic λ_trace. The second statistic (λ_max) is related to the test of the null hypothesis that the number of co-integration vectors is equal to r. The competing assumption here is that the number of these vectors is equal to r + 1. Here again, if the estimated values of the characteristic roots are close to zero, then λ_max will be small.

The error correction expression has long-term information. Through the significance of the coefficients of the error correction expression or t-statistic, the long-term causal relationship between the explanatory variables and the dependent variable can be understood. Therefore, in this study, to investigate the causal relationship, the vector error correction model is used, which is shown as follows:

$$\Delta(X-I)_t = \phi_0 + \sum_{j=1}^{p} \phi_{1j}\Delta GDP_{t-j} + \sum_{j=1}^{p} \phi_{2j}\Delta OIL\_VOLATILITY_{t-j} + \phi_{3j}ECT_{1,t-1} + \varepsilon_{1t} \quad (7)$$

$$\Delta OIL\_VOLATILITY_T = \lambda_0 + \sum_{j=1}^{p} \lambda_{1j}\,\Delta(X-I)_{t-j} + \sum_{j=1}^{p} \lambda_{2j}\Delta GDP_{t-j} + +\lambda_{3j}ECT_{2,t-1} + \varepsilon_{2t} \quad (8)$$

$$\Delta GDP_T = \lambda_0 + \sum_{j=1}^{p} \theta_{1j}\,\Delta OIL\_VOLATILITY_{t-j} + + \sum_{j=1}^{p} \theta_{1j}\,\Delta(X-Y)_{t-j} + \theta_{3j}ECT_{2,t-1} + \varepsilon_{4t} \quad (9)$$

The critical values of the generalized Dickey Fuller statistic at the 5% level are given in the table below. According to Dickey-Fuller test, it is a variable that the absolute value of the calculated t-statistic is less than the absolute value of the critical value provided by Dickey-Fuller. It can be said that the hypothesis H_0, which indicates that the variables are anonymous, can not be rejected, and therefore all the variables under study are at the level of anonymous.

In order to make the variables mean, a difference was taken from all of them once and it was found that all the variables became meaning after making a difference once. Therefore, it can be said that the variables are constant at level I (1).

Table 2. Stationary test results

Possibility	ADF (t-atistic)	variable	symbol
0.00	-10.66	Oil revenue changes	Volatility
0.4	-1.72	Trade balance (excluding oil)	XI
0.99	0.73	GDP	L ngdp
0.02	-3.25	GDP difference	D (lngdp)
0.04	-3.64	Trade balance difference (excluding oil)	D (XI)

4-2. Statistical description of the data

4-2-1. Determining the optimal interval length and model structure

Estimating the Johansson-Eusilius co-integration model requires estimating a system of VAR equations, in which obtaining the optimal interval length is a prerequisite for estimating the model because determining the appropriate number of interrupts in this model ensures that the error statements are related to the noise equations. Be white. There are various criteria for determining the optimal interval length, including the Akaic (AIC), Schwartz-Bayesian (SC), Henan-Quinn (HQ), FPE, and LR criteria, or likelihood ratios. In this study, based on AIC and FPE criteria, LR, SC and HQ and the number of data, the interval length p = 3 was selected as the optimal interval.

4-2-2. Co-integration test results

After determining the optimal interval length and the initial estimation of the VAR model, we examine the co-integration vectors. For this purpose, Johansson (1998) and Johansson Vivilius (1990) test are used. The Johansson test uses the maximum likelihood method to determine the co-integration relationship. The degree of coherence between the pattern variables can be determined using the Johansson method and the λ_trace effect tests and the λ_max maximum likelihood test. The results of these two tests showed that the null hypothesis (absence of co-integration vector) is rejected at a significant level of 5% and the null hypothesis of the existence of only one co-integration vector is accepted. This means that there is at least one long-run relationship between the variables. The results of the co-integration tests are given in Table 5.

Table3. Integration tests

Maximum eigenvalue test				Effect test		
Hypothesis zero	Opposite hypothesis	Test statistics	Critical %95 value	Opposite hypothesis	Test statistics	Critical %95 value
r=0	r=1	22.93	21.13	r>=1	37.25	29.79
r>=1	r=2	12.58	14.26	r>=2	14.31	15.49
r>=2	r=3	1.73	3.84	r>=3	1.73	3.84

Source: Research Findings

And the co-integration relationship is as follows:

X-I = -0/98 oil_ volatility + 3658/644lnGDP

Estimation of the long-run relationship showed that there is a significant relationship between the three variables of trade balance and GDP and fluctuations in oil revenues. The coefficients of fluctuations in oil revenue and GDP indicate that in the long run, by changing one of these variables, the trade balance decreases by 0.98 and increases by 3658.644 units, respectively. Fluctuations in oil revenues relative to the trade balance. The long-run relationship between GDP and the trade balance can be explained by the fact that an increase in real output and national income initially results in a decrease in the trade balance of the next period by increasing imports, while a net decrease in exports can occur in periods Later, it will lead to a decrease in demand and product level, and a decrease in imports will lead to an increase in the trade balance.

4-2-3. Vector Error Correction Pattern Estimation (VECM):

In order to relate the long-run equilibrium relationship between the variables to their short-term changes, the vector error correction model has been used. The vector error correction pattern is constructed by differentiating the variables used in the VAR pattern, except for the long-run ECM (-1) relationship disorder. Also, the number of interrupts in the vector error correction pattern is one less than the VAR pattern, and since the optimal number of interrupts in the VAR pattern was seven, the number of interrupts in the current pattern is two. The results of estimating the VECM model are given in the table below, however, it should be noted that due to the long-term relationships and the principle of brevity, only the adjustment coefficients are sufficient.

Table 4- Estimated coefficients of vector error correction pattern

D(XI)	D(VOLATILITY)	D(Lngdp)	
0.05	1.63	1.55*10^-6	ECM
0.04	0.32	6.93*10^-6	D(XI(-1))
-0.08	3.35	8.07*10^-6	D(XI(-2))
0.10	0.74	-1.39*10^-6	D(VOLATILITY(-1))
0.02	0.10	-8.71*10^-7	D(VOLATILITY(-2))
-17170.05	-214344.2	0.11	D(Lngdp(-1))
16984.49	-37402.20	-0.22	D(Lngdp(-2))
-1353.112	48225.71	0.26	C

Source: Research Findings

As can be seen, the first interval of changes in oil revenue fluctuations has a positive effect on the trade balance and 10%, but in the second interval, these effects remain direct but decrease. Also, the first interval of GDP changes on the trade balance is very high and has a negative sign, but in the second interval, these effects are very large and positive. In fact, the estimated numbers show that the effect of changes in oil revenue fluctuations and GDP on the trade balance in the short and long term are inversely related to each other, so that a shock in oil revenue in the short term increases the trade balance but gradually and In the long run, its positive effects are reduced, and vice versa, the short-term change in GDP first causes a large reduction in the trade balance, but in the long run, you have many positive effects on it. Regarding the effect of changes in oil revenues, it can be said that although the increase in oil prices leads to an increase in foreign exchange earnings from oil exports, but on the contrary, since our country is a major importer of petroleum products such as gasoline and semi-industrial and industrial products Are industrialized countries, will also increase the value of the country's imports.

4-2-4. Instant reaction functions (shock response):

Because in the vector autoregression model, the coefficients of the estimated variables lack economic analysis due to the different effects of the intermittent values of the endogenous variables. Therefore, for this purpose, it is necessary to use the instantaneous reaction and analysis of variance functions to affect each of the current account balance variables.

Analysis of reaction functions, or in other words, dynamic incremental coefficient, is a common and useful tool for examining and obtaining information about the interactions between variables in dynamic patterns. In addition to being used in conventional VAR model analysis, it is also a valuable tool for short-term analysis in integrated systems. According to recent discussions in econometrics, however, individual variables may be unstable in aggregate systems; But there are linear combinations of variables that are stable; these linear combinations are often interpreted as long-run equilibrium relationships. In other words, deviations from equilibrium relationships are assumed to be stable. As a result, assuming that the variables are in equilibrium at times such as t = 0, a shock or shock to one of the variables creates time paths for the system that eventually settle into the new equilibrium, provided that no subsequent shock occurs. . These time paths of variables can provide interesting insights into the long-term and short-run relationships of variables that can be used in many empirical analyzes, especially when direct interpretation of aggregate relationships is difficult.

Since impact response functions measure the time course of impact of impact on future states of a dynamic system, so the effects of shocks on various variables can be observed in the vector error correction model. In the discussion of impact response for variables, it is assumed that the system is in equilibrium and that equilibrium is at the origin of the coordinates, so that all variables in equilibrium are equal to zero. The effect of a single impact on a variable is then called temporary when the variable returns to its previous equilibrium value after a period of time. Now, if this variable does not return to zero and is established in a different equilibrium value, it is called a permanent impact effect (Mahmoudzadeh, Asgharpour, 2008)

It is noted here that the magnitude of the impact is considered a standard deviation. In other words, in the study of the instantaneous reaction function, the effect of a standard deviation of the variable momentum on other variables is analyzed. The impact response function is used to consider the direction and stability of the effect of each of the variables used in the pattern. This function allows the direction and stability of the shock effect of each of the variables used in the model can be analyzed. (Habibizad, 2011)

Figure (3) shows the results of the impact response analysis of the change as a standard deviation in other variables.

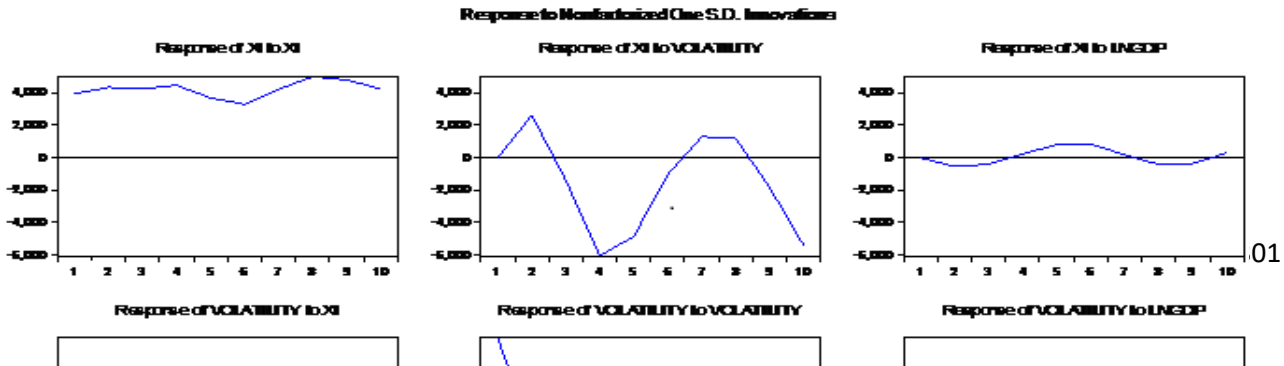

Figure 3 - The results of the analysis of the impact response to change as a standard deviation in other variables

As can be seen from these charts, the trade balance response to oil price fluctuations is initially upward, which will be decreasing over time. The results also show that the direct effect of oil revenue fluctuations on the trade balance is positive but the indirect effect is negative. Finally, the direct effect overcomes the indirect effect, and positive oil revenue fluctuations improve the ratio of total trade balance to GDP. Fluctuations in positive oil revenues also reduce the ratio of non-oil trade balance to GDP. On the other hand, fluctuations in oil revenues increase production, investment and inflation. Impact response functions show that the effect of oil revenue fluctuations on the trade balance is moderated slowly, while macroeconomic variables are adjusted more quickly. Given the negative impact of oil revenue fluctuations on the non-oil trade balance, as well as the role that improving this balance in reducing unemployment and increasing foreign exchange earnings for the country, it is necessary for the government to reduce its dependence on oil revenues and increase production. Gross domestic lead.

5. Conclusions and policy suggestions

5-1 Discussion:

Iran is one of the countries that is highly dependent on oil revenues and the increase or decrease in oil prices and as a result fluctuations in oil revenues cause a trade surplus or deficit. In this study, oil revenue fluctuations and trade balance in Iran are analyzed. In this regard, the interrelationships of the model variables were investigated using a self-explanatory model including instantaneous reaction functions and

analysis of variance of the prediction error, and then the long-run relationship between the variables was analyzed using the Johansen-Josilius co-integration technique. Research data were also extracted from various statistical centers and used realistically.

5-2 Conclusion:

Estimates of long-term relationships show a positive relationship between oil revenue fluctuations and trade balance. The results of Granger causality also indicate the existence of a two-way relationship between variables. Findings of the shock-response function showed that a sudden shock to the endogenous variables of the study increased the changes in the trade balance and this effect gradually decreased over time. On the other hand, the effect of the sudden shock of changes in GDP showed that this variable is inversely related in the short run and directly related to the trade balance in the long run.

Therefore, research calculations show that fluctuations in oil revenues have a significant causal relationship with national production and trade balance. Given that the index of national production and trade balance is an indicator of domestic and foreign stability, it can be concluded that domestic and foreign economic stability of the country have a significant causal relationship with economic sanctions. Therefore, given the effects of fluctuations in oil revenues on the economic stability of the country, it is necessary for governments to take serious steps to eliminate dependence on oil revenues. In other words, the Achilles heel of the Iranian economy is the dependence on oil revenues and the support of the domestic and foreign sectors of the Iranian economy from the fluctuation of these revenues; In a way, the decrease in GDP and changes in the trade balance are constantly accompanied by a decrease in oil revenues and fluctuations in oil revenues.

5-3 Suggestions:

Based on what has been said and considering the relations between oil revenue fluctuations and domestic and foreign economic stability indicators of the country that have been studied in this study, the negative impact of oil revenue fluctuations on the domestic and foreign sectors of the economy can be determined in two ways. Iran controlled. Since the causality of oil revenue fluctuations on the reverse changes in GDP was confirmed in this study, "reducing budget dependence on oil revenues" and "reducing oil revenue fluctuations" are the focus of this study.

In order to achieve the first fundamental goal, policy to distance itself from the mono-product economy and rent in order to reduce economic dependence on oil and eliminate potential threats and increase non-oil exports or strategic oil-based goods such as petrochemicals and intermediate oil products along with capacity building. New regional trade can be very rewarding through the export of gas, electricity and petroleum products, economic benefits and attention to the downstream oil and gas condensate industries.

But in order to achieve the second focal goal, purposeful and law-based use of oil revenue fluctuation shock funds (such as the National Development Fund of Iran), with the aim of converting part of the proceeds from the sale of oil and gas and gas condensate and petroleum products into wealth Sustainable, productive and economically viable capital, as well as preserving the share of future generations in oil and gas resources and petroleum products, can be helpful. This control and regulation tool, by adjusting the pressures caused by oil price fluctuations on the national economy, provides the basis for accurate planning for the exploitation of oil revenues in accordance with the law.

6. Resources

1- Eghbali, Alireza and Halfi, Hamidreza (2005); Analysis of the effect of oil shock on Iran's economy: Should we wait for the Dutch disease? Political Economy Quarterly, Second Year, No. 7, 71-89.

2- Akbarifard, Hossein and Kooshesh, Sajjad (2009), The effect of income shocks on the trade balance in the Iranian economy, Quantitative Economics Quarterly (Former Economic Studies), Volume 6, Number 3, Fall 2009, pp. 119-126.

3- Central Bank of the Islamic Republic of Iran, National Accounts of Iran, different years.

4- Central Bank of the Islamic Republic of Iran (2015), Iran Time Series Database, http:..tsd.cbi.ir

5- Behboodi, Davood et al. (2009), The effects of oil price instability on GDP in Iran, Quarterly. Energy Economics Studies, Year 6, Issue 20.

6- Jalali Naeini, Seyed Ahmad Reza and Naderian, Mohammad Amin (2016), "Monetary and exchange rate policies in an open, small and developing economy", Monetary-Banking Research Quarterly, Year 9, No. 29, pp. 372-327 .

7- Jahani, Leila and Khodaparast, Jalil (2019), The effect of global shocks of crude oil prices and gold prices on the Iranian stock market, Quarterly Journal of Applied Economics, ready-to-publish articles, accepted, published online in June 1998.

8- Berkashli, Fereydoun (2019), Iran, the most resilient economy of the region, online economy news site, 16.06.98.

9- Fadaei, Mehdi and Derakhshan, Morteza (2015), Analysis of short-term and long-term effects of economic sanctions on economic growth in Iran, Quarterly Journal of Economic Growth and Development Research, pp. 113-132.

10- Mahmoudzadeh, Mahmoud and Asgharpour, Hossein (2008), Factors Affecting Current Account Deficit in Iran, Economic Modeling Quarterly, Volume 2, Number 6.

11- Mosallanejad, Abbas (2015), Policy-Making of Political Economy of Oil and International Sanctions of Iran, Journal of Political Science, Year 10, Number 3, Summer 2015, pp. 171-201.

12- Nematollahi, Fatemeh and Majdzadeh Tabatabai, Sharareh (2011), The effect of OPEC oil price fluctuations on Iran's trade balance, Economic Modeling Quarterly, Third Year, No. 4.

13- Yazdani, Mehdi and Nourafrooz, Tahereh (2015), Evaluation of the effect of oil price fluctuations and production gap on the trade balance of Iran's economy, Economic Sciences Quarterly, No. 9, No. 12, Summer 2015.

14- Ahmed, Khalid and Bhutto, Niaz Ahmed and Kalhoro, Muhammad Ramzan, 2017, Decomposing the links between oil price shocks and macroeconomic indicators: Evidence from SAARC region, MPRA Paper No. 84901, Online at https:..mpra.ub.uni-muenchen.de.84901.

15- Hufbauer, G., Jeffrey, S., Elliott. K. & Oegg, B. (2007). Economic Sanctions Reconsidered: History and Current Policy. 3rd ed., Institute for International Economics, Washington DC.

16- Le, T., 2011, Oil prices shocks and trade Imbalance, International Finance Discussion, Papers Number 897.

17- Madsen, Jakob B., 2002. "The causality between investment and economic growth," Economics Letters, Elsevier, vol. 74(2), pages 157-163, January.

18- Kwon, C.S. and T.S. Shin. Cointegration and Causality between Macroeconomic Variables and Stock Market Returns .. Global Finance Journal, 1999, Vol. 10, No. 1, pp. 71-81.

19- Mendoza, E. (1991). Real Business Cycles in a Small Open Economy. American Economic Review, 81: 797-818.

20- Opec. (2015). "OPEC Annual Statistical Bulletin". (A.-M. Fantini, Ed.). Organization of the Petroleum Exporting Countries. Retrieved from www.opec.org.

21- Reneé , van Eyden and Mamothoana , Difeto , 2019, Oil price volatility and economic growth: Evidence from advanced economies using more than a century's data, Applied Energy, Volumes 233–234, 1 January 2019, Pages 612-621

22- Veselkoa, M. & J. Horvath. (2008) Trade Balance and Income Shocks:Experience of Transition Economies. Springer- Verlag, Transition Studies Review, 15: 241-249.