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Assessment of Asymmetric Oil Price Shock, Tax Revenues, Resource Curse, Stock Market, and Business Cycles of Iran Using Structural Vector Auto Regression (SVAR) Model

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ABSTRACT

This study was conducted to determine the effect of the asymmetric oil price shock, tax revenues, resource curse, stock market, and business cycles of Iran by using the structural vector auto regression model (SVAR) for the 1984-2018 period. According to results of the estimated SVAR model, an impulse imposed by the duration of sanctions on oil exports led to an 89% increase in production gap, and impulses caused by liquidity and stock price led to 86% and 53% rises in production gap, respectively. Variation in oil and foreign exchange earnings results in different and even conflicting changes in foreign and domestic sectors of the economy, which subsequently affect the economic performance positively or negatively. Regarding economic structure and principles, a constant increased exchange rate leads to economic growth while a cross-sectional increment in exchange rate does not lead to any economic prosperity. Increased exchange rate and decreased domestic money weakness will increase foreign debt, which in turn causes liquidity shortage. Overall, the liquidity shortage of economic firms has a negative impact on the return of stock and business cycles. Hence, policymakers must pay considerable attention to macroeconomic indicators.

1. Introduction

There is a dominant perspective assuming that oil brings substantial financial resources for consumption and investment in oil-exporting countries. Compared to what occurs in absence of oil, there can be rapid growth in both national income and consumption. On the other hand, some believe that structural and institutional weaknesses of oil-exporting communities have created barriers to optimized use of oil revenues. Oil rents, in some cases, have intensified the mentioned

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shortcomings. Although oil revenues contribute to the consumption and production of oil-exporting countries, they might cause economic and political backwardness. The oil crisis in recent years stems from oil shocks that have occurred due to various reasons. Monetary and financial crises also are rooted in a set of political-economic factors and market forces affecting the exchange rate of oil-exporting countries. Those countries that experience such crisis will face stable current account deficits, the increased value of imports relative to net income obtained from exporting goods and services owing to lower value of export after depreciation of the domestic currency, increased rate of borrowing from foreign organizations for long-term and infrastructural project finance, decreased tax revenues, and fluctuations in the stock market index. The important point is that a set of various factors may cause such crises in oil-exporting countries that must be taken into account not only within several months but also in annual periods. This is not, however, a simple measure. The poor monetary system, weak economic policymaking, lack of public trust in economic conditions of the country, changing oil price in global markets, weak commercial system, and people's concern about the future economic conditions can be named as drivers for such crises. If the mentioned problems are solved, domestic money will not experience any decline and this is what occurs in industrial and developed economies worldwide. This unpleasant economic event requires several months or years to be solved (Emami & Adibpour, 2009). On the other hand, the development of the capital market and advances in financial institutions facilitate the actual investment process. Different factors affect the stock market index, including variations and fluctuations in the foreign exchange rate as uncertainty index in foreign exchange policies, liquidity shifts as uncertainty index in monetary policies, and fluctuations in oil market rate as financial market' indicators. Extensive fluctuations in the abovementioned indicators are commonly seen in oil-producing developing countries.

Therefore, asymmetric oil price shock, tax revenues, resource curse, stock market, and business cycles must be studied because economic planning cannot be achieved without understanding fluctuations in GDP and causes for such fluctuations. Economic recession results in increased unemployment and poverty. Furthermore, increased oscillations and instability can lead to a reduction in investment and economic growth. Under the economic recession circumstances, governments face difficulties in providing health, education, or construction costs. Therefore, the structure of fluctuations and economic cycles should be identified well to control and mitigate their velocities. According to Lucas, recognizing and understanding business cycles is the first step to design stabilization policies. Irrespective of business cycles' reasons, determination of characteristics (duration, extent, intensity, etc.) can be effective for economic policymakers in economic planning and finding the best approach (Hooshmand et al., 2008). Considering the mentioned points, this study aimed at examining asymmetric oil price shock, tax revenues, resource curse, stock market, and business cycles of the economy of Iran by using the SVAR model. This research paper has been organized as follows: section two includes a literature review consisting of related theories and results of empirical studies. In section three, the applied model, methodology, and tests are explained. Results of tests and estimates have been reported in section four; summary and conclusions are presented in section five.

2. Literature review

2.1. Asymmetric oil price, resource curse, and the business cycle

Economic boom duration might be influenced by oil price shocks. Many theories have been raised about the relationship between oil shocks and macroeconomic variables. Some researchers such as Hamilton (2013) and Murek (2013) believe that not only there is a direct association between variations in macroeconomic variables and oil shocks but also these shocks cause an economic recession. Hamilton (2013) indicated that seven recessions, out of 8 ones that occurred after World War II in the USA, have been influenced by oil shocks. Proving the relation between macroeconomic variables and oil shocks, some studies investigated the shifts in this relationship over time. Oil shocks show different effects in short-term and long-term periods. The period is a factor affecting the extent the economy matches with the new situation and new relative prices. For example in the short-term, an increase in oil prices has an instant effect on the business cycle. Short-term effects of oil shocks are greater owing to friction in the reallocation of resources and the pause of activities until the elimination of uncertainties. While in mid-term, these shocks cause some modifications in economic behavior. Economic entities can prevent income reduction caused by worsening terms of trade through substitution (Tooraji, 2014). Iran's economy is highly affected by external factors such as oscillations in the world oil price due to

problems, which stem from a single-product economy and overreliance on oil revenues. Non-realization of government's predicted revenues raised from oil exports, in Iran's economy that is the exclusive owner of this sector, not only influences different projects and economy but also affects the future of the economy, plans, and projects reversely. The mentioned problems, in turn, cause many problems for economic sectors (Mahdavi Adeli et al., 2012). Therefore, oil price and its revenues might perform as an exogenous driver for the economic boom or recession in Iran. Also, since Iran's economy dramatically depends on oil revenues, uncontrolled fluctuations in this factor cause variations in most of the economic variables (Barani, 2014).

In general, oil price shocks affect the economic activities of a country in two manners. One through the impact on the supply side of the economy, which leads to lagged effects on production capacity. The second one affects aggregate demand, which influences economic activities (Shakeri, 2017). Some economists do not consider both negative and positive oil price shocks in favor of oil-exporting countries. Mostly affected by negative oil price shocks, the states have to impose more restrictions on imports of goods and services to supply necessary needs and finance repayment of foreign liabilities through exchange savings. Since a major part of imports in oil-producing countries, such as Iran include capital goods and raw materials required for the production sector, constraints on imports cause adverse effects on the production sector. Under such circumstances, inflationary pressures, increased foreign exchange rate, economic recession, and increased unemployment occur (Samadi et al., 2015). Positive oil price shocks have negative impacts on the economy of oil-exporting countries in a different manner. Geleb (2010) conducted a study on oil price shocks and found that increased oil prices left oil-exporting countries in the long-term inappropriate situations rather than those countries that did not experience any considerable change in their export prices. Negative effects of price fluctuations, wrong price forecasts, and subsequent rise in the risk of decision-making and inaccurate use of windfalls (resulted by a sudden increase in oil price) can be named as factors that remove the possible positive effect of positive oil price shocks (Haghdoost, 2017). According to other conducted studies, oil prices have an asymmetric effect on oil-exporting countries. This means that the reduction extent in oil price that results in output decrease does not necessarily occur in the reverse direction. Moreover, the effect of oil price on the economy of oil-exporting countries is also studied in the framework of the resource curse. This phenomenon literary refers to a multilateral destructive effect stem from the increased price of oil and other natural resources on the economic, social, and political living conditions of oil exporters. Economists explained this case as Dutch disease. Dutch disease leads to increased income and subsequently the increased domestic demand if the economy faces a sudden rise in export price of basic commodities such as crude oil. The main response of the economy against this impulse is increased demand for labor, which in turn leads to increased wages. Since the price of products is assumed as an endogenous variable in the trade sector, the only price of products in the untradeable sector is increased. Accordingly, increased wages will reduce the profit of the export sector. Finally, the effect caused by sudden oil price impulse will result in a reduced actual foreign exchange rate. This issue decreases the competitive advantage of the country at the international level and ultimately reduces the output and value-added of tradable sectors.

2.2. Analysis of the relation between world oil price impulses, stock price index, and business cycles of Iran

The dramatic increase in the world price of crude oil and intensified fluctuations in the price of this strategic good over recent years have made many researchers involved in analyzing reasons. In general, three factors affect the price of crude oil like any other commodity: first, political factors, which mostly comprise demand and supply and factors affecting them; second, political-mental factors because political phenomenon usually has mental consequences so that these are parallel issues. Oil is not a manufacturing good but is an extracted material. Since oil reserves, subsequently, the extraction and production process of this material is not located in consuming areas, oil can be considered as a geopolitical case that may be influenced by political changes particularly those occurring in supply regions. The third category included technical factors. However, the abovementioned factors have a more intense impact on the oil rather than any other commodity owing to the sensitivity, necessity, and strategic nature of oil (Emami, Shahriari, Darbani, 2011). There is also a fourth category, which might be seen mostly in the oil market making it more sophisticated to analyze the oil market and t forecast prices; this included data on supply, demand, and market (Darbani, 2018). According to microeconomic principles, increased oil prices have an adverse effect on the profitability of those corporations that oil constitutes their direct or indirect cost of

production. If the corporations cannot transfer this increased cost of production to their consumers then corporate profit and dividends- that are major measures used to determine stock price- will be reduced. There is evidence regarding the positive relationship between oil price and stock prices. This positive relation exists due to several reasons. During a global economic boom or improved economic recession, global demand increases, and such an increase causes a rise in the price of mineral materials, such as crude oil. Moreover, if the stock market of a developing economy cooperates with stock markets of developed countries then such shared impact most likely causes a considerable increase in consequences. It is expected that oil price increase in oil-exporting countries affects stock markets positively through income and wealth effects. This positive effect is the outcome of a rise in government revenues and public spending on the infrastructural and final projects (Darabi, 2018). The first and most important factor affecting decisions made by investors in the stock exchange market is the stock price index. Hence, factors affecting stock price must be identified. Naturally, many variables are effective in the stock price of corporations as well as information and perspective of market parties. Some of these factors are indigenous, and some others stem from variables outside the domestic economy. Generally, oil price oscillations affect the stock price of oil-exporting countries through different channels. The first channel is liquidity creation (expanding money volume) so that an increased oil price leads to the injection of the foreign currency obtained from oil revenues to the foreign exchange reserve. If there is not sufficient demand for foreign exchange based on the target price, the central bank has to buy the foreign currency and convert it to domestic money in the budget. This policy will increase the net foreign assets of the central bank as well as the monetary base of the whole economy. Reduction in oil price will cause a budget deficit since the government does not decrease its costs and must borrow from the central bank. Therefore, the net debt of the government to the central bank will be increased and this, in turn, strengthens the monetary base. Accordingly, fiscal policies made by the government will expand money volume in either increased or decreased oil prices (Ebrahimi & Shokri, 2012). Foreign currency income is the second channel in which oil price affects the stock price. Since the amount obtained from oil revenues are paid based on foreign currency, increased oil price results in higher foreign currency incomes and reserves, which leads to a rise in domestic monetary value compared to foreign currency. On the one hand, an increase in the foreign exchange rate leads to a rise in income of goods-exporting corporations as well as an increase in their stock prices (after demand). On the other hand, this increase leads to a decline in earnings and stock price of intermediate inputs-importing firms. The effect of expectations is the third channel through which oil price affects the stock price. An increase in oil price and naturally oil revenues of oil-exporting countries will form optimistic expectations for improved economic activities. Such expectations for listed companies and their increased profitability lead to positive growth in their present value of future cash flow and stock index (Miller & Schofeng, 2001). The income effect is the fourth channel through which oil price affects the stock price. In higher oil prices, wealth is transferred from oil-importing to oil-exporting countries. The effect of this price shift depends on how the government uses the revenues created by the increased oil price. If this revenue is paid for domestic goods and services, it will expand public wealth. Furthermore, increased demand for work and capital provide many investment and business opportunities. Therefore, it has a positive effect on the future cash flow of firms. On the other hand, rising oil price- that is a production input- means an increase in cost and reduction in revenues of firms, which affects the future cash flow negatively and results in a decline in stock price (Hassanzadeh & Kiavand, 2014). Oil price can also affect the stock price in oil-exporting countries through a fifth channel called the recursive effect. Since rising oil prices cause an increase in the cost of manufactured products of industrial countries and because most of the oil-exporting countries import oil products and derivatives due to lack of capacity and technology requiring for crude oil processing, this case will increase the monetary value of imports. On the other hand, rising oil price leads to a negative effect on future cash flow and reduction in the stock price of firms in such countries (Ebrahimi & Shokri, 2018). Oil price can also affect the stock price in oil-exporting countries through a fifth channel called the recursive effect. Since rising oil prices cause an increase in the cost of manufactured products of industrial countries and because most of the oil-exporting countries import oil products and derivatives due to lack of capacity and technology requiring for crude oil processing, this case will increase the monetary value of imports. On the other hand, rising oil price leads to a negative effect on future cash flow and reduction in the stock price of firms in such countries (Ebrahimi & Shokri, 2018).

Many economists agree that business cycle driver includes fiscal and monetary policies shocks to

consumption and investment demands, business impulses such as shifts in oil price or stock market shocks. However, there is no consensus between them on which one of the mentioned shocks is effective in describing fluctuations and the business cycle. Regardless of two perspectives at two sides of the range, many assume that fiscal and monetary policies, as well as crises, might, in separation or combination, affect the real economic activities and business cycles under different circumstances. Although these theories have been studied in developed countries, there are few studies on theories related to the effect of fiscal, monetary, and oil shocks on developing countries. A great understanding of the effect of these shocks on the economic system, tax revenues, and business cycles can serve as a perfect guide for making the best policies about other macroeconomic variables. This case has been discussed within the modeling process of Iran's economy in this research.

2.3. The relation between tax revenues and business cycles

The economic structure of every society comprises some entities, including households, firms, and governments that the last one needs incomes to apply collective governance. The major part of these incomes is met by tax revenues. On the other hand, governments have faced many tasks and duties in the recent century so that they are responsible to pursue some objectives, such as economic growth, employment, equitable distribution of income, and economic security, and associated economic issues. Tax revenues are more significant rather other revenue resources since they are widely used in controlling adverse economic effects. The tax amount is not the only substantial element of these decisions but also some instruments must be designed to generate revenues. The effects of different tax rates as well as tax structure on the behavior of economic entities most likely, represent themselves at the general level of living standards. Such impacts have made many OECD countries adopt structural reforms in their tax systems. A considerable part of tax reforms in individual's incomes has been done to create a financial environment prone to increase saving, investment, and entrepreneurship. Besides, tax reforms have been adopted to expand trade and economic growth in order to encourage work incentives. Almost all these reforms can be taken as a measure to reduce the consumption tax rate to improve production and business cycles. Oi-exporting developing countries, such as Iran face a high uncertainty degree of macroeconomic variables. Compared to industrial countries, macroeconomic variables, including growth, inflation, oil, liquidity, and exchange rate in developing countries is more exposed to fluctuations so that permanent effects of such changes on different economic sectors may cause more structural problems in these countries. Fluctuations in mentioned indicators affect the output by creating risk and uncertainty and influencing the investment and decisions made by investors. Shifts in these indicators leave critical effects on liquidity, investment, exports and imports, production, and ultimately tax revues and business cycles in Iran. Therefore, such fluctuations are crucial cases taken into account by economic practitioners. Despite the importance of this case, there have not been considerable studies on the effect of the asymmetric oil price shock, tax revenues, and resource curse on business cycles and their expansion in Iran.

2.4. Background

Zakharov (2019) studied the asymmetric oil price shocks, tax revenues, and the resource curse in Russia. Results showed that increases in tax revenues caused by exogenous positive oil price shocks do not change regional income but increase corruption and reduce regional democracy and governance quality. Declines in tax revenues from negative oil price shocks do not affect institutional quality but decrease regional income.

Hailemariam and colleagues (2019) carried out a study on oil prices and economic policy uncertainty: evidence from a nonparametric panel data model in G7 countries over the period 1980-2018. Their results showed that the estimated time-varying coefficient function of the oil price was negative in years in which increases in oil prices were driven by a surge in global aggregate demand. Further, their nonparametric local linear estimates showed that the country-specific and common trend functions are increasing over time.

Yin and Feng (2019) conducted a study on oil market uncertainty and international business cycle dynamics using the Granger causality model as well as linear and nonlinear tests. Results showed that there was no significant evidence of nonlinear relation between oil market uncertainty and business cycle indicators. Furthermore, the dynamic panel analysis utilizing the Arellano-Bond GMM procedures indicated that oil velocity risk premium (VRP) has a significant effect on the output growth even controlling for country specific characters and other classic pricing factors of the stock market. Further, the impulse responses indicated that the shock of innovation in oil market uncertainty can boost

the output growth within half a year and the effect will be absorbed gradually over time. Overall, oil market uncertainty does have a linear leading effect on the international business cycle.

Sydney and colleagues (2019)[2] conducted a study on the relationship between economic fluctuations and business cycles using the SVAR model. Results showed that macroeconomic uncertainty in recessions is often an endogenous response to output shocks, while uncertainty about financial markets is a likely source of output fluctuations. Findings also indicated that uncertainty and fluctuations in macroeconomic variables play a vital role in an economic recession, and the main cause of economic recession includes fluctuations in foreign exchange indicators, financial crises, oil velocities, and monetary shocks.

Albaity and Mustafa (2018)[3] studied the international and macroeconomic determinants of oil price: evidence from Gulf Cooperation Council Countries (GCC) using DOLS panel model over period 2005-2015. The causality test showed a one-way relationship between oil prices and GDP, and a two-way relationship between stock returns and oil prices. For robustness, the sample was divided into two sub-periods: before and after the 2007/2008 global financial crisis. A long-run relationship was found among the variables, but there was no short-run relationship between the variables and oil prices before the crisis. Oil shocks had a significant impact on gold returns and exchange rate growth, while the GDP growth rate affected oil prices. The individual countries' results suggest the presence of a long-run relationship as well as short-run dynamics between selected variables and oil price for a majority of the GCC countries. These results suggest the need for policies aimed at further reducing dependence on oil since the effect of oil shocks is still significant in these economies.

Seifipour and colleagues (2019) studied the synchronization of oil price and stock index with real business cycles based on the Markov Switching Approach for the period 1993-2016. The results indicated that in the real sector of the economy, the length of a period of the boom and its durability is more than the recession. Also, periods of the rising of the stock index and oil prices are more than the period of recession. To examine synchronization of cycles, correlation coefficient, and Granger causality equation were used. Results of cycles' coincidence indicated that oil price and stock to GDP ratio are leading variables. Accordingly, it is recommended that having regard to the extent to which the real sector of the economy is closely aligned with the stock index and the price of oil, and is leading of the stock index and the price of oil in the real sector of the economy, by adopting appropriate policies, they can reduce the negative effects of fluctuations in the stock market and oil and add its positive effects.

Faaljou and Seyyed Ahmadi (2015) examined the impact of the global financial crisis on the duration of economic recession in Iran (periodic models approach). To this end, the periodic models' approach was employed to investigate the impact of the global financial crisis besides other explanatory variables, such as oil revenues, inflation rate, and investment on the duration of economic recession in Iran for the period 1971-2013. Results of model estimation indicate that oil revenues and investment had a negative effect while inflation rate and global financial crisis had a positive and significant effect on the duration of economic recession in Iran.

Afshari and colleagues (2014) evaluated the neoclassical growth model in explaining Iranian business cycles using a neoclassical growth model augmented with technological and government expenditure shocks. They also calibrated parameters using time-series features of Iran's economy. To evaluate the model, the simulated business cycles from the model were compared with the business cycles from time series. Results showed the model could reproduce the fluctuations in business cycles very well. Also, simulation results indicated that the main source of business cycles in Iran's economy is technological shocks while government expenditure has a minor effect on economic fluctuations.

Because the considered subject has not been examined directly in previous studies, this complementary study was conducted to investigate the mechanism of the effect of asymmetric oil price shock, tax revenues, resource curse, stock market, and business cycles of Iran using the SVAR model. Regarding the dependence of Iran's economy to oil income and vulnerability to oil price and monetary shocks, results of the extant study can reveal whether this study is in line with previous Iranian and foreign researches or not. It also indicates how the oil, gold, and exchange price shocks have affected the business cycles of Iran. The results were analyzed through the SVAR model for Iran's economy during 1984-2018. Hence, innovative aspects of this study are as follows: firstly, a more holistic period

[2] Sydney C. Ludvigson et al., 2019

[3] Mohamed Albaity, Hasan Mustafa, 2018

is included compared to previous studies. Secondly, more reliable and real results can be presented due to a more detailed study of data features and their effects as well as using the most authenticate econometric methods that are matched with these features.

3. Methodology

This study was conducted to examine asymmetric oil price shock, tax revenues, resource curse, stock market, and business cycles in the economy of Iran. To this end, the methodology of studies conducted by Zakharov (2019), Hailemariam and colleagues (2019), Yin and Feng (2019), Hamdi et al. (2018), and Bergholt (2017) was adopted for this research paper. Therefore, the research model was designed to trace the effects on the economy of Iran.

$$\begin{bmatrix} \varepsilon_{DEXO} \\ \varepsilon_{EX} \\ \varepsilon_{M2} \\ \varepsilon_{SP} \\ \varepsilon_{TAX} \\ \varepsilon_{GDPgap} \end{bmatrix} = \begin{bmatrix} a_{11}(1) & 0 & 0 & 0 & 0 & 0 \\ a_{21}(1) & a_{22}(1) & 0 & 0 & 0 & 0 \\ a_{31}(1) & a_{32}(1) & a_{33}(1) & 0 & 0 & 0 \\ a_{41}(1) & a_{42}(1) & a_{43}(1) & a_{44}(1) & 0 & 0 \\ a_{51}(1) & a_{52}(1) & a_{53}(1) & a_{54}(1) & a_{55}(1) & 0 \\ a_{61}(1) & a_{62}(1) & a_{63}(1) & a_{64}(1) & a_{65}(1) & a_{66}(1) \end{bmatrix} \times \begin{bmatrix} U_{DEXO} \\ U_{EX} \\ U_{M2} \\ U_{SP} \\ U_{TAX} \\ U_{GDPgap} \end{bmatrix}$$

Where the left matrix represents a logarithmic difference of dependent variables. The right side of the equation indicates the square matrix of A (L), which includes some polynomials based on the lag operator. For instance, the element on row i and column j of A (L) matrix equal a_{ij} (L) that represents response i of the variable to j of the structural variable. E= [Uij] vector includes those sentences with the structural bias that are defined as follows:

U_{DEXO} : The socks related to dummy variable of sanction years multiplied by oil exports.

U_{EX} : The shock related to exchange rate.

U_{M2} : The shocks related to liquidity.

U_{SP} : The shock related to stock price.

U_{TAX} : The shock related to tax revenues.

U_{GDPgap} : The shock related to the GDP gap.

According to Blanchard-Quah's (1989) approach, identification of structural shocks is done by imposing some constraints on the long-run effects of socks on some of the variables.

4. Results and analysis

4.1. Measurement of GDP gap

To measure potential output and to show business cycles, Hodrick-Prescott (HP) filter approach for the period 1984-2018 was used and results are depicted in the diagram below. This variable is entered as GDPgap into the model.

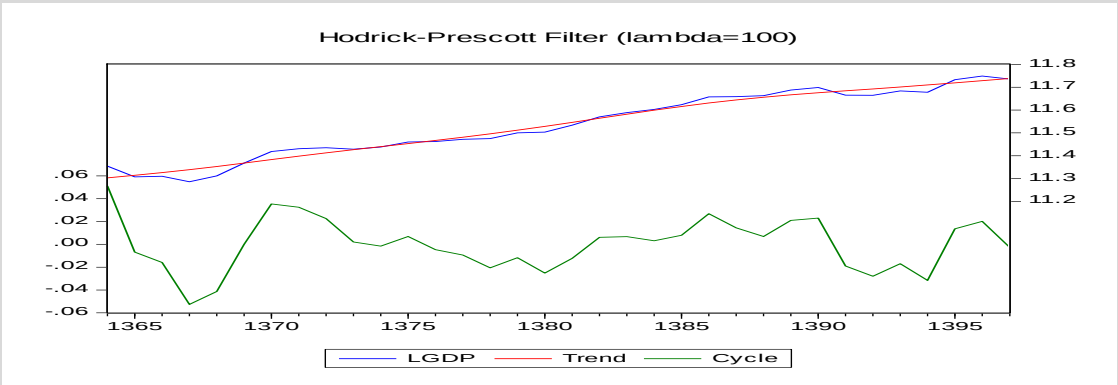

Figure 1: GDP gap to show business cycles

Reference: research findings

According to diagram 1, the obtained cyclic component is used to determine recession and boom periods. To determine recession and boom periods by using cyclic components, the apsis should be found. In this research, studies conducted by Hamberg and Verstandig (2008) and Chin, Geweke, and Miller (2000) were reviewed to determine the turning point. Results indicated five cycles in Iran's economy for period 1985-2018; accordingly, 1985-1968 was boom period, 1989-1991 was boom period, 1992-1995 was recession period, 1996 was boom period, 1997-1999 was recession period, 2000-2007 was boom period, 2008-2009 was recession period, 2010-2011 was boom period, 2012-2015 was recession period, 2016-2017 was boom period, and 2018 was recession period.

4.2. Estimation of SVAR model

When the stationary state of variables is identified then the first step is finding the optimal lag length in autoregression models. To determine the lag length herein, Schwarz-Bayesian information criterion (SC), Akaike information criterion (AIC), Final Prediction Error (FPE), Hannan-Quinn information criterion (HQ), and Likelihood Ratio (LR) were used. Results of Table 1 indicates that the applied criteria of LR, FPE, AIC, and HQ found the second lag as the optimal lag of this model while the first lag is selected as the optimal lag based on SC criterion. Ultimately, since SC follows the principle of parsimony and pays more attention to reducing parameters or soothing the system to a rather better fit, it will be more proper for small sample size, particularly the sample size selected in this study. Hence, optimal lag one is chosen as the optimal lag of the model.

Table 1: Determining the optimal lag in the VAR model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	24.32756	-	3.84e-10	-1.815694	-1.485657	-2.322330
1	248.3477	231.6499	3.21e-15	-12.61019	-9.96989*	-11.48328
2	328.0763	57.28970*	1.40e-15	-15.10871*	-10.15816	-14.32826*

Reference: research findings note: * represents the lag selected by the criterion

4.3. Circle unit root test

Since the ADF test showed that variables are non-stationary at the level and in part two, SC selected lag 1 as the optimal lag, the model was estimated as vector error correction with one lag. To ensure the lack of regression spurious, unit root tests were performed for the whole regression model. If the SVAR model is not stable, the results will not be reliable. To assess the stability of the estimated model, an AR chart is used. This diagram indicates the inverse characteristic roots of an AR process. If absolute values of these roots are smaller than one unit and placed inside of the unit circle, the estimated SVAR model is stationary. The AR model figure shows that all inverse characteristic roots are inside of the unit circle and the SVAR model estimated for these models meets the stationary term.

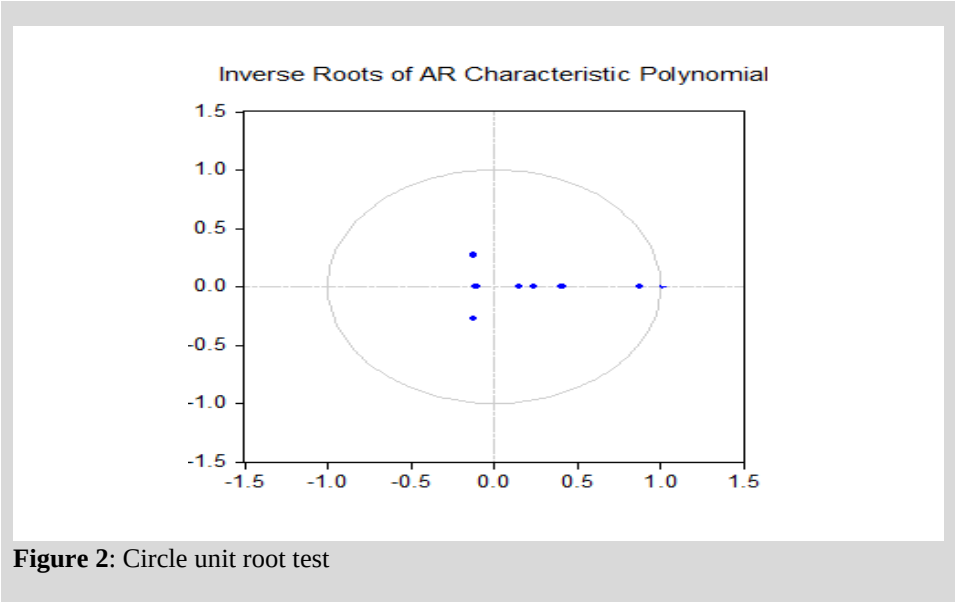

Figure 2: Circle unit root test

4.4. Results of model estimation

Results of the SVAR model have been reported in Table 2 to examine the effect of explanatory variables on the output gap. This Table indicates the system structural shocks and summarized form shock. In Table 2, @e1 represents the shock related to dummy variable of sanctions on oil exports, @e2 represents the shocks related to exchange rate, @e3 includes liquidity shock, @e4 represents shocks related to the stock price index, @u5 includes shocks related to tax revenues, and @u6 represents shocks related to the output gap. Results of model estimation have been reported in the table below.

Table 2: Estimation of long-run equilibrium of the model

Structural VAR Estimates Sample (adjusted): 1984 2018 Structural VAR is just-identified				
	Coefficient	**SD**	**t-value**	**Prob.**
Coefficient of shocks to dummy variable of sanctions on oil exports in exchange equation C(2)	-0.894853	0.296714	-3.015880	0.0033
Coefficient of shocks to dummy variable of sanctions on oil exports in liquidity equation C(4)	-0.18833	0.009218	-2.043013	0.0415
Coefficient of exchange rate shocks in liquidity equation C(5)	0.188014	0.237241	0.792503	0.4284
Coefficient of dummy variable of sanctions on oil exports in stock price equation C(7)	-1.456170	45.30145	-0.032144	0.9744
Coefficient of exchange rate shocks in stock price equation C(8)	-0.001675	0.002822	-0.593339	0.5532
Coefficient of liquidity shock in stock price equation C(9)	.018876	0.016614	1.136126	0.2563
Coefficient of shocks to dummy variable of sanctions on oil exports in tax revenues equation C(11)	-0.611363	0.147189	-4.153601	0.0000
Coefficient of exchange shocks in tax revenues equation C(12)	-1.484398	0.656300	-2.755978	0.0059
Coefficient of liquidity shocks in tax revenues equation C(13)	-0.001008	0.000366	-2.755978	0.0059
Coefficient of stock price shocks in tax revenues equation C(14)	-0.088427	0.021983	-4.022583	0.0001

Coefficient of shocks to dummy variable of sanctions to oil exports in output gap equations C(16)	0.898140	0.312275	2.876118	0.0050
Coefficient of exchange shock in output gap equation C(17)	0.110214	0.019702	53.594031	0.0000
Coefficient of liquidity shock in output gap equation C(18)	0.869605	0.065657	13.24474	0.0000
Coefficient of stock price shock in output gap equation C(19)	.530516	0.196940	2.693798	0.0084
Coefficient of tax revenues shock in output gap equation C(20)	0.002923	0.000637	4.586778	0.0000

Reference: research findings

The most important variables required to be analyzed in the results of the SVAR model include the shocks imposed on the dummy variable of sanctions on oil exports and exchange rate shocks, liquidity shock, stock price shocks, tax revenues shocks on the output gap in Iran. Accordingly, a shock imposed by a dummy variable of sanctions on oil exports causes an 89% rise in the output gap. Furthermore, a shock imposed by the exchange rate causes an 11% increase in the output gap. Results indicate that an impulse caused by liquidity and stock price leads to an 86% and 53% increase in the output gap, respectively. Shifts in oil and exchange revenues occur along with a set of different and conflicting changes in domestic and foreign sectors of the economy, which can, in turn, affects the economic performance negatively or positively. When there is an increase in oil price and exchange currency revenues in Iran's economy, capital is only spent on imports to deal with stagflation conditions instead of entering them into the production sectors with value-added. Therefore, the production sector faces serious harm and many manufacturing sectors become far from the economic cycle so that the capitals existing in the production sector remain stagnant or enters the black market and speculation. In contrast, reduced oil price or exchange revenues due to negative oil shock leads to a decline in imports of intermediary commodities and manufacturing machinery as well as investment, production, and employment rates in the economy. Therefore, the effect of oil, sanction, and liquidity shocks depends on the inflationary conditions, which rise the investment costs. Therefore, an increase in the inflation rate leads to the higher effect of oil shocks on the output gap and may have a positive effect on the output gap at greater inflation rates. Therefore, determination of exchange rate not only has an effective role in imports and exports as well as business balance adjustment and business balance of the country but also plays a significant role in identifying the competitive power of domestic producers compared to foreign competitors in domestic and foreign markets as well as determining output rate and business cycles. Therefore, foreign exchange management is highly substantial due to the extensive consequences of foreign exchange on the economic performance of Iran. In the current economic circumstances of Iran particularly after performing a targeting subsidies plan, increased economic sanctions have become more problematic due to the jump in the informal exchange rate in the free market and return to the two-rate exchange system. If Iran's economy depended on the revenues that stem from non-oil exports like many other countries around the world, the equilibrium exchange rate stem from exchange supply and demand could be the optimal rate. But the crucial role of exogenous high oil revenues in determining the exchange rate, the equilibrium approach might not be an optimal approach to determine the exchange rate in Iran's economy. In fact, it is not expected that economic policymakers determine exchange rate through equilibrium approach- if there is a significant difference between equilibrium ad optimal exchange rate in Iran, while the main issue is determining the optimal exchange rate for the economy of Iran and directing the equilibrium exchange rate toward the optimal rate that may affect the output rate and economy of the country. On the other hand, under normal conditions, crises, monetary and financial shocks, as well as sanctions, should create recession and reduction in price in the stock market while bubble growth of exchange rate and reduction in the value of domestic money cause a rise in the stock price index of different industries. Regarding economic structure and principles, and increased exchange rate leads to economic growth while a cross-sectional increment in exchange rate does not lead to any economic prosperity. Increased exchange rate and decreased domestic money weakness will increase foreign debt, which in turn causes liquidity shortage. Overall, the liquidity shortage of economic firms has a negative impact on the return of

stock and business cycles. Also, it must be known that an increase in the foreign exchange rate causes a higher probability of capital exclusion from the stock market its entrance to the money market. Therefore, it can be stated that a continuous rise in foreign exchange rate reduces the liquidity in the stock market leading to a decline in the production of firms and an increase in the output gap.

4.5. Impulse response functions

Impulse response functions (IRFs) and analysis of variance (ANOVA) must be assessed to analyze the results of long-run equilibrium results for the SVAR model. In other words, the SVAR model presents two robust instruments for analysis of economic fluctuations including IRF and ANOVA. Therefore, after estimating the SVAR model, the results of IRF and ANOVA can be assessed. In fact, an IRF expresses the effects of a standard deviation of a shock to indigenous variables of a model. For the variable used in this research, the response of output gap to an impulse or sudden change has been illustrated in Diagram 3 considering the size of one standard deviation in each indigenous variable of model, including studied shocks of dummy variable of sanctions on oil exports of the country, foreign exchange, liquidity, stock price index, and tax revenues. The horizontal axis indicates the time (annual periods) and the vertical axis shows the growth rate of changes in the variable.

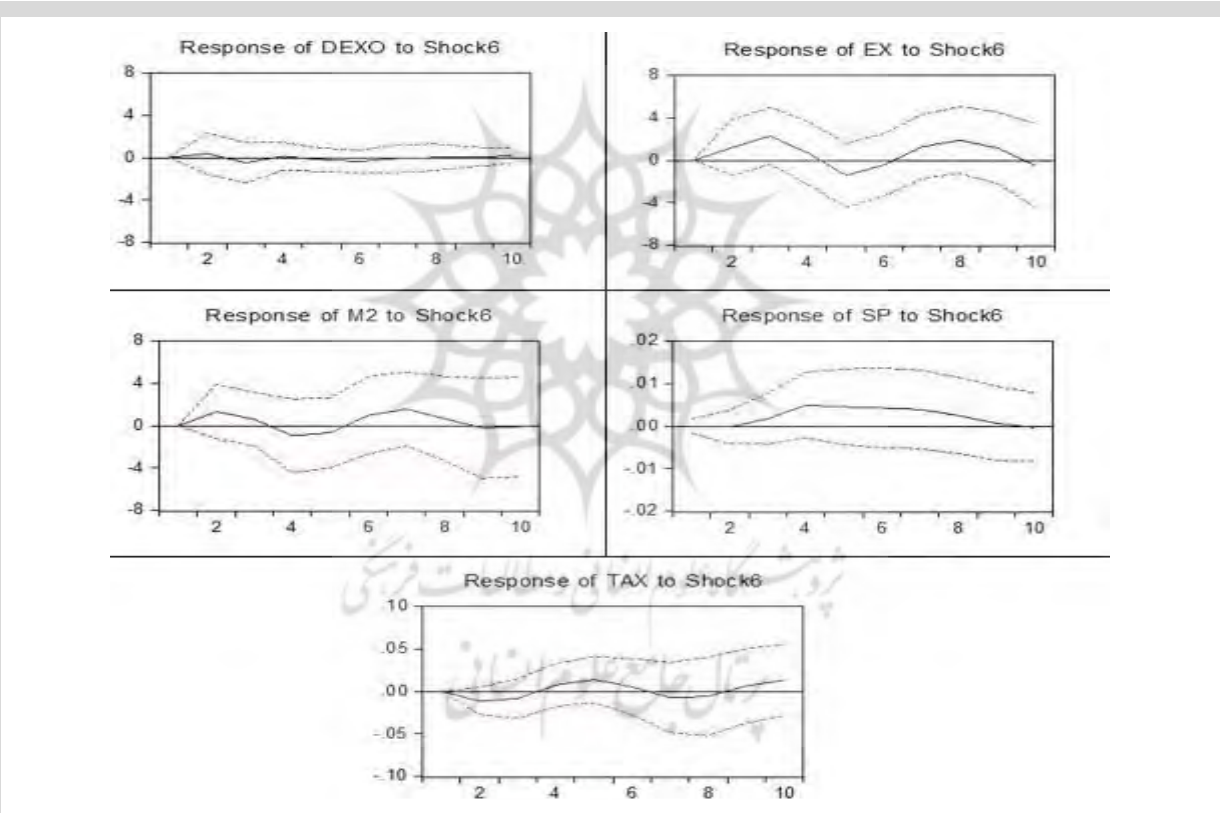

Figure 3: Results of IRFs for the model

Reference: research findings

According to results of IRFs (Diagram 3) for the model, the effect of shocks imposed by the dummy variable of sanctions on the oil export of country on the output gap has been ascending during the first two periods then this effect follows its descending process. In other words, the graphical process of oil price in Iran and the oil shocks occurring worldwide may make Iran's economy shows the response to positive oil shocks rather than negative ones. However, it is asked whether this positive shock of increased oil price leads to output. According to results of the impulse response function of the first variable (oil price shock), increased oil price only in the first two periods leads to a decline in output gap then follows its ascending process and tends to zero in long term. Moreover, the liquidity shock to output gap is ascending within several first periods then becomes zero. The shocks imposed by the foreign exchange rate and stock price on the output gap follow an ascending

trend within several periods then continue their descending trend. Further, the shock imposed by tax revenues on the output gap is descending within two periods then follows its ascending trend. In other words, the effect of oil revenues on Iran's output likes a case in which the income obtained from oil sales is invested so that physical capital increases and leads to a higher output rate. In periods of increasing oil price, investment and output will be increased and when there is a decline in oil revenues, the output will be reduced. However, the issue of Iran's economy is about the unmanaged oil revenues that have been spent on short-run investments instead of long ones that will result in inflation, liquidity, and the output gap.

4.6. Analysis of variance (ANOVA)

Analysis of variance of variables has been done in this part based on the estimated model, and obtained results are reported in Table 12 in which column S.E represents the prediction error of relevant variables during different periods. Since this error is measured based on the error of the previous year and the source of this error stem from the change in current values and future shocks, this rate will be increased over time. Results of Table 3, standard error of the first period equaled 4.86 and equaled 5.40 in the second period and experienced an increased through time. The next columns indicate the variance percent caused by the sudden change or a specific shock. The third column indicates that although 100% and 83.36% of the change in the first and second periods have stemmed from oil price shocks, 70.87% of changes in this index have been related to the shocks of sanctions on oil exports, 16.45% of changes were related to the foreign exchange rate, 5.14% of changes was associated with liquidity shock, 14.2% was associated with stock price shock, 1.78% was associated with tax revenues shock, and 0.48% of changes were related to output gap shock. Among variables, sanctions on oil exports, foreign exchange shock, liquidity shock, stock price shock, and tax shocks had the highest explanatory power, respectively, to explain changes in the model during the studied period. This is a justifiable result in Iran's economy, which was analyzed in this study.

Table 3: ANOVA of model

		Shock 1	Shock 2	Shock 3	Shock 4	Shock 5	Shock 6
Period	S.E.	DEXO	EX	M2	SP	TAX	GDP gap
1	4.865963	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	5.408340	83.3625	4.2658	5.3652	3.6987	1.3263	0.3653
3	6.280962	70.8755	16.4526	5.1452	4.1256	1.7854	0.4875
4	6.467059	67.1523	16.7854	7.4851	4.1478	2.1265	0.6352
5	6.742518	62.2874	20.2152	7.2363	5.3698	3.1478	0.5523
6	6.919912	59.2156	19.9653	9.1478	5.3658	3.3652	1.1486
7	7.512055	51.7865	19.1478	12.2145	7.4523	4.2154	4.3654
8	8.016999	47.1478	22.2514	11.7845	8.3647	4.2487	5.5428
9	8.183438	47.9632	23.8754	10.2365	8.4298	4.2365	4.3658
10	8.276969	47.2547	23.3654	10.2663	8.4598	3.1258	5.1257

Reference: research findings

5. Conclusions

The study of asymmetric oil price shock, tax revenues, resource curse, stock market, and business cycles, is a new debatable issue regarding the economic analysis. This is a critical case since there is decreasing opportunity for economic growth through discovery and using new production resources worldwide. Hence, researchers tend to use the maximum capacity of existing resources to achieve potential production. Therefore, knowledge of the process of potential production and its distortion is useful to direct monetary and fiscal policies and to control accelerated inflation and rising unemployment. According to the mentioned points and

results, some recommendations have been proposed herein:

1. To determine an optimal exchange system, conditions of the country must be noted; hence, it is suggested that economic policymakers and officials of the central bank not only adopt a single-rate managed floating exchange rate system instead of a fixed exchange rate considering the consequences of shocks to the foreign exchange rate. Moreover, it is necessary to match other macroeconomic policies, particularly the monetary policy with the exchange regime using inflationary targeting policy because foreign exchange policies without adopting suitable monetary and fiscal policies to inflation control create the spiral of rising inflation-rising foreign exchange-rising inflation.

2. An increase in oil revenues creates more earnings for the government due to intense dependence on oil revenues. Since Iran is a consuming country with high dependence on imports demand, an increase in oil revenues leads to a rise in aggregate demand of the whole economy. An increase in demand of consumers of goods and products leads to a rise in the general level of prices (inflation) due to the lack of production capacity of industry and agriculture. Under such circumstances, imports (that is a direct function to income) from other countries is increased to prevent inflation and rise in the general level of prices owing to increased demand. Moreover, lack of competition power and proper infrastructures in the domestic economy as well as oil rents under the authority of governments, the surplus oil revenues are spent on short-run current costs and investments that have higher profitability in short term instead of investing in the production sector. This has led to an output gap in the economy, and the economy has experienced an overload. Moreover, increased oil revenues and foreign assets of the central bank lead to a rise in the monetary base of the economy and liquidity volume, which in turn causes increased inflation. Expectations from inflation in future period and inflation rate uncertainty highly affects the inflation rate. The higher the uncertainty, the lower the investment in the production sector and the worse the situation of the country will be. Under such circumstances, a gap occurs between potential and actual outputs so the government must invest in production and industry.

3. Since the return on the stock market is one of the most accurate expressed instruments in the economy that has a high sensitivity to economic conditions and also affects the interest rate and public trust, policymakers should adopt some policies to encourage people to exclude their stagnant capitals from banks and invest in the stock market to pave the way for the development of this market.

4. Results of SVAR model estimation indicate that increase in liquidity volume within the first period's leads to increased output but after several periods it causes a decline in liquidity volume. As it was mentioned, increased oil revenues have not been managed well but they have been spent on long-run investments in short-run expenses, which cause inflation and the output gap. The mentioned issues should be solved by governments.

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