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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 using the structural vector autoregression model (SVAR) from 1984 to 2018. According to the results of the estimated SVAR model, an impulse imposed by the duration of sanctions on oil exports led to an 89% increase in the production gap, and impulses caused by liquidity and stock price led to an 86% and 53% rise in the production gap, respectively. Variations in oil and foreign exchange earnings result in different and even conflicting changes in foreign and domestic sectors of the economy, subsequently affecting 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 economic prosperity. Increased exchange rates and decreased domestic money weakness increase foreign debt, which in turn causes liquidity shortages. Overall, the liquidity shortage of financial firms has a negative impact on the return of stock and business cycles. Hence, policymakers must pay considerable attention to macroeconomic indicators.

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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 the 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 the optimized use of oil revenues. Oil rents, in some cases, have intensified the mentioned 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 for various reasons. Monetary and financial crises are also rooted in political-economic factors and market forces affecting the exchange rate of oil-exporting countries. Those countries that experience such a crisis will face stable current account deficits, the increased value of imports relative to net income obtained from exporting goods and services owing to the 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 critical point is that various factors may cause such crises in oil-exporting countries that must be considered within several months and annually. This is not, however, a simple measure. The flawed monetary system, weak economic policymaking, lack of public trust in the economic conditions of the country, changing oil prices in global markets, weak commercial system, and people's concern about the future economic conditions can be named as the 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 and 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 the uncertainty index in foreign exchange policies, liquidity shifts as the uncertainty index in monetary policies, and fluctuations in the 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 GDP fluctuations and causes. Economic recession results in increased unemployment and poverty. Furthermore, increased oscillations and instability can lead to a reduction in investment and economic growth. Under economic recession circumstances, governments face difficulties 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 designing stabilization policies. Irrespective of business cycles' reasons, determining characteristics (duration, extent, and intensity) can be effective for economic policymakers in economic planning and finding the best approach (Hooshmand et al., 2008). Considering the mentioned points, this study examined 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 2 includes a literature review of related theories and results of empirical studies. Section 3 explains the applied model, methodology, and tests. The results of the tests and estimates are reported in Section 4. The summary and conclusions are presented in Section 5.

2. Literature review

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

Oil price shocks might influence economic boom duration. Many theories about the relationship between oil shocks and macroeconomic variables have been raised. Some researchers, such as Hamilton (2013) and Murek (2013), believe there is a direct association between variations in macroeconomic variables and oil shocks, and these shocks cause an economic recession.

Hamilton (2013) indicated that seven recessions out of eight that occurred after World War II in the USA had been influenced by oil shocks. Some studies investigated the shifts in this relationship over time, proving the relationship between macroeconomic variables and oil shocks. Oil shocks also show different effects in short-term and long-term periods. The period affects how the economy matches the new situation and relative prices. For example, in the short term, an increase in oil prices instantly affects the business cycle. Short-term effects of oil shocks are more significant owing to friction in the reallocation of resources and the pause of activities until the elimination of uncertainties, while in the 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 global oil price oscillations due to problems stemming from a single-product economy and overreliance on oil revenues. Nonrealization of the 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 the economy but also affects the economy's future, plans, and projects reversely. The mentioned problems, in turn, cause many problems for economic sectors (Mahdavi Adeli et al., 2012). Therefore, oil prices and revenues might be an exogenous driver for Iran's economic boom or recession. Further, since Iran's economy dramatically depends on oil revenues, uncontrolled fluctuations in this factor cause variations in most economic variables (Barani, 2014).

In general, oil price shocks affect the economic activities of a country in two ways. One is through the impact on the supply side of the economy, which leads to lagged effects on production capacity. The second affects aggregate demand, influencing economic activities (Shakeri, 2017). Some economists do not consider negative and positive oil price shocks in favor of oil-exporting countries. Affected mainly by adverse oil price shocks, the states have to impose more restrictions on the imports of goods and services to supply necessary needs and finance repayment of foreign liabilities through exchange savings. Since a significant part of imports in oil-producing countries, such as Iran, includes 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 rates, economic recession, and 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 long-term inappropriate situations rather than those countries that did not experience any considerable change in their export prices. The adverse effects of price fluctuations, wrong price forecasts, the subsequent rise in the risk of decision-making, and inaccurate use of windfalls (resulting from 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 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 prices on the economy of oil-exporting countries is also studied in the framework of the resource curse. This literary phenomenon refers to a destructive multilateral effect stemming from the increased price of oil and other natural resources on oil exporters' economic, social, and political living conditions. Economists explained this case as a Dutch disease. The Dutch disease leads to increased income and, subsequently, increased domestic demand if the economy faces a sudden rise in the export price of essential commodities such as crude oil. The primary 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 country's competitive advantage internationally 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 these are similar issues. Oil is not a manufacturing good but is an extracted material. Since the extraction and production process of this material is not located in consuming areas, oil can be considered 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 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 forecast prices; this includes data on supply, demand, and market (Darbani, 2018). According to microeconomic principles, increased oil prices have an adverse effect on the profitability of the 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, which are major measures used to determine stock price, will be reduced. There is evidence regarding the positive relationship between oil prices and stock prices. This positive relationship 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 the stock markets of developed countries, such shared impact most likely causes a considerable increase in consequences. Oil price increase in oil-exporting countries is expected to affect stock markets positively through income and wealth effects. This positive effect results from increased government revenues and public spending on 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 and the information and perspective of market parties. Some of these factors are indigenous, and 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 into the foreign exchange reserve. If there is insufficient 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 prices will cause a budget deficit since the government does not decrease its costs and must borrow from the central bank. Therefore, the government's net debt to the central bank will be increased, which, 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 and 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 the income of goods-exporting corporations and an increase in their stock prices (after demand). On the other hand, this increase leads to a decline in earnings and the stock price of intermediate inputs-importing firms. The effect of expectations is the third channel through which the oil price affects the stock price. An increase in oil prices and natural 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 and Schofeng, 2001). The income effect is the fourth channel through which the 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 provides many investment and business opportunities. Therefore, it has a positive effect on the future cash flow of firms. On the other hand, a rising oil price, a production input, means an increase in cost and a reduction in firms' revenues, which affects the future cash flow negatively and declines stock price (Hassanzadeh and Kiavand, 2014). Oil prices 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 most oil-exporting countries import oil products and derivatives due to lack of capacity and technology required for crude oil processing, this case will increase the monetary value of

imports. On the other hand, rising oil price negatively affects future cash flow and reduction in the stock price of firms in such countries (Ebrahimi and Shokri, 2018).

Many economists agree that business cycle driver includes fiscal and monetary policy shocks to consumption and investment demands and business impulses such as shifts in oil price or stock market shocks. However, there is no consensus between them on which of the mentioned shocks effectively describes fluctuations and the business cycle. Regardless of the two perspectives on two sides of the range, many assume that fiscal and monetary policies and crises might, in separation or combination, affect actual 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. An excellent understanding of the effect of these shocks on the economic system, tax revenues, and business cycles can be a perfect guide for making the best policies about other macroeconomic variables. This research has discussed this case within the modeling process of Iran's economy.

2.3. The relation between tax revenues and business cycles

The economic structure of every society comprises some entities, including households, firms, and governments, and the last one needs income to apply collective governance. Tax revenues meet a significant part of these incomes. On the other hand, governments have faced many tasks and duties in the recent century, so they are responsible for pursuing some objectives, such as economic growth, employment, equitable income distribution, economic security, and associated economic issues. Tax revenues are more significant than other revenue resources since they are widely used to control adverse economic effects. The tax amount is not the only substantial element of these decisions; some instruments must also be designed to generate revenues. The effects of different tax rates and tax structures 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 incomes has been done to create an economic environment prone to increase saving, investment, and entrepreneurship.

Moreover, tax reforms have been adopted to expand trade and economic growth to encourage work incentives. Almost all these reforms can be taken to reduce the consumption tax rate to improve production and business cycles. Oil-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, are more exposed to fluctuations, so the permanent effects of such changes on different economic sectors may cause more structural problems. 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, imports, production, 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. The results showed that increases in tax revenues caused by exogenous positive oil price shocks did not change regional income but increased corruption and reduced regional democracy and governance quality. Declines in tax revenues from adverse oil price shocks did not affect institutional quality but decreased regional income.

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

Yin and Feng (2019) studied oil market uncertainty and international business cycle dynamics using the Granger causality model and linear and nonlinear tests. The results showed 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) significantly affected output growth even when 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 could boost the output growth within half a year, and the effect would be absorbed gradually over time. Overall, oil market uncertainty did have a linear leading effect on the international business cycle.

Sydney and colleagues (2019) [2] studied the relationship between economic fluctuations and business cycles using the SVAR model. The results showed that macroeconomic uncertainty in recessions was often an endogenous response to output shocks, while uncertainty about financial markets was a likely source of output fluctuations. Findings also indicated that uncertainty and fluctuations in macroeconomic variables played a vital role in an economic recession, and the leading cause of economic recession included 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 the DOLS panel model from 2005 to 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 significantly impacted gold returns and exchange rate growth, while the GDP growth rate affected oil prices. The individual countries' results suggested a long-run relationship and short-run dynamics between selected variables and most GCC countries' oil prices. These results suggested the need for policies to further reduce dependence on oil since the effect of oil shocks was still significant in these economies.

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

Faaljou and Seyyed Ahmadi (2015) examined the impact of the global financial crisis on the duration of the economic recession in Iran (periodic models approach). To this end, the periodic models' approach was employed to investigate the impacts of the global financial crisis, in addition to other explanatory variables, such as oil revenues, inflation rate, and investment, on the duration of economic recession in Iran from 1971 to 2013. The model estimation results indicated that oil revenues and investment had a negative effect, while the inflation rate and global financial crisis had a positive and significant effect on the duration of the 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. The simulated business cycles from the model were compared with the business cycles from the time series to evaluate the model. The results showed that the model could reproduce the fluctuations in business cycles very well. Moreover, the simulation results indicated that the primary source of business cycles in Iran's economy was technological shocks, while government expenditure had a minor effect on economic fluctuations.

Because the considered subject had not been examined directly in previous studies, this complementary study was conducted to investigate the mechanism of the effects 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 on oil income and vulnerability to oil prices and monetary shocks, the

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

[3] Mohamed Albaity, Hasan Mustafa, 2018

results of the extant study can reveal whether this study is in line with previous Iranian and foreign research. It also indicates how the oil, gold, and exchange price shocks have affected the business cycles of Iran. The results are analyzed through the SVAR model for Iran's economy from 1984 to 2018. Hence, the innovative aspects of this study are as follows. Firstly, a more holistic period is included compared to previous studies. Secondly, more reliable and actual results can be presented due to a more detailed study of data features and their effects and the most authenticated econometric methods matched with these features.

3. Methodology

This study examined 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. Therefore, the research model was designed to trace the effects on the economy of Iran.

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

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

U_{DEXO}: The socks related to the dummy variable of sanction years multiplied by oil exports;
U_{EX}: The shock related to the 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, the identification of structural shocks is made 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

Hodrick-Prescott (HP) filter approach for 1984–2018 is used to measure potential output and show business cycles, and the results are depicted in Figure 1. This variable is entered as GDPgap into the model.

According to Figure 1, the obtained cyclic component determines recession and boom periods. The apsis should be found to determine recession and boom periods using cyclic components. This research reviewed studies by Hamberg and Verstandig (2008) and Chin, Geweke, and Miller (2000) to determine the turning point. The results indicated five cycles in Iran's economy from 1985 to 2018. Accordingly, 1985–1968 and 1989–1991 were the boom periods, and 1992–1995 was the recession period; 1996 was the boom period, and 1997–1999 was the recession period; 2000–2007 was the boom period, and 2008–2009 was the recession period; 2010–2011 was the boom period, and 2012–2015 was the recession period; 2016–2017 was the boom period, and 2018 was the recession period.

4.2. Estimation of SVAR model

When the stationary state of variables is identified, the first step is finding the optimal lag length in autoregression models. To determine the lag length herein, we used Schwarz–Bayesian information criterion (SC), Akaike information criterion (AIC), Final Prediction Error (FPE), Hannan-Quinn information criterion (HQ), and Likelihood Ratio (LR). The results in Table 1 indicate 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 the SC criterion. Ultimately, since SC follows the principle of parsimony and pays more

attention to reducing parameters or soothing the system to a better fit, it is more proper for a small sample size, particularly the sample size selected in this study. Hence, optimal lag one is chosen as the optimal lag of the model.

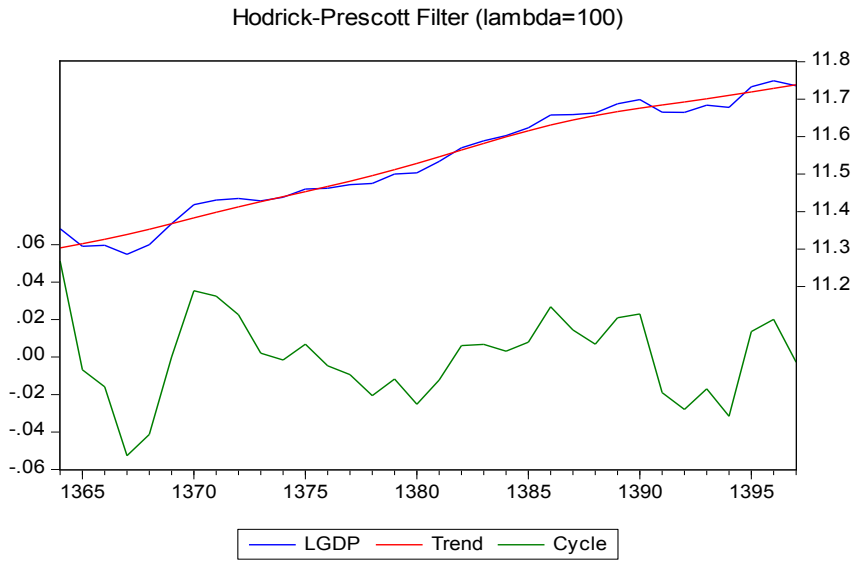

Figure 1: The GDP gap to show business cycles

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*

Note: * represents the lag selected by the criterion.

4.3. Circle unit root test

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

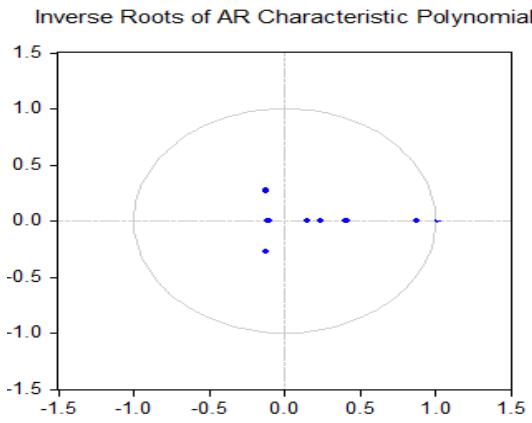

Figure 2: The circle unit root test

4.4. Results of model estimation

The results of the SVAR model are reported in Table 2 to examine the effect of explanatory variables on the output gap. This table indicates the system's structural shocks and summarizes the shock form. In Table 2, @e1 represents the shock related to the dummy variable of sanctions on oil exports, and @e2 represents the shocks related to the exchange rate; @e3 includes liquidity shock, and @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. The results of the model estimation have been reported in Table 2.

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 the 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 the stock price equation C(9)	0.018876	0.016614	1.136126	0.2563
Coefficient of shocks to dummy variable of sanctions on oil exports in tax revenue equation C(11)	–0.611363	0.147189	–4.153601	0.0000
Coefficient of exchange shocks in tax revenue equation C(12)	–1.484398	0.656300	–2.755978	0.0059
Coefficient of liquidity shocks in tax revenue equation C(13)	–0.001008	0.000366	–2.755978	0.0059
Coefficient of stock price shocks in tax revenue 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)	0.530516	0.196940	2.693798	0.0084
Coefficient of tax revenue shock in output gap equation C(20)	0.002923	0.000637	4.586778	0.0000

The most critical 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 shocks, stock price shocks, and tax revenue 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. The 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, affect 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 the capital existing in the production sector remains stagnant or enters the black market and speculation.

In contrast, reduced oil prices or exchange revenues due to adverse oil shocks led to declining imports of intermediary commodities and manufacturing machinery, investment, production, and employment rates in the economy. Therefore, the effect of oil sanctions and liquidity shocks depends on the inflationary conditions that increase investment costs. Therefore, an increase in the inflation rate leads to a higher effect of oil shocks on the output gap and may have a positive effect on the output gap at more excellent inflation rates. Therefore, the determination of the exchange rate not only has an influential 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 Iran's current economic circumstances, 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 depends on the revenues that stem from nonoil exports like many other countries worldwide, the equilibrium exchange rate stemming from the exchange of supply and demand could be the optimal rate.

Nevertheless, despite the crucial role of exogenous high oil revenues in determining the exchange rate, the equilibrium approach might not be optimal for determining the exchange rate in Iran's economy. It is not expected that economic policymakers determine the exchange rate through the equilibrium approach if there is a significant difference between the equilibrium and 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 the bubble growth of the 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, an increased exchange rate leads to economic growth, while a cross-sectional increment in the exchange rate does not lead to economic prosperity. Increased exchange rates and decreased domestic money weakness will increase foreign debt, which in turn causes liquidity shortage. Overall, the liquidity shortage of financial firms negatively impacts the return of stock and business cycles. Moreover, it must be known that an increase in the foreign exchange rate causes a higher probability of capital exclusion from the stock market's entrance to the money market. Therefore, it can be stated that a continuous rise in foreign exchange rates 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 long-run equilibrium results for the SVAR model. In other words, the SVAR model presents two robust instruments for analyzing economic fluctuations, including IRF and ANOVA. Therefore, after estimating the SVAR model, the results of IRF and ANOVA can be assessed. 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 the output gap to an impulse or sudden change is illustrated in Figure 3, considering the size of one standard deviation in each indigenous variable of the 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.

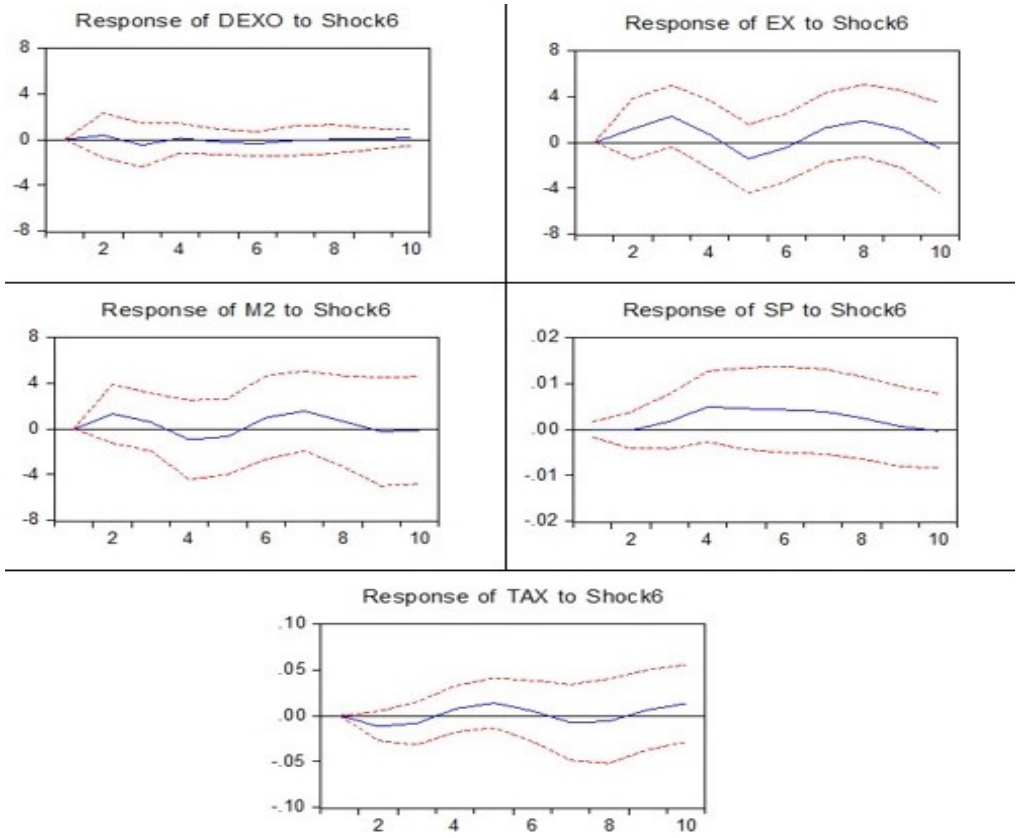

Figure 3: The results of IRFs for the model

According to the results of IRFs (Figure 3) for the model, the effect of shocks imposed by the dummy variable of sanctions on the country's oil export on the output gap has been ascending during the first two periods following its descending process. In other words, the graphical process of oil prices in Iran and the worldwide oil shocks may make Iran's economy respond to positive rather than negative ones. However, whether this positive shock of increased oil price leads to output is asked. According to the 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 the output gap, following its ascending process, and tends to zero in the long term. Moreover, the liquidity shock to the output gap ascends within the first several periods and 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 and then continue their descending trend.

Further, the shock imposed by tax revenues on the output gap descends within two periods and follows its ascending trend. In other words, the effect of oil revenues on Iran's output is like 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 prices, 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)

This part analyzes the variables' variance 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 stems from the change in current values and future shocks, this rate will be increased over time. According to Table 3, the standard error of the first and second periods equals 4.86 and 5.40, respectively and experiences an increase over time. The following 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 stems from oil price shocks, 70.87% of the change in this index is related to the shocks of sanctions on oil exports, 16.45% of change is related to the foreign exchange rate, 5.14% of change is associated with liquidity shock, 14.2% is associated with stock price shock, 1.78% is associated with tax revenues shock, and 0.48% of change is related to output gap shock. Among the variables, sanctions on oil exports, foreign exchange shock, liquidity shock, stock price shock, and tax shock have the highest explanatory power to explain changes in the model during the studied period. This is a justifiable result in Iran's economy, analyzed in this study.

Table 3: The ANOVA of the 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

Studying 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 discovering and using new production resources worldwide. Hence, researchers tend to use the maximum capacity of existing resources to achieve potential production. Therefore, knowledge of potential production and its distortion is useful to direct monetary and fiscal policies and control accelerated inflation and rising unemployment. According to the mentioned points and results, some recommendations are proposed herein:

- Conditions of the country must be noted to determine an optimal exchange system; hence, it is suggested that economic policymakers and officials of the central bank 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 an inflationary targeting policy because foreign exchange policies without adopting suitable monetary and fiscal policies for inflation control create the spiral of rising inflation and rising foreign exchange.
- 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 import 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 (a direct function of income) from other countries are increased to prevent inflation and the general price level owing to increased demand. Moreover, due to the

lack of competition power and proper infrastructures in the domestic economy and oil rents under governments' authority, the surplus oil revenues are spent on short-run current costs and investments with higher short-term profitability 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 the future and inflation rate uncertainty highly affect the inflation rate. The higher the uncertainty, the lower the investment in the production sector and the worse the country's situation will be. Under such circumstances, a gap occurs between potential and actual outputs, so the government must invest in production and industry.

- 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 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.
- The results of the SVAR model estimates indicate that an increase in liquidity volume within the first period leads to increased output, but it causes a decline in liquidity volume after several periods. As mentioned, increased oil revenues have not been managed well but have been spent on long-run investments in short-run expenses, which cause inflation and the output gap. Governments should solve the mentioned issues.

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